JSS Mahavidyapeetha

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE

B. N. ROAD, MYSURU – 570 025

POSTGRADUATE DEPARTMENT OF CHEMISTRY

SYLLABUS FOR M.Sc. DEGREE PROGRAMME IN CHEMISTRY

PROGRAMME CODE: CHE

under

Choice Based Credit System (CBCS) and

Continuous Assessment Grading Pattern (CAGP)

(With effect from 2018-19)

GENERAL REQUIREMENTS

Scheme of Instructions:

A. A Masters Degree program is of 4 semesters-two years duration. A candidate can avail a maximum of 8 semesters – 4 years (in one stretch) to complete Masters Degree (including blank semesters, if any). Whenever a candidate opts for blank semesters, he/ she has to study the prevailing courses offered by the department when he/ she continues his/ her studies.

B. A candidate has to earn a minimum of 76 Credits, for successful completion of a Master Degree. The 76 Credits shall be earned by the candidate by studying Hard Core, Soft Core and Open Elective.

C. **Minimum for Pass:** In case a candidate secures less than Thirty percent in C_1 and C_2 put together, the candidate is said to have DROPPED the course, and such a candidate is not allowed to appear for C_3.

D. In case a candidate secures less than Thirty percent in C_3, or secures more than Thirty percent in C_3 but less than Thirty percent in C_1, C_2 and C_3 put together, the candidate is said to have not completed the course and he/ she may either opt to DROP the course or to utilize PENDING option.

E. **Credits (Minimum) Matrix:** A candidate has to study a minimum of 16 Credits in Soft Core (sum total of 4 semesters) and 04 Credits in Open Elective (in III Semester) for the successful completion of the Masters Degree course. A minimum of 15 students should register for every Soft Core or Open Elective course.

F. All other rules and regulations hold good which are governed by the College/ University.

GENERAL SCHEME WITH RESPECT TO THE ASSESSMENT OF CREDITS

Semester	Hard Core (HC)		Total	Soft Core (SC)		Total	Open Elective (OE)
	Theory	Practicals		Theory	Practicals		
I	3+3+3+3=12	(4+4)+(4+4)=08[a]	**20**	2+2+2+2=08[b]	NIL	**08[b]**	NIL
II	3+3+3+3=12	(4+4)+(4+4)=08[a]	**20**	2+2+2+2=08[b]	NIL	**08[b]**	NIL
III	3+0+3+0=06	NIL	**06**	0+(2x2)+0+(2x2)=08	(4+4)+(4+4)=08[a,c]	**16**	04
IV	0+3+0+3=06	NIL	**06**	(2x2)+0+(2x2)+0=08	4[d]+(4+4)+(4+4)=08[a,c]	**18**	NIL
Grand Total	**36**	**16**	**52**	**26**	**16**	**42**	**04**

[a]Fifty percent of the students will attend Analytical/ Inorganic Practicals and remaining Fifty percent students will attend Organic/ Physical Practicals in I or III Semester and *vice-versa* during II or IV Semester.

[b]Courses are common for both I and II Semesters and the candidate can opt any course of his/ her choice in aforesaid semesters and should ascertain that the course/ s already studied in I Semester are not repeated in the II Semester.

[c]Practicals are only for chemistry students which are compulsory courses.

[d]Dissertation/ Project work

SCHEME OF STUDY AND EXAMINATION

FIRST SEMESTER
HARD CORE

THEORY

Course Code	Course Title	Contact Hours/ Week	Credits	Max. Marks/ Course	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration	Max. Marks
CHA 130	Fundamentals of Chemical Analysis	03	03	100	15	15	03	70
CHA 140	Inorganic Chemistry-I	03	03	100	15	15	03	70
CHA 150	Organic Chemistry-I	03	03	100	15	15	03	70
CHA 160	Physical Chemistry-I	03	03	100	15	15	03	70

PRACTICALS

Course Code	Course Title	Contact Hours/ Week	Credits	Max. Marks/ Course	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration	Max. Marks
CHA 050	Analytical Chemistry Practicals	08	04	100	15	15	06	70
CHA 060	Inorganic Chemistry Practicals	08	04	100	15	15	06	70
CHA 070	Organic Chemistry Practicals	08	04	100	15	15	06	70
CHA 080	Physical Chemistry Practicals	08	04	100	15	15	06	70

Note: Fifty percent of the students will attend Analytical and Inorganic practicals and remaining Fifty percent of the students will attend Organic and Physical practicals in I semester and *vice-versa* during II semester.

SOFT CORE

THEORY

Course Code	Title	Contact Hours/ Week	Credits	Max. Marks/ Course	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration	Max. Marks
CHA 500	Applied Analysis I	02	02	100	15	15	03	70
CHA 510	Frontiers in Inorganic Chemistry	02	02	100	15	15	03	70
CHA 520	Reaction Mechanisms	02	02	100	15	15	03	70
CHA 530	Solid State Chemistry and Chemistry of Nano Materials	02	02	100	15	15	03	70

SECOND SEMESTER
HARD CORE

THEORY

Course Code	Course Title	Contact Hours/ Week	Credits	Max. Marks/ Course	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration	Max. Marks
CHB 090	Separation Techniques	03	03	100	15	15	03	70
CHB 100	Advanced Coordination Chemistry	03	03	100	15	15	03	70
CHB 170	Organic Chemistry-II	03	03	100	15	15	03	70
CHB 120	Physical Chemistry - II	03	03	100	15	15	03	70

PRACTICALS

Course Code	Course Title	Contact Hours/ Week	Credits	Max. Marks/ Course	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration	Max. Marks
CHB 130	Analytical Chemistry Practicals	08	04	100	15	15	06	70
CHB 140	Inorganic Chemistry Practicals	08	04	100	15	15	06	70
CHB 150	Organic Chemistry Practicals	08	04	100	15	15	06	70
CHB 160	Physical Chemistry Practicals	08	04	100	15	15	06	70

Note: It is same as that of I Semester. Students who have studied Analytical/ Inorganic or Organic/ Physical Practicals will get interchanged during II Semester.

SOFT CORE

All the courses are common for both I and II Semesters and the candidate can opt any course of his/ her choice in aforesaid semesters and should ascertain that the course/ s already studied in I Semester are not repeated in the II Semester.

THEORY

Course Code	Title	Contact Hours/ Week	Credits	Max. Marks/ Course	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration	Max. Marks
CHB 500	Applied Analysis I	02	02	100	15	15	03	70
CHB 510	Frontiers in Inorganic Chemistry	02	02	100	15	15	03	70
CHB 520	Reaction Mechanisms	02	02	100	15	15	03	70
CHB 530	Solid State Chemistry and Chemistry of Nano Materials	02	02	100	15	15	03	70

THIRD SEMESTER

HARD CORE

THEORY

Course Code	Course Title	Contact Hours/ Week	Credits	Max. Marks/ Course	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration	Max. Marks
CHC 030	Instrumental Methods of Analysis	03	03	100	15	15	03	70
CHC 040	Spectroscopy	03	03	100	15	15	03	70

OPEN ELECTIVE (for Non-Chemistry Students only)

Course Code	Course Title	Contact Hours/ Week	Credits	Max. Marks/ Course	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration	Max. Marks
CHC 600	Selected Topics in Chemistry	04	04	100	15	15	03	70

SOFT CORE

THEORY

Course Code	Course Title	Contact Hours/ Week	Credits	Max. Marks/ Course	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration	Max. Marks
CHC 500	Inorganic Chemistry-II	02	02	100	15	15	03	70
CHC 510	Structural Methods in Inorganic Chemistry	02	02	100	15	15	03	70
CHC 520	Biophysical Chemistry and polymers	02	02	100	15	15	03	70
CHC 530	Applications of Chemical Kinetics and Quantum Chemistry	02	02	100	15	15	03	70

PRACTICALS

Course Code	Course Title	Contact Hours/ Week	Credits	Max. Marks/ Course	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration	Max. Marks
CHC 210	Analytical Chemistry Practicals	08	04	100	15	15	06	70
CHC 220	Inorganic Chemistry Practicals	08	04	100	15	15	06	70
CHC 230	Organic Chemistry Practicals	08	04	100	15	15	06	70
CHC 240	Physical Chemistry Practicals	08	04	100	15	15	06	70

Note: 1. Fifty percent of the students will attend Analytical and Inorganic practicals and remaining Fifty percent of the students will attend Organic and Physical practicals in III semester and *vice-versa* during IV semester.

2. Practicals papers are only for chemistry students which are compulsory

FOURTH SEMESTER
HARD CORE

THEORY

Course Code	Course Title	Contact Hours/ Week	Credits	Max. Marks/ Course	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration	Max. Marks
CHD 010	Bioinorganic Chemistry	03	03	100	15	15	03	70

CHD 020	Advanced Physical Chemistry	03	03	100	15	15	03	70

SOFT CORE

THEORY

Course Code	Title	Contact Hours/ Week	Credits	Max. Marks/ Course	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration	Max. Marks
CHD 500	Applied Analysis II	02	02	100	15	15	03	70
CHD 510	Applied Analysis III	02	02	100	15	15	03	70
CHD 520	Retrosynthesis and Organometallic Chemistry	02	02	100	15	15	03	70
CHD 530	Biomolecules and Natural Products	02	02	100	15	15	03	70

PRACTICALS

Course Code	Course Title	Contact Hours/ Week	Credits	Max. Marks/ Course	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration	Max. Marks
CHD 210	Analytical Chemistry Practicals	08	04	100	15	15	06	70
CHD 220	Inorganic Chemistry Practicals	08	04	100	15	15	06	70
CHD 230	Organic Chemistry Practicals	08	04	100	15	15	06	70
CHD 240	Physical Chemistry Practicals	08	04	100	15	15	06	70

Note: It is same as that of III Semester. Students who have studied Analytical/ Inorganic or Organic/ Physical Practicals will get interchanged during IV Semester.

PROJECT /DISSERTATION WORK

Course Code	Course Title	Contact Hours/ Week	Credits	Max. Marks/ Course	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration	Max. Marks
CHD 250	Project /Dissertation Work	08	04	100	15	15	06	70

SCHEME OF EXAMINATION FOR C_1, C_2 AND C_3 COMPONENTS

Preamble: In view of the CBCS syllabus, following is the model distribution of marks for C_1, C_2 and C_3 Components. At a glance, the model includes both theory (HC/ SC/ OE) as well as practicals (HC/ SC) assessment of marks.

The following is the scheme which will be followed for the assessment of marks for both theory (HC/ SC/ OE) as well as practicals (HC/ SC) irrespective of the Credits associated with each Course. Thirty percent of the marks will be assessed for the internals (C_1 and C_2) and remaining seventy percent will be for the semester end examinations (C_3). Each Course carries 100 marks and hence thirty marks for internal assessment and remaining seventy marks will be for Semester End Examinations. Out of thirty marks for internals, fifteen marks will be allotted to each C_1 and C_2 components. The distribution of marks for C_1 and C_2 varies with HC and SC papers.

Each theory Course (HC/ SC/ OE) consists of three components namely C_1, C_2 and C_3. C_1 and C_2 are designated as Internal Assessment (IA) and C_3 as Semester End Examination. Each Course (HC/ SC/ OE) carries **100 Marks** and hence the allotment of marks to C_1, C_2 and C_3 Components will be fifteen, fifteen and seventy marks respectively. i.e.,

C_1 Component	: 15 Marks	Internal Assessment Marks
C_2 Component	: 15 Marks	
C_3 Component	: 70 Marks	Semester End Examination
Total	**: 100 Marks**	

The above will be followed in common for all the theory (HC/ SC/ OE) and practical (HC/ SC) Courses in all the four semesters.

1. THEORY:

1.1. HARD CORE (03 CREDITS COURSES)

1.1.1 Distribution of Marks for C_1 and C_2 Components (I/ II Semesters):

IA consists of fifteen marks for each component it will be divided into three parts viz., ***Internal Test, Home Assignment and Seminar***. Internal tests will be conducted during the 8th Week of the semester for C_1 and 16th Week of the semester for C_2. Home Assignment will be

concerned for C_1 Component and Seminar for C_2 Component only. Hence, a teacher may give only one assignment (or in their personal interest one more may be given). Since each Course has three units, the marks shall be divided equally. Allotment of marks for C_1 and C_2 is as follows: Out of fifteen Marks for IA for C_1, Internal test will be conducted for Thirty Marks (reduced to 10 Marks) and Home Assignment will be given for 05 Marks (Each Home Assignment from every unit will be assessed for 05 Marks and finally reduced to 05 Marks). IA for C_2 will be distributed as follows: Internal test will be conducted for Thirty Marks (reduced to 10 Marks) and Seminar will be assigned for 05 Marks for the favor of IA. Please note that actual Seminar will be assessed for 20 Marks and finally 05 Marks will be distributed to each theory HC Course. i.e.,

C_1		**C_2**	
Internal Test	: 30 Marks (10+10+10) **Reduced to 10 Marks**	Internal Test	: 30 Marks (10+10+10) **Reduced to 10 Marks**
Home Assignment	: 15 Marks (05+05+05) **Reduced to 05 Marks**	Seminar	: 20 Marks (05+05+05+05) **Distributed 05 Marks to each HC Course**
Total	**: 15 Marks**	**Total**	**: 15 Marks**

1.1.1a Distribution of Marks for C_1 and C_2 Components (III/ IV Semesters):

The modalities discussed above in 1.1.1 holds good for this also except for Seminar component. Seminar will be assigned for 05 Marks for the favor of IA. Please note that actual Seminar will be assessed for 10 Marks and finally 05 Marks will be distributed to each theory HC Course. i.e.,

C_1		**C_2**	
Internal Test	: 30 Marks (10+10+10) **Reduced to 10 Marks**	Internal Test	: 30 Marks (10+10+10) **Reduced to 10 Marks**
Home Assignment	: 15 Marks (05+05+05) **Reduced to 05 Marks**	Seminar	: 10 Marks (05+05) **Distributed 05 Marks to each HC Course**
Total	**: 15 Marks**	**Total**	**: 15 Marks**

1.1.2 Distribution of Marks for C_3 Component (Semester End Examination):

The question paper is of 3 hr duration with Max. Marks 70. The following question paper pattern will be followed for all the theory Courses (HC/ SC/ OE). Question paper will have 2 parts both parts will cover all units of the course with equal proportional of distribution. Part A is of Short Answer Type questions which will have ten questions and each question carries two

Marks. Part B carries fifty Marks and comprises of seven questions where in a student has to answer any five. Each question carries ten marks with sub question i.e.,

Model Question Paper Pattern:

Max. Duration: 3 Hr **Max. Marks: 70**

Note: *Question paper has two parts, answer both the parts*.

PART A

Ten questions will be given and all ten should be answered. Each question carries two marks.

10 x 2 = 20

PART B

Seven questions will be given and any five should be answered. Each question carries Ten marks. An examiner may distribute marks as (3+3+4), (5+5), (7+3) & (4+6). Two marks question shall be avoided to maximum extent. **5 x 10 = 50**

1.2 SOFT CORE (02 CREDITS COURSES):

1.2.1 Distribution of Marks for C_1 and C_2 Components:

IA consists of 15 marks for each components; it will be divided into two parts viz., ***Internal Test and Home Assignment***. Internal tests will be conducted during the 8th Week of the semester for C_1 and 16th Week of the semester for C_2. As far as Home Assignment is concerned, the concerned teacher will assign one or two Home Assignments to each student. Since each Course has two units, the marks will be divided equally. Allotment of marks for C_1 and C_2 is as follows: Out of 15 Marks for IA, Internal tests will be conducted for 10 marks and Home Assignment for 05 Marks. i.e.,

C_1		**C_2**	
Internal Test	: 20 Reduced to10	Internal Test	: 20 Marks 10
Home Assignment	: 10 Marks **Reduced to 05**	Home Assignment	: 10 Marks **Reduced to 05**
Total	**: 15 Marks**	**Total**	**: 15 Marks**

1.2.2 Distribution of Marks for C_3 Component (Semester End Examination):

The above discussed pattern (1.1.2) holds good in this case also.

1.3 OPEN ELECTIVE (04 CREDITS COURSE):

1.3.1 Distribution of Marks for C_1 and C_2 Components:

IA consists of 15 marks for each components; it will be divided into two parts viz., ***Internal Test and Home Assignment***. Internal tests will be conducted during the 8th Week of the semester for C_1 and 16th Week of the semester for C_2. As far as Home Assignment is concerned, the concerned teacher will assign one or two Home Assignments to each student. Allotment of marks for C_1 and C_2 is as follows: Out of 15 Marks for IA, Internal tests will be conducted for 20 marks and reduced to 10 Home Assignment for 05 Marks. i.e.,

C_1		**C_2**	
Internal Test	: 20 Marks **Reduced to 10**	Internal Test	: 20 Marks **Reduced to 10**
Home Assignment	: 20 Marks **Reduced to 05**	Home Assignment	: 20 Marks **Reduced to 05**
Total	**: 15 Marks**	**Total**	**: 15 Marks**

1.3.2 Distribution of Marks for C_3 Component (Semester End Examination):

The above discussed pattern (1.1.2) holds good in this case also.

2. PRACTICALS (04 CREDITS COURSES):

The following scheme will be applicable for both HC and SC in all the four semesters (SC courses are for chemistry students only which are compulsory Courses).

Each practical (HC/ SC) consists of three components namely C_1, C_2 and C_3. C_1 and C_2 are designated as Internal Assessment (IA) and C_3 as Semester End Examination. Each practical (HC/ SC) carries **100 Marks** and hence the allotment of marks to C_1, C_2 and C_3 Components will be fifteen, fifteen and seventy marks respectively. i.e.

C_1 Component	: 15 Marks	} Internal Asessment Marks
C_2 Component	: 15 Marks	
C_3 Component	: 70 Marks	Semester End Examination
Total	**: 100 Marks**	

2.1 Distribution of Marks for C_1 and C_2 Components:

IA consists of **15 Marks**; it will be divided into three parts viz., ***Internal Test, Continuous Assessment and Record***. Continuous assessment refers to the daily assessment of

each student based on his/ her attendance, skill, results obtained etc. Thus, three marks are allotted for Continuous Assessment. Internal tests will be conducted for ten marks during the 8th Week of the semester for C_1 and 16th Week of the semester for C_2. Finally, remaining two Marks will be for the record. i.e.,

C_1		**C_2**	
Internal Test	: 10 Marks	Internal Test	: 10 Marks
Continuous Assessment	: 03 Marks	Continuous Assessment	: 03 Marks
Record	: 02 Marks	Record	: 02 Marks
Total	**: 15 Marks**	**Total**	**: 15 Marks**

5.1.2 Distribution of Marks for C_3 Component (Semester End Examination):

The end examination will be conducted for **seventy Marks/ Course** with a maximum duration of six hours. Two experiments will be given to each student which carries thirty Marks each. Each student will be subjected to Viva-Voce Examination for which ten Marks is allotted. i.e.,

Two Experiments	: 60 Marks
Viva-Voce	: 10 Marks
Total	**: 70 Marks**

2.3 Evaluation of Project Work/ Dissertation (Minor):

Each student can take up Project Work/ Dissertation under the guidance of the faculty of the department during the IV Semester as a Soft Core course.

2.3.1 Distribution of Marks for C_1 and C_2 Components:

IA consists of **fifteen Marks** for each components; it will be divided into three parts viz., ***Attendance, Continuous Assessment and Work Progress***. Continuous assessment refers to the daily assessment of each student based on his or her skill, results obtained, literature survey etc. C_1 will be assessed during the 8th Week of the semester and C_2 during the 16th Week of the semester. Hence, the concerned guide will prepare the marks list based on the above said parameters for both C_1 and C_2 Components.

2.3.2 Distribution of Marks for C_3 Component (Semester End Examination):

The semester end examination will be conducted for **seventy Marks**. Every student is suppose to prepare a hard copy of the findings of the work in the form of report and submitted for

evaluation. This part will be assessed for fourth Marks. Each student will be subjected to Viva-Voce Examination for which thirty Marks is allotted. i.e.,

Evaluation of Report	: 40 Marks
Viva-Voce	: 30 Marks
Total	**: 70 Marks**

Programme Outcomes (POs)
At the end of the programme the student able to:

POID	PO
39167	Work in the pure, interdisciplinary and multidisciplinary areas of chemical sciences and its applications.
39159	Learn about the potential uses of analytical, inorganic, organic and physical chemistry.
39165	Acquire knowledge, abilities and insight in well-defined area of research within Chemistry.
39168	Plan and execute research in frontier areas of chemical sciences.
39162	Develop knowledge of scientific theories and methods, gain experience in working independently with scientific questions and clearly express opinion on academic issues.
39163	Acquire the skills of planning and conducting advanced experiments by applying suitable simple and sophisticated analytical techniques.
39169	Learn professionalism, including the ability to work in teams and apply basic ethical principles.
39166	Adopt the skills and knowledge required to the professional life, and to qualify for training as scientific researcher.
39160	Develop scientific communication skills for differently specialized and non-specialized audiences.

POID	PO
39161	Gather attention about the physical aspects of chemistry.
39164	Examine specific phenomena theoretically and/or experimentally, contribute to the generation of new scientific insights or to the innovation of new applications of research in Chemistry.

Programme Specific Outcome (PSOs)

After completion of this programme the candidate able to

PSOID	PSOs
PSO1	Think and teach aspects of chemistry to the different levels of students in a futuristic manner.
PSO2	Reach the positions by employment in chemical, pharmaceutical, food and material industries.
PSO3	Reach a level to think about the scientific situations existing around him/her.
PSO4	Take up Global level research opportunities to pursue Ph.D. programme and will be more resourceful and will have targeted approach to qualify CSIR- NET and other competitive examinations.
PSO5	Analyse data obtained from sophisticated instruments for the structure determination and chemical analysis.
PSO6	Understand the background of organic mechanism and instrumental methods of chemical analysis.
PSO7	Apply modern methods of analysis to chemical systems in a laboratory setting.
PSO8	Find placements in R & D and synthetic division of polymer industries & allied division.
PSO9	Explore new areas of research in both chemistry and allied fields of science and technology.

FIRST SEMESTER

THEORY – HARD CORE

Course Title: FUNDAMENTALS OF CHEMICAL ANALYSIS
Course Code: CHA 130
Course Outcomes
After studying this course the student able to:

COID	CO
47457	Learn in depth Language of analytical chemistry, Errors and treatment of analytical data.
47470	Specify in depth Titrimetric analysis, Acid-base titrations in non-aqueous media, Precipitation titrations.
47494	Learn in depth Complexometric titrations, Redox titrations, Obtaining and preparing samples for analysis.

UNIT – I

Analytical Chemistry–Meaning, role, central location of analytical chemistry. Quantitative and qualitative analysis.Steps in quantitative analysis.

Language of analytical chemistry - Analysis, determination and measurement.Techniques, methods, procedures and protocols.Classifying analytical techniques.

Errors and treatment of analytical data: Limitations of analytical methods – Error: determinate and indeterminate errors, minimization of errors. Accuracy and precision,distribution of random errors, the normal error curve. Statistical treatment of finite samples-measures of central tendency and variability: mean, median, range, standard deviation and variance. Student's t-test,confidence interval of mean.Testing for significance-comparison of two means and two standard deviations.Comparison of an experimental mean and a true mean.Criteria for the rejection of an observation- Q-test. Propagation of errors: determinate errors and indeterminate errors.

Standardization and calibration: Comparison with standards-direct comparison and titrations. External standard calibration-the least squares methods, regression equation, regression coefficient. Internal standard methods and standard-addition methods.

Selecting an analytical method: Accuracy, precision, sensitivity, selectivity, robustness and ruggedness,scale of operation, equipment, time and cost.Making the final choice.Figures of merit of analytical methods–sensitivity, detection and quantitation limit, linear dynamic range.

[16 HOURS]

UNIT – II

Titrimetric analysis: An overview of titrimetry. Principles of titrimetric analysis. Titration curves. Titrations based on acid-base reactions-titration curves for strong acid and strong base, weak acid and strong base and weak base and strong acid titrations. Selecting and evaluating the end point. Finding the end point by visual indicators, monitoring *p*H and temperature. Quantitative applications – selecting and standardizing a titrant, inorganic analysis-alkalinity, acidity and free CO_2 in water and waste waters, nitrogen, sulphur ammonium salts, nitrates and nitrites, carbonates and bicarbonates. Organic analysis-functional groups like carboxylic acid, sulphonic acid, amine, ester, hydroxyl, carbonyl. Air pollutants like SO_2.Quantitative calculations. Characterization applications-equivalent weights and equilibrium constants.

Acid-base titrations in non-aqueous media: Role of solvent in acid-base titrations, solvent systems, differentiating ability of a solvent, some selected solvents, titrants and standards, titration curves, effect of water, determining the equivalence point, typical applications-determination of carboxylic acids, phenols and amines.

Precipitation titrations: Titration curves, feasibility of precipitation titrations, factors affecting shape - titrant and analyte concentration, completeness of the reaction, titrants and standards, indicators for precipitation titrations involving silver nitrate, the Volhard, the Mohr and the Fajan's methods, typical applications.

[16 HOURS]

UNIT – III

Complexometric titrations: Complex formation reactions, stability of complexes, stepwise formation constants, chelating agents, EDTA-acidic properties, complexes with metal ions, equilibrium calculations involving EDTA, conditional formation constants, derivation of EDTA titration curves, effect of other complexing agents, factors affecting the shape of titration curves-completeness of reaction, indicators for EDTA titrations-theory of common indicators, titration methods employing EDTA-direct, back and displacement titrations, indirect determinations, titration of mixtures.

Redox titrations: Balancing redox equations, calculation of the equilibrium constant of redox reactions, calculating titration curves, detection of end point, visual indicators and potentiometric end point detection. Quantitative applications-adjusting the analyte's oxidation state, selecting and standardizing a titrant. Inorganic analysis-chlorine residuals, dissolved oxygen in water, water in non-aqueous solvents. Organic analysis-chemical oxygen demand (COD) in natural and waste waters, titrations of mercaptans and ascorbic acid with $I_3^-$and titration of organic compounds using periodate.

Obtaining and preparing samples for analysis: Importance of sampling, designing a sample plan-random, judgement, systematic-judgement, stratified and convenience sampling. Type of sample to collect - grab and composite samples. *Insitu* sampling. Size of sample and number of samples.Implementing the sampling plan - solutions, gases and solids. Bringing solid samples into solution - digestion and decomposing.

[16 HOURS]

References

1. Fundamental of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch, 8th edition, 2005, Saunders College Publishing, New York.
2. Analytical Chemistry, G.D. Christian, 5th edition, 2001, John Wiley & Sons, Inc, India.
3. Quantitative Analysis, R.A. Day and A.L. Underwood, 6th edition,1993,Prentice Hall, Inc. New Delhi.
4. Vogel's Textbook of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J.D. Barnes and M.J.K. Thomas, 6th edition, Third Indian Reprint, 2003, Pearson Education Pvt. Ltd., New Delhi.
5. Analytical Chemistry Principles, John H. Kennedy, 2nd edition, Saunders CollegePublishing, California, 1990.
6. Principles and Practice of Analytical Chemistry, F.W. Fifield and Kealey, 3rd edition, 2000, Blackwell Sci., Ltd. Malden, USA.
7. Modern Analytical Chemistry, David Harvey, McGraw Hill, New Delhi, 2000.

Course Title: INORGANIC CHEMISTRY-I
Course Code: CHA 140
Course Outcomes

After studying this course the student able to:

COID	CO
48345	Understand the details of Molecular symmetry and group theory and applications, Representation of groups.
48356	Learn in details with examples VSEPR model , Non-aqueous solvents, Electron deficient compounds, Lanthanides & Actinides.
48360	Understand the classification and characteristics of Organometallics of transition metals.
48367	Specify in depth Ferrocene and ruthenocene, Complexes containing alkene, alkyne, arene and allyl ligands.

UNIT – I

Molecular symmetry and group theory: Symmetry elements and symmetry operations. Concept of a group, definition of a point group. Classification of molecules into point groups. Subgroups. Schoenflies and Hermann-Maugin symbols for point groups. Multiplication tables (C_n, C_{2V} and C_{3V}). Matrix notation for the symmetry elements. Classess and similarity transformation.

Representation of groups: The Great Orthogonality theorem and its consequences. Character tables (C_s, C_i, C_2, C_{2v}, C_{2h} and C_{3v}).

Applications of group theory: Group theory and hybrid orbital. Group theory to Crystal field theory and Molecular orbital theory (octahedral and tetrahedral complexes). Determining the symmetry groups of normal modes (both linear and non-linear molecules).

[16 HOURS]

UNIT – II

Structures and energetics of inorganic molecules: Introduction, Energetics of hybridization. VSEPR model for explaining structure of AB, AB_2E, AB_3E, AB_2E_2, ABE_3, AB_2E_3, AB_4E_2, AB_5E and AB_6 molecules. M.O. treatment of homonuclear and heteronuclear diatomic molecules. M.O. treatment involving delocalized π-bonding (CO_3^{2-}, NO_3^-, NO_2^-, CO_2 and N_3^-).

Non-aqueous solvents: Classification of solvents, Properties of solvents (dielectric constant, donor and acceptor properties) protic solvents (anhydrous H_2SO_4, HF and glacial acetic acid) aprotic solvents (liquid SO_2, BrF_3 and N_2O_4). Solutions of metals in liquid ammonia. Super acids.

Electron deficient compounds: Higher boranes, polyhedral boranes (preparations, properties, structure and bonding). Wade's rules, carboranes and metallocarboranes.

Lanthanides & Actinides: Spectral & magnetic properties. Use of lanthanide compounds as shift reagents.

[16 HOURS]

UNIT – III

Fundamental concepts: Introduction, Classification of organometallic compounds by bond type, nomenclature, the effective atomic number rule, complexes that disobey the EAN rule, common reactions used in complex formation.

Organometallics of transition metals: Preparation, bonding and structures of nickel, cobalt, iron and manganese carbonyls. Preparation and structures of metal nitrosyls in organometallics.

Ferrocene and ruthenocene: Preparation, structure and bonding.

Complexes containing alkene, alkyne, arene and allyl ligands: preparation, structure and bonding. The isolobal principles.

[16 HOURS]

References:

1. Symmetry and spectroscopy of molecules, 2nd Ed. Veera Reddy, New Age International Publication (2009).
2. Group Theory and its Chemical Applications, P.K. Bhattacharya, Himalaya Publishing House (1986).
3. Chemical Applications of Group Theory, 3rd Ed., F.A. Cotton,Wiley, New York (1990).
4. Inorganic Chemistry, 3rd edition. James E. Huheey, Harper and Row Publishers (1983).
5. Inorganic Chemistry, 3rd edition. G.L. Miessler and D.A. Tarr, Pearson Education (2004).
6. Inorganic Chemistry, 4th edition. P. Atkins, T. Overton, J. Rourke, M. Weller and F. Armstrong, Oxford University Press (2004).
7. Inorganic Chemistry, 2nd edition. C.E. Housecroft and A.G. Sharpe, Pearson Education Ltd. (2005).
8. Basic Organometallic Chemistry - B.D. Gupta and A.J. Elias, Universities Press (2010).

Course Title: ORGANIC CHEMISTRY-I
Course Code: CHA 150
Course Outcomes

After studying this course the student to:

COID	CO
49763	Learn in details with examples Stereoisomerism, Stereoselectivity, Optical, Geometrical, isomerism and Conformational isomerism.
49791	Understand in details with examples Molecular rearrangements, Carbon to carbon migration, Carbon to nitrogen migration.
49796	Learn in details with examples Miscellaneous rearrangements.
49802	Learn the classification and characteristics of Heterocyclic chemistry.

UNIT – I

Stereoisomerism: Projection formulae [Fly wedge, Fischer, Newman and Saw horse], enantiomers, diasteroisomers, configurational notations of simple molecules, *DL* and *RS* configurational notations.

Stereoselectivity: Stereoselective reactions, diasteroselective reactions, stereospecific reactions, regioselective and regiospecific reactions, enantioselective and enantiospecific reactions.

Optical isomerism: Conditions for optical isomerism, Elements of symmetry – plane of symmetry, centre of symmetry, alternating axis of symmetry (rotation-reflection symmetry);

optical isomerism due to chiral centers and molecular dissymmetry, allenes and biphenyls, criteria for optical purity.

Geometrical isomerism: Due to C=C, C=N and N=N bonds, E, Z conventions, determination of configuration by physical and chemical methods.

Conformational isomerism: Elementary account of conformational equilibria of ethane, butane and cyclohexane. Conformation of cyclic compounds such as cyclopentane, cyclohexane, cyclohexanone derivatives and decalins. Conformational analysis of 1,2, 1,3, and 1,4-disubstituted cyclohexane derivatives and *D*-Glucose, Effect of conformation on the course/ rate of reactions.

[16 HOURS]

UNIT – II

Molecular rearrangements: Introduction

Carbon to carbon migration: Pinacol-pinacolone, Wagner-Meerwein, Benzidine, Demjanov, benzylic acid, Favorskii, Arndt-Eistert synthesis, Fries rearrangement, Steven's rearrangement, dienophine rearrangement.

Carbon to nitrogen migration: Hofmann, Curtius, Lossen, Schmidt and Beckmann rearrangements.

Miscellaneous rearrangements: Sommelet-Hauser, Wittig, Smiles, Neber, Japp-Klingemann rearrangement, Meisenheimer rearrangements, Bayer-Villeger rearrangement, Allylic rearrangements.

[16 HOURS]

UNIT – III

Heterocyclic chemistry: Nomenclature of heterocyclic systems

Structure, reactivity, synthesis and reactions of indole, pyridine, benzofuran, quinoline, isoquinoline, pyrazole, imidazole, pyrone, coumarin, chromones, pyrimidines and purines. Synthesis and synthetic applications of azirines and aziridines, isoxazole, oxazole and azepine.

[16 HOURS]

References:

1. H. Pine, Hendrickson, Cram and Hammond, Organic Chemistry, Mc Graw Hill, New York, 1987.
2. Organic Chemistry by Morrison & Boyd.
3. I.L. Finar, Organic Chemistry, ELBS Longmann, Vol. I & II, 1984.
4. E.L. Eliel and S.H. Wilen, Stereochemistry of Organic Compounds, John Wiley and Sons, New York. 1994.

5. Introduction to Stereochemistry by K. Mislow.
6. Basic Principles of Organic Chemistry by Roberts & Caserio
7. N.S. Issacs, Reactive Intermediates in Organic Chemistry, John Wiley and Sons, New York.1974.
8. R.K. Bansal, Organic Reaction Mechanism, Wiley Eastern Limited, New Delhi, 1993.
9. J. March, Advanced Organic Chemistry, Wiley Interscience, 1994.
10. E.S. Gould, Mechanism and Structure in Organic Chemistry, Halt, Rinhart & Winston, New York, 964.
11. A Guide Book to Mechanism in Organic Chemistry by Petersykes
12. Stereochemistry and Mechanism through Solved Problems by P.S. Kalsi.
13. Text book of Organic Chemistry by P.S. Kalsi.
14. F.A. Carey and Sundberg, Advanced Organic Chemistry – Part A & B, 3rd edition, Plenum Press, New York, 1990.
15. D. Nasipuri, Stereochemistry of Organic Compounds, 2nd edition, Wiley Eastern Limited, New Delhi, 1991.
16. S.K. Ghosh, Advanced General Organic Chemistry, Book and Alleied (P) Ltd, 1998.
17. Heterocyclic Chemistry – Joule & Smith
18. Heterocyclic Chemistry – Achaeson
19. Basic Principles of Heterocyclic Chemistry – L.A. Pacquette
20. Comprehensive Heterocyclic Chemistry – Kartritzky series, Pergamon Press, New York, 1984.

Course Title: PHYSICAL CHEMISTRY-I
Course Code: CHA 160
Course Outcomes
After studying this course the student to:

COID	CO
51245	Learn in depth Concepts of entropy and free energy, Partial molar properties.
51250	Learn the details of Fugacity, Statistical thermodynamics.
51272	Learn the details of Chemical Kinetics, Kinetics of reactions in solution, Linear free energy, Enzyme kinetics.
51303	Learn the characteristics of Electrochemistry, Energetics of cell reactions, Corrosion.

UNIT – I

Concepts of entropy and free energy: Second law of thermodynamics, definition of entropy,entropy of phase transition,entropy change during spontaneous process. Helmholtz and Gibbs free energies,Maxwellrelations,Variation of free energy with temperature and pressure. Third law of thermodynamics,Nernst heat theorem & its applications,numericals based on entropy and free energy changes.

Partial molar properties: Partial molar quantities,Partial molar gibbsfunction,Partial molar volume and its determination by intercept method and density measurements.Chemical potential and its significance. Variation of chemical potential with temperature and pressure.Formulation of the Gibbs Duhem equation.Derivation of Duhem-Margules equation.

Fugacity: Determination of fugacity of gases. Variation of fugacity with temperature and pressure.Activity and activity coefficients.Variation of activity with temperature and pressure.Determination of activity co-efficients by vapour pressure, depression in freezing points and solubility measurements by electrical methods.

Statistical thermodynamics: Different types of ensembles, ensemble averaging, distribution law (Boltzmann statistics),partition function and thermodynamic parameters; relation between molecular and molar partition functions, translational partition function, rotational partition function for linear and non-linear molecules.

[16 HOURS]

UNIT – II

Chemical Kinetics: Basic concepts of chemical kinetics. Complex reactions: measurement of kinetics. Chain, parallel, consecutive and reversible reactions. Arrhenius equation, energy of activation and its experimental determination. Simple collision theory-mechanism of bimolecular reaction. Lindemann's theory, Hinshelwood's theory for unimolecular reaction. Activated complex theory of reaction rate.

Kinetics of reactions in solution-salt effects, effect of dielectric constant (single sphere and double sphere model), effect of pressure, volume and entropy change on reaction rates. Cage effect with an example. Oscillatory reactions: oxidation of malonic acid. Kinetics of heterogeneous reactions - Langmuir's theory, unimolecular and bimolecular surface reactions.

Linear free energy relationship: Hammett equation, Taft equation. Isokinetic relationship and significance of isokinetic temperature.

Enzyme kinetics: Effect of substrate concentration (Michaelis Menton equation), Effect of *p*H, effect of catalysts and inhibitors, effect of temperature.

[16 HOURS]

UNIT – III

Electrochemistry: Arrhenius theory of strong and weak electrolytes and its limitations. Factor effecting conductance, Debye-Huckel-Onsager equation of conductivity and its validity. Walden`s rule. Debye-Huckel theory - concept of Ionic strength, Debye-Huckel limiting law (DHL), its modification for appreciable concentrations. Determination of transference number by moving boundary and Hittorf's methods. True and apparent transference numbers (TrN). Abnormal TrN, effect of temperature on TrN. Liquid junction potential-determination and minimization.

Energetics of cell reactions: Effect of temperature, pressure and concentration on energetics of cell reactions (calculation of ΔG, ΔH and ΔS). Electrochemical energy sources – batteries, classification, primary & secondary.

Corrosion: Manifestations of corrosion, types of corrosion, basis of electrochemical corrosion, theories of corrosion. Local cell theory (Wagner and Traud theory), Corrosion inhibition and prevention.

[16 HOURS]

References:

1. Thermodynamics for Chemists by S. Glasstone, Affiliated East-West Press, New Delhi, (1965).
2. Chemical Thermodynamics by I.M. Klotz, W.A. Benzamin Inc. New York, Amsterdam (1964).
3. Basic Physical Chemistry by W.J. Moore, Prentice Hall of India Pvt. Ltd., New Delhi (1986).
4. Text Book of Physical Chemistry by Samuel Glasstone, MacMillan Indian Ltd., 2nd edition (1974).
5. Theoretical Chemistry by S. Glasstone.
6. Elementary Statistical Thermodynamics by N.D. Smith Plenum Press, NY (1982).
7. Elements of Physical Chemistry by Lewis and Glasstone.
8. Physical Chemistry by P.W. Atkins, ELBS, 4th edition, Oxford University Press (1990)

9. Chemical Kinetics by K.J. Laidler.
10. Chemical Kinetics by Frost and Pearson.
11. Kinetics and Mechanism of Chemical Transformation by J. Rajaram and J.C. Kuriacose.
12. Chemical Kinetics by L.K. Jain.
13. Chemical Kinetics by Benson.

PRACTICALS – HARD CORE

Course Title: ANALYTICAL CHEMISTRY PRACTICALS
Course Code: CHA 050
Course Outcomes
After studying this course the student to:

COID	CO
CO1	Analyze various samples with different classical and simple instrumental skills.
CO2	Obtain knowledge for selection of analytical methods with suitable technique being adopted for the analysis different samples like, water, laboratory chemicals and reagents, body fluids such as urine etc.
CO3	Distinguish classical and instrumental methods.
CO4	Propose and conduct experiment for quantification of individual analytes.

[128 HOURS]

PART – I

1. Determination of total acidity of vinegar and wines by acid-base titration.
2. Determination of purity of a commercial boric acid sample, and Na_2CO_3 content of washing soda.
3. Determination of relative equivalent weight of a weak organic acid by titration with NaOH.
4. Determination of ephedrine and aspirin in their tablet preparations by residual acid-basetitrimetry.
5. Determination of carbonate and bicarbonate in a mixture by *p*H-metric titration and comparison with visual acid-base titration.
6. Determination of carbonate and hydroxide-analysis of a commercial washing soda by visual and *p*H-titrimetry.
7. Determination of purity of a commercial sample of mercuric oxide by acid-base titration.

8. Determination of benzoic acid in food products by titration with methanolic KOH in chloroform medium using thymol blue as indicator.
9. Determination of the *p*H of hair shampoos and *p*H determination of an unknown soda ash.
10. Analysis of water/ waste water for acidity by visual, *p*H metric and conductometric titrations.
11. Analysis of water/ waste water for alkalinity by visual, *p*H metric and conductometric titrations.
12. Determination of ammonia in house-hold cleaners by visual and conductometric titration.
13. Determination of chromate and dichromate in mixture by acid-base titration: visual and pH metric methods.
14. Potentiometric determination of the equivalent weight and Ka for a pure unknown weak acid.
15. Determination of purity of aniline by non-aqueous acid-base titration by visual and potentiometric methods.
16. Determination of purity of ethylene glycol and glycerol by oxidimetric method using periodate (Malprade reaction).
17. Spectrophotometric determination of creatinine and phosphorus in urine.
18. Flame emission spectrometric determination of sodium, potassium and calcium in river/ lake water.

PART – II

1. Determination of percentage of chloride in a sample by precipitation titration- Mohr, Volhard and Fajan's methods.
2. Determination of silver in an alloy and Na_2CO_3 in soda ash by Volhard method.
3. Mercurimetric determination of chloride in blood or urine.
4. Determination of total hardness, calcium and magnesium hardness and carbonate and bicarbonate hardness of water by complexation titration using EDTA.
5. Determination of calcium in calcium gluconate/ calcium carbonate tablets/ injections and of calcium in milk powder by EDTA titration.
6. Determination of zinc in a sample of foot powder and thallium in a sample of rodenticide by EDTA titration.
7. Analysis of commercial hypochlorite and peroxide solution by iodometric titration.
8. Determination of copper in an ore/ an alloy by iodometry and tin in stibnite by iodimetry.
9. Determination of ascorbic acid in vitamin C tablets by titrations with $KBrO_3$ and of vitamin C in citrus fruit juice by iodimetric titration.
10. Determination of iron in razor blade by visual and potentiometric titration using sodium metavanadate.

11. Determination of iron in pharmaceuticals by visual and potentiometric titration using cerium(IV) sulphate.
12. Determination of nickel in steel by synergic extraction and boron in river water/ sewage using ferroin.
13. Determination of total cation concentration of tap water by ion-exchange chromatography.
14. Determination of magnesium in milk of magnesium tablets by ion-exchange chromatography.
15. Cation exchange chromatographic separation of cadmium and zinc and their estimation by EDTA titration.
16. Gas chromatographic determination of ethanol in beverages.
17. Solvent extraction of zinc and its spectrophotometric determination.
18. Anion exchange chromatographic separation of zinc and magnesium followed by EDTA titration of the metals.
19. Separation and determination of chloride and bromide on an anion exchanger.
20. Separation of *o*- and *p*-nitroaniline and analysis by thin layer chromatography.

References

1. Fundamental of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch 8th edition, 2005, Saunders College Publishing, New York.
2. Analytical Chemistry, G.D. Christian, 5th edition, 2001 John Wiley & Sons, Inc, India.
3. Quantitative Analysis, R.A. Day and A.L. Underwood, 6th edition, 1993, Prentice Hall, Inc. New Delhi.
4. Vogel's Textbook of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J.D. Barnes and M.J.K. Thomas, 6th edition, Third Indian Reprint, 2003, Pearson Education Pvt. Ltd., New Delhi.
5. Analytical Chemistry Principles, John H. Kennedy, 2nd edition, Saunders College Publishing, California, 1990.
6. Practical Clinical biochemistry methods and interpretations, R. Chawla, J.P. Bothers Medical Publishers (P) Ltd., 1995.
7. Laboratory manual in biochemistry, J. Jayaraman, New Age International Publishers, New Delhi, 1981.
8. Practical Clinical Biochemistry by Harold Varley and Arnold.Heinmann, 4th edition.

Course Title: INORGANIC CHEMISTRY PRACTICALS
Course Code: CHA 060
Course Outcomes
After studying this course the student to:

COID	CO
CO1	Prepare reagents required for analysis.
CO2	Propose and conduct experiment for quantitative analysis of inorganic samples such as ore, metals, complexes mixture of metals and complexes etc.
CO3	Propose schemes for semi-micro qualitative analysis.
CO4	Develop skills for the scientific and relevant documentation and risk and security assessment.

[128 HOURS]

PART – I

1. Determination of iron in haematite using cerium(IV) solution (0.02M) as the titrant, and gravimetric estimation of insoluble residue.
2. Estimation of calcium and magnesium carbonates in dolomite using EDTA titration, and gravimetric analysis of insoluble residue.
3. Determination of manganese dioxide in pyrolusite using permanganate titration.
4. Quantitative analysis of copper-nickel in alloy/ mixture:
    i. Copper volumetrically using KIO_3.
    ii. Nickel gravimetrically using DMG
5. Determination of lead and tin in a mixture: Analysis of solder using EDTA titration.
6. Quantitative analysis of chloride and iodide in a mixture:
    i. Iodide volumetrically using KIO_3
    ii. Total halide gravimetrically
7. Gravimetric analysis of molybdenum with 8-hydroxyquinoline.
8. Micro-titrimetric estimation of :
    a) Iron using cerium(IV)
    b) Calcium and magnesium using EDTA
9. Quantitative estimation of copper(II), calcium(II) and chloride in a mixture.
10. Circular paper chromatographic separation of: (Demonstration)
    a. Iron and nickel
    b. Copper and nickel

PART – II

Semimicro qualitative analysis of mixtures containing **TWO** anions and **TWO** cations (excluding sodium, potassium and ammonium cations) and **ONE** of the following less common cations: W, Mo, Ce, Th, Ti, Zr, V, U and Li.

References

1. Vogel's Text Book of Quantitative Chemical Analysis – 5th edition, J. Basset, R.C. Denney, G.H. Jeffery and J. Mendhom.
2. A Text Book of Quantitative Inorganic Analysis by A.I. Vogel, 3rd edition.
3. Spectrophotometric Determination of Elements by Z. Marczenko.
4. Vogel's Qualitative Inorganic Analysis – Svelha.
5. Macro and Semimicro Inorganic Qualitative Analysis by A.I. Vogel.
6. Semimicro Qualitative Analysis by F.J. Welcher and R.B. Halin.
7. Quantitative Chemical Analysis by Daniel C. Harris, 7th edition, (2006).

Course Title: ORGANIC CHEMISTRY PRACTICALS
Course Code: CHA 070
Course Outcomes

After studying this course, the student to:

COID	CO
CO1	Prepare several simple organic compounds and also propose suitable mechanisms.
CO2	Acquire knowledge of different reactions, conditions to be maintained, precautions to be exercised before/during/after the reaction.
CO3	Learn qualitative analysis and to separate a mixture of two components.
CO4	Gain confidence to set up reactions individually either in the pharma industry or for the Research.

PART – I

1. Preparation of *p*-nitro aniline from acetanilide.
2. Preparation of *p*-bromo aniline from acetanilide.
3. Preparation of benzoic acid from benzaldehyde
4. Preparation of n-butyl bromide from n-butanol.
5. Preparation of *p*-nitroiodobenzene from paranitroaniline.
6. Preparation of aniline from nitrobenzene.
7. Preparation of ß-*D*-Glucose penta acetate.

8. Preparation of phenoxy acetic acid.
9. Preparation of cyclohexanone from cyclohexanol.
10. Preparation of chalcone.
11. Preparation of *S*-benzylthiuronium chloride.
12. Condensation of anthracene and maleic anhydride (Diels-Alder reaction).
13. Preparation of *m*-nitrobenzoic acid from methyl benzoate.

PART – II

Qualitative analysis: Separation of binary mixtures, identification of functional groups and preparation of suitable solid derivatives.

References

1. Manual of Organic Chemistry -Dey and Seetharaman.
2. Modern Experimental Organic Chemistry by John H. Miller and E.F. Neugil, p 289.
3. An Introduction to Practical Organic Chemistry -Robert, Wingrove etc.
4. A Text Book of Practical Organic Chemistry–A.I. Vogel, Vol.III.
5. Practical Organic Chemistry, Mann & Saunders.
6. Semimicro Qualitative Organic Analysis by Cheronis, Entrikin and Hodnet.
7. J. N. Guthru & R. Kapoor, Advance experimental Chemistry, New Delhi-1991.
8. R. K. Bansal, Laboratory Manual of Organic Chemistry, New PGE International (P) LTd. London, 3rd edition. 1996.18
9. N. K. Visno, Practical Organic Chemistry, New PGE International (P) Ltd. London, 3rd edition, 1996.

Course Title: PHYSICAL CHEMISTRY PRACTICALS
Course Code: CHA 080
Course Outcomes
After studying this course, the student to:

COID	CO
CO1	An idea about handling of instruments like UV-Visible Spectrophotometer, Potentiometer, pH meter, etc.
CO2	Determine the concentration of the species in given solutions using kinetic methods.

CO3	Distinguish between different physical properties of substances or compounds.
CO4	Acquire knowledge of different thermodynamic parameters.

[128 HOURS]

PART – I (Non-instrumental)

1. Study of kinetics of hydrolysis of an ester using HCl/ H_2SO_4 at two different temperature, determination of rate constants and energy of activation.
2. Study of kinetics of the iodine-hydrogen peroxide clock reaction.
3. Determination of activation energy for the bromide-bromate reaction.
4. Determination of heat of solution of benzoic acid by variable temperature method (graphical method).
5. Determination of partial molar volume of NaCl-H_2O system.
6. Determination of critical solution temperature of phenol-water system.
7. Binary analysis of two miscible liquids by viscometric method (Ethanol & Water).
8. To study oscillating or periodic or rhythmic reactions of malonic acid.
9. Thermometric titration of hydrochloric acid with NaOH.
10. Kinetics of photodegradation of indigocarmime(IC) using ZnO as photocatalyst and study the effect of [ZnO] and [IC] on the rate of photodegradation.

PART – II (Instrumental)

1. Conductometric titration of a mixture of HCl and CH_3COOH against NaOH.
2. Conductometric titration of orthophosphoric acid /formic acid/ oxalic acid against NaOH and NH_4OH.
3. Determination of PI of glycine by by potentiometric method.
4. Potentiometric titration of KI vs $KMnO_4$ solution.
5. pH Titration of (a) polybasic acid(H_3PO_4), (b) (CH_3COOH+HCl) and (c) $CuSO_4$*vs*NaOH and determination of K_a.
6. To obtain the absorption spectra of colored complexes, verification of Beer's law and estimation of Ni^{+2} ions from $[Ni(NH_3)_6]^{2+}$ by spectrophotometry.
7. Analysis of binary mixture (Glycerol and Water) by the measurement of refractive index.
8. Study the kinetics of reaction between CAT and indigo carmine spectrophotometrically and determination of rate constant.
9. Spectrophotometric titration of $FeSO_4$ against $KMnO_4$.
10. Determination of the molecular weight of a polymer material by viscosity measurements (cellulose acetate/methyl acrylate).

References

1. Practical Physical Chemistry – A.J. Findlay.
2. Experimental Physical Chemistry – F. Daniels *et al*.
3. Selected Experiments in Physical Chemistry – Latham.
4. Experiments in Physical Chemistry – James and Prichard.
5. Experiments in Physical Chemistry – Shoemaker.
6. Advanced Physico-Chemical Experiments – J. Rose.
7. Practical Physical Chemistry – S.R. Palit.
8. Experiments in Physical Chemistry – Yadav, Geol Publishing House.
9. Experiments in Physical Chemistry – Palmer.
10. Experiments in Chemistry – D.V. Jahagirdar, Himalaya Publishing House, Bombay, (1994).
11. Experimental Physical Chemistry – R.C. Das and B. Behera, Tata Mc Graw Hill.

THEORY – SOFT CORE

Course Title: APPLIED ANALYSIS-I
Course Code: CHA 500
Course Outcomes

After studying this course, the student to:

CO1: Describe the meaning of applied analysis.

CO2: Make out the causes for air pollution and water pollution, and knowledge an control devices or techniques or processes of such pollutions.

CO3: Understand the importance of food and drug analysis.

CO4: Acquire the knowledge to choose methodologies for the preliminary and complete analysis of air, water, food and drugs.

CO5: Adopt suitable analytical technique for sampling and analysis of air, water, food and drug samples for analysis.

CO6: Describe suitable analytical method for the determination of required analytes/components of the sample provided.

UNIT – I

Air pollution, analysis and control: Historical overview-global implications of air pollution, sources of pollutants, classification of pollutants. Sources and effects of particulates,

carbonmonoxide, sulphur oxides, nitrogen oxides, hydrocarbons and photochemical oxidants on human health, vegetation and materials.Standards for air pollutants.

Air quality monitoring: Sampling methods and devices for particulates and gaseous pollutants.SO_2: ambient air measurements and stack gas measurements-Turbidimetric,colorimetric, conductometric and coulometric methods, NOX: Griess-Ilosvay and Jacobs-Hockheiser colorimetric methods, Hydrocarbons: total and individual hydrocarbons by gas chromatography. Oxidants and ozone: colorimetric, titrimetric and chemiluminescence methods.

Control devices for particulates: Gravitational settlers, centrifugal collectors, wet collectors, electrostatic precipitation and fabric filtration.

Control devices for gaseous pollutants: adsorption, absorption, condensation and combustion processes. Automative emission control-catalytic converters.

Water pollution and analysis: Water resources, origin of wastewater, types of water pollutants; their sources and effects, chemical analysis for water pollution control-objectives of analysis, parameters of analysis, sample collection and preservation. Environmental and public health significance and measurement of colour, turbidity, total solids, acidity, alkalinity, hardness, chloride, residual chlorine, chlorine demand,sulphate, fluoride, phosphates, total nitrogen, NO_3^- and NO_2^-nitrogesn in natural and waste/ polluted waters, heavy metal pollution-public health significance of Pb, Cd, , Hg, andAs, general survey of the instrumental techniques for the analysis of heavy metals in aquatic systems, organic loadings-significance and measurement of DO, BOD, COD, TOD, and TOC.

[16 HOURS]

UNIT – II

Food analysis: Objectives of food analysis. Sampling procedures.Detection and determination of sugars and starch.Methods for protein determination.Oils and fats and their analysis-iodine value, saponification value and acid value. Rancidity-detection and determination (peroxide number). Tests for common edible oils.Analysis of foods for minerals-phosphorus, sodium, potassium and calcium.General methods for the determination of moisture, crude fibre and ash contents of food.Analysis of milk for fat and added water.Non-alcoholic beverages-determination of chicory and caffeine in coffee; caffeine and tannin in tea.Alcoholic beverages-methanol in alcoholic drinks and chloral hydrate in toddy. Food additives-chemical, preservatives-inorganic preservatives-sulphur dioxide and sulphites, their detection and determination. Organic preservatives-benzoic acid and benzoates, their detection and determination.Flavouring agents-detection and determination of vanilla and vanillin. Coloring matters in foods-classification, certified colors, detection of water soluble dyes, color in citrus fruits, beet dye in tomato

products, mineral color. Pesticide residues in foods-determination of chlorinated organic pesticides. Control food quality-codex alimentarius, Indian standards.

Drugs and pharmaceutical analysis: Importance of quality control; drugs and pharmaceuticals. Sources of impurities in pharmaceutical chemicals.Analytical quality control in finished/ final products.Common methods of assay. Analysis of common drugs; Analgesics-aspirin, paracetamol; Anthelmintics-mebendazole; Antiallergies-chlorpheneraminemalleate; Antibiotics-penicillin, chloromecytin; Anti-inflammatory agents-oxyphenbutazone; Antimalarials-primaquine phosphate; Antituberculosists-INH; Narcotics-nicotine, morphine; Expectorants-Benadryl; Sedative-diazepam; Vitamins-A. C, B1, B2, B6, niacin and folic acid.

[16 HOURS]

References

1.Standard Methods of Chemical Analysis, A.J.Weleher(Part B), Robert E.KriegorPublishing Co.USA, 1975.

2. Environmental Chemistry, S.E. Manahan Willard grant press, London, 1983.

3. Environmental Chemical Analysis, Iain L Marr and Malcolm S. Cresser, Blackie and Son Ltd., London, 1983.

4. Chemistry for Environmental Engineering, Chair N. Sawyer and Perry L.M Canty,Mcgraw Hill Book, Co., New York, 1975.

5. The Air Pollution Hand Book, Richard Mabey, Penguin, 1978.

6. The Pollution Hand Book, Richard Mabey, Ponguin 1978.

7. Soil Chemical Analysis, M.L.Jackson, Prentice Hall of India Pvt, Ltd., New Delhi, 1973.

8. Experiments in Environmental Chemistry,P.D.Vowler and D.W. Counel, Pergamon press,Oxford 1980.

9. Manual Soil Laboratory Testing, vol I, K.H. Head, Pentech Press, London 1980.

10. A Text Book of Environmental Chemistry and Pollution Control, S.S. Dara, S.Chand andco. Ltd. New Delhi 2004.

11. Air pollution Vol II edition by A.C. Stern, Academic Press New York, 1968.

12. Instrumental Methods for Automatic Air Monitoring Systems in Air Pollution Control, Part-III edition by W.Stranss, John-Wiley and Sons, New York, 1978.

13. Analysis of Air pollutants, P.O.Warner, John Wiley and Sons, New York, 1976.

14. The Chemical Analysis Air pollutants, Interscience, New York, 1960.

15. The Analysis of Air Pollutants, W.Liethe, Ann Arbor Science Pub.Inc. Michigan 1970.

16. Environmental Chemistry, A. K. De.

17. Food Analysis, A.G. Woodman, McGraw Hill. 1971.

18. Chemical Analysis of Foods, H.E. Cox and Pearson.
19. Analysis of Foods and Food Products, J.B. Jacob.
20. A First Course in Food Analysis, A.Y. Sathe, New Age Internationals (P) Ltd., Publishers, Bangalore, 1999.
21. Analytical Agricultural Chemistry, S.L. Chopra and J.S. Kanwar, Kalyani Publishers, New Delhi, 1999.
22. Pharmaceutical Analysis, (Ed). T. Higuchi and E.B. Hanssen, John Wiley and Sons, New York, 1997.
23. Pharmaceutical Analysis-Modern Methods, Part A and B, (Ed). James W. Hunson.
24. Quantitative Analysis of Drugs in Pharmaceutical Formulations, P. D. Sethi, 3rd edition. CBS Publishers and Distributors, New Delhi, 1997.

Course Title: FRONTIERS IN INORGANIC CHEMISTRY
Course Code: CHA 510
Course Outcomes

After studying this course, the student to:

CO1: Know the significance of materials chemistry

CO2: Acquire knowledge of various characterization techniques

CO3: Obtain the skills about the inorganic pigments.

CO4: Obtain the skills about the nanomaterials, nanoscience and nanotechnology.

UNIT – I

Materials chemistry

General principles-Defects, nonstoichiometric compounds and solid solutions, atom and ion diffusion, solid electrolytes. Synthesis of materials-The formation of extended structures, chemical deposition.

Metal oxides, nitrides and fluorides: Monoxides of the 3d metals, higher oxides and complex oxides, oxide glasses, nitrides and fluorides.

Chalcogenides, intercalation chemistry and metal rich phases: Layered MS_2 compounds and intercalation, Chevrel phases.

Framework structures: Structures based on tetrahedral oxoanions, structures based on octahedral and tetrahedral.

Inorganic pigments: Coloured pigments, white and black inorganic materials.

Molecular materials and fullerides: Fullerides, Molecular material chemistry.

Silicates: Structure, classification - silicates with discrete anions, silicates containing chain anion, silicates with layer structure, silicones with three dimensional net work and applications.

[16 HOURS]

UNIT – II

Nanomaterials, nanoscience and nanotechnology

Fundamentals-Terminology and history, novel optical properties of nanomaterials.

Characterization and fabrication: Characterization methods. Top-down and bottom-up fabrication. Solution based synthesis of nanoparticles. Vapour-phase synthesis of nanoparticles. Synthesis using frameworks, supports and substrates.

Artificially layered materials: Quantum wells and multiple quantum wells. Solid state superlattices. Artificially layered crystal structures.

Self-assembled nanostructures: Self-assembly and bottom-up fabrication. Supramolecular chemistry and morphosynthesis. Dimensional control in nanostructures.

Bioinorganic nanomaterials: DNA and nanomaterials. Natural and artificial nanomaterials-Biomimetics. Bionanocomposites.

Inorganic-organic nanocomposites: Uses and design strategies. Polymer nanocomposites.

[16 HOURS]

References:

1. Inorganic Chemistry, 4th edition. P. Atkins, T. Overton, J. Rourke, M. Weller and F. Armstrong, Oxford University Press (2006).
2. Inorganic Chemistry Principles of Structure and Reactivity: James E. Huheey, Ellen A. Keiter, Richard L. Keiter, Okhil K. Medhi, Delhi University, New Delhi (2006)
3. Chemistry of the Elements – N.N. Greenwood and A. Earnshaw, Pergamon Press (1985).
4. Industrial Inorganic Chemistry – 2nd edition. K.H. Buchel, H.H. Moretto and P. Woditsh, Wiley - VCH (2000).
5. Basic Inorganic Chemistry – 3rd edition. F.A. Cotton, G. Wilkinson and P.L. Gaus, John Wiley and Sons (2002).
6. 6.Inorganic Chemistry, 3rd edition. James E. Huheey, Harper and Row Publishers (1983).
7. Inorganic Chemistry, 3rd edition. G.L. Miessler and D.A. Tarr, Pearson Education (2004).
8. Inorganic Chemistry, 2nd edition. C.E. Housecroft and A.G. Sharpe, Pearson Education.

Course Title: REACTION MECHANISMS
Course Code: CHA 520
Course Outcomes

CO1: Identify the reactivity of the molecules

CO2: Fate of the reaction by knowing the thermodynamic and kinetic requirements.

CO3: Identify the products, structure, and stability through mechanistic approach.

CO4: Mechanistic pathway of different reactions.

CO5: Know the nucleophilic, electrophilic and elimination reactions. Each of these will have different mechanistic route.

UNIT – I

Structure and reactivity: Brief discussion on effects of hydrogen bonding, resonance, inductive and hyperconjugation on strengths of acids and bases.

Methods of determining organic reaction mechanism: Thermodynamic and kinetic requirements for reactions, kinetic and thermodynamic control. Hammonds postulates and Curtin-Hammett principle.

Identification of products. Formation, structure, stability, detection and reactions of carbocations (classical and non-classical), carbanions, free radicals, carbenes, nitrenes, nitrile oxides, nitrile imines, nitrile ylides and arynes. Determination of reaction intermediates, isotope labeling and effects of cross over experiments. Kinetic and stereochemical evidence, solvent effect. Linear free energy relationship-Hammet equation and Taft treatment.

[16 HOURS]

UNIT – II

Basics of organic reactions: Meaning and importance of reaction mechanism, classification and examples for each class.

Aliphatic substitution reactions:

Nucleophilic substitution reactions: Kinetics, mechanism and stereochemical factors affecting the rate of S_N1, S_N2, S_Ni, S_N1', S_N2' and S_Ni' reactions, Neighbouring group participation.

Electrophilic substitution reactions: S_E1 and S_E2 reactions

Aromatic substitution reactions:

Nucleophilic substitution reactions: S_N1, S_N2 and benzyne mechanism, Bucherer reaction.

Electrophilic substitution reactions: Mechanism of Friedel-Crafts alkylation and acylation, Mannich reaction, chloromethylation, Vilsmeier-Haack reaction.

Mechanism of hydrolysis of carboxylic acid derivatives: Hydrolysis of esters, amides and acid chlorides.

Elimination reactions: Mechanism and stereochemistry of eliminations - E_1, E_2, E_1cB. *cis* elimination, Hofmann and Saytzeff eliminations, competition between elimination and substitution, decarboxylation reactions. Chugaev reaction.

[16 HOURS]

References:

1. Organic Chemistry by Morrison and Boyd.
2. H. Pine, Hendrickson, Cram and Hammond, Organic Chemistry, Mc Graw Hill, New York, 1987.
3. I.L. Finar, Organic Chemistry, ELBS Longmann, Vol. I & II, 1984.
4. E.L. Eliel and S.H. Wilen, Stereochemistry of Organic Compounds, John Wiley and Sons, New York. 1994.
5. Basic Principles of Organic Chemistry by Roberts & Caserio
6. N.S. Issacs, Reactive Intermediates in Organic Chemistry, John Wiley and Sons, New York.1974.
7. R.K. Bansal, Organic Reaction Mechanism, Wiley Eastern Limited, New Delhi, 1993.
8. J. March, Advanced Organic Chemistry, Wiley Interscience, 1994.
9. A Guide Book to Mechanism in Organic Chemistry by Petersykes
10. Stereochemistry and Mechanism through Solved Problems by P.S. Kalsi.
11. Text book of Organic Chemistry by P.S. Kalsi.
12. F.A. Carey and Sundberg, Advanced Organic Chemistry – Part A & B, 3rd edition, Plenum Press, New York, 1990.
13. S.K. Ghosh, Advanced General Organic Chemistry, Book and Alleied (P) Ltd, 1998.
14. Organic chemistry, Gram Solomons.

Course Title: SOLID STATE CHEMISTRY AND CHEMISTRY OF NANOMATERIALS
Course Code: CHA 530
Course Outcomes
After studying this course, the student to:

CO1: Learn solid state chemistry, X-ray crystallography, etc.

CO2: Learn the fundamentals of semiconductors, superconductors, nanomaterials and the methods by which nanoparticle is synthesized.

UNIT – I

Solid state chemistry: Types of imperfections, classification of imperfections, point defects, Schottky defects, Frenkel defects, disordered crystals, line defects, dislocation types, plane defects, small-angle and large-angle boundaries, stacking faults, crystal growth and twinning.

X-ray crystallography: law of interfacial angles, laws of symmetry, Miller indices, Bragg equation (no derivation), Experimental methods – powder and rotating crystal methods, indexing of powder and rotating crystal photographs. Atomic scattering factor, structure factor, Fourier synthesis and electron density diagrams. Electron diffraction of gases, experimental technique, Scattering-Intensity curves, Wierl equation (no derivation), Radial distribution method determination of bond lengths and bond angles. Heat capacity of solids: Einstein and Debye equations (with derivation).

[16 HOURS]

UNIT – II

Semiconductors: Band theory, energy bands, intrinsic and extrinsic semiconductors. Conductivity: electrons and holes, temperature dependence on conductivity, Optical properties: absorption spectrum, photoconductivity, photovoltaic effect and luminescence. Junction properties: metal-metal junctions, metal-semiconductor junctions, p-n junctions, transistors, industrial applications of semiconductors: Mixed oxides, spinels and other magnetic materials.

Superconductors: Meissner effect, type I and II super conductors, isotope effect, basic concepts of BCS theory, manifestations of the energy gap, Josephson devices.

Chemistry of nanomaterials: Nano particles. Synthesis - Laser abalation, chemical vapour transportor (CVT) and sol-gel methods. Metal oxides nanoparticles with supercritical water and precursor method. Synthesis of metal oxides and its composite nanoparticles by solvothermal and hydrothermal methods. Carbon nanotube, carbon nanowires and its composites. Applications of nanomaterials in renewable energy. Inorganic and organic nanoporous aerogels.

[16 HOURS]

References:

1. Solid State Chemistry and its Applications, Anthony R. West.
2. Solid State Chemistry: An Introduction, 3rd edition, Lesley E. Smart and Elaine A. Moore.
3. Introduction to Solid State Physics - C. Kittel, 5th edition, Wiley Eastern Ltd.

4. Advances in Technologically Important Crystals - Binay Kumar, R.P. Tandon, Mcmillan.
5. Hand Book of Nanotechnology, Bharat Bhushan, Springer Publisher.
6. Nanotechnology - Importance and Applications, M. H. Fulekar, Ink International publisher.

SECOND SEMESTER

THEORY – HARD CORE

Course Title: SEPARATION TECHNIQUES
Course Code: CHB 090
Course Outcomes:
After completion of this course, a student will be able to

COID	CO
51645	Learn the details of Solvent extraction, Extraction systems, Solid Phase Extraction, Chromatography.
51652	Learn the classification and characteristics of Gas chromatography, HPLC, Ion exchange, Size-exclusion chromatography.
51670	Learn in details with examples Thin layer, Affinity chromatography.
51682	Understand the details of Supercritical fluid exraction and Electrophoretic methods.

UNIT – I

Solvent extraction: Theory-Nernst partition law, efficiency and selectivity of extraction.

Extraction systems: Extraction of covalent neutral molecules, extraction of uncharged metal chelates and synergic extraction, extraction of ion-association complexes-non chelated complexes, chelated complexes and oxonium systems. Use of salting out agents.Methods of extraction-batch and continuous extractions.applications.

Solid Phase Extraction (SPE): Principles,apparatus and instrumentation. Solid phase sorbents, extraction formats - Automated solid phase extraction. Solid phase micro extraction (SPME).Applications of SPE and SPME.

Chromatography: Definition, principles and mechanism of separation, classification of chromatographic techniques. General descriptions of column chromatography-frontal analysis, displacement analysis and elution analysis. General theory of column chromatography: characterizing a chromatogram-retention time, retention volume and baseline width. Chromatographic resolution, capacity factor, column selectivity.Column efficiency-band

broadening-rate theory and plate theory.Peak capacity, non ideal behavior.Optimizing chromatographic separations using capacity factor, column selectivity and column efficiency-van Deemter equation, and its modern versions, Golay equation and Huber-Knox equations.

[16 HOURS]

UNIT – II

Gas chromatography (GC): Principles, instrumentation-mobile phase, chromatographic columns, stationary phases, sample introduction, temperature control, and detectors for gas chromatography. Quantitative and qualitative applications.

Highperformance liquid chromatography (HPLC): Principles, instrumentation- columns (analytical and guard columns), stationary phases, mobile phases, choosing a mobile phase, isocratic *vs*gradient elution, HPLC plumbing, sample introduction. Detectors for HPLC-spectroscopic, electrochemical and others, quantitative applications.

Ion exchange chromatography (IEC): Definitions, requirements for ion-exchange resin, synthesis and types of ion-exchange resins, principle, basic features of ion-exchange reactions, resin-properties-ion-exchange capacity, resin selectivity and factors affecting the selectivity, applications of IEC in preparative, purification and recovery processes.Ion chromatography (IC) : Double column IC and single column IC.

Size-exclusion chromatography: Theory and principle of size-exclusion chromatography, experimental techniques of gel-filtration chromatography (GFC) and gel-permeation chromatography (GPC), materials for packing-factors governing column efficiency, methodology and applications.

[16 HOURS]

UNIT – III

Thin layer chromatography: Principle, apparatus and methodology, applications, HPTLC

Affinity chromatography: Definitions, separation-mechanism-matrices, matrix activation, role of spacer arms and applications.

Supercritical fluid chromatography (SFC): Properties of supercritical fluids, instrumentation and operating variables, comparison of SFC with other types of chromatography, applications.

Supercritical fluid extraction: Advantages of supercritical fluid extraction, instrumentation, supercritical fluid choice, off-line and on-line extractions, typical applications of supercritical fluid extraction.

Electrophoretic methods - Electrophoresis & Capillary Electrophoresis**:** Theory-electrophoretic mobility, electroosmotic mobility, electroosmotic flow velocity, total mobility, migration time, efficiency, selectivity and resolution. Instrumentation-capillary tubes, hydrodynamic and electrokinetic methods of sample injection, applying electric field and detectors. Capillary

electrophoresis methods-capillary zone electrophoresis, micellarelectrokinetic capillary chromatography, capillary gel electrophoresis and capillary electrochromatography.

[16 HOURS]

References

1. Fundamental of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch 8th edition, 2005, Saunders College Publishing, New York.
2. Analytical Chemistry, G.D. Christian, 5th edition, 2001 John Wiley & Sons, Inc. India.
3. Quantitative Analysis, R.A. Day and A.L. Underwood, 6th edition,1993 Prentice Hall, Inc. New Delhi.
4. Vogel's Textbook of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J.D. Barnes and M.J.K. Thomas, 6th edition, Third Indian Reprint, 2003 Pearson Education Pvt. Ltd., New Delhi.
5. Analytical Chemistry Principles, John H. Kennedy, 2nd edition, Saunders CollegePublishing, California, 1990.
6. Introduction to Instrumental Analysis, Robert. D. Braun, Pharm. Med. Prem. India, 1987.
7. Instrumental Method of Analysis, W.M. Dean and Settle, 7th edition, 1986, CBS Publishers, New Delhi.
8. Instant Notes of Analytical Chemistry, Kealey and Haines, Viva Books Pvt. Ltd., 2002.
9. Modern Analytical Chemistry, David Harvey, McGraw Hill, New Delhi, 2000.
10. Principles and Practice of Analytical Chemistry, F. W. Fifield and Kealey, 5th edition, 2000, Blackwell Sci., Ltd. Malden, USA.

Course Title: ADVANCED COORDINATION CHEMISTRY
Course Code: CHB 100
Course Outcomes:
After studying this course, the student to:

COID	CO
47143	Learn in depth Preparation of coordination compounds, Stability of coordination compounds, Geometries of metal complexes, Determination of stability constants, Crystal field theory.
47150	Understand in details with examples Molecular Orbital Theory, Electronic spectra and Magnetic properties.

47159	Learn in details with examples Reaction and Mechanisms, Substitution reactions.
47165	Identify in details with examples Inner-sphere mechanism and outer-sphere mechanism.

UNIT – I

Preparation of coordination compounds: Introduction, Preparative methods - simple addition reactions, substitution reactions, oxidation-reduction reactions, thermal dissociation reactions, reactions of coordinated ligands, the trans-effect & other methods.

Stability of coordination compounds: Introduction, trends in stepwise stability constants, factors influencing the stability of metal complexes with reference to the nature of metal ion and ligands, the Irving-William series, chelate effect.

Geometries of metal complexes: Coordination numbers 2-8.

Determination of stability constants: Theoretical aspects of determination of stability constants of metal complexes by spectrophotometric, *p*H metric and polarographic methods.

Crystal field theory: Salient features of CFT, d-orbital splitting in octahedral, tetrahedral, square planar and tetragonal complexes, Jahn-Teller distortions, measurement of 10 Dq and factors affecting it. Evidences for metal-ligand covalency.

[16 HOURS]

UNIT – II

Molecular Orbital Theory: Introduction, Principles of Molecular orbital theory, sigma and pi-bonds in MOT. Applications to Ligand filed theory. MOT to octahedral, tetrahedral and square planar complexes with and without pi-bonding.

Electronic spectra: Introduction, selection rules and intensities, electronic spectra of octahedral and tetrahedral complexes, Term symbols for d^n ions, Orgel and Tanabe-Sugano diagrams, charge-transfer spectra. Ligand-field transition, Optical rotatory dispersion and Circular dichroism.

Magnetic properities: Origin of magnetism, types of magnetism, Curie law, Curie Weiss law, magnetic susceptibility and its measurements. Spin and orbital contributions to the magnetic moment, the effects of temperature on μeff, spin-cross over, ferromagnetism, antiferromagnetism and ferrimagnetism.

[16 HOURS]

UNIT - III

Reaction and Mechanisms: Introduction

Substitution reactions - Inert and labile compounds, mechanisms of substitution.

Kinetic consequences of Reaction pathways - Dissociation, interchange and association. Experimental evidence in octahedral substitution - Dissociation, associative mechanisms, the conjugate base mechanism, the kinetic chelate effect.

Stereochemistry of reactions- Substitution in trans and its complexes, isomerization of chelate rings.

Substitution reactions of square-planar complexes - kinetics and stereochemistry of square-planar substitutions, evidence for associative reactions, explanations of the trans effect.

Electron-transfer processes: Inner-sphere mechanism and outer-sphere mechanism, conditions for high and low oxidation numbers.

[16 HOURS]

References

1. Physical Inorganic Chemistry - A Coordination Chemistry Approach- S.F.A. Kettle, Spektrum, Oxford, (1996).
2. Inorganic Chemistry - 2nd edition, C.E. Housecroft and A.G. Sharpe, Pearson Education Ltd., (2005).
3. Inorganic Chemistry - 3rd edition, G.L. Miessler and D.A. Tarr, Pearson Education, (2004).
4. Inorganic Chemistry - 2nd edition, D.F. Shriver, P.W. Atkins and C.H. Langford, Oxford University Press, (1994).
5. Inorganic Chemistry- 3rd edition, James E. Huheey, Harper and Row Publishers, (1983).
6. Basic Inorganic Chemistry- 3rd edition, F.A. Cotton, G. Wilkinson and P.L. Gaus, John Wiley and Sons, (2002).

Course Title: ORGANIC CHEMISTRY-II
Course Code: CHB 170
Course Outcomes:

After studying this course, the student to:

COID	CO
50609	Understand in depth Reductions and Oxidations
50614	Learn in depth Reagents in organic synthesis, Green Synthesis
50628	Understand in details with examples Photochemistry and concerted reactions,Electrocyclic reactions

50648	Learn the details of Cycloaddition reactions, dipolar cycloadditions, cycloaddition reactions, Sigmatropic reactions

UNIT – I

Reductions: Catalytic hydrogenations (homogeneous and heterogeneous) - catalysts, reduction of functional groups, catalytic hydrogen transfer reactions. Wilkinson catalyst. Baker's yeast, $LiAlH_4$, $NaBH_4$, metal dissolving reactions (Birch reduction). Leukart reaction (reductive amination), diborane, Meerwein-Ponndorf-Verley reduction, Wolf-Kishner reduction, Clemensen reduction, tributyl tinhydride, stannous chloride.

Oxidations: Oxidation with chromium and manganese compounds (CrO_3, $K_2Cr_2O_7$, PCC, PDC, Sarret reagent, Jones reagent, MnO_2, $KMnO_4$), ozone, peroxides and peracids, lead tetra acetate, periodic acid, OsO_4, SeO_2, NBS, chloramine-T, Sommelet oxidation, Oppenauer oxidation, Sharpless epoxidation, Woodward and Prevost hydroxylation. Electrochemical Oxidation and reduction of organic compounds, green oxidation agents.

[16 HOURS]

UNIT – II

Reagents in organic synthesis: Use of following reagents in organic synthesis and functional group transformations: Lithium disopropylamide (LDA), Gilmann reagent, dicyclohexyl carbodimide (DCC), dichloro dicyano quinone (DDQ), trialkyl silyl halides, phase transfer catalyst, crown ethers, Fenton's reagent, Ziegler-Natta catalyst, diazomethane, Stark enamine reaction, Phosphorus ylides – Wittig and related reactions, 1,3-dithiane anions - Umpolung reaction, sulphur ylides – reactions with aldehydes and ketones, Peterson reactions - synthesis of alkenes.

Green Synthesis: Designing of green synthesis, choice of reagents and catalysis. Microwave induced organic synthesis, ionic liquids in organic synthesis, polymer supported reagents and synthesis and the use of ultra sound in organic synthesis.

[16 HOURS]

UNIT – III

Photochemistry and concerted reactions: Introduction, light absorption and electronic transitions, Jablonski diagram, intersystem crossing, energy transfer, sensitizers, quenchers.

Photochemistry of olefins, conjugated dienes, aromatic compounds, ketones, enones, photooxidations, photoreductions, Norrish type I and II reactions, Paterno-Buchi reaction, Barton reaction, Di-pi-rearrangements.

Electrocyclic reactions: Stereochemistry, symmetry and Woodward-Hofmann rules for electrocyclic reactions, FMO theory of electrocyclic reactions, correlation diagram for cyclobutadiene and cyclohexadiene systems.

Cycloaddition reactions: Classification, analysis by FMO and correlation diagram method. **1,3-dipolar cycloadditions**: involving nitrile oxide, nitrile imine, nitrile ylide cycloaddition. Intra and intermolecular 3+2 cycloaddition and their application in organic synthesis. **[4+2] cycloaddition reactions**: Deils-Alder reacion, hetero Diels-Alder reaction and their applications.

Sigmatropic reactions: Classification, stereochemistry and mechanisms. suprafacial and antarafacial shifts of H, sigmatropic shifts involving carbon moieties. [3,3] and [5,5]- sigmatropic rearrangement, Claisen, Cope and aza-Cope rearrangement

[16 HOURS]

References

1. H. Pine, Hendrickson, Cram and Hammond, Organic Chemistry, Mac Grow Hill, New York, 1987.
2. Organic Chemistry - Morrison and Boyd
3. I.L. Finar, Organic Chemistry, ELBS Longmann, Vol. 1 & II, 1984.
4. J. March, Advanced Organic Chemistry, Wiley Interscience, 1994.
5. E.S. Gould, Mechanism and Structure in Organic Chemistry, Halt, Rinhart & Winston, New York, 1964.
6. F.A. Carey and Sundberg. Advanced Organic Chemistry – Part A & B, 3rd edition, Plenum Press, New York. 1990.
7. Principles of Organic Synthesis - ROC Norman and Coxon
8. S.K. Ghosh, Advanced General Organic Chemistry, Book and Allied (P) Ltd. 1998.
9. R.K. Kar, Frontier orbital and symmetry controlled Pericyclic reaction.

Course Title: PHYSICAL CHEMISTRY-II
Course Code: CHB 120
Course Outcomes:
After studying this course, the student to:

COID	CO
50689	Learn in depth Quantum Chemistry

50698	Learn in details with examples Microwave and Vibration spectroscopy
50709	Understand in depth Raman and UV-Visible spectroscopy
50728	Learn the classification and characteristics of NQR, Mössbauer, ESR spectroscopy

UNIT – I

Quantum Chemistry: A brief resume of black body radiation, and atomic spectra-Bohr's theory of hydrogen atom. Photoelectric and Compton effects, de-Broglie concept, uncertainty principle, operators (algebra of operators, commutative and non-commutative operators, linear operator, Laplacian operator, Hermitian operator-Hamiltonian operator, turn over rule. Schrodinger wave equation for particles, Eigen values and Eigen functions, postulates of quantum mechanics. Application of Schrodinger equation to a free particle and to a particle trapped in a potential field (one dimension and three dimensions). Degeneracy, Wave equation for H-atom, separation and solution of R, ϕ and θ equations. Application of Schrodinger equation to rigid rotator and harmonic oscillator. Quantum numbers and their characteristics, orbital diagrams.

Approximate methods – Necessity of approximate methods, perturbation method, and the theory of perturbation method – first order and second order correction, application to He-atom (first order correction only).

[16 HOURS]

UNIT-II

Microwave spectroscopy: Rotation spectra of diatomic Molecules - rigid and non rigid rotator model. Rotational quantum number and the selection rule. Effect of isotopic substitution on rotation spectra. Relative intensities of the spectral lines. Classification of polyatomic molecules based on moment of inertia - Linear, symmetric top, asymmetric top and spherical molecules. Rotation spectra of polyatomic molecules (OCS,CH_3F and BCl_3). Moment of inertia expression for linear tri-atomic molecules. Applications - Principles of determination of Bond length and moment of inertia from rotational spectra. Stark effect in rotation spectra and determination of dipole moments.

Vibration spectroscopy: Vibration of diatomic molecules, vibrational energy curves for simple harmonic oscillator. Effects of anharmonic oscillation. Vibration - rotation spectra of carbon monoxide. Expressions for fundamental and overtone frequencies. Vibration of polyatomic molecules – The number of degrees of freedom of vibration. Parallel and perpendicular vibrations (CO_2 and H_2O). fundamental, overtone, combination and difference bands. Fermi resonance. Force constant and its significance. Theory of infrared absorption and theoretical group frequency. Intensity of absorption band and types of absorptions. Correlation chart. Important spectral regions - hydrogen stretching region, double and triple bonds regions, fingerprint region. Factors affecting the group frequency – Physical state, vibrational coupling,

electrical effect, hydrogen bonding, steric effect and ring strain. Applications: Structures of small molecules: XY_2 – linear or bent, XY_3 – planar or pyramidal.

[16 HOURS]

UNIT- III

Raman spectroscopy: Introduction, Raman and Rayleigh scattering, Stokes and anti-Stokes lines, polarization of Raman lines, depolarization factor, polarizability ellipsoid. Theories of Raman spectra - classical and quantum theory. Rotation-Raman and vibration-Raman spectra. Comparison of Raman and IR spectra, rule of mutual exclusion principle. Vibration modes of some simple molecules and their activity in Raman.

UV Visible spectroscopy: Quantitative aspects of absorption – Beer's law, Technology associated with absorption measurements. Limitations of the law – real, chemical, instrumental and personal.

NQR Spectroscopy: Quadrupolar nuclei, electric field gradient, nuclear quadrupole coupling constants, energies of quadrupolar transitions, effect of magnetic field. Applications.

Mössbauer spectroscopy: The Mössbauer effect, chemical isomer shifts, quadrupole interactions, measurement techniques and spectrum display, application to the study of Fe^{2+} and Fe^{3+} compounds, Sn^{2+} and Sn^{4+} compounds, nature of M-L bond, coordination number and structure), detection of oxidation states and inequivalent Mössbauer atoms.

Electron Spin Resonance Spectroscopy: Basic principles, hyperfine couplings, the 'g' values, factors affecting 'g' values, isotropic and anisotropic hyperfine coupling constants, Zero Field splitting and Kramer's degeneracy. Measurement techniques and Applications to simple inorganic and organic free radicals and to inorganic complexes.

[16 HOURS]

References

1. Vibrational Spectroscopy - Theory and Applications- D.N. Sathyanarayana, New Age International Publications, New Delhi (1996).
2. Spectroscopy, B.P. Straughan and S. Walker, John Wiley & Sons Inc., New York, Vol. 1 and 2, 1976.
3. Vibration Spectroscopy Theory and Applications, D.N. Satyanarayana, New Age International, New Delhi.
4. Spectroscopy, B.P. Straughan and S. Salker, John Wiley and Sons Inc., New York, Vol.2, 1976.

5. Organic Spectroscopy, William Kemp, English Language Book society, Macmillan, 1987.
6. Quantum Chemistry – A.K. Chandra. 2nd edition, Tata McGraw Hill Publishing Co. Ltd., (1983).
7. Quantum Chemistry – Eyring, Walter and Kimball. John Wiley and Sons, Inc., New York.
8. Quantum Chemistry – I.N. Levine. Pearson Education, New Delhi, (2000).
9. Theoretical Chemistry – S. Glasstone. East West Press, New Delhi, (1973).
10. Quantum Chemistry – R.K. Prasad, New Age International Publishers, (1996).
11. Valence Theory – Tedder, Murel and Kettle.
12. Quantum Chemistry – D.A. McQuarrie.
13. Theoretical Inorganic Chemistry – Day and Selbin.
14. Fundamentals of Molecular Spectroscopy, C.N. Banwell and E.M. McCash. 4th edition, Tata McGraw Hill, New Delhi.
15. Introduction to Spectroscopy - Pavia, Lampman and Kriz, 3rd edition, Thomson.
16. Spectroscopy, B.P. Straughan and S. Walker, John Wiley & Sons Inc., New York, Vol. 1 and 2, 1976.
17. Vibration Spectroscopy Theory and Applications, D.N. Satyanarayana, New Age International, New Delhi.
18. D. A. McQuarrie and J.D. Simon –Physical Chemistry, VIVA Students Ed. (2003).
19. J. D. Graybeat. Molecular Spectroscopy, McGraw-Hill International Edition (1988). Spectroscopy of Organic Compounds-3rd Ed.-P.S. Kalsi (New Age, New Delhi) 2000.
20. E.A.V. Ebsworth, D.W.H. Ranklin and S. Cradock: Structural Methods in Inorganic Chemistry, Blackwell Scientific, 1991.
21. J. A. Iggo: NMR Spectroscopy in Inorganic Chemistry, Oxford University Press, 1999.
22. C. N. R. Rao and J. R. Ferraro: Spectroscopy in Inorganic Chemistry, Vol I & II (Academic) 1970.
23. Spectroscopy, B. P. Straughan and S. Salker, John Wiley and Sons Inc., New Yourk, Vol.2, 1976.

PRACTICALS – HARD CORE

Course Title: ANALYTICAL CHEMISTRY PRACTICALS
Course Code: CHB 130
Course Outcomes
After studying this course the student to:

COID	CO
CO1	Analyze various samples with different classical and simple instrumental skills.

CO2	Obtain knowledge for selection of analytical methods with suitable technique being adopted for the analysis different samples like, water, laboratory chemicals and reagents, body fluids such as urine etc.
CO3	Distinguish classical and instrumental methods.
CO4	Propose and conduct experiment for quantification of individual analytes.

[128 HOURS]

PART – I

1. Determination of total acidity of vinegar and wines by acid-base titration.
2. Determination of purity of a commercial boric acid sample, and Na_2CO_3 content of washing soda.
3. Determination of relative equivalent weight of a weak organic acid by titration with NaOH.
4. Determination of ephedrine and aspirin in their tablet preparations by residual acid-basetitrimetry.
5. Determination of carbonate and bicarbonate in a mixture by *p*H-metric titration and comparison with visual acid-base titration.
6. Determination of carbonate and hydroxide-analysis of a commercial washing soda by visual and *p*H-titrimetry.
7. Determination of purity of a commercial sample of mercuric oxide by acid-base titration.
8. Determination of benzoic acid in food products by titration with methanolic KOH in chloroform medium using thymol blue as indicator.
9. Determination of the *p*H of hair shampoos and *p*H determination of an unknown soda ash.
10. Analysis of water/ waste water for acidity by visual, *p*H metric and conductometric titrations.
11. Analysis of water/ waste water for alkalinity by visual, *p*H metric and conductometric titrations.
12. Determination of ammonia in house-hold cleaners by visual and conductometric titration.
13. Determination of chromate and dichromate in mixture by acid-base titration: visual and pH metric methods.
14. Potentiometric determination of the equivalent weight and Ka for a pure unknown weak acid.
15. Determination of purity of aniline by non-aqueous acid-base titration by visual and potentiometric methods.
16. Determination of purity of ethylene glycol and glycerol by oxidimetric method using periodate (Malprade reaction).
17. Spectrophotometric determination of creatinine and phosphorus in urine.

18. Flame emission spectrometric determination of sodium, potassium and calcium in river/ lake water.

PART – II

1. Determination of percentage of chloride in a sample by precipitation titration- Mohr, Volhard and Fajan's methods.
2. Determination of silver in an alloy and Na_2CO_3 in soda ash by Volhard method.
3. Mercurimetric determination of chloride in blood or urine.
4. Determination of total hardness, calcium and magnesium hardness and carbonate and bicarbonate hardness of water by complexation titration using EDTA.
5. Determination of calcium in calcium gluconate/ calcium carbonate tablets/ injections and of calcium in milk powder by EDTA titration.
6. Determination of zinc in a sample of foot powder and thallium in a sample of rodenticide by EDTA titration.
7. Analysis of commercial hypochlorite and peroxide solution by iodometric titration.
8. Determination of copper in an ore/ an alloy by iodometry and tin in stibnite by iodimetry.
9. Determination of ascorbic acid in vitamin C tablets by titrations with $KBrO_3$ and of vitamin C in citrus fruit juice by iodimetric titration.
10. Determination of iron in razor blade by visual and potentiometric titration using sodium metavanadate.
11. Determination of iron in pharmaceuticals by visual and potentiometric titration using cerium(IV) sulphate.
12. Determination of nickel in steel by synergic extraction and boron in river water/ sewage using ferroin.
13. Determination of total cation concentration of tap water by ion-exchange chromatography.
14. Determination of magnesium in milk of magnesium tablets by ion-exchange chromatography.
15. Cation exchange chromatographic separation of cadmium and zinc and their estimation by EDTA titration.
16. Gas chromatographic determination of ethanol in beverages.
17. Solvent extraction of zinc and its spectrophotometric determination.
18. Anion exchange chromatographic separation of zinc and magnesium followed by EDTA titration of the metals.
19. Separation and determination of chloride and bromide on an anion exchanger.
20. Separation of *o*- and *p*-nitroaniline and analysis by thin layer chromatography.

References

1. Fundamental of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch 8th edition, 2005, Saunders College Publishing, New York.
2. Analytical Chemistry, G.D. Christian, 5th edition, 2001 John Wiley & Sons, Inc, India.
3. Quantitative Analysis, R.A. Day and A.L. Underwood, 6th edition, 1993, Prentice Hall, Inc. New Delhi.
4. Vogel's Textbook of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J.D. Barnes and M.J.K. Thomas, 6th edition, Third Indian Reprint, 2003, Pearson Education Pvt. Ltd., New Delhi.
5. Analytical Chemistry Principles, John H. Kennedy, 2nd edition, Saunders College Publishing, California, 1990.
6. Practical Clinical biochemistry methods and interpretations, R. Chawla, J.P. Bothers Medical Publishers (P) Ltd., 1995.
7. Laboratory manual in biochemistry, J. Jayaraman, New Age International Publishers, New Delhi, 1981.
8. Practical Clinical Biochemistry by Harold Varley and Arnold.Heinmann, 4th edition.

Course Title: INORGANIC CHEMISTRY PRACTICALS
Course Code: CHB 140
Course Outcomes
After studying this course the student to:

COID	CO
CO1	Prepare reagents required for analysis.
CO2	Propose and conduct experiment for quantitative analysis of inorganic samples such as ore, metals, complexes mixture of metals and complexes etc.
CO3	Propose schemes for semi-micro qualitative analysis.
CO4	Develop skills for the scientific and relevant documentation and risk and security assessment.

[128 HOURS]

PART – I

1. Determination of iron in haematite using cerium(IV) solution (0.02M) as the titrant, and gravimetric estimation of insoluble residue.
2. Estimation of calcium and magnesium carbonates in dolomite using EDTA titration, and gravimetric analysis of insoluble residue.

3. Determination of manganese dioxide in pyrolusite using permanganate titration.
4. Quantitative analysis of copper-nickel in alloy/ mixture:
    a) Copper volumetrically using KIO_3.
    b) Nickel gravimetrically using DMG
5. Determination of lead and tin in a mixture: Analysis of solder using EDTA titration.
6. Quantitative analysis of chloride and iodide in a mixture:
    a) Iodide volumetrically using KIO_3
    b) Total halide gravimetrically
7. Gravimetric analysis of molybdenum with 8-hydroxyquinoline.
8. Micro-titrimetric estimation of :
    a) Iron using cerium(IV)
    b) Calcium and magnesium using EDTA
9. Quantitative estimation of copper(II), calcium(II) and chloride in a mixture.
10. Circular paper chromatographic separation of: (Demonstration)
    a) Iron and nickel
    b) Copper and nickel

PART – II

Semimicro qualitative analysis of mixtures containing **TWO** anions and **TWO** cations (excluding sodium, potassium and ammonium cations) and **ONE** of the following less common cations: W, Mo, Ce, Th, Ti, Zr, V, U and Li.

References

1. Vogel's Text Book of Quantitative Chemical Analysis – 5th edition, J. Basset, R.C. Denney, G.H. Jeffery and J. Mendhom.
2. A Text Book of Quantitative Inorganic Analysis by A.I. Vogel, 3rd edition.
3. Spectrophotometric Determination of Elements by Z. Marczenko.
4. Vogel's Qualitative Inorganic Analysis – Svelha.
5. Macro and Semimicro Inorganic Qualitative Analysis by A.I. Vogel.
6. Semimicro Qualitative Analysis by F.J. Welcher and R.B. Halin.
7. Quantitative Chemical Analysis by Daniel C. Harris, 7th edition, (2006).

Course Title: ORGANIC CHEMISTRY PRACTICALS
Course Code: CHB 150
Course Outcomes
After studying this course, the student to:

COID	CO
CO1	Prepare several simple organic compounds and also propose suitable mechanisms.
CO2	Acquire knowledge of different reactions, conditions to be maintained, precautions to be exercised before/during/after the reaction.
CO3	Learn qualitative analysis and to separate a mixture of two components.
CO4	Gain confidence to set up reactions individually either in the pharma industry or for the Research.

[128 HOURS]

PART – I

1. Preparation of *p*-nitro aniline from acetanilide.
2. Preparation of *p*-bromo aniline from acetanilide.
3. Preparation of benzoic acid from benzaldehyde
4. Preparation of n-butyl bromide from n-butanol.
5. Preparation of *p*-nitroiodobenzene from paranitroaniline.
6. Preparation of aniline from nitrobenzene.
7. Preparation of ß-*D*-Glucose penta acetate.
8. Preparation of phenoxy acetic acid.
9. Preparation of cyclohexanone from cyclohexanol.
10. Preparation of chalcone.
11. Preparation of *S*-benzylthiuronium chloride.
12. Condensation of anthracene and maleic anhydride (Diels-Alder reaction).
13. Preparation of *m*-nitrobenzoic acid from methyl benzoate.

PART – II

Qualitative analysis: Separation of binary mixtures, identification of functional groups and preparation of suitable solid derivatives.

References

1. Manual of Organic Chemistry -Dey and Seetharaman.
2. Modern Experimental Organic Chemistry by John H. Miller and E.F. Neugil, p 289.
3. An Introduction to Practical Organic Chemistry -Robert, Wingrove etc.

4. A Text Book of Practical Organic Chemistry–A.I. Vogel, Vol.III.

5. Practical Organic Chemistry, Mann & Saunders.

6. Semimicro Qualitative Organic Analysis by Cheronis, Entrikin and Hodnet.

7. J. N. Guthru & R. Kapoor, Advance experimental Chemistry, New Delhi-1991.

8. R. K. Bansal, Laboratory Manual of Organic Chemistry, New PGE International (P) LTd. London, 3rd edition. 1996.18

10. N. K. Visno, Practical Organic Chemistry, New PGE International (P) Ltd. London, 3rd edition, 1996.

Course Title: PHYSICAL CHEMISTRY PRACTICALS
Course Code: CHB 160
Course Outcomes

After studying this course, the student to:

COID	CO
CO1	An idea about handling of instruments like UV-Visible Spectrophotometer, Potentiometer, pH meter, etc.
CO2	Determine the concentration of the species in given solutions using kinetic methods.
CO3	Distinguish between different physical properties of substances or compounds.
CO4	Acquire knowledge of different thermodynamic parameters.

[128 HOURS]

PART – I (Non-instrumental)

1. Study of kinetics of hydrolysis of an ester using HCl/ H_2SO_4 at two different temperature, determination of rate constants and energy of activation.
2. Study of kinetics of the iodine-hydrogen peroxide clock reaction.
3. Determination of activation energy for the bromide-bromate reaction.
4. Determination of heat of solution of benzoic acid by variable temperature method (graphical method).
5. Determination of partial molar volume of NaCl-H_2O system.
6. Determination of critical solution temperature of phenol-water system.
7. Binary analysis of two miscible liquids by viscometric method (Ethanol & Water).
8. To study oscillating or periodic or rhythmic reactions of malonic acid.
9. Thermometric titration of hydrochloric acid with NaOH.

10. Kinetics of photodegradation of indigocarmime(IC) using ZnO as photocatalyst and study the effect of [ZnO] and [IC] on the rate of photodegradation.

PART – II (Instrumental)

1. Conductometric titration of a mixture of HCl and CH_3COOH against NaOH.
2. Conductometric titration of orthophosphoric acid /formic acid/ oxalic acid against NaOH and NH_4OH.
3. Determination of PI of glycine by by potentiometric method.
4. Potentiometric titration of KI vs $KMnO_4$ solution.
5. pH Titration of (a) polybasic acid(H_3PO_4), (b) (CH_3COOH+HCl) and (c) $CuSO_4$*vs*NaOH and determination of K_a.
6. To obtain the absorption spectra of colored complexes, verification of Beer's law and estimation of Ni^{+2} ions from $[Ni(NH_3)_6]^{2+}$ by spectrophotometry.
7. Analysis of binary mixture (Glycerol and Water) by the measurement of refractive index.
8. Study the kinetics of reaction between CAT and indigo carmine spectrophotometrically and determination of rate constant.
9. Spectrophotometric titration of $FeSO_4$ against $KMnO_4$.
10. Determination of the molecular weight of a polymer material by viscosity measurements (cellulose acetate/methyl acrylate).

References

1. Practical Physical Chemistry – A.J. Findlay.
2. Experimental Physical Chemistry – F. Daniels *et al*.
3. Selected Experiments in Physical Chemistry – Latham.
4. Experiments in Physical Chemistry – James and Prichard.
5. Experiments in Physical Chemistry – Shoemaker.
6. Advanced Physico-Chemical Experiments – J. Rose.
7. Practical Physical Chemistry – S.R. Palit.
8. Experiments in Physical Chemistry – Yadav, Geol Publishing House.
9. Experiments in Physical Chemistry – Palmer.
10. Experiments in Chemistry – D.V. Jahagirdar, Himalaya Publishing House, Bombay, (1994).
11. Experimental Physical Chemistry – R.C. Das and B. Behera, Tata Mc Graw Hill.

THEORY – SOFT CORE

All the courses are same as that of I Semester and a student can chose any course of his/ her choice provided that the same course has not been studied in the I Semester.

THIRD SEMESTER

THEORY – HARD CORE

Course Title: INSTRUMENTAL METHODS OF ANALYSIS
Course Code: CHC 030
Course Outcomes:
After studying this course, the student to:

COID	CO
48402	Learn the details of Electro analytical methods, Electrogravimetric analysis, Coulometric and Amperometric, Voltammetry.
48415	Understand in details with examples Thermal method of analysis, Thermogravimetric analysis, Differential thermal analysis and Differential scanning calorimetry.
48422	Learn in details with examples Enthalpimetric analysis, Microscopic analysis.

UNIT – I

Flame photometry and Atomic absorption spectrometry: Energy level diagrams-atomic absorption spectra. Flame characteristics. Flame atomizers and electrothermal atomization.Comparison of spectral interferences, chemical and physical interferences in FP and AAS. Background correction methods in AAS.Use of organic solvents. Quantitative techniques-calibration curve procedure and the standard addition technique. Typical commercial instruments for FP and AAS (Single and double beam atomic absorption spectrophotometers), applications of FES and AAS.Qualitative analysis and quantitative evaluations. Relative detectabilities of atomic absorption and flame emission spectrometry.

Molecular luminescence spectrometry: Theoretical basis for fluorescence and phosphorescence. Singlet and triplet excited states. Variables affecting luminescence-quantum efficiency, transition types, structure and structural rigidity, temperature and solvent effects, effect of *p*H, dissolved oxygen and concentration effect. Excitation spectra *vs* emission spectra.Origin of fluorescence, relationship between fluorescence and concentration.Fluorescence instrumentation-fluorometers and spectrofluorometers.Sensitivity and selectivity.Modification necessary to measure phosphorescence.Applications of fluorometry: inorganic and organic analyses.

Nephelometry and turbidometry: Principles, instrumentation and applications.

[16 HOURS]

UNIT – II

Electroanalytical methods: Classification. Potentiometers, galvanostats and potentiostats. Potentiometric methods of analysis.Potentiometric electrochemical cells.The Nernst equation.Liquid junction potentials.Reference electrodes-SHE, calomel electrode and silver/ silver chloride electrode.Metallic indicator electrodes-electrodes of first kind and second kind.Redox electrodes.Membrane electodes –membrane potential, selectivity of membranes.Glass ion selective electrodes.Crystalline solid state ion selective electrodes.Liquid-based ion selective electrodes.Gas sensing electrodes.Potentiometric biosensors.Quantitative applications.Activity *vs* concentration.Quantitative analysis using external standards and the method of standard additions. Measurement of*p*H. Clinical and environmental applications.

Electrogravimetric analysis: Theory, apparatus, cell processes, deposition and separation, electrolytic separation of metals, applications.

Coulometric methods of analysis: General discussion, coulometry at controlled potential, apparatus and general technique, applications,coulometric titrations (amperometriccoulometric)-principles, apparatus, comparison of coulometric titrations with conventional titrations, automatic coulometric titrations, applications.

Amperometric titrations: Principle, titration curve, apparatus and techniques, applications.

Voltammetry: Fundamentals of voltammetry. Cyclic voltammetry**:** Principles and applications. Stripping analysis:Stripping voltammetry-basic principles, electrodes used for stripping analysis, apparatus for stripping analysis, applications, determination of lead in water voltammetry with micro electrodes.

[16 HOURS]

UNIT – III

Thermal method of analysis: Introduction,

Thermogravimetric analysis (TGA): Types of thermogravimetric analysis, principles and general thermal decomposition curve. Factors affecting the results-heating rate, furnace, instrument control/ data handling. Applications-purity and thermal stability, evaluation of correct drying temperature, analysis of complex mixture and determination of kinetic parameters of thermal degradation.

Differential thermal analysis (DTA): General principles. Theory-variables affecting the DTA curves. Instrumentation. Applications-analysis of the physical mixtures and thermal behaviour study. Determination of melting point, boiling point and decomposition point.

Differential scanning calorimetry (DSC): Basic principle. Instrumentation-power compensated DSC, Heat flux DSC. Applications- studies of thermal transitions and isothermal crystallization. Testing the purity of the pharmaceutical samples.

Thermomechanical analysis.Dynamic mechanical analysis**.**

Enthalpimetric analysis: Thermometric titrations and direct injection enthalpimetry: Principles, apparatus and applications.

Microscopic analysis: Principle and mechanism in characterization of compounds by scanning electron and transmission electron microscopic (SEM & TEM) techniques.Components of instruments of SEM and TEM.

[16 HOURS]

References

1. Fundamental of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch 8th edition, 2005, Saunders College Publishing, New York.
2. Analytical Chemistry, G.D. Christian, 5th edition, 2001 John Wiley & Sons, Inc. India.
3. Quantitative Analysis, R.A. Day and A.L. Underwood, 6th edition,1993 Prentice Hall, Inc. New Delhi.
4. Vogel's Textbook of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J.D. Barnes and M.J.K. Thomas, 6th edition, Third Indian Reprint, 2003 Pearson Education Pvt. Ltd., New Delhi.
5. Analytical Chemistry Principles, John H. Kennedy, 2nd edition, Saunders CollegePublishing, California, 1990.
6. Instrumental Methods of Analysis by H.H. Willard, L.L. Merritt and J.A. Dean,7th Edition, CBS Publishers, New Delhi, 1988.
7. Principles and Practice of Analytical Chemistry, F.W. Fifield and Kealey, 3rd edition, 2000, Blackwell Sci., Ltd. Malden, USA.
8. Modern Analytical Chemistry, David Harvey, McGraw Hill, New Delhi, 2000.
9. Introduction to Instrumental Analysis, Braun, Pharm. Med. Press. India.
10. Instant Notes of Analytical Chemistry, Kealey and Haines, Viva Books Pvt. Ltd., New Delhi, 2002.
11. Analytical Transmission Electron Microscopy, An Introduction for OperatorsThomas, Jürgen, Gemming, Thomas., Springer, 2014.
12. Scanning Transmission Electron Microscopy, Imaging and Analysis.Pennycook, Stephen J., Nellist, Peter D. (Eds.), Springer, 2011.

Course Title: SPECTROSCOPY
Course Code: CHC 040
Course Outcomes:
After studying this course, the student to:

COID	CO
51691	Understand in details with examples UV-Visible and IR spectroscopy.
51705	Understand in depth Nuclear magnetic resonance spectroscopy, Chemical shift.
51710	Learn the characteristics of 13C-NMR spectroscopy.
51714	Understand the details of Mass spectroscopy and problems.

UNIT – I

UV Visible spectroscopy: Introduction, electronic transitions, simple chromophoric groups - systems of extended conjugation - aromatic systems - types of auxochromes - Functions of auxochromes - absorption and intesity shift - types of trasitions - transition probability - types of absorption bonds - solvent effects and choice of solvent - effect of polarity on various type of bonds Woodwards empirical rules for predicting the wavelength of maximum absorption for conjugated dienes, cyclic trienes and polyenes, α,ß-unsaturated aldehydes and ketones, benzene and substituted benzene rings.

IR spectroscopy: Introduction, instrumentation, sample handling, modes of vibrations, Hooks law, Characteristic group frequencies and skeletal frequencies. Finger print region, Identification of functional groups - alkenes, aromatics, cabonyl compounds (aldehydes and ketones, esters and lactones), halogen compounds, sulphur and phosphorus compounds, amides, lactums, amino acids and amines. Factors affecting group frequencies and band shapes, conjugation, resonance and inductance, hydrogen bonding and ring strain. Tautomerism, *Cis-trans* isomerism. Applications of IR spectroscopy.

[16 HOURS]

UNIT – II

Nuclear magnetic resonance spectroscopy: General introduction and definition, magnetic properties of nuclei (magnetic moment, g factor) and theory of nuclear resonance. Larmor precession frequency, resonance condition and relaxation processes.

Chemical shift: Standards employed in NMR, factors affecting chemical shift, electronegativity, shielding and deshielding mechanism, van der Waals deshielding, H-bonding, diamagnetic and paramagnetic anisotropics. Spin-spin coupling, chemical shift values and correlation for protons bonded to carbon and other nuclei. Instrumentation and sample handling.

Equivalence and magnetic equivalence proton exchange reactions, effects of chiral center, complex spin-spin interaction, stereochemistry, hindered rotation, Karplus curve - variation of coupling constants with dihedral angles. Simplification of complex spectra: isotopic substitution, increasing magnetic field strength, double resonance, spin decoupling, contact shift reagents, FT-NMR: Principle and applications, variable temperature profile, Nuclear Overhauser Effect (NOE).

[16 HOURS]

UNIT – III

^{13}C-NMR spectroscopy: Comparison of ^{1}H-NMR and ^{13}C-NMR. Multiplicity - proton decoupling, noise decoupling, off resonance decoupling, selective proton decoupling, noise decoupling by FT mode, chemical shift, application of ^{13}C-NMR. ^{31}P & ^{19}F, Two dimensional NMR.

Mass spectroscopy: Principles, instrumentation, different methods of ionization. EI, CI, FD and FAB, Ion separators - single focusing separator with magnetic deflection, double focusing analyzer, time-of-fight separator and quadrupole analyzer, Mass spectra – molecular ion, base peak, meta-stable peak. General rules for fragmentation pattern. Nitrogen rule, ortho effect, Hydrogen transfer rearrangement and McLafferty rearrangement. Mass spectral fragmentation of organic compounds (acids, esters, hydrocarbons, halogenated hydrocarbons, alcohols, carbonyl compounds, amines, ethers and heterocyclic compounds).

Composite problems: Problems involving the application of the above spectroscopic techniques for structural elucidation of organic molecules.

[16 HOURS]

References:

1. Spectroscopy, B.P. Straughan and S. Salker, John Wiley and Sons Inc., New York, Vol.2, 1976.
2. Organic Spectroscopy, William Kemp, English Language Book society, Macmillan, 1987.
3. Application of Absorption Spectroscopy of Organic Compounds, John R. Dyer, Prentice Hall of India Private Ltd., New Delhi, 1974.
4. Spectrometric Identification of Organic Compounds, 4th edition, Robert M. Silverstein, G. Clayton Bassler and Terence C. Morrill, John Wiley & Sons, New York, 1981.
5. Organic Spectroscopy, V.R. Dani, Tata MeGraw-Hall Publishing Company Limited, New Delhi. 1995.
6. Interpretation of Carbon-13 NMR Spectra, F.W. Wehrli and T. Wirthin, Heyden, London, 1976.
7. NMR spectroscopy – Powai.
8. Introduction to spectroscopy 3^{ed}, Pavia, Lampman, Kriz.

THEORY – OPEN ELECTIVE

Course Title: SELECTED TOPICS IN CHEMISTRY
Course Code: CHC 600
Course Outcomes:
After studying this course, the student to:

COID	CO
CO1	Gain knowledge on importance of chemistry or different branches of chemistry.
CO2	Acquire knowledge about the use of chemistry in everyday life.
CO3	Get knowledge about the extraction and purification techniques.
CO4	Learn importance of metals in biology; natural products and also various physical aspects.

UNIT – I

Solvent extraction: Basics of solvent extraction principal and application of solvent extraction.

Purification techniques: Crystallization, fractional crystallization, distillation techniques (simple distillation, steam distillation, distillation under reduced pressure, fractional distillation).

Chromatography: Definition, terms, classification of chromatographic techniques, principles of column and planar chromatography

Column chromatography: gas chromatography, high performance liquid chromatography, ion exchange chromatographic method.

Planar chromatography: Paper chromatography and TLC principles, mechanism of separation and application.

Electrophoretic methods: principles, definition, terms, types and applications.

[16 HOURS]

UNIT – II

An overview of metals in Biology: Introduction, the element content of living systems, biological chemistry of hydrogen, the economical use of resources- abundance and availability. Biological need for and the behaviors of inorganic elements.

Basic coordination chemistry for biologists: Introduction, ionic bonding, covalent bonding, coordination geometry, crystal field and ligand field theory.

Metal assimilation pathways: Introduction, metal assimilation in bacteria, plants, fungi and in mammals (iron, copper and zinc).

Metals in medicine: Introduction, *cis*-platin, radioactive pharmaceuticals, lithium compounds in therapy.

[16 HOURS]

UNIT – III

Chemistry of natural products: Carbohydrates (classification and structure of glucose, fructose, galactose, sucrose, maltose and lactose, carbohydrates as source of energy and breakdown process.

Proteins: amino acids classification and structure of α-amino acid, zwitter ion, isoelectric point and its determination by electrophoretic method, Elementary aspect of primary and secondary structures.

Vitamins: Classification, importance of vitamin A, D, E, K, B & C.

[16 HOURS]

UNIT – IV

Thermodynamics: First and second laws of thermodynamics. Concept of entropy and free energy, entropy as a measure of unavailable energy. Entropy and free energy changes and spontaneity of process. Variation of free energy with temperature and pressure. **Chemical kinetics**: Factor affecting the rate of reaction. Order of reaction and its determination. Energy of activation and its determination. Assumption of activated complex theory. **Electrochemistry:** Arrhenius theory of strong and weak electrolytes. Assumptions of Debye-Huckel theory of strong electrolytes. Electrode potential and construction of electrochemical cells. Corrosion and its prevention. **Photochemistry:** Laws of photochemistry, quantum yield and its determination, photodegradation.

[16 HOURS]

References:

1. Arthur I Vogel, Elementary Practical Organic Chemistry, Part I, II and III, CBS Publishers and Distributors, New Delhi, India.
2. I.L. Finar, Organic Chemistry, ELBS Longmann, Vol. I and II, 1984.
3. S K. Ghosh, Advanced General Organic Chemistry, Book and Allied (P) Ltd, 1998.
4. Organic Spectroscopy, William Kemp, English Language Book society, Macmillan, 1987.
5. Application of Absorption Spectroscopy of Organic Compounds, John R. Dyer, Prentice Hall of India Private Ltd., New Delhi, 1974.

6. Spectrometric Identification of Organic Compounds, 4th edition, Robert M. Silverstein, G. Clayton Bassler and Terence C. Morrill, John Wiley & Sons, New York, 1981.
7. Basic Inorganic Chemistry- 3rd edition, F.A. Cotton, G. Wilkinson and P.L. Gaus, John Wiley and Sons, (2002).
8. Inorganic Chemistry Principles of Structure and Reactivity: James E. Huheey, Ellen A. Keiter, Richard L. Keiter, Okhil K. Medhi, Delhi University, New Delhi (2006)
9. Elements of Physical Chemistry – Lewis and Glasstone.
10. Physical Chemistry by P.W. Atkins, ELBS, 4th edition, Oxford University Press (1990).
11. Basic Physical Chemistry by W.J. Moore, Prentice Hall, New Delhi, (1986).
12. Physical Chemistry – G.M. Barrow, McGraw Hill International Service (1988).

THEORY – SOFT CORE

Course Title: INORGANIC CHEMISTRY-II
Course Code: CHC 500
Course Outcomes:
After studying this course, the student to:
CO1: Gain knowledge from basic concepts of ionic solids, modern concept of acids and bases.
CO2: Demonstrate and understand the basic principles of acid-base chemistry and nonaqueous solvents.
CO3: Acquire knowledge to handle homogeneous and heterogeneous catalysis.

UNIT – I

Ionic solids: Introduction, Characteristic structures of ionic solids (NaCl, CsCl, ZnS, fluorite, rutile, β-crystobalite and cadmium iodide). The rationalization of structures.

The energetics of ionic bonding: Lattice enthalpy and Born-Haber cycle. Calculation of lattice enthalpies. Comparison of experimental and theoretical values of lattice enthalpy. The Kapustinskii equation. Consequences of lattice enthalpies.

Modern concept of acids and bases: Lux-Flood and Usanovich concepts, solvent system and leveling effect. Hard-Soft Acids and Bases, Classification and Theoretical backgrounds.

Supercritical fluids: Properties of supercritical fluids and their uses as solvents. Supercritical fluids as media for inorganic chemistry.

[16 HOURS]

UNIT – II

Biological and Medicinal Applications: Organomercury, boron, silicon and aresenic compounds.

Catalysis: General principles-The language of catalysis. Homogeneous and heterogeneous catalysts.

Homogeneous catalysis: Alkene hydrogenation, hydroformylation, The Wacker's process, Monsanto acetic acid process and L-DOPA synthesis, alkene oligomerizations, water-gas shift reactions. Palladium catalysed C-C bond forming reactions.

Heterogeneous catalysis: Alkene polymerization: Ziegler-Natta catalysis, Fischer-Tropsch carbon chain growth.

Zeolites as catalysts for organic transformation: Uses of ZSM - 5

Alkene metathesis, hydroboration, arylation or vinylation of olefins (Heck reaction).

Hybrid catalysts: Tethered catalysis. Biphasic systems.

Hydrosilylation: Platinum catalyst, Asymmetric palladium catalyst, Rhodium catalysts for asymmetric ketone reduction.

Asymmetric catalysis: General features of chiral ligands and complexes; mechanisms and catalytic cycles in hydrogenation, isomerization, epoxidation and catalytic reactions of C-C bond formation.

[16 HOURS]

References:

1. Basic Organometallic Chemistry - B.D. Gupta and A.J. Elias, Universities Press (2010).
2. Organometallics - A Concise Introdution, 2nd edition, Chistoph Elschenbroich and Albert salzer VCH, (1992).
3. Inorganic Chemistry, 2nd edition, C.E. Housecroft and A.G. Sharpe, Pearson Education Ltd., (2005).
4. Inorganic Chemistry- 3rd edition, G.L. Miessler and D.A. Tarr, Pearson Education, (2004).
5. Inorganic Chemistry, 4th edition. P. Atkins, T. Overton, J. Rourke, M. Weller and F. Armstrong, Oxford University Press (2004).

Course Title: STRUCTURAL METHODS IN INORGANIC CHEMISTRY

Course Code: CHC 510

Course Outcomes:

After studying this course, the student to:

CO1: Gain knowledge from basic concepts of instrumentation.

CO2: Demonstrate and understand basic principles of spectroscopic techniques.

CO3: Acquire knowledge about applications of spectroscopic techniques.

UNIT – I

NMR spectroscopy: Basic principles, chemical shift and factors affecting it, coupling constants. ^{19}F, ^{31}P, ^{11}B - NMR and NMR of paramagnetic complexes. Double resonance technique, The Nuclear Overhauser Effect, Magnetic susceptibility measurements by Evan's method. NMR to solids.

ESR spectroscopy: Theory, presentation of the spectrum, hyperfine coupling, the g value and factors affecting the magnitude of the g value. Zero-field splitting and Kramers' degeneracy. Application to simple inorganic and organic free radicals and to metal complexes.

NQR spectroscopy: Theory, energies of the quadrapole transitions, instrumentation, effect of magnetic field on the spectra, relationship between electric field gradient and molecular structures. Applications - interpretation of e^2Qq data, structural information from NQR data.

[16 HOURS]

UNIT – II

Vibrational spectroscopy: Introduction, theory of infrared absorption, theoretical group frequencies, correlation chart. Applications to coordination compounds - aquo, amine, urea, DMSO, *cis* and *trans* metal complexes. Change in spectra accompanying change in symmetry upon coordination (nitrite, sulphate, nitrate, perchlorate and carbonate)

Mossbauer spectroscopy: Theoretical basis, interpretation of Mossbauer spectra - isomer shift, quadrupole splitting and magnetic hyperfine structures. Application: $I_2Br_2Cl_4$, $Fe_3(CO)_{12}$, Prussian blue, nitroprusside, hexacyanoferrate.

Photoelectron spectroscopy: Introduction, principles, chemical shifts, photoelectron spectra of simple molecules, X-ray photoelectron and Auger electron spectroscopy. Applications.

Mass spectrometry: Theory, experimental techniques, molecular ions, fragmentation and ion reaction, Applications to coordination compounds.

[16 HOURS]

References:

1. Electronic Absorption Spectroscopy and Related Techniques – D.N. Sathyanarayana, Universities Press (2001).
2. Structural Methods in Inorganic Chemistry – E.A.V. Ebsworth, D.W.H. Ranklin and Cradock, Blackwell Scientific Publications (1988).
3. Physical Methods in Inorganic Chemistry – R.S. Drago, Saunders Publishers (1966).

Course Title: BIOPHYSICAL CHEMISTRY AND POLYMERS
Course Code: CHC 520

Course Outcomes:

After studying this course, the student to:

CO1: Learn electrophoresis, kinetics of polymerization, phase transition in polymer, polymers in solutions.

CO2: Distinguish different types of electrophoresis like free electrophoresis, zone electrophoresis, gel electrophoresis.

UNIT – I

Electrokinetic phenomena: Electrophoresis - principles of free electrophoresis, zone electrophoresis, gel electrophoresis and its applications in qualitative and quantitative study of proteins. Determination of isoelectric point of a protein. Electroosmosis and streaming potential and its biological significance. Biological significance of Donnan membrane phenomenon. Micelles and its involvement during digestion and absorption of dietary lipids. Diffusion of solutes across biomembranes and its application in the mechanism of respiratory exchange. "Salting In" and "Salting Out" of proteins. Osmotic behaviour of cells and osmo-regulation and its application in the evolution of excretory systems of organisms. Effect of temperature and *p*H on the viscosity of biomolecules (albumin solution). Significance of viscosity in biological systems - mechanism of muscle contraction, detection of intrastrand disulfide bonds in proteins, polymerization of DNA and nature of blood flow through different vessels. Effect of temperature, solute concentration (amino acids) on surface tension. Biological significance of surface tension - stability of Alveoli in lungs, interfacial tension in living cells (Danielli and Davson model). Application of sedimentation velocity and sedimentation equilibrium method for molecular weight determination of proteins.

[16 HOURS]

UNIT – II

Polymers: Fundamentals of polymers - monomers, repeat units, degree of polymerization. Linear, branched and network polymers. Classification of polymers. Polymerization - condensation, addition, free radical, ionic, co-ordination polymerization and ring opening polymerization. Molecular weight and size. Polydispersion. Average molecular weight concepts – number, weight and viscosity average molecular weight. Determination of molecular weights - viscosity method, osmotic pressure method, sedimentation and light scattering method.

Kinetics of Polymerization - condensation, addition, free radical, ionic, co-ordination polymerization. Kinetics of copolymerisation and polymer degradation.

Phase transitions in polymers and thermal characterization: Glass transition, crystallinity and melting- correlation with the polymer structure.

Polymers in solution: Criteria of polymer solubility. Thermodynamics of polymer solutions.

[16 HOURS]

References

1. Introduction to Physical Organic Chemistry, R.D. Gilliom, Madison – Wesley, USA (1970).
2. Physical Organic Chemistry, Reaction Rate and Equilibrium Mechanism – L.P. Hammett, McGraw HillBook, Co., (1970).
3. Biophysical Chemistry, Principle and Technique – A. Upadhyay, K. Upadhyay and N. Nath, Himalaya Publishing House, Bombay, (1998).
4. Essentials of Physical Chemistry and Pharmacy – H. J. Arnikar, S. S. Kadam, K.N. Gujan, Orient Longman, Bombay, (1992).
5. Text book of polymer Science. F.W. Billmeyer, Jr., John Wiley. London (1994).
6. Polymer Science. V. R. Gowrikar, N. V. Vishwanathan and J. Sreedhar, Wiley Eastern, New Delhi (1990).
7. Fundamentals of Polymer Science and Engineering. A. Kumar and S.K. Gupta, Tata – McGraw Hill New Delhi (1978).
8. Polymer Characterization, D. Campbell and J. R. White, Chapman and Hall, New York.

Course Title: APPLICATIONS OF CHEMICAL KINETICS AND QUANTUM CHEMISTRY

Course Code: CHC 530

Course Outcomes:

After studying this course, the student to:

CO1: Understand the fundamentals of polymers, degree of polymerization and classification of polymers.

CO2: Acquire knowledge on different methods for the classification of compounds based on their molecular weights.

CO3: Develop knowledge on different methods for the classification of homogeneous catalysis.

UNIT - I

Homogenous catalysis: Acid-base catalysis, specific acid and base catalysis. General acid and base catalysis. Oxidation of amino acids and carbohydrates in presence of acid and base catalysis. Acidity functions - Bronstead, Hückel, Hammett and Bunnett hypothesis.

Chain reactions: Rice-Herzfeld mechanism for the thermal decomposition of acetaldehyde, Kinetics of explosive reactions, explosion limits (H_2 and O_2 reaction). Kinetics of autocatalytic and oscillatory chemical reactions, oscillatory chemical reaction of oxidation of malic acid by bromate ion catalyzed by Ce(III). Catalyzed and uncatalyzed reaction: Ru(III) catalyzed oxidation reaction of primary amines by chloramine – T in HCl medium.

[16 HOURS]

UNIT – II

Applications of quantum chemistry: Variation theorem- statement and proof. Application of variation method to He atom, the structure of many electron systems/ atoms (secular equations & determinants), Spin-orbit interaction, antisymmetry and Pauli exclusion principle. Angular momenta (commutations, relations, operators), Term symbols, Russell-Saunders terms and coupling schemes, Slater orbitals and SCF method for many electron systems.

Molecular wave functions: Born-Oppenheimer approximations. Covalent bond –valence bond and molecular orbital approaches with comparisons. MO theory applied to homonuclear and heteronuclear diatomics by LCAO methods, correlation diagrams, non-crossing rule.

Theory of directed valence-hybridization and geometry of molecules in terms of molecular orbitals (bond angle, dihedral angle), localised and delocalised molecular orbitals.

Conjugated and aromatic molecules: Huckel molecular orbital (HMO) theory of linear conjugated systems (ethane & allyl systems) and aromatic molecules (benzene as an example). Calculation of delocalization energies, bond order & charge density.

[16 HOURS]

References:

1. Statistical Thermodynamics by B.C. Mclelland, Chapman and Hall, London (1973).
2. Elementary Statistical Thermodynamics by N.D. Smith, Plenum Press, NY (1982).
3. Elements of Classical and Statistical Thermodynamics by L.K. Nash, Addison-Wesley (1970).
4. Statistical Thermodynamics by I.M. Klotz.
5. Introduction to Statistical Thermodynamics by M. Dole, Prantice Hall, (1962).
6. Text Book of Physical Chemistry by Samuel Glasstone, McMillan Indian Ltd., 2nd edition (1974).

7. Elements of Physical Chemistry by Lewis and Glasstone.
8. Physical Chemistry by P.W. Atkins, ELBS, 4th edition, Oxford University Press (1990).
9. Kinetics and Mechanism of Chemical Transformation by J. Rajaram and J.C. Kuriacose.
10. Chemical Kinetics – L.K. Jain.
11. Chemical Kinetics – Benson.
12. Physical Organic Chemistry, Reaction Rate and Equilibrium Mechanism – L.P. Hammett, McGraw HillBook, Co., (1970).
13. Fundamentals of Photochemistry – Rohatgi and Mukherje (New Age Bangalore) 2000.

PRACTICALS – SOFT CORE

Course Title: ANALYTICAL CHEMISTRY PRACTICALS
Course Code: CHC 210
Course Outcomes:
After studying this course, the student to:

COID	CO
CO1	Get experience on analysis of various complex mixtures by following multistep reactions.
CO2	Acquire the knowledge on handling instruments and to overcome the general problems arises during the analysis.
CO3	Acquire industrial skills required for sampling, analytical and interpretation and presentation of results.
CO4	Possess adequate knowledge on literature search for developed analytical methods.

[128 HOURS]

PART – III

1. Determination of calcium in limestone by redox, acid-base and complexation titrations.
2. Determination of vitamin C in orange juice by titration with cerium(IV) and with 2,6-dichlorophenol indophenol.
3. Determination of mercury in an algaecide by EDTA titration; and arsenic in ant control preparation by redox titration.
4. Determination of aluminium and magnesium in antacids by EDTA titration.
5. Analysis of a copper-nickel alloy sample for copper and nickel by EDTA titration using masking and selective demasking reactions.
6. Determination of saccharin in tablets by precipitation titration.
7. Determination of iodine value and saponification value of edible oils.

8. Determination of ascorbic acid in goose berry/bitter gourd by titrimetry and spectrophotometry using *N*-bromosuccinimide (NBS).
9. Analysis of a mixture of iron(II) and iron(III) by EDTA titration using *p*H control.
10. Determination of sulpha drugs by potentiometry using $NaNO_2$ and iodometric assay of penicillin.
11. Solvent extraction method for determination of silver as ion-associate with 1,10-phenanthroline and bromopyragallol red.
12. Electrolytic determination of copper and lead in brass.
13. Polarographic determination of copper and zinc in brass.
14. Determination of sodium, potassium and calcium in mineral waters by atomic emission spectrometry.
15. Determination of iron in mustard seeds and phosphorus in peas by spectrophotometry.
16. Analysis of waste water for anionic detergents and phenol by spectrophotometry.
17. Fluorimetric determination of riboflavin (vit.B_2) in tablets.
18. Colorimetric analysis of procaine by diazotization and coupling reaction.
19. Determination of manganese in steel by extraction-free spectrophotometry and molybdenum in steel by extractive spectrophotometry.
20. Determination of ethanol in wine by titrimetric and spectrophotometric dichromate methods

PART – IV

1. Analysis of waste waters for DO and COD by titrimetry.
2. Analysis of a ground water sample for sulphate by titrimetry (EDTA) and turbidimetry.
3. Potentiometric determination of formula and stability constant of a silver-ammonia complex ion.
4. Determination of aspirin, phenacetin and caffeine in mixture and APC tablets by solvent extraction and UV spectrophotometry.
5. Kinetic determination of urinary creatinine and purity of a commercial H_2O_2 sample.
6. Determination of chromium(III) and iron(III) in a mixture by kinetic masking methods.
7. Catalytic determination of traces of selenium in biological materials and iodide in blood serum.
8. Photometric and potentiometric titration of iron(III) with EDTA.
9. Photometric and potentiometric titration of copper with EDTA.
10. Determination of copper(II) and iron(III) in mixture by photometric titration with EDTA.

11. Analysis of brackish water for chloride content by a**)** spectrophotometry (mercuric thiocyanate method), b) conductometry (silver nitrate) and c**)** potentiometry (silver nitrate).
12. Conductometric titration of sodium acetate with HCl and NH_4Cl with NaOH.
13. Ascorbic acid determination in natural orange juice by coulometry.
14. Spectrophotometric determination of iron in natural waters using thiocyanate and 1,10-phenanthroline as reagents.
15. Determination of fluoride in drinking water/ground water by spectrophotometry(alizarin red lake method).
16. Analysis of waste water for
    a) phosphate by molybdenum blue method
    b) ammonia-nitrogen by Nessler's method
    c) nitrite-nitrogen by NEDA method

15. Analysis of a soil sample for
    a) calcium carbonate and organic carbon by titrimetry.
    b) calcium and magnesium by EDTA titration.

16. Analysis of a soil sample for
    a) Nitrogen content by Kjeldahl method
    b) Available phosphorus by spectrophotometry.
    c) Nitrate-nitrogen/nitrite nitrogen/ammonia nitrogen by spectrophotometry.
    d) sodium and potassium by flame photometry.

17. Analysis of urine for
    a) urea and uric acid by titrimetrysnd spectrophotometry.
    b) Sulphate by precipitation titration after ion-exchange separation.
    c) Sugar by Benedict's reagent.

18. Analysis of blood for
    a) cholesterol by spectrophotometry
    b) bicarbonate by acid-base titration.

19. Fluorimetric determination of quinine in an antimalarial tablet.

References

1. Fundamental of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch 8thedition, 2005, Saunders College Publishing, New York.
2. Analytical Chemistry, G.D. Christian, 5th edition, 2001 John Wiley & Sons, Inc. India.

3. Quantitative Analysis, R.A. Day and A.L. Underwood, 6th edition, 1993, prentice Hall, Inc. New Delhi.
4. Vogel's Textbook of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J.D.Barnes and M.J.K. Thomas, 6th edition, Third Indian Reprint, 2003 Pearson EducationPvt. Ltd., New Delhi.
5. Analytical Chemistry Principles, John H. Kennedy, 2nd edition, Saunders CollegePublishing, California, 1990.
6. Quantitative Analysis of Drugs in Pharmaceutical Formulations, P. D. Sethi, 3rdedition, CBS Publishers & Distributors, New Delhi, 1997.
7. Practical Clinical biochemistry methods and interpretations, R. Chawla, J.P. BothersMedical Publishers (P) Ltd., 1995.
8. Laboratory Manual in Biochemistry, J. Jayaraman, New Age International Publishers,New Delhi, 1981.
9. Experiments on Water Pollution, D.I.Williams and D. Anglesia, Wayland Publishers Ltd., England, 1978.
10. Experiments on Land Pollution, D.I. Williams and D. Anglesia, Wayland PublishersLtd., England, 1978.
15. Experiments in Environmental Chemistry, P.D. Vowler and D.W. Counel, Pergamon Press,Oxford 1980.
16. Manual Soil Laboratory Testing, vol.I, K.H. Head, Pentech Press, London 1980.

Course Title: INORGANIC CHEMISTRY PRACTICALS
Course Code: CHC 220
Course Outcomes:
After studying this course, the student to:

COID	CO
CO1	Get experience on analysis of various complex mixtures by multistep reactions.
CO2	Acquire knowledge on handling instruments.
CO3	Acquire skills required for sampling, analytical and interpretation and presentation of results.
CO4	Possess adequate knowledge on literature search for developed preparative methods.
CO5	Synthesize and characterization of complexes.

[128 HOURS]

PART – III

1. Determination of aluminium and bismuth by complexometric titration.
2. Determination of lead and tin in a mixture.
3. Determination of calcium and lead in a mixture by pH control and complexation method.
4. Determination of zinc, manganese and magnesium in a mixture using fluoride as a demasking agent.
5. Quantitative analysis of copper(II) and iron(II) in a mixture:
   i. Copper gravimetrically as CuSCN and
   ii. Iron volumetrically using cerium(IV) solution
6. Determination of iron as the 8-hydroxyquinolate by solvent extraction method.
7. Determination of the composition of iron-phenanthroline complex by:
   (a) Job's method
   (b) Mole-ratio method and
   (c) Slope-ratio method.
8. Polarographic estimation of cadmium and zinc.
9. Spectrophotometric determinations of:
   a. Titanium using hydrogen peroxide
   b. Chromium using diphenyl carbazide in industrial effluents
   c. Nickel using dimethylglyoxime in steel solution
10. Solvent extraction of ferric thiocyanate complex and determination by colorimetry.

PART – IV

1. Preparation of hexaamminecobalt(III) chloride and estimate cobalt ion.
2. Preparation and characterization of Chloropentaamminecobalt(III) chloride and estimate cobalt ion.
3. Using chloropentaamminecobalt(III) chloride, prepare nitro and nitritopentamamine cobalt(III) chloride. Record the IR spectra of the isomers and interpret.
4. Preparation of potassium tris-oxolatochromate(III) trihydrate.
5. Preparation of mercurytetrathiocyanatocobaltate(II) and estimation of mercury by gravimetry.
6. Preparation of tetraamminecopper(II) sulphate terahydrate

7. Preparation and characterization of manganese dioxide nano-particles
8. Preparation of bis-dichlorotriphenyl phosphine nickel (II).
9. Preparation and characterization of hexaamminenickel(II) chloride.
10. Demonstration Experiments:
    (a) Recording and interpretation of IR and NMR spectra of complexes.
    (b) Spectrochemical series - Evaluation of Dq value.
    (c) DNA interaction with metal complexes by UV-visible absorption and viscosity methods.

References

1. Basic principles of Practical Chemistry – V. Venkateswaran, R. Veeraswamy and A.R. Kulandraivelu
2. Instrumental Analysis Manual - Modern Experiments for Laboratory – G.G. Guilbault and L.G. Hargis.
3. A Text Book of Quantitative Inorganic Analysis – A.I. Vogel, 5th edition.
4. Experimental Inorganic Chemistry – G. Palmer.
5. Inorganic Synthesis – O. Glemser.
6. Experimental Inorganic/ Physical Chemistry- Mounir A. Malati.
7. Quantitative Chemical Analysis – Daniel C. Harris, (2006) 7th edition.
8. Spectrophotometric Determination of Elements – Z. Marczenko

Course Title: ORGANIC CHEMISTRY PRACTICALS
Course Code: CHC 230
Course Outcomes:
After studying this course, the student to:

COID	CO
CO1	Develop experience in multistep synthesis and also mechanisms.
CO2	Learn different kinds of reactions under multistep synthesis.
CO3	Learn isolation experiments, preliminary identification and separation.
CO4	Acquire knowledge of various estimations like sugars, enol content, ketones, nitro, protein etc.

[128 HOURS]

PART – III

Multi step synthesis

1. Oxidation of cyclohexanol to adipic acid via cyclohexanone
2. Preparation of benzoccaine from *p*-nitrotoluene
3. Preparation of *p*-chlorobenzoic acid from *p*-toluidine (Sandmeyer's reaction)
4. Molecular rearrangement:
   i. Preparation of *o*-chlorobenzoic acid from phthalic anhydride
   ii. Preparation benzilic acid from benzaldehyde
   iii. Preparation of *o*-hydroxy benzophenone from phenyl benzoate via Fries rearrangement
   iv. Prepartion of benzanilide from benzophenone (Beckmann rearrangement).
5. Grignard reaction: Prepearation of triphenyl carbinol
6. Preparation of luminol from phthalic anhydride
7. Synthesis of isoxazolines and pyrazolines via 1,3-dipolar cycloaddition.
8. Synthesis of tetralones from aryl aldehydes.
9. Synthesis of *m*-chloroiodobenzene from *m*-dinitrobenzene
10. Synthesis of Schiff base from nitro compound.

PART – IV

Isolation of natural products

1. Fractional crystallization: separation of mixture of naphthalene and biphenyl
2. Fractional distillation: Separation of mixture of hexane and toluene.
3. Thin layer chromatography: Separation of plant pigments
4. Column chromatography: Separation of mixture of *o* and *p*-nitro anilines
5. Isolation of piperine from pepper
6. Isolation of caffeine from tea
7. Isolation of azeleic acid from castor oil
8. Isolation of clove oil from clove
9. Estimation of sugars by Fehlings method
10. Determination of enol content by Meyer's method
11. Estimation of ketones by haloform reaction
12. Estimation of sugars by Bertrand's method
13. Estimation of nitro groups
14. Estimation of protein by biuret method

Spectral analysis: Structural elucidation of some simple organic compounds by UV, IR, NMR and mass. The spectra have to be provided by the teachers.

References

1. Manual of Organic Chemistry - Dey and Seetharaman.
2. Modern Experimental Organic Chemistry by John H. Miller and E.F. Neugil, p 289.
3. An Introduction to Practical Organic Chemistry - Robert, Wingrove etc.
4. A Text Book of Practical Organic Chemistry – A.I. Vogel, Vol.III
5. Practical Organic Chemistry - Mann & Saunders
6. Semimicro Qualitative Organic Analysis by Cheronis, Entrikin and Hodnet .
7. R.K. Bansal, Laboratory Manual of Organic Chemistry, New Age International (P) Ltd. London, 3rd edition, 1996.

Course Title: PHYSICALCHEMISTRY PRACTICALS
Course Code: CHC 240
Course Outcomes:
After studying this course, the student to:

COID	CO
CO1	Acquire knowledge on handling instruments and to overcome the general problems arises during the analysis.
CO2	Learn concepts of rate constants, energy of activation, order of the reaction and also thermodynamics parameters.
CO3	Learn concepts of kinetics experiments.

[128 HOURS]

PART – III (NON-INSTRUMENTAL)

1. Determination of energy of activation for reaction between sodium formate and iodine.
2. To study the kinetics of reaction between acetone and iodine-determination of order of reaction w.r.t. iodine and acetone.
3. Determination of rate of decomposition of hydrogen peroxide with manganese dioxide.
4. Determination of order and rate constant of hydrolysis of ethyl acetate in acid medium.
5. Kinetics of decomposition of benzene diazonium chloride, determination of energy of activation and thermodynamic parameters.
6. Kinetics of decomposition of diacetone alcohol by NaOH-determination of energy of activation.

7. To determine the eutectic point of a two component system (Naphthalene-*m*-dinitrobenzene system).
8. Study of phase diagram of a three component system (e.g. acetic acid-chloroform water and system).Construction of binodal curve and indicating tie line.
9. Determination of heat of solution and lattice energy of calcium chloride.
10. Determination of partition co-efficient of acetic acid in water and butanol.
11. Study of kinetics of reaction between $K_2S_2O_8$ and KI, first order, determination of rate constants at two different temperatures and E_a.
12. To determine the rate constant for the reaction glycine and CAT.

PART IV (INSTRUMENTAL)

1. Kinetics of saponification of ethyl acetate by conductivity method and study the effect of dielectric constant of the medium (using CH_3OH).
2. Simultaneous spectrophotometric determination ofmanganese and chromium in $KMnO_4$ and $K_2Cr_2O_7$ mixture.
3. Determination of ionic product of water and study the effect of temperature.
4. Coulometric titration I_2 *vs* $Na_2S_2O_3$.
5. Conductometric study of charge transfer complex of p-phyenylenediamine with phthalic acid.
6. Determination of mean ionic activity coefficient of a weak electrolyte (acetic acid) by conductometric measurements.
7. Conductometric determination of the degree of hydrolysis and hydrolysis constant of aniline hydrochloride.
8. Conductometric titration of potassium iodide with mercuric perchlorate.
9. Determination of pK value of an indicator (methyl orange).
10. Potentiometric titration of mixture of KCl+KBr+KI*vs* $AgNO_3$.
11. Conductometric titration of a mixture of HCl, CH_3COOH and $CuSO_4$ against NaOH.
12. Thermometric titration of HCl and H_3BO_3 with NaOH.
13. Determination of quantum yield for the photolysis of Chloramine-T.
14. Determination of quantum yield for the photolysis of Chloramine-B.

References

1. Practical Physical Chemistry – A.J. Findlay.
2. Experimental Physical Chemistry – F. Daniels *et al*.

3. Selected Experiments in Physical Chemistry – Latham.
4. Experiments in Physical Chemistry – James and Prichard.
5. Experiments in Physical Chemistry – Shoemaker.
6. Advanced Physico-Chemical Experiments – J. Rose.
7. Practical Physical Chemistry – S.R. Palit.
8. Experiments in Physical Chemistry – Yadav, Geol Publishing House.
9. Experiments in Physical Chemistry – Palmer.
10. Experiments in Chemistry – D.V. Jahagirdar, Himalaya Publishing House, Bombay, (1994).
11. Experimental Physical Chemistry – Das. R.C. and Behera B, Tata Mc Graw Hill.

FOURTH SEMESTER

THEORY – HARD CORE

Course Title: BIOINORGANIC CHEMISTRY
Course Code: CHD 010
Course Outcomes:
After studying this course, the student to:

COID	CO
47414	Understand in details with examples Structural and molecular biology, Bioenergetics, Sodium and potassium-channels and pumps, Biochemistry of calcium, Vitamin B12 and Coenzymes.
47426	Understand the characteristics of Electron transport proteins and redox enzymes, Non-redox metalloenzymes.
47438	Specify the classification and characteristics of Identify the details of Metal ion transport and storage, Oxygen transport and oxygen uptake proteins.
47447	Learn the details of Metals in medicine, Disease due to metal deficiency and treatment, Metal complexes as drugs and therapeutic agents, Treatment of toxicity.

UNIT – I

Structural and molecular biology: Introduction, The structural building blocks of proteins, the structural building block of nucleic acids. Metal ion interactions with nucleosides and nucleotides.

General features of DNA - metal complex interaction.

Bioenergetics: Introduction, Redox reactions in metabolism, the central role of ATP in metabolism. Kinetic stability of ATP, Mitochondrial flow of electrons from NADH to O_2. Oxidative phosphorylation and respiratory chain.

Sodium and potassium-channels and pumps: Introduction, transport across membranes. Potassium and sodium channels, The sodium-potassium ATPase, Macro cyclic crown ether compounds, cryptands and ionophores.

Biochemistry of calcium: Introduction - comparison of Ca^{2+} and Mg^{2+}. Biological roles of calcium, binding sites of calcium and proteins, storage of calcium, calcium in muscle contraction, calcium in blood clotting process.

Vitamin B_{12} and Coenzymes: Structural feature, names of different forms, chemistry of cobalamin, biochemical functions of cobalamins, model compounds. Special characteristics of B_{12} co-enzyme.

[16 HOURS]

UNIT – II

Metal ion transport and storage:

Iron storage and transport: Transferrin, ferratin, phosvitin and gastroferrin.

Iron transport in microbes: siderophores, *in vivo* microbial transport of iron

Oxygen transport and oxygen uptake proteins: Properties of dioxygen (O_2): Thermodynamic and kinetic aspects of dioxygen as an oxidant, activation of dioxygen through complexation with metal ions.

Haemoglobin (Hb) and Myoglobin (Mb) in oxygen transport mechanism: Introduction to porphyrin system, substituent effects on porphyrin rings, functions of Hb and Mb. Characteristics of O_2^- binding interaction with Hb and Mb. Model compounds for oxygen carriers (Vaska's complex and cobalt(III) – Schiff base complexes). Hemerythrin and hemocyanin.

Electron transport proteins and redox enzymes: Iron – sulfur proteins (rubredoxins and ferredoxins) and cytochromes including cytochrome P450. Catalase and peroxidase: Structure and reactivity.

Superoxide dismutase: Structure and reactivity.

Molybdenum containing enzymes: Aspects of molybdenum chemistry, Xanthine oxidase, aldehyde oxidase, sulfite oxidase, nitrogenase and nitrite reductase.

Non-redox metalloenzymes - Structure and reactivity: Carboxypeptidase-A, alcohol dehydrogenase, leucine aminopeptidase and carbonic anhydrase.

[16 HOURS]

UNIT - III

Therapeutic uses of Metals - Metals in medicine: Introduction, metals and human biochemistry, general requirements.

Disease due to metal deficiency and treatment: Iron, zinc, copper, sodium, potassium, magnesium, calcium and selenium.

Metal complexes as drugs and therapeutic agents: Introduction, antibacterial agents, antiviral agents, metal complexes in cancer therapy, metal complexes for the treatment of rheumatoid arthritis, vanadium diabetes, metal complexes as radio diagnostic agents.

Treatment of toxicity due to inorganics: General aspects of mechanism of metal ion toxicity,

(i) Mechanism of antidote complex with poison, rendering it inert: arsenic, lead, mercury, iron, copper.

(ii) Antidote accelerated metabolic conversion of poison to non-toxic product: cyanide and carbon monoxide.

[16 HOURS]

References:

1. The Inorganic Chemistry of Biological Process- 2nd edition, M. N. Hughes, John Wiley and Sons, (1988).
2. Bioinorganic Chemistry - R.W. Hay, Ellis Horwood Ltd., (1984).
3. Biological Inorganic Chemistry – An Introduction, R.R. Crichton, Elsevier, (2008).
4. Bioinorganic Chemistry - A.K. Das, Books and Allied (P) Ltd, (2007).
5. Bioinorganic Chemistry - K. Hussain Reddy, New Age International Ltd. (2003).
6. Bioinorganic Chemistry: A Survey - Eiichiro Ochiai, Academic Press, (2008).
7. Bioinorganic Chemistry: A Short Course - 2nd edition, R.M. Roat-Malone, Wiley Interscience, (2007).
8. Medicinal Applications of Coodination Chemistry - Chris Jones and John Thornback, RSC Publishing, (2007).
9. Transition Metal Complexes as Drugs and Chemotherapeutic Agents - N. Farrell, Kluwer Academic Publishers (1989).
10. The Biological Chemistry of the Elements: The Inorganic Chemistry of Life - 2nd edition, J.J.R. Frausto da Silva and R.J.P. Williams, Oxford University Press,(2001).

Course Title: ADVANCED PHYSICAL CHEMISTRY
Course Code: CHD 020
Course Outcomes:
After studying this course, the student to:

COID	CO
47184	Learn in depth Photochemistry, Mechanism of absorption and emission of radiation, Photophysical kinetics.

UNIT – I

Kinetics and Thermodynamics of Polymerization: Kinetics of addition, condensation and radiation induced polymerization. Thermodynamics of polymer solutions, The Flory-Huggins Theory, Flory Krigbaum and modified Flory-Huggins Theory.

Copolymerization: Kinetics of copolymerization, Copolymer equation, Monomer reactive ratios. Properties of Polymers: Crystalline melting point and the glass transition temperature.

Polymer molecular weights: Molecular weight distribution, Number average and Weight average molecular weight. Methods for determination of molecular weight – Osmometry-membrane osmometry, vapour pressure osmometry, light scattering, viscosity, ultracentrifugation.

Conducting Polymers: Structure, properties, characterization and applications.

Polymer Degradation, Stability and Environmental Issues: Types of degradation, Thermal degradation, Mechanical degradation, Photodegradation, Degradation by high energy radiation. Chemical, hydrolytic and UV stability. Recycling and biodegradation.

[16HOURS]

UNIT – II

Photochemistry: Introduction to photochemistry, quantum yield and its determination, factors affecting quantum yield, Actinometry - Uranyloxalate and potassium ferrioxalate actinometers, acetone and diethylketone actinometers. Photosensitization: by mercury, dissociation of H_2. Photochemical kinetics of: Decomposition of CH_3CHO, formation of HCl. Photodegradation: Photocatalyst – ZnO, TiO_2, principle, application of ZnO/ TiO_2 in the photo degradation of dyes (IC), pesticides (DDT) and in industrial effluents. Effect of photo degradation on COD value.

Mechanism of absorption and emission of radiation: Einstein's treatment, selection rules, Life times of excited electronic states of atoms and molecules Types of electronic transitions in organic

molecules photochemical pathways, Jablonski diagram, Fluorescence, Phosphorescence. Fluorescence emission, factors affecting fluorescence, viz. structure, solvent, pH, temperature etc. Triplet state and phosphorescence**.**

Photophysical kinetics: kinetics of unimolecular processes, delayed fluorescence mechanisms, kinetics of collisional quenching, Stern-Volmer equation, quenching by added substances charge transfer mechanism, energy transfer mechanism.

[16 HOURS]

UNIT – III

Nuclear Chemistry: Radioactive decay – General characteristics, decay kinetics, parent – daughter decay growth relationships, determination of half-lives, Nuclear stability – packing fraction, binding energy, Brief survey of alpha, beta and gamma decays. Nuclear reactions – Bethe's notation, types of nuclear reactions – specific nuclear reactions, photonuclear reactions, Oppenheimer – Phillips process, spallation reactions. Definition of Curie and related calculations. Szilard-Chalmers process. Geiger-Muller counters – G.M. Plateau, dead time, coincidence loss, determination of dead time.

Radiation Chemistry: Introduction, units, interaction of electromagnetic radiation with matter, G-value, LET of radiation, dosimetry, Fricke dosimeter. Radiolysis - cysteine, and biphenyl. Radioisotopes as tracers, use of isotopic tracers in the elucidation of reaction mechanism, structure determination and solubility of sparingly soluble substances. ^{14}C dating, medical applications of isotopic tracers. Hazards in radiochemical work and radiation protection.

[16 HOURS]

References

1. Polymer Science and Technology by Joel R. Fried Third edition, 2002.
2. Polymer Science, V.R.Gowarikar , N.V.Vishwanathan and Jaydev Sreedhar Reprint edition, 2002.
3. Text book of Polymer Science, Fred W. Billmeyer Jr. Third edition, 2000.
4. Principles of Polymerization, George Odian, Third edition 2002.
5. Handbook on Conducting Polymers – T.A.Skotheim, Ed Marcel Dekker Inc, New York, 1 and 2, 1986.
6. Essentials of Nuclear Chemistry, H. J Arnikar, Wiley Eastern Limited, 4th Edition, (1995).

7. Nuclear and Radiochemistry, G. Friedlander, J. W. Kennedy and J. M. Miller, John Wiley (1981).
8. Introduction to Radiation Chemistry, J. W. T. Spinks and R. J. Woods, John Wiley (1990)
9. Introduction to Nuclear Physics and Chemistry, B.G. Harvey, Prentice hall (1963).
10. Sourcebook on Atomic Energy-S. Glasstone, Van Nostrand Company (1967).
11. Radiochemistry and Nuclear methods of analysis-W.D.Ehman and D.E. Vance, John Wiley (1991).
12. Fundamentals of photochemistry by K.K.Rohatgi-Mukherjee, New Age International Publishers Revised Edition (Reprint 2003).
13. Chemistry and light by Paul Suppan, The Royal Society of Chemistry.
14. Nuclear Chemistry by Friedlander and Kennedy, John Wiley and Sons (1987).
15. Nuclear Physics and Chemistry by G. Harvey.
16. Essentials of Nuclear Chemistry by H.J. Arnikar, Eastern Wiley (1990).
17. Nuclear Chemistry by U.N. Dash, Sultan Chand and Sons (1991).
18. Source Book on Atomic Energy by S. Glasstone, 3rd edition Van Nonstrand (1967).
19. Nuclear Chemistry by Friedlander and Kennedy, John Wiley and Sons (1987).
20. Essentials of Nuclear Chemistry by H.J. Arnikar, Eastern Wiley (1990).
21. Fundamentals of Radiochemistry by D.D. Sood, A.V.R. Reddy and N. Ramamoorthy

THEORY – SOFT CORE

Course Title: APPLIED ANALYSIS II
Course Code: CHD 500
Course Outcomes:
After studying this course, the student to:
CO1: Acquire knowledge on fertility and essential minor and major nutrients of soil for better growth of plants

CO2: Learn meaning, classification, characteristic features and components of fuels.

CO3: Describe feasible analytical methods for the quantitative analysis of fuels

CO4: Learn importance of analysis of different components of body fluids with adequate knowledge and skills to employ a suitable analytical method

CO5: Know background on forensic analysis with reference to its importance and analytical Methods.

UNIT – I

Soil Analysis: Inorganic and organic components of soil, collection and preparation of soil samples for analysis. Measurement of soil *p*H and conductivity. Determination of organic carbon, total nitrogen, 53 available nitrogen, ammonia nitrogen, nitrate nitrogen and nitrite nitrogen. Available phosphorus and sulphur-their determination. Analysis of soil for sodium, potassium and calcium and magnesium. Micronutrient elements and their analysis. Pesticide residues in soil, their separation and determination.

Fuel analysis- Fuels and their classification. Solid fuels and their classes - natural, artificial and industrial solid fuels. Coal and its analysis - proximate analysis and ultimate analysis. Liquid fuels and their types. Aniline point, flash point and fire point and their determination, octane number of liquid fuels. Gaseous fuels and their classes, advantages. Combustion of a carbonaceous fuel – flue gas. Analysis of flue gas or automobile exhaust for CO_2, CO, O_2 and N_2 by Orsat's apparatus. Calorific value of fuel - net and gross calorific values. Determination of calorific value of solid and liquid fuels by bomb calorimeter method.

[16 HOURS]

UNIT - II

Biomedical and forensic analysis: Composition of body fluids and detection of abnormal levels of certain constituents leading to diagnosis of disease. Sample collection and preservation of physiological fluids. Analytical methods for the constituents of physiological fluids (blood, serum, urine).

Blood - estimation of glucose, cholesterol, urea, haemoglobin and bilirubin.

Urine - urea, uric acid, creatinine, calcium phosphate, sodium, potassium and chloride.

Biological significance, analysis and assay of enzymes (pepsin, monoaminoxidase, tyrosinase); and hormones (progesterone, oxytocin, insulin). Chemical, instrumental and biological assays to be discussed wherever necessary.

Forensic analysis: General discussion of poisons with special reference to mode of action of cyanide, organophosphates and snake venom. Estimation of poisonous materials such as lead, mercury and arsenic in biological materials.

[16 HOURS]

Course Title: APPLIED ANALYSIS III

Course Code: CHD 510

Course Outcomes:

After studying this course, the student to:

CO1: Learn meaning, laws and techniques of chemical kinetics.

CO2: Know importance of chemical kinetics in enzyme catalysed and non-enzyme

catalysed reactions.

CO3: Acquire knowledge on automated and automatic methods of analysis with choice on instrumental methods

CO4: Distinguish between conventional and radio-chemical methods

CO5: Know about Type of samples subjected to radio-chemical analysis and radioimmunoassay.

UNIT – I

Kinetic methods of analysis: Introduction, basis of kinetic methods, rate law expressions. Classifying chemical kinetic methods – direct-computation integral methods, direct-computation rate methods, curve-fitting methods. Instrumentation. Quantitative applications - enzyme catalyzed reactions, non-enzyme catalyzed reactions, non-catalytic reactions. Determining V_{max}, K_m for enzyme catalyzed reactions. Elucidating mechanism for the inhibition of enzyme catalysis. Determination of enzymes, LDH, GOT and GPT. Determination of substrates – urea, uric acid, blood glucose and blood alcohol. Analysis of closely related compounds - neglect of reaction of slow reacting component method and logarithmic extrapolation method.

Automated methods of analysis: An overview. Principles of automation. Automated instruments: process control. Continuous analyzers. Discrete autoanalyzers. Instruments used in automated process control. Automatic instruments - discrete and continuous flow sampling instruments. Flow injection analysis – principles - dispersion co-efficient. Factors affecting peak height, sample volume, channel length and flow rate, and channel geometry. Applications - limited dispersion applications, medium dispersion applications, stopped flow methods and flow injection titrations. Discrete automatic systems - centrifugal fast scan analyzer, automatic organic elemental analyzers.

Analysis based on multilayer films-general principles, film structures, instrumentation, performance and applications – blood urea nitrogen, blood glucose and potassium.

[16 HOURS]

UNIT – II

Radiometric methods: Radioactive isotopes. Nuclear emissions - α and β-particles, neutrons, gamma rays and miscellaneous nuclear particles. Nuclear reactions, radiochemical decay and activity. Instrumentation and measurement of radioactivity. Radiation detectors - gas ionization, scintillation and semiconductor detectors. Pulse height analysis. Autoradiography. Statistics of radioactive measurements.

Radiochemical analysis: **Neutron activation methods -** neutrons and their sources. Interaction of neutrons with matter. Theory, experimental considerations and applications. **Isotope dilution methods -** direct isotope dilution and inverse isotope dilution methods and their applications. Radiometric titrations. Radiorelease methods. Radioactive tracers.

Radio immunoassay: Principles of immunoassay. Specificity of immuno assays. Preparation of the antibody, incubation period for the assay, separation of the bound and free antigen. Fluorescence immunoassay. Enzyme immunoassay.

[16 HOURS]

References:

1. Fundamental of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch 8th edition, 2005, Saunders College Publishing, New York.
2. Analytical Chemistry, G.D. Christian, 5th edition, 2001 John Wiley & Sons, Inc. India.
3. Quantitative Analysis, R.A. Day and A.L. Underwood, 6th edition, 1993 Prentice Hall, Inc. New Delhi.
4. Vogel's Textbook of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J.D. Barnes and M.J.K. Thomas, 6th edition, Third Indian Reprint, 2003 Pearson Education Pvt. Ltd., New Delhi.
5. Analytical Chemistry Principles, John H. Kennedy, 2nd edition, Saunders College Publishing, California, 1990.
6. Instrumental Methods of Analysis by H.H. Willard, L.L. Merritt and J.A. Dean, 7th edition, (1988).
7. Principles and Practice of Analytical Chemistry, F.W. Fifield and Kealey, 3rd edition, 2000, Blackwell Sci., Ltd. Malden, USA.
8. Modern Analytical Chemistry, David Harvey, McGraw Hill, New Delhi, 2000.
9. Introduction to Instrumental Analysis, Braun, Pharm. Med. Press. India.
10. Instrumental Method of Analysis, W. M. Dean and Settle, 7th edition, 1986, CBS Publishers, New Delhi.
11. Instant Notes of Analytical Chemistry, Kealey and Haines, Viva books Pvt. Ltd., 2002.
12. Soil Chemical Analysis, M.L. Jackson, Prentice Hall of India Pvt. Ltd., New Delhi, 1973.
13. Clinical Chemistry, Principles and Procedures, J.S. Annino, 2nd edition, Boston: Little, Brown, 1960.
14. Methods of Geochemical Analysis, D. Click, Ed., A Multi volume series, NewYork, Inter science.
15. Clinical Chemistry, Principles and Techniques, R.J. Henry, D.C. Cannon and J.W. Winkleman, Eds., 2nd edition, Hagerstorm, M.D: Harper and Row, 1974.

16. Fundamentals of Clinical Chemistry, N.W. Tietz, Ed., 2nd edition, Philaddphia: W.B. Saunders, 1976.

Course Title: RETROSYNTHESIS AND ORGANOMETALLIC CHEMISTRY

Course Code: CHD 520

Course Outcomes:

After studying this course, the student to:

CO1: Acquire knowledge of protection and deprotection in organic synthesis.

CO2: Learn about different named reactions which are highly useful for competitive exams and interviews.

CO3: Learn disconnection approach, their principles and terminologies.

CO4: Learn retrosynthesis of different complex organic molecules.

UNIT – I

Protecting groups: Protection of hydroxyl, carboxyl, carbonyl, thiol and amino groups. Illustration of protection and deprotection in synthesis.

Named reactions: Keto-enol tautomerism, mechanism and synthetic applications of aldol condensations, Claisen reaction, Schmidt reaction, Perkin reaction, Knoevenagel, benzoin and Stobbe condensation, Darzens glysidic ester condensation, Cannizaros reaction, Tischenko reaction. Michael addition, Robinson's annulation reaction.

Retrosynthesis: Introduction to disconnection approach: Basic principles and terminologies used in disconnection approach. One group C-X and two group C-X disconnections. Synthons and synthetic equivalents.

Retrosynthesis and synthesis of benzofurans, *p*-methoxy acetophenone, saccharine, α-bisabolene, nuciferal, penicillin-V.

[16 HOURS]

UNIT - II

Chemistry of organometallic compounds: Synthesis and reactions of organolithium (n-BuLi, PhLi) and organomagnesium (Grignard reagent) compounds.

Organoaluminium reagents: Preparation, site selective and stereoselctive additions of nucleophiles mediated by organoaluminum reagents, reaction with acid chlorides, allyl vinyl ethers, 1,2-addition to imines and application in the synthesis of natural products.

Organopalladium compounds: Suzuki coupling, Heck reaction.

Organotin reagents: Barton decarboxylation reaction, Barton deoxygenation reaction, Stille coupling, Stille-Kelley coupling reactions, Barton McCombie reaction, Keck stereoselective allylation and other applications.

Organozinc reagents: Preparation - oxidative addition and transmetallation, addition reactions of alkyl, aryl, allylic and propargylic zinc reagents, diastereoselective and enantioselective addition reaction with aldehydes, Reformatsky reaction.

[16 HOURS]

References:

1. H. Pine, Hendrickson, Cram and Hammond, Organic Chemistry, Mac Grow Hill, New York, 1987.
2. Organic Chemistry - Morrison and Boyd
3. Organic Chemistry- Crabtree
4. Organic Chemistry- Clayden
5. I.L. Finar, Organic Chemistry, ELBS Longmann, Vol. 1 & II, 1984.
6. J. March, Advanced Organic Chemistry, Wiley Interscience, 1994.
7. E.S. Gould, Mechanism and Structure in Organic Chemistry, Halt, Rinhart & Winston, New York, 1964.
8. F.A. Carey and Sundberg. Advanced Organic Chemistry – Part A & B, 3rd edition, Plenum Press, New York. 1990.
9. Principles of Organic Synthesis - ROC Norman and Coxon.
10. S.K. Ghosh, Advanced General Organic Chemistry, Book and Allied (P) Ltd. 1998.

Course Title: BIOMOLECULES AND NATURAL PRODUCTS
Course Code: CHD 530
Course Outcomes:

After studying this course, the student to:

CO1: Know about amino acids, peptides, proteins: their structure, function and properties.

CO2: Learn structural determination of the proteins which are called as energy of the body.

CO3: About the chemistry lying behind the heredity.

CO4: Learn nomenclature, classification and biological importance of other natural Products.

UNIT - I

Amino Acids: General structure, Physiological properties

Peptides: Structure and conformation of peptide bond, peptide synthesis: Solution phase and Merrifield's solid phase synthesis, Racemization and use of HOBt, Synthesis of oxytocin and

vasopressin, biological importance of insulin, selective cleavage of polypeptide bonds (chemical and enzymatic).

Proteins: Structure determination: *C* and *N* terminal residue determination, primary, secondary, tertiary and quartenary structure determination, denaturing and renaturing of proteins.

Nucleic acids: Introduction, structure and synthesis of nucleosides and nucleotides, Solid phase synthesis of oligonucleotides, Structure of RNA and DNA, Crick-Watson model, role of nucleic acids in the biosynthesis of proteins.

[16 HOURS]

UNIT – II

Carbohydrates: Synthesis, industrial and biological importance of glycosides, amino sugars, sucrose, maltose and lactose. General methods of structure elucidation. Industrial importance and biological importance of cellulose, starch, glycogen, dextran, hemicellulose, pectin, agar-agar. Photosynthesis and biosynthesis of carbohydrates.

Carbohydrates Metabolism: Glycolysis and Krebs cycle.

Lipids: Nomenclature, classification, purification, synthesis of lipids, phospholipids, sphingolipids, biological importance of lipids: Lecithin, sphingolipids, oils and fats.

Terpenoids: Introduction, classification (natural and essential oils), isoprene rule and biological importance of terpenoids.

Steroids: Introduction, classification and biological significance of Testosterone, Progesterone, Estrogen

[16 HOURS]

References:

1. I. L. Finar, Organic Chemistry, ELBS Longmann, Vol. I & II, 1984.
2. Essentials of physiological chemistry – Anderson, John Wiley & Sons, New York, 1953.
3. K. Albert, L. Lehninger, D.L. Nelson, M.M. Cox, Principles of Biochemistry, CBZ publishers, 1st edition, New Delhi, 1993.
4. Harper's Biochemistry, Ed. R.Harper, 22nd edition, Prenctic Hall Press, New York, 1990
5. Carbohydrates – Chemistry and Biochemistry by Pigmann and Harton.
6. An introduction to carbohydrate chemistry by Guthri and Honeymon.
7. Protein chemistry by Neurth, Vol. I, II and III.
8. Peptide chemistry by Bodanski, Vol. I, II and III.
9. Introduction to the chemistry of fats and fatty acids by F. D. Gunstone.

PRACTICALS – SOFT CORE

Course Title: ANALYTICAL CHEMISTRY PRACTICALS
Course Code: CHD 210
Course Outcomes:
After studying this course, the student to:

COID	CO
CO1	Get experience on analysis of various complex mixtures by following multistep reactions.
CO2	Acquire the knowledge on handling instruments and to overcome the general problems arises during the analysis.
CO3	Acquire industrial skills required for sampling, analytical and interpretation and presentation of results.
CO4	Possess adequate knowledge on literature search for developed analytical methods.

[128 HOURS]

PART – III

1. Determination of calcium in limestone by redox, acid-base and complexation titrations.
2. Determination of vitamin C in orange juice by titration with cerium(IV) and with 2,6-dichlorophenol indophenol.
3. Determination of mercury in an algaecide by EDTA titration; and arsenic in ant control preparation by redox titration.
4. Determination of aluminium and magnesium in antacids by EDTA titration.
5. Analysis of a copper-nickel alloy sample for copper and nickel by EDTA titration using masking and selective demasking reactions.
6. Determination of saccharin in tablets by precipitation titration.
7. Determination of iodine value and saponification value of edible oils.
8. Determination of ascorbic acid in goose berry/bitter gourd by titrimetry and spectrophotometry using *N*-bromosuccinimide (NBS).
9. Analysis of a mixture of iron(II) and iron(III) by EDTA titration using *p*H control.
10. Determination of sulpha drugs by potentiometry using $NaNO_2$ and iodometric assay of penicillin.
11. Solvent extraction method for determination of silver as ion-associate with 1,10-phenanthroline and bromopyragallol red.
12. Electrolytic determination of copper and lead in brass.
13. Polarographic determination of copper and zinc in brass.

14. Determination of sodium, potassium and calcium in mineral waters by atomic emission spectrometry.
15. Determination of iron in mustard seeds and phosphorus in peas by spectrophotometry.
16. Analysis of waste water for anionic detergents and phenol by spectrophotometry.
17. Fluorimetric determination of riboflavin (vit.B_2) in tablets.
18. Colorimetric analysis of procaine by diazotization and coupling reaction.
19. Determination of manganese in steel by extraction-free spectrophotometry and molybdenum in steel by extractive spectrophotometry.
20. Determination of ethanol in wine by titrimetric and spectrophotometric dichromate methods

PART – IV

1. Analysis of waste waters for DO and COD by titrimetry.
2. Analysis of a ground water sample for sulphate by titrimetry (EDTA) and turbidimetry.
3. Potentiometric determination of formula and stability constant of a silver-ammonia complex ion.
4. Determination of aspirin, phenacetin and caffeine in mixture and APC tablets by solvent extraction and UV spectrophotometry.
5. Kinetic determination of urinary creatinine and purity of a commercial H_2O_2 sample.
6. Determination of chromium(III) and iron(III) in a mixture by kinetic masking methods.
7. Catalytic determination of traces of selenium in biological materials and iodide in blood serum.
8. Photometric and potentiometric titration of iron(III) with EDTA.
9. Photometric and potentiometric titration of copper with EDTA.
10. Determination of copper(II) and iron(III) in mixture by photometric titration with EDTA.
11. Analysis of brackish water for chloride content by a**)** spectrophotometry (mercuric thiocyanate method), b) conductometry (silver nitrate) and c**)** potentiometry (silver nitrate).
12. Conductometric titration of sodium acetate with HCl and NH_4Cl with NaOH.
13. Ascorbic acid determination in natural orange juice by coulometry.
14. Spectrophotometric determination of iron in natural waters using thiocyanate and 1,10-phenanthroline as reagents.
15. Determination of fluoride in drinking water/ground water by spectrophotometry(alizarin red lake method).
16. Analysis of waste water for

a) phosphate by molybdenum blue method
b) ammonia-nitrogen by Nessler's method
c) nitrite-nitrogen by NEDA method

15. Analysis of a soil sample for
    a) calcium carbonate and organic carbon by titrimetry.
    b) calcium and magnesium by EDTA titration.
16. Analysis of a soil sample for
    a) Nitrogen content by Kjeldahl method
    b) Available phosphorus by spectrophotometry.
    c) Nitrate-nitrogen/nitrite nitrogen/ammonia nitrogen by spectrophotometry.
    d) sodium and potassium by flame photometry.
17. Analysis of urine for
    a) urea and uric acid by titrimetrysnd spectrophotometry.
    b) Sulphate by precipitation titration after ion-exchange separation.
    c) Sugar by Benedict's reagent.
18. Analysis of blood for
    a) cholesterol by spectrophotometry
    b) bicarbonate by acid-base titration.
19. Fluorimetric determination of quinine in an antimalarial tablet.

References

1. Fundamental of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch 8thedition, 2005, Saunders College Publishing, New York.
2. Analytical Chemistry, G.D. Christian, 5th edition, 2001 John Wiley & Sons, Inc. India.
3. Quantitative Analysis, R.A. Day and A.L. Underwood, 6th edition, 1993, prentice Hall, Inc. New Delhi.
4. Vogel's Textbook of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J.D.Barnes and M.J.K. Thomas, 6th edition, Third Indian Reprint, 2003 Pearson EducationPvt. Ltd., New Delhi.
5. Analytical Chemistry Principles, John H. Kennedy, 2nd edition, Saunders CollegePublishing, California, 1990.
6. Quantitative Analysis of Drugs in Pharmaceutical Formulations, P. D. Sethi, 3rdedition, CBS Publishers & Distributors, New Delhi, 1997.
7. Practical Clinical biochemistry methods and interpretations, R. Chawla, J.P. BothersMedical Publishers (P) Ltd., 1995.

8. Laboratory Manual in Biochemistry, J. Jayaraman, New Age International Publishers,New Delhi, 1981.
9. Experiments on Water Pollution, D.I.Williams and D. Anglesia, Wayland Publishers Ltd., England, 1978.
10. Experiments on Land Pollution, D.I. Williams and D. Anglesia, Wayland PublishersLtd., England, 1978.
15. Experiments in Environmental Chemistry, P.D. Vowler and D.W. Counel, Pergamon Press,Oxford 1980.
16. Manual Soil Laboratory Testing, vol.I, K.H. Head, Pentech Press, London 1980.

Course Title: INORGANIC CHEMISTRY PRACTICALS
Course Code: CHD 220
Course Outcomes:
After studying this course, the student to:

COID	CO
CO1	Get experience on analysis of various complex mixtures by multistep reactions.
CO2	Acquire knowledge on handling instruments.
CO3	Acquire skills required for sampling, analytical and interpretation and presentation of results.
CO4	Possess adequate knowledge on literature search for developed preparative methods.
CO5	Synthesize and characterization of complexes.

[128 HOURS]

PART – III

1. Determination of aluminium and bismuth by complexometric titration.
2. Determination of lead and tin in a mixture.
3. Determination of calcium and lead in a mixture by pH control and complexation method.
4. Determination of zinc, manganese and magnesium in a mixture using fluoride as a demasking agent.
5. Quantitative analysis of copper(II) and iron(II) in a mixture:
   a) Copper gravimetrically as CuSCN and
   b) Iron volumetrically using cerium(IV) solution

6. Determination of iron as the 8-hydroxyquinolate by solvent extraction method.
7. Determination of the composition of iron-phenanthroline complex by:
    a) Job's method
    b) Mole-ratio method and
    c) Slope-ratio method.
8. Polarographic estimation of cadmium and zinc.
9. Spectrophotometric determinations of:
    a) Titanium using hydrogen peroxide
    b) Chromium using diphenyl carbazide in industrial effluents
    c) Nickel using dimethylglyoxime in steel solution
10. Solvent extraction of ferric thiocyanate complex and determination by colorimetry.

PART – IV

1. Preparation of hexaamminecobalt(III) chloride and estimate cobalt ion.
2. Preparation and characterization of Chloropentaamminecobalt(III) chloride and estimate cobalt ion.
3. Using chloropentaamminecobalt(III) chloride, prepare nitro and nitritopentamamine cobalt(III) chloride. Record the IR spectra of the isomers and interpret.
4. Preparation of potassium tris-oxolatochromate(III) trihydrate.
5. Preparation of mercurytetrathiocyanatocobaltate(II) and estimation of mercury by gravimetry.
6. Preparation of tetraamminecopper(II) sulphate terahydrate
7. Preparation and characterization of manganese dioxide nano-particles
8. Preparation of bis-dichlorotriphenyl phosphine nickel (II).
9. Preparation and characterization of hexaamminenickel(II) chloride.
10. Demonstration Experiments:
    a) Recording and interpretation of IR and NMR spectra of complexes.
    b) Spectrochemical series - Evaluation of Dq value.
    c) DNA interaction with metal complexes by UV-visible absorption and viscosity methods.

References

1. Basic principles of Practical Chemistry – V. Venkateswaran, R. Veeraswamy and A.R. Kulandraivelu

2. Instrumental Analysis Manual - Modern Experiments for Laboratory – G.G. Guilbault and L.G. Hargis.
3. A Text Book of Quantitative Inorganic Analysis – A.I. Vogel, 5th edition.
4. Experimental Inorganic Chemistry – G. Palmer.
5. Inorganic Synthesis – O. Glemser.
6. Experimental Inorganic/ Physical Chemistry- Mounir A. Malati.
7. Quantitative Chemical Analysis – Daniel C. Harris, (2006) 7th edition.
8. Spectrophotometric Determination of Elements – Z. Marczenko

Course Title: ORGANIC CHEMISTRY PRACTICALS
Course Code: CHD 230
Course Outcomes:
After studying this course, the student to:

COID	CO
CO1	Develop experience in multistep synthesis and also mechanisms.
CO2	Learn different kinds of reactions under multistep synthesis.
CO3	Learn isolation experiments, preliminary identification and separation.
CO4	Acquire knowledge of various estimations like sugars, enol content, ketones, nitro, protein etc.

[128 HOURS]

PART – III

Multi step synthesis

1. Oxidation of cyclohexanol to adipic acid via cyclohexanone
2. Preparation of benzoccaine from *p*-nitrotoluene
3. Preparation of *p*-chlorobenzoic acid from *p*-toluidine (Sandmeyer's reaction)
4. Molecular rearrangement:
    a. Preparation of *o*-chlorobenzoic acid from phthalic anhydride
    b. Preparation benzilic acid from benzaldehyde
    c. Preparation of *o*-hydroxy benzophenone from phenyl benzoate via Fries rearrangement
    d. Prepartion of benzanilide from benzophenone (Beckmann rearrangement).
5. Grignard reaction: Prepearation of triphenyl carbinol
6. Preparation of luminol from phthalic anhydride
7. Synthesis of isoxazolines and pyrazolines via 1,3-dipolar cycloaddition.

8. Synthesis of tetralones from aryl aldehydes.
9. Synthesis of *m*-chloroiodobenzene from *m*-dinitrobenzene
10. Synthesis of Schiff base from nitro compound.

PART – IV

Isolation of natural products

1. Fractional crystallization: separation of mixture of naphthalene and biphenyl
2. Fractional distillation: Separation of mixture of hexane and toluene.
3. Thin layer chromatography: Separation of plant pigments
4. Column chromatography: Separation of mixture of *o* and *p*-nitro anilines
5. Isolation of piperine from pepper
6. Isolation of caffeine from tea
7. Isolation of azeleic acid from castor oil
8. Isolation of clove oil from clove
9. Estimation of sugars by Fehlings method
10. Determination of enol content by Meyer's method
11. Estimation of ketones by haloform reaction
12. Estimation of sugars by Bertrand's method
13. Estimation of nitro groups
14. Estimation of protein by biuret method

Spectral analysis: Structural elucidation of some simple organic compounds by UV, IR, NMR and mass. The spectra have to be provided by the teachers.

References

1. Manual of Organic Chemistry - Dey and Seetharaman.
2. Modern Experimental Organic Chemistry by John H. Miller and E.F. Neugil, p 289.
3. An Introduction to Practical Organic Chemistry - Robert, Wingrove etc.
4. A Text Book of Practical Organic Chemistry – A.I. Vogel, Vol.III
5. Practical Organic Chemistry - Mann & Saunders
6. Semimicro Qualitative Organic Analysis by Cheronis, Entrikin and Hodnet .
7. R.K. Bansal, Laboratory Manual of Organic Chemistry, New Age International (P) Ltd. London, 3rd edition, 1996.

Course Title: PHYSICALCHEMISTRY PRACTICALS
Course Code: CHC 240
Course Outcomes:
After studying this course, the student to:

COID	CO
CO1	Acquire knowledge on handling instruments and to overcome the general problems arises during the analysis.
CO2	Learn concepts of rate constants, energy of activation, order of the reaction and also thermodynamics parameters.
CO3	Learn concepts of kinetics experiments.

[128 HOURS]

PART – III (NON-INSTRUMENTAL)

1. Determination of energy of activation for reaction between sodium formate and iodine.
2. To study the kinetics of reaction between acetone and iodine-determination of order of reaction w.r.t. iodine and acetone.
3. Determination of rate of decomposition of hydrogen peroxide with manganese dioxide.
4. Determination of order and rate constant of hydrolysis of ethyl acetate in acid medium.
5. Kinetics of decomposition of benzene diazonium chloride, determination of energy of activation and thermodynamic parameters.
6. Kinetics of decomposition of diacetone alcohol by NaOH-determination of energy of activation.
7. To determine the eutectic point of a two component system (Naphthalene-*m*-dinitrobenzene system).
8. Study of phase diagram of a three component system (e.g. acetic acid-chloroform water and system).Construction of binodal curve and indicating tie line.
9. Determination of heat of solution and lattice energy of calcium chloride.
10. Determination of partition co-efficient of acetic acid in water and butanol.
11. Study of kinetics of reaction between $K_2S_2O_8$ and KI, first order, determination of rate constants at two different temperatures and E_a.
12. To determine the rate constant for the reaction glycine and CAT.

PART IV (INSTRUMENTAL)

1. Kinetics of saponification of ethyl acetate by conductivity method and study the effect of dielectric constant of the medium (using CH_3OH).

2. Simultaneous spectrophotometric determination ofmanganese and chromium in $KMnO_4$ and $K_2Cr_2O_7$ mixture.
3. Determination of ionic product of water and study the effect of temperature.
4. Coulometric titration I_2 *vs* $Na_2S_2O_3$.
5. Conductometric study of charge transfer complex of p-phyenylenediamine with phthalic acid.
6. Determination of mean ionic activity coefficient of a weak electrolyte (acetic acid) by conductometric measurements.
7. Conductometric determination of the degree of hydrolysis and hydrolysis constant of aniline hydrochloride.
8. Conductometric titration of potassium iodide with mercuric perchlorate.
9. Determination of pK value of an indicator (methyl orange).
10. Potentiometric titration of mixture of KCl+KBr+KI*vs* $AgNO_3$.
11. Conductometric titration of a mixture of HCl, CH_3COOH and $CuSO_4$ against NaOH.
12. Thermometric titration of HCl and H_3BO_3 with NaOH.
13. Determination of quantum yield for the photolysis of Chloramine-T.
14. Determination of quantum yield for the photolysis of Chloramine-B.

References

1. Practical Physical Chemistry – A.J. Findlay.
2. Experimental Physical Chemistry – F. Daniels *et al*.
3. Selected Experiments in Physical Chemistry – Latham.
4. Experiments in Physical Chemistry – James and Prichard.
5. Experiments in Physical Chemistry – Shoemaker.
6. Advanced Physico-Chemical Experiments – J. Rose.
7. Practical Physical Chemistry – S.R. Palit.
8. Experiments in Physical Chemistry – Yadav, Geol Publishing House.
9. Experiments in Physical Chemistry – Palmer.
10. Experiments in Chemistry – D.V. Jahagirdar, Himalaya Publishing House, Bombay, (1994).
11. Experimental Physical Chemistry – Das. R.C. and Behera B, Tata Mc Graw Hill.

PROJECT WORK/ DISSERTATION–SOFT CORE

Course Title: PROJECT WORK/ DISSERTATION–SOFT CORE
Course Code: CHD 250
Course Outcomes

After studying this course, the student to:

COID	CO
CO1	Carry out literature survey on the problem/s to be solved.
CO2	Learn and follow suitable research methodologies to propose and to perform Experiments.
CO3	Attain the state of ability to take up research work.
CO4	Better understanding about research articles, patents, book chapters or books on relevant research problem
CO5	Acquire skills of writing research reports in the form of articles or thesis.

Each student can take up Project Work/ Dissertation under the guidance of the faculty of the department during the IV Semester as a Soft Core course.

JSS COLLEGE OF ARTS, COMMERCE & SCIENCE

(AUTONOMOUS)

OOTY ROAD, MYSORE-570 025

Postgraduate Department of Commerce

Syllabus

2016– 17

ONWARDS

COURSE STRUCTURE AND SYLLABUS

MINIMUM CREDITS REQUIRED FOR M.COM. DEGREE

I to IV Semesters	HARD CORE COURSE		SOFT CORE COURSE		OPEN ELECTIVE COURSE		TOTAL	
	Number	Credits	Number	Credits	Number	Credits	Number	Credits
Total	12	48	6	24	1	4	19	76

Semester wise requirements of course and credits

Semester	HARD CORE COURSE		SOFT CORE COURSE		OPEN ELECTIVE COURSE		TOTAL	
	Number	Credits	Number	Credits	Number	Credits	Number	Credits
I	4	16	1	4	-	-	5	20
II	3	12	2	8	-	-	5	20
III	3	12	1	4	1	4	5	20
IV	2	8	2	8	-	-	4	16
Total	12	48	6	24	1	4	19	76

First Semester

Sl. No.	Course Code	Title of the course	Hard core/ Soft core/	Number of Credits			
				L	T	P	TOTAL
HC01	MCA010	Accounting Theory	HC	3	1	0	4
HC02	MCA080	Corporate Governance and Business ethics	HC	3	1	0	4
HC03	MCA090	Advanced Financial Management	HC	3	1	0	4
HC04	MCA100	Strategic Management	HC	3	1	0	4
SC01	MCA210	Business Policy and Environment	SC	3	1	0	4
SC02	MCA220	Statistics for Business Decisions	SC	3	1	0	4

Note: students can register for any one of the above soft cores.

Second Semester

Sl. No.	Course Code	Title of the course	Hard core/ Soft core	Number of Credits			
				L	T	P	TOTAL
HC05	MCB030	Organizational Behavior	HC	3	1	0	4
HC06	MCB050	Entrepreneurial Development	HC	3	1	0	4
HC07	MCB010	Capital Market Instruments	HC	3	1	0	4
SC05	MCB240	Human Resource Management	SC	3	1	0	4
SC06	MCB270	Management of Financial Services	SC	3	1	0	4
SC07	MCB250	Banking Technology	SC	3	1	0	4

Note: Students can register for any two of the above soft cores.

Third Semester

Sl. No.	Course Code	Title of the course	Hard core/ Soft core/ Open elective	Number of Credits			
				L	T	P	TOTAL
HC08	MCC010	International Business	HC	3	1	0	4
HC09	MCC030	Business Research Methods	HC	3	1	0	4
HC10	MCC040	Security Analysis and Portfolio Management	HC	3	1	0	4
SC15	MCC230	Elective- Paper- 1	SC	3	1	0	4
SC17	MCC250	Elective – Paper -1	SC	3	1	0	4
OE	540/580	Retail Banking/ Personal Financial Management/Financial Accounting/Management of non-profit organization	OE	3	1	0	4

Note

1. Students can register for any one of the elective groups as soft core (first paper in the group)
2. Non-commerce students can register any one of the following open-electives.

Fourth Semester

Sl. No.	Course Code	Title of the course	Hard core/ Soft core/ Open elective	Number of Credits			
				L	T	P	TOTAL
HC11	MCD010	International Accounting	HC	3	1	0	4
HC12	MCD020	Current Trends in Business and Commerce	HC	3	1	0	4
SC09	MCD260	Advanced Cost Accounting	SC	3	1	0	4
SC10	MCD210	Supply chain Management	SC	3	1	0	4
SC12	MCD220	Major Project Work	SC	0	1	3	4
SC16	MCD230	Elective – Paper 2	SC	3	1	0	4
SC18	MCD250	Elective- Paper 2	SC	3	1	0	4

Note: 1 Major project work is a soft core course. The students can register for the Project work or for Advanced Cost Accounting or Supply Chain Managementcarrying four credits each.

Note: 2 Guiding 4 students for Major Project work is considered to be equal to 01 hour of class room teaching

Note: 3 Students must register for 2nd paper in the elective group selected by them in the III semester as soft core.

Elective Group

Any one group from the available electives shall be selected by a student at the commencement of the III Semester. Once a group has been selected, no change in the selected group will be allowed later. While the first paper of the selected group will be taught in Semester III, second paper of the selected group will be taught in Semester IV as Soft Core Courses. The Department will announce in the beginning of the third semester, any one or more elective groups which will be offered during III and IV semesters depending upon the availability of faculty members and the demand for electives.

Group A: Financial Accounting

1. Contemporary Areas of Financial Accounting
2. International Financial Reporting Standards (IFRS)

Group B: Financial Management

Futures, Options & Swaps
Strategic Financial Decisions

Group C: Business Taxation

1.Indirect Tax Laws and Practice

2.Corporate Tax Laws and Planning

Group D: Cost Management

1.Marginal Costing& Decision Making
2. Tools and Techniques of control.

PROGRAMME OUTCOMES:

After studying this programme the students are able to

PO1 Understand role of accounting and finance in the present business scenario.

PO2 Identify the latest trends in banking and finance

PO3 Use wide varieties of tools and techniques to meet the emerging opportunities and challenges

PO4 Become an entrepreneur based on the knowledge gained.

PO5 Strengthen the knowledge base to take up CA/ICWA/ICS and other competitive examination

PO6 Acquire the ability to engage in independent & lifelong learning in the broader context of social and technical changes.

PO7 Accept the challenges of business world.

PO8 Enhance logical thinking and decision making ability.

PROGRAMME SPECIFIC OUTCOMES:

After studying this programme the students are able to

PSO1 Inculcate the knowledge of business and the techniques of managing the Business with special focus on Accounting, finance, and financial services.

PSO2 Identify knowledge based accounting principles and the latest application oriented corporate accounting methods.

PSO3 Develop decision-making skill through costing methods and practical application of management accounting principles.

PSO4 Enhance taxation skills through a thorough understanding of tax laws.

First Semester

HARD CORE SUBJECTS

HC01: MCA010 ACCOUNTING THEORY

1. **Course Description:** The course provides the coverage of the meaning of accounting theory, its types, approaches to formulate accounting theory; the IASB's conceptual framework; recognition, measurement and disclosure of elements of financial statements.

2. **Course Outcome:**

CO1 Deliberate the characteristics of structure of accounting theory

CO2 Deliberate the classification and characteristics of relationship between research and accounting theory

CO3 Specify the classification and characteristics of types of accounting theories

CO4 Identify in detail with examples conceptual frame work for financial reporting

CO5 Identify the characteristics of recognition, measurement and disclosure of elements of financial statements

3. **Pedagogy:** Course activities consist of lectures, case study analysis, group discussions, seminar presentation, assignment writing and tests. Reading and analysis of annual reports of companies will be the integral part of instruction.

4. **Course Contents:**

Module 1: The Meaning of Accounting Theory: The meaning of accounting theory; relationship with accounting research and practice. Types of accounting theories- syntactical, semantical and behavioral theories. Approaches to formulation of Accounting Theory. Ownership theories - proprietary, entity and fund theories.

Module 2: The Conceptual Framework of Accounting: The IASB Framework for the Preparation and Presentation of Financial Statements-preface, purpose and scope; Users and their information needs; Objectives of financial statements; Underlying concepts and assumptions; Qualitative characteristics of financial statements; Constraints on relevant and reliable information; True and fair view; the elements of financial statements; Structure and format of financial statements. The accounting cycle.

Module 3: Recognition, Measurement and Disclosure of Elements of Income Statement: The concept of revenue and expense; their recognition principles and processes, measurement methods and disclosure issues. Recognition, measurement and disclosure of gains and losses from extraordinary items, unusual items, discontinued operations, effects of changes in accounting principles, and prior period items. Problems. Case studies on annual reports of companies.

Module 4: Recognition, Measurement and Disclosure of Elements of Balance Sheet: Definition of asset, liability and owners' equity; their types and characteristics. Recognition, measurement and disclosure of long-term and short-terms assets and liabilities, owners' equity and retained earnings. Problems. Case studies of annual reports of companies.

References:

Anthony R.N., D.F. Hawkins and K.A. Merchant, *Accounting: Text and Cases* , McGraw Hill, 1999

Richard G. Schroeder, Myrtle W. Clark and Jack M. Cathey, *Financial Accounting Theory and Analysis: Text Readings and Cases*, John Wiley and Sons, 2005.
Ahmed Riahi Belkaoui, *Accounting Theory*, Quorm Books, 2000.
Jawahar Lal, *Accounting Theory and Practice*, Himalaya Publishing House, 2008.
L.S. Porwal, *Accounting Theory*, TMH, 2000.
Thomas R.Dyckman, Charles J Davis, Roland E.Dukes, *Intermidate Accounting,* Irwin McGraw-Hill.
Eldon S. Hendriksen, Accounting Theory; www.iasb.org. www.icai.org.www.dca.gov.in

HC02:MCA080 CORPORATE GOVERNANCE AND BUSINESS ETHICS

Course Outcome:

CO1	Understand in depth concept of corporate governance
CO2	Deliberate in depth corporate ethics and cultural influences
CO3	Understand the detail of Corporate social responsibility and accountability
CO4	Learn in depth E-governance
CO5	Write down the detail of Committees in corporate governance

Pedagogy:

The subject matter will be presented through lecture, class discussion, student presentation, guest lectures and laboratory experiences.

Module 1: Business ethics: Ethics; Doctrine of Trusteeship: Unethical practices; Good ethics and Good Business. Corporate Ethics: Concept and Importance – Benefits of corporate Ethics- Corporate Philosophy and Culture – Managing Ethics and Legal Compliance – Case Analysis.

Module 2: Social Responsibility of Business; Doctrine of Social Responsibilities of Business, Dimensions of Social Responsibility, and Assumptions of S.R. Corporate Social Responsibility: Corporate Crimes – Company and Society Relations – corporate Social Challenges – Corporate Accountability – Business and Ecology –Case Analysis.

Module 3: Concept of Corporate Governance: It's Importance –Agency Theory – Benefits of Good Corporate Governance – Present Scenario – Case Studies.

Module 4: Corporate Governance In India: Reforming BOD –Birla Committee – Naresh Chandra Committee – Narayana Murthy Committee – Audit Committee – Corporate Governance Code – The Future

References:

Business ethics by L.P. Hartman, (Tata Mc Graw Hill)
Business ethics by W.H. Shaw, (Thomson)
Corporate management and Accountability by L.C. Gupta (Mc Millan Institute for FM and Research, Chennai-1974)
Strategic Management by Hill, Ireland and Horkisson (Thomson)
Business and society by Keith Davis (Mc Graw Hill)
Corporate Governance – Fernando.
Business ethics and corporate Governance – Bansal Sandeep, Bansal Sanjiv, Bansal Rama – Kalyani Publishers.

HC03: MCA090 ADVANCED FINANCIAL MANAGEMENT

1. Course Description:

Financial management is a functional area in general management. This subject is focusing on introduction, scope and importance of financial management, investment decisions, capital structure decisions, dividend decisions and working capital management.

2. Course Outcome:

CO1	Understand in depth financial management concepts and its important functions
CO2	Understand in depth financial management concepts and its important functions
CO3	Identify the detail of Capital structure theories
CO4	Identify in detail with examples Risk analysis in capital budgeting
CO5	Learn in depth Dynamics of financial markets

3. Pedagogy:

Students must work out assigned individual topics, present seminars and participate in case studies or group discussions.

Course Contents:

Module 1: Introduction : Meaning, Scope, and functions of Financial Management. Corporate Objectives-Profit Maximization and Wealth Maximization, their social implications.

Module 2: Capital Budgeting Decision – Importance – Challenges – NCF estimation DCF Techniques- NPV vs IRR – Multiple IRR Problem- Modified IRR (MIRR) – Capital Rationing.

Module 3: Risk Analysis in Capital Budgeting- Approaches to risk absorption- Expected Net Present Value (ENPV) - Payback method - Risk-Adjusted Discount rate - Use of Normal Distributions - Sensitivity analysis - Measurement of Project risk- Risk Analysis of Project Portfolios.

Module 4: Capital Structures Decision – Traditional View – MM's theory- Factors impacting leverage decision. Cost of capital – Cost of equity – Cost of preferred capital- Cost of debt- Cost of retained earnings – WACC- Marginal cost of capital

References:

Pandey, I.M. financial Management, Vikas Publishing House, New Delhi.
Khan M.Y. and Jain P.K. Financial Management, Tata McGraw Hill, New Delhi.
Kishore, R., Financial Management, Taxmans Publishing House, New Delhi.
Chandra, Prasanna; Financial Management TMH, New Delhi.
Horn, Van; Financial management and Policy, Prentice Hall of India.
Brigaham & Houston, Fundamentals of Financial Management, Thomson Learning, Bombay.
Richard Brealey and Stewart Myers, Principles of Corporate Finance, Tata McGraw Hill, 2000.
V K Bhalla, Financial Management and Policy: Text and Cases, Annual Publishers, 2002.

HC04: MCA100 STRATEGIC MANAGEMENT

1. Course Outcome:

CO1 Deliberate the detail of strategy formulation
CO2 Deliberate in detail with examples implementation of strategy
CO3 Identify the detail of strategic analysis and choice
CO4 Specify in depth strategy evaluation
CO5 Understand in depth E-commerce business model

2. Pedagogy: Teaching method comprises of lecture sessions and tutorials. Lecture sessions focus on providing conceptual understanding and analytical setting for select aspects of the course content.

3. Course Contents:

Module 1: Strategic Management - An Introduction Concept of strategic management - Characteristics of strategic management - Defining strategy, Strategy formulation - Stakeholders in business - Vision, mission and purpose - Business definition, objectives and goals - Environmental appraisal - Types of strategies - Guidelines for crafting successful business strategies, Tailoring strategy to fit specific industry

Module 2: Strategic analysis and choice - Environmental Threat and Opportunity Profile(ETOP) – Organizational Capability Profile - Strategic Advantage Profile - Corporate Portfolio Analysis - SWOT Analysis - Synergy and Dysergy - GAP Analysis - Porter's Five Forces Model of competition - Mc Kinsey's 7s- Framework - GE 9 Cell Model - Distinctive competitiveness - Selection of matrix. Case study.

Module 3: Strategy implementation - Issues in implementation - Project implementation – Procedural implementation – Resource Allocation - Budgets - Organization Structure – Matching structure and strategy - Behavioral issues - Leadership style - Corporate culture – Values - Power - Social responsibilities – Ethics. Case study.

Module 4: Strategy Evaluation - Importance - Symptoms of malfunctioning of strategy - Organization anarchies - Operations Control and Strategic Control - Measurement of performance - Analyzing variances - Role of organizational systems in evaluation,. New Business Models and strategies for Internet Economy - Shaping characteristics of E-Commerce environment - E-Commerce Business Model and Strategies - Internet Strategies for Traditional Business - Key success factors in E-Commerce

References:

A concept of corporate planning-, Russel Ackoff, Newyork wiley
Business policy and strategic management- Tokyo, McGraw hill
Strategic Management-Text and Cases- V.S.P. Rao and V. Harikrishna
Strategic Management-Azar Kazmi
Strategic Management-Francis Cherunillam
Strategic Management-Subba Rao
Strategic Planning Formulation of Corporate Strategy - Ramaswamy
Strategic Management, 12th Ed. - Concepts and Cases - Arthur A. Thompson Jr. and A.J.Strickland
Management Policy and Strategic Management (Concepts, Skills and Practices) - R.M.Shrivastava
Strategic Management – Pearce
Strategy & Business Landscape - Pankaj Ghemawat

Second Semester

HC05: MCB030 ORGANISATIONAL BEHAVIOUR

1. Course Outcome:

CO1 Learn in depth individual behaviour in the organization
CO2 Understand in detail with examples foundation of individual behaviour
CO3 Deliberate the detail of skills in motivation
CO4 Deliberate in detail with examples individual behaviour in group
CO5 Identify in detail with examples resolve the conflicts

2. Pedagogy:

Teaching method comprises of lecture sessions and tutorials. Lecture sessions focus on providing conceptual understanding and analytical setting for select aspects of the course content.

3. Course Contents

Module1: Introduction: Meaning-Definitions and scope of organizational behavior-people-Organizational structure-technology and environment-OB as a Behavioral science-Contributing Discipline to OB-Psychology-Sociology-social psychology-Anthropology-Political science-OB and Management-Comparative roles in organization-Case studies.

Module 2: Foundations of Individual Behaviour: Biological Characteristics-Age-Sex-Marital Status-Number of Dependents-Tenure-Ability-Intellectual Abilities- Physical Abilities-The Ability-Job fit personality-personality determinants-Personality Traits-Major Personality Attributes influencing OB-Matching personality and Jobs-Values, attitudes, and Job satisfaction: Importance of Values-Sources of Value system-Sources and types of Attitudes-learning –Theories of learning shaping values-Case Studies.

Module 3: Motivation: The concept of Motivation-Early Theories of Motivation-Hierarchy of Needs theory-theory X and Theory Y-Hygiene theory-contemporary theories of motivation-ERG Theory-three needs theory-cognitive evaluation theory and others –case studies.

Module 4: Foundation of group behaviour: Defining and classifying groups-group process-group tasks-cohesive groups-group dynamics-leadership-nature and importance-functions-styles-communications-nature and types-effective communication-Roles of Formal and informal communication-Conflict management-The process of conflict-types of conflict-functional and dysfunctional conflict-resolution of conflict-case studies.

References:

Organisational Behaviour: Concept, Theory and Practice-Nirmal Singh

Organisational Behaviour - Fred Luthans

Organisation Theory and Behaviour - V S P Rao and PS Narayana

Organisational Behaviour - Niraj Kumar

Organisational Behaviour – K. Aswathappa

Management of organisational change –Harigopal

HC06: MCB050 ENTREPRENEURIAL DEVELOPMENT

Course Outcome:

CO1	Understand the characteristics of foundations and different dimensions of entrepreneurial development
CO2	Write down in detail with examples skills of an young entrepreneurs
CO3	Write down in detail with examples techniques of project planning, implementation and execution
CO4	Identify in detail with examples institutional support to entrepreneurs
CO5	Learn the characteristics of MIS in project

Pedagogy: A combination of Lectures, Case Analysis, Group Discussion, Seminars, Assignments, etc.

Module – 1: Entrepreneurship: Need, Scope, Entrepreneurial Competencies and Traits, Factors affecting Entrepreneurial Development, Entrepreneurial Motivation, Conceptual Model of Entrepreneurship, Entrepreneur Vs Intrapreneur, and Classification of Entrepreneurs. Micro, Small and Medium Enterprises (MSMEs): Meaning and Definitions of MSMEs, Features, Scope, Objectives, Relationship between Small and Large Units; Indian MSME Sector - Nature, Contribution to Economy, Problems and Government Schemes; and MSMEs Act, 2006.

Module – 2: Entrepreneurial Development Programs and Small Business: Relevance and Achievements of EDPs, Role of Government in Organizing such Programs, Women and Rural Entrepreneurs - Present Status in India. Small Business: Concept and Definition, Role of Small Business in Modern Indian Economy, Small Entrepreneur in International Business, Steps for starting a Small Industry, Registration as SSI, Role of SIDBI, Advantages and Problems of SSIs, Institutional Support Mechanism in India, EDI, Incubation Centers, Incentives and Facilities, and Government Policies for SSIs.

Module – 3: Project: Definition, Characteristics, Types, Steps in identification of Projects, Project Life Cycle. Project Management - Meaning, Scope and Importance, Role of Project Manager. Project Appraisal - Preparation of a Real Time Project, Feasibility Report containing Technical Appraisal, Environment Appraisal, Market Appraisal and Managerial Appraisal. Project Identification - Environment for Business Opportunities, Idea Generation, Short Listing and Selection of Product/Service, Stages in Venture Appraisal, Factory Design and Layout, and Feasibility Report Preparation.

Module – 4: Project Planning: Functions, Project Objectives and Policies, Identifying Strategic Project Variables; Statement of Work; Mild Stone Schedules Tools for Planning Hierarchy of Plans.Project Financing: Project Cost Estimation and Working Capital Requirement, Sources of Fund, Preparation of Projected Income Statement, etc; Implementation of Projects - Graphic representation of Project Activities, Management and Control of Projects, Project Scheduling, MIS in Project, Problems of Project Implementation.

Reference

1. Singh Narendra, Project Management and Control, Himalaya Publishing House.
2. Prasanna Chandra, Projects: Planning, Analysis, Selection, Implementation and Review, Tata McGraw Hill.
3. P. Gopala Krishnan and V. E Rama Moorthy, Project Management, MacMillan India.
4. Chandra Prasanna, Project Preparation, Appraisal and Implementation, Tata McGraw Hill.
5. A. N Desai, Entrepreneurship Management, Ashish Publishing House.
6. Vasanth Desai, The Dynamics of Entrepreneurial Development and Management, Himalaya Publishing House.
7. Nicholas, Project Management for Business and Technology: Principles and Practice, Prentice Hall of India.
8. Hall B. L, Pickle and Yance, Small Business Management, John Wiley & Sons, USA.

9. Kenneth R. Van Vloorthis, Entrepreneurship and Small Business Management, Allyn and Bacon. Kuvempu University, Master of Commerce (Regular), 2017-18 51
10. C. M. Bammback and J. R. Manscusu, Entrepreneurship and Venture Management, Prentice Hall of India.
11. Yound, Trevour L, Planning and Implementing Project, Sterling Publishing Ltd.
12. C. A Dailey, Entrepreneurship Management, McGraw Hill.

HC07: MCB010 CAPITAL MARKET INSTRUMENTS

1. Course Description:

Capital markets in recent times are flooded with new and innovative instruments enhancing vibrancy and volume of capital markets. Every advanced programme in commerce should consist of a course in analysis and evaluation of various instruments traded in capital markets today.

2. Course Outcome:

CO1	Learn the characteristics of capital market in India
CO2	Deliberate the classification and characteristics of various capital market instruments
CO3	Specify the characteristics of dynamics of global capital markets
CO4	Understand the classification and characteristics of derivatives in risk management
CO5	Understand the characteristics of option and swaps

3. Pedagogy:

Teaching method comprises of lecture sessions and tutorials. Lecture sessions focus on providing conceptual understanding and analytical setting for select aspects of the course content.

4. Course Contents:

Module 1: Origin, Nature and Role of Capital Markets -Globalization of Capital markets- Capital Markets in India - Stock exchanges.

Module 2: Stocks, Bonds, Debentures – Types of Debentures, Private Placement, Guidelines for IPO – ADRs - GDRs – ETFs –Units of Mutual funds

Module 3: Derivatives- Basic features – Role of Derivatives markets - Forwards and Futures - Commodity Futures – stock Futures and Index futures.

Module 4: Options - Stock options and Index options-Swaps – Currency Swaps and Interest Rate Swaps.

References:

Financial institutions and markets- by Bhole (TMH).

Financial markets- by M.Y.Khan (Vivek).

Financial Derivatives – Dr.G.Kotreshwar

HC08: MCC010 INTERNATIONAL BUSINESS

1. Course Outcome:

CO1 Write down in depth scope of international business along with drivers of globalisation
CO2 Specify the characteristics of policy and practice skills related to international business
CO3 Understand the classification and characteristics of international business environment and the issues associated with them
CO4 Identify in detail with examples modes of entry in international business
CO5 Learn the detail of functions of WTO and MNCs

2. Pedagogy:

The course would be taught under LTP method. The lecture sessions are designed to be interactive with the student expected to come prepared with basic reading suggested before every session. The tutorial sessions are basically group exercises with each designated group handling a prescribed module for presentation and interaction, in a three-way interactive process. It basically involves preparing field reports and presenting them for plenary discussions.

3. Course Contents:

Module 1: Introduction**:** International Marketing-Trends in International Trade-Reasons for Going International-Global Sourcing and Production Sharing-International Orientations-Internationalization Stages and Orientations-Growing Economic Power of Developing Countries-International Business Decision-Case Studies.

Module 2: International Business Environment: Trading Environment-Commodity Agreements-Cartels-State Trading-Trading Blocks and Growing Intra-Regional Trade-Other Regional Groupings-SAARC-GATT/WTO and Trade Liberalization-The Uruguay Round-Evaluation-UNCTAD and WTO negotiation

Module 3: Multinational Corporations: Definition-Organizational Structures-Dominance of MNC's-Recent Trends-Code of Conduct-Multinationals in India-Case Studies.

Module 4: India in the Global Setting: India an Emerging Market-India in the Global Trade-Liberalization and Integration with Global Economy-Obstacles in Globalization-Factors Favoring Globalization-Globalization Strategies. Trade Policy and Regulation in India: Trade Strategies-Trade Strategy of India-Export-Import Policy-Regulation and Promotion of Foreign Trade in India-Case studies.

References:

Chadha.G.K : WTO and Indian Economy
G.S.Batra & R.C.Dangwal : International Business : New Trends
Jean Pierre & H.David Hennessay : Global Marketing Strategies
Justine Palu : International Business
Francis Cheruniulam : International Business

HC09: MCC030 BUSINESS RESEARCH METHODS

1. Course Outcome:

CO1	Learn in detail with examples Objectives and role of business research
CO2	Understand in depth Developing research proposal
CO3	Learn in detail with examples Questionnaire design
CO4	Write down in detail with application, if applicable, Measurement and scaling concepts
CO5	Deliberate the characteristics of Measurement and scaling concepts

2. Pedagogy:

The lecture sessions focus on providing conceptual understanding and analytical setting for select aspects of the course content. This session focuses on student involved and student driven content study. Identified groups of students make presentations and interact with both the faculty and the other students. The aspects reinforced through lecture and tutorial is taken up for practical study. Here the students would undertake field exercises related to different aspects of the course content.

3. Course Content:

Module 1: Introduction: Objectives and Role of Business Research–Distinct Features of Business Research-Theoretical Setting for Business Research–Ethical Issues in Business Research.

Module 2: Research Process: Developing a Research Proposal–Exploratory Research and Qualitative Analysis–Sources of Data- Methods of data collection–Techniques of Communicating with Respondents.

Module 3: Managing Research Assignment: Questionnaire Design-Sampling and Fieldwork Techniques-Measurement and Scaling Concepts-Attitude Measurement.

Module 4: Analysis and Presentation: Application of Unvariate, Bivariate and Multivariate methods of Statistical Analysis-Methods of Business Research Report Writing–Language-Referencing-Bibliography.

References:

Business Research Methods, William G. Zikmund, The Dryden Press

Research for Development: A Practical Guide, Sophie Laws, VISTAAR Publications

Methodology in Social Research, Partha Nath Mukherjee, Sage Publications

HC10: MCC040 SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT

1. Course Outcome:

CO1	Understand in depth practical aspects of investment analysis
CO2	Specify in depth functions of SEBI
CO3	Deliberate the detail of various investment alternatives
CO4	Deliberate in depth skills to construct investment portfolio
CO5	Identify in depth technical analysis of portfolio

2. Pedagogy:

In the LTP framework the Lecture sessions focus on building conceptual clarity and providing basic information on the nature and role of nonprofit sector. The reinforcement through Tutorial sessions focus on group exercises related to Indian nonprofit sector. Practical exercises involve field reports by students, both at individual and group levels.

3. Course Contents:

Module 1: Investment Setting - Securities – Sources of investment information – Security market indications – Security Contract regulation Act. Investor Protection. Over view of capital market, Institutional structure in capital market, Reforms and state of capital market, New issue market and problems, Securities and Exchange Board of India (SEBI), Debt Market.

Module 2: Fundamental Analysis - Economic Analysis – Economic forecasting and stock Investment Decisions – Forecasting techniques. Industry Analysis – Industry classification. Economy and Industry Analysis. Industry life cycle – Company Analysis Measuring Earnings – Forecasting Earnings – Applied Valuation Techniques – Graham and Dodds investor ratios.

Module 3: Technical Analysis - Fundamental Analysis Vs Technical Analysis – Charting methods – Market Indicators. Trend – Trend reversals – Patterns - Moving Average – Exponential moving Average – Oscillators – ROC Momentum – MACD – RSI – Stoastics.

Module 4: Portfolio Theory – Portfolio Construction – Diagnostics Management – Performance Evaluation – Portfolio revision- Mutual Funds.

References:

1. Donald E.Fischer & Ronald J.Jordan, 'Security Analysis & Portfolio Management', Prentice Hall of India Private Ltd., New Delhi 2000.
2. V.A.Avadhani – 'Securities Analysis and Portfolio Management', Himalaya Publishing House, 1997.
3. V.K.Bhalla, 'Investment Management', S.Chand & Company Ltd., Seventh Edition, 2000.
4. Punithavathy Pandian, 'Security Analysis & Portfolio Management' – Vikas Publishing House Pvt., Ltd., 2001.

HC11: MCD010 INTERNATIONAL ACCOUNTING

1. Course Description: This course is designed to provide a deeper understanding of international accounting issues related to global financial reporting. It focuses on major diversities and challenges of financial reporting in the global arena, harmonization and international financial reporting standards. It also covers accounting for foreign currency transactions and major translation methods. It focuses on main issues in international financial statement analysis.

2. Course Outcome:

CO1	Understand in depth international accounting issues related to global financial reporting
CO2	Understand the detail of harmonisation of accounting
CO3	Identify in detail with examples diversities and challenges of financial reporting
CO4	Write down the detail of techniques of international financial statement analysis
CO5	Learn the characteristics of accounting for foreign exchange rate fluctuations

3. Pedagogy: Method of instruction consists of lectures, analysis of international financial statements, group discussions, seminar presentations, writing assignments and tests. Reading and analysis of annual reports of multi-national organizations will be integral part of instruction.

4. Course Contents:

Module 1: **International Financial Reporting**: Definition and scope of international accounting. Main causes of diversity in international financial reporting. Harmonization vs. standardization. Rationale for and obstacles to harmonization. Role of regional and international organizations engaged in accounting harmonization – EU, ASEAN, IASB, IFAC, IOSCO, OECD, U.N., etc. Case studies on current evidence on accounting harmonization at regional level and global level.

Module 2: **International Financial Reporting Standards (IFRS)**:The structure of IFRS. Process of IFRS Standard Setting. Constraints. Conceptual Framework for Financial Reporting under IFRS. Hierarchy of Standards. IFRS adoption or convergence. Case studies on compliance with IFRS by Indian Companies and MNCs.

Module 3: **Accounting for Foreign Exchange Rate Fluctuations**: An overview of foreign currency markets and exchange rates. Foreign exchange exposures. Accounting for spot and forward foreign currency transactions. Foreign currency translation methods- current rate method, current/non-current method, monetary/non-monetary method and temporal method. IFRS on foreign currency exchange accounting. Case studies on the annual reports of companies.

Module 4: **International Financial Statement Analysis:** Main issues in international financial statement analysis –understandability, availability, reliability, comparability and timeliness of financial information. Language, terminology and format. Techniques of financial statement analysis-horizontal, vertical, trend and ratio analysis. Analysis of income statement, balance sheet and cash flow statements of multinational corporations.

References:

International Accounting by Shirin Rathore, Prentice-Hall of India, New Delhi
Comparative International Accounting by Christopher Nubs and Robert Parker, Pearson Education Asia, New Delhi.
International Accounting: A User Perspective by Shahrokh M. Saudagaran, South-Western Thomson Learning, Australia.
International Accounting by A.K.Das Mohapatra, Prentice-Hall of India, New Delhi
The Analysis and use of Financial Statements by Gerlad I.White, Ashwinipaul C.Sondhi and Dov Fried, John Wiley, New York.

The Economic Times, The Business Line and Financial Express daily papers.
Research Journals on International Accounting.
Internet Sources; www.iasb.org. www.worldbank.org. www.unctad.org. etc,.

HC12: MCD020 CURRENT TRENDS IN BUSINESS AND COMMERCE

Course Outcome:

CO1	Identify in detail with examples changing business and financial environment
CO2	Specify the detail of reforms in the areas of banking and insurance
CO3	Learn in depth trends in inflation
CO4	Understand in depth trends in international business and collaboration
CO5	Deliberate in depth social, economics and political event in the country

Pedagogy: LTP Model of facilitating learning process, working out MCQ's and group discussions.

Course contents:

1. All the compulsory subjects of M.Com programme.
2. The study of trends in the area of business and commerce – Trading, manufacturing, Finance, Capital Market, Foreign Trade, Foreign Exchange, Industrial relations, International Business and Collaborations, Taxation, Internal Marketing Scenario.
3. Trends in Inflation, Economics Development, Employment, Industry and Agriculture, World Economics and Trade Problems; Social, Economics and Political event in the Country and the world.

Reference:

1. Reserve bank of Indian Bulletin
2. Yojana
3. The Economic Times Daily
4. Business Line Daily
5. Business Standards
6. Business India

SOFT CORE SUBJECTS

First Semester

SC01: MCA210 BUSINESS POLICY AND ENVIRONMENT

1. Course Outcome:

CO1 Specify in detail with examples Policy formation
CO2 Understand the detail of Environmental factors that influence business
CO3 Understand the detail of Corporate social responsibility
CO4 Deliberate the detail of Principles of business ethics
CO5 Learn in detail with examples Control of MRTP

2. Pedagogy:

Teaching method comprises of lecture sessions and tutorials. Lecture sessions focus on providing conceptual understanding and analytical setting for select aspects of the course content.

3. Course Contents:

Module 1: Introduction: Business Policy: Importance of business policy-essentials of business policy-classification of business policy-Vision, Mission, Objectives–Types of Policies: Production policy-personnel policy- Financial policy-Marketing Policy-case studies.

Module 2: Business in a Social System, Business and Economic system –Business Objectives-Internal and External Business Environment.

Module 3: Business Environment: Internal Environment ofBusiness-External Environment-Economic-Political-Socio-Cultural-Technological Environment –case studies

Module 4: Business Ethics: Principles of Business Ethics; Doctrine of trusteeship; unethical practices; good ethics and good business. Social responsibility of business; Doctrine of social responsibility: Rationale of social responsibility; control of monopoly and restrictive and unfair trade practices.

References:

A concept of corporate planning-, Russel Ackoff, Newyork wiley

Business policy and strategic management- Tokyo, McGraw hill

Strategic Management-Text and Cases- V.S.P. Rao and V. Harikrishna

Strategic Management-Azar Kazmi

Strategic Management-Francis Cherunillam

Strategic Management-Subba Rao.

SC02: MCA220 STATISTICS FOR BUSINESS DECISIONS

1. Course Description:

The course comprises of probability theories, sampling techniques, time series analysis and multivariate analysis.

2. Course Outcome:

CO1	Understand the detail of probability theory and sampling
CO2	Learn in detail with examples various methods of theoretical probability distribution
CO3	Specify the detail of different tools in taking business decision
CO4	Understand the detail of advanced application oriented test
CO5	Understand in detail with examples time series analysis

3. Pedagogy:

Class room teaching of basic statistical models shall be followed by solving problems involving business applications. Assigned problems are to be worked on an individual basis, followed by group discussion of case problems.

4. Course Contents:

Module 1:Probability: Meaning, terminology, types and rules. Random variables and use of expected value in decision making. Binomial, Poisson and Normal probability distributions- their characteristics and applications in business decisions.

Module 2:Sampling: Meaning of sample and population. Probability and non-probability methods of sampling. Use of random digits to choose random samples. Sampling from normal and non-normal populations. The Central limit theorem. Use of sampling in business decisions

Module 3:Time Series Analysis : Variations in time series. Cyclical, seasonal and irregular variations. Trend analysis. Application of time series analysis in forecasting.

Module 4:Multivariate Analysis: Multiple regression and correlation analysis. Analysis of Variance. Application of multivariate analysis in business decisions. Using Statistical Package for Social Sciences (SPSS) to solve problems.

References:

Wonnacott and Wonnacott: “Statistics for Business and Economics” Wiley Publications
Wonnacott and Wonnacott: “Econometrics” Wiley Publications
Sanchetti and Kapoor: “Statistics”
Morris Hamber: “Statistical Analysis for Decision Making”
Richard Livin and David Robin: “Statistics for Management”

SC03: MCB270 DISASTER MANAGEMENT

1. **Course Description:** The course essentially covers all aspects of disaster management.
2. **Course Outcome:**

   CO1: Understand the concept of disaster management.

   CO2: Learn the management of natural and man-made disaster.

   CO3: Knowledge of National policies on Disaster Management.

3. **Pedagogy**: Method of instruction consists of lectures, case study design and analysis, group discussions, seminar presentations, writing assignments and tests.

4. **Course content:**

Module 1: Basics of Disaster: Definition of hazard and disaster; typology of disaster; natural and human; made disasters. Geological disaster; earth quakes and seismology, volcanic eruptions, tsunami and landslides. Hydrological disasters- floods, droughts and famines, cyclones and hurricanes.

Module 2: Human made disaster: Human instigated disaster; communal forces and violence, caste conflicts, ethnic conflicts, refugees. Industrial and technological accidents, system failure, explosion and chemical leakers/spillage, biological weapons.

Module 3: National policy on disaster management, contingency action plans, financial assistance, from center to states under calamity relief fund. Crisis management groups; their formations and functions

Module 4: Management of disaster: Risk assessment and disaster response, quantification techniques, NGO management, SWOT Analysis based on design and formulation strategies, insurance and risk management, role of financial institutions in mitigation effort.

References:

Encyclopedia of disaster management By Goel, S. L. Deep & Deep, Publication Pvt, Ltd.
Disaster management by G. K. Ghosh, A. P.H Publishing corporation.
Disaster management by R. B. Singh, Rawat Publications
Disaster management : Through the new millennium by Ayaz Ahmed, Anmol Publications.
Emergency medical services and disaster management: A Holistic approach by P.K.Dave, Gaytee Brothers medical Publishers(P) ltd.
Disaster management by D. Narayan, A.P.H. Publishing Corporations.
Model Encyclopedia of Disaster and Hazard management by B.C. Bose, Rajath Publications.
Disaster management by Nikuj Kumar, Alpha Publications.
Disaster management: recent approaches by Aravind Kumar. Anmol Publications.

Second Semester

SC05: MCB240 HUMAN RESOURCE MANAGEMENT

1. Course Outcome:

CO1	Learn in depth significance and management of human resources in organisations
CO2	Specify in depth human resource planning
CO3	Understand in detail with examples human resource development
CO4	Specify the characteristics of reward system
CO5	Deliberate in detail with examples 360 degree appraisal

2. Pedagogy:

Teaching method comprises of lecture sessions and tutorials. Lecture sessions focus on providing conceptual understanding and analytical setting for select aspects of the course content.

3. Course Contents:

Module 1: Environmental context: New economic policy and changing business-technological –socio-economic and political and legal environment, structural reforms and their implications for HRM in India-Response of the management-worker and unions to structural reforms and their implications for HRM in India-Response of the management –Worker and unions to structural adjustment. Concepts of human resource management-Meaning-Objectives-Scope and functions-Perspective of HRM: linking corporate strategies and policies with HRM Organization of HRM department.

Module 2: Human Resources planning and Procurement; Job analysis and evaluation-job description-job specification -job rotation and job enrichment. Human resource planning- importance-objectives and problems. Recruitment-meaning-recruitment policy, sources –factors affecting selection decision-selection procedure. Human resource information system.

Module 3: Human resource development: Meaning-concepts of HRD-objectives of training-organization of training programmers-methods-advantages and limitations of training. Evaluation of training program HRD for total quality management. Transfer policy Promotion policy-Demotion and Discipline-consequences of indiscipline –disciplinary procedure.

Module 4: Compensation/Rewards system: Significance of reward system in business organisation. Compensation system in practice-systems of promoting -factors determining employee compensation and rewards-dearness allowance, employee benefits-bonus-laws on wages, bonus and social security-managerial compensation. Performance Appraisal: concepts, objectives philosophy and process of performance appraisal system- counseling-career planning and management.

References:

1. Human Resource Management: Strategies and Action -Armstrong
2. Human Resource Management -Dr.Ashwathappa
3. Personnel and Human Resource Management -D.A. Deonz and F.P. Robins
4. Personnel Management - Edwin Phillip
5. Human Resources Management—L.M. Prasad

SC06: MCB270 MANAGEMENT OF FINANCIAL SERVICES

1. Course Description:

This course is all about Financial Services industry analysis, trends, globalization and government policy. It also includes an analysis of future of Financial Services, particularly in respect of investment banking, micro-finance/insurance and angel investing.

2. Course Outcome:

CO1	Specify in detail with examples role of financial service industry in India
CO2	Understand the detail of globalisation of financial service
CO3	Deliberate the detail of trends in financial services in India
CO4	Understand the detail of Factoring service and securitisation system
CO5	Identify in detail with examples futures of financial services industries

3. Pedagogy:

Students must work out assigned individual topics, present seminars and participate in case studies or group discussions.

4. Course Contents:

Module 1: Concept and Scope of Financial Services – Marketing of Financial Services Problems and Prospects of Financial Services Industry in India.

Module 2: Globalization of Financial Services – GATS – Functions and the Role of GATS Evaluation of Government's policy towards globalization.

Module 3: An Overview of Trends in Financial Services in India – Lease Financing; Types, History and Development of Lease Financing, Structure of Leasing Industries, Factoring and International Factoring, Securitization- meaning, features, process, IPO Management – Venture Capital; Features, Methods of Venture Financing, Initiatives – Credit Rating; functions –Credit Rating Agencies. Portfolio Management Services.

Module 4: Future of Financial Services Industry – Micro Finance/Insurance – Angel investing – Investment Banking.

References:

1. Financial Markets and Institutions – Bhole L. M. (Tata McGraw Hill)
2. Indian Financial System – Theory and Practice – Khan M.V (Vikas Publishing)
3. Financial Management and Control – Chakraborty S.K (Mc Milan)
4. New Issues Markets - Khan M.Y (Allied Publishers)
5. Emerging Scenario of Financial Services – Gordon & Natarajan (Himalaya Publishing House)
6. Financial Services in India - M.A. Kohok (Himalaya Publishing House)
7. Management of Financial Services – Avadhani (Himalaya Publishing House

SC07:MCB250 BANKING TECHNOLOGY

1. **Course description:** The course deals with study of technology adaption in banking, besides providing scope of practical side of banking
2. **Course Outcome:**

CO1	Identify the characteristics of Recent developments in banking technology
CO2	Identify in depth Impact of technology on banks
CO3	Specify in depth Payment channels and their delivery system
CO4	Deliberate the detail of Global developments in banking technology
CO5	Understand in depth Confidentiality information system audit

3. **Pedagogy:** LTP model, field survey, summary and group discussions.

4. **Course Contents:**

Module 1: Branch Operation and Core Banking - Introduction and Evolution of Bank Management – Technological Impact in Banking Operations – Total Branch Computerization – Concept of Opportunities – Centralized Banking – Concept, Opportunities, Challenges & Implementation . – Case study: Analysis of Recent Core Banking Software.

Module 2: Delivery Channels - Overview of delivery channels – E – Lounge establishment - Phone Banking – Call centers – Internet Banking – Mobile Banking – Payment Gateways – Card technologies – MICR electronic clearing

Module 3: Interbank Payment System - Interface with Payment system Network – Structured Financial Messaging system – Electronic Fund transfer – RTGSS – Negotiated Dealing Systems & Securities Settlement Systems – Electronic Money – E Cheques

Module 4: Global developments in banking technology - Information technology in finance and service delivery. Impact of technology on banks – protecting the confidentiality information system audit. Audit measures in computerized environment information system security and disaster management.

References:

1. Financial Services Information Systems - Jessica Keyes Auerbach publication; 2nd edition (March 24, 2000)(Text Book)
2. Kaptan S S & Choubey N S., "E-Indian Banking in Electronic Era", Sarup & Sons, New Delhi, 2003
3. Vasudeva, "E – Banking", Common Wealth Publishers, New Delhi, 2005
4. Turban Rainer Potter, Information Technology, John Wiely & Sons Inc
5. Banking Technology - Indian Institute of Bankers Publication

Fourth Semester

SC09: MCD260 ADVANCED COST ACCOUNTING

1. **Course Description:** This course is intended to expose students on advanced aspects of cost accounting
2. **Course Outcome:**

CO1	Specify the characteristics of reconciliation between cost and cost financial accounts
CO2	Deliberate in depth Technique of product life cycle costing
CO3	Learn in depth Value chain analysis
CO4	Deliberate the detail of Productivity and concept of measurement
CO5	Deliberate in depth Advanced cost accounting practices

3. **Pedagogy**: Method of instruction consists of lectures, case study design and analysis, group discussions, seminar presentations, writing assignments and tests.

4. **Course content:**

Module 1: Cost Book Keeping and Reconciliation between Cost and Cost financial Accounts – Book - keeping, Cost Ledgers, interlocking and integral Accounts. Reconciliation of Cost and Financial Accounts, Reasons, Needs, Methods.

Module 2 : Product Life Cycle Costing: Introduction, Product Life cycle, Phases and Characteristics of Product Life Cycle, Stages of Product Life Cycle, Product Life Cycle Costing Features and benefits of Product Life Cycle Costing.

Module 3 : Value Chain Analysis Introduction - Definition – Role of Management Accountant – Value Chain Analysis – approach for assessing competitive advantages – value chain analysis v/s conventional management accounting.

Module 4 : Productivity & Concept and Measurement i) Productivity Meaning, Measurement of Material, Labour, Capital and Management Productivity. Productivity V/s Efficiency. Capacity - Theoretical, Practical and idle capacity, Capacity utilization and effect of same on cost. ii) Concept and Measurement Measures to improve productivity - Technical, Financial, Operational Measures. Restructuring of activities - Business Process Re-engineering elementary knowledge. Human aspect of productivity.

References:
Cost accounting – S P jain and Narang
Cost accounting – NK Prasad

SC 10: MCD210 SUPPLY CHAIN MANAGEMENT

1. Course Outcome:

CO1	Understand the detail of fundamentals of supply chain management
CO2	Deliberate the detail of foundational role of logistics management
CO3	Understand in detail with examples evaluation of marketing channels
CO4	Learn in depth channel management
CO5	Identify the detail of staffing the sales team

2. Pedagogy:

Method of instruction consists of lectures, group discussions, seminar presentations, writing assignments and tests. Reading and analysis of supply chain strategies of national and multi-national organisations will be integral part of instruction.

3. Course Contents:

Module 1 Introduction to Sales Management: Sales Management: Its Nature, Rewards, and Responsibilities, Social, Ethical, and Legal Responsibilities of Sales Personnel. Building Relationships through Strategic Planning, The Market-Driven Sales Organization, Forecasting Market Demand and Sales Budgets Design and Size of Sales Territories, Sales Objectives and Quotas, staffing the Sales Team - Planning for and Recruiting Successful Salespeople, Selection, Placement, and Socialization of Successful Salespeople, Training theSales Team - The Management of Sales Training and Development, Contents of the Sales Training Program: Sales Knowledge and the Selling Process, Directing The Sales Team -Motivating Salespeople toward High Performance, Compensation for High Performance, Leading the Sales Team

Module 2 Marketing Logistics : Logistics and its importance, Functions of Logistics management - Procurement /Purchasing, Inward Transport, Receiving, Warehousing, Stock Control, Order Picking, Materials Handling, Outward Transport, Physical Distribution Management, Recycling, Returns, and Waste Disposal, Importance of Communication in Logistics, Technology in Logistics- Electronic Data interchange (EDI), Artificial Intelligence, Expert Systems, Communication Technology, Bar Coding and Scanning, Streamlining the Logistics Process, Strategic Issues in Logistics Management

Module 3 Marketing Channels: Evolution of Marketing Channels- The Production Era, The Sales Era, The Marketing Era, Relationship Marketing Era, Channel member and their roles, Roles of Channel Members, Channel Functions, Designing marketing channels - Channel Structure, Channel Intensity, Types of Channel Intermediaries at Each Level, Channel Flows and Cost.Importance of Channel Integration, Vertical Marketing Systems, Types of vertical marketing systems - Corporate VMS, Administered VMS, Contractual VMS, Horizontal Marketing Systems, Hybrid channel system, Designing and Managing Hybrid Channel Systems

Module 4 Channel Management: Recruiting Channel, Members - Recruiting as a Continuous Process, Recruiting Manufacturers, Screening, Criteria for Selecting Channel Members - Sales Factors, Product Factors, Experience Factors, Administrative Factors, Risk Factors, Motivating Channel Members, Distributor Advisory Councils, Modifying Channel Arrangements - PLC Changes, Customer-Driven Refinement of Existing Channels, Growth of Multi-Channel Marketing Systems, Managing Channel Relationships - Cooperation and coordination, Conflict, Power

References:

Sales And Distribution Management, Tapan Panda And Sunil Sahadev, Oxford Publications
Sales Management, Still And Cundiff, PHI
S.L. Gupta, Sales & Distribution Management, Excel Books
Marketing Channels, Coughian, Anderson, PHI
Sales And Distribution Management; Krishna Havaldar And Cavale; Tata Mcgraw-Hill
Sales Management, Dasgupta, PHI

ELECTIVE GROUPS

GROUP C: BUSINESS TAXATION
Paper-1

SC11: MCC230 INDIRECT TAX LAW AND PRACTICE
Goods and Services Tax and Customs Duty

1. **Course Description:** This paper is to educate the taxation students about Indian Tax System, its background, and its operation in the global competitive market. The importance and administration of the indirect taxes in the Indian market oriented economy and its role in achieving the objectives of modern welfare government. To understand the relevance of GST in the present Indian Tax Scenario.

2. Course Outcome:

CO1	Understand in depth significance and contribution of indirect taxes in India
CO2	Understand in detail with examples principles of taxation and incidence process of indirect taxes in market oriented economy
CO3	Understand the implications of indirect taxes on the taxable capacity of consumers, dealers and society at large.
CO4	Learn in depth tax planning, tax management, payment of tax and filling of tax returns
CO5	Specify in depth impact of GST on Domestic, National and International trade

3. Pedagogy:

1) Lecture:
2) Tutorial and bridge class*(Non tax students)
3) Live leading cases pending and deciding in the high court and supreme courts.
4) Practical works: Tax planning, Tax management, filing of various tax returns and working as consultants and tax adviser for small companies nearby dealers and companies relating to GST and Customs

2. Course Contents:

Module 1: Constitutional Provision for Indian tax system, structure of Indian tax system. Public finance, public expenditure and public revenue. Principle and objectives of taxations in the modern welfare governments. Indian tax structure, different types of taxes- taxes under indirect tax family in India, methods of taxations, tax reforms and recent tax reforms committees and its recommendations and fiscal discipline.

Module 2: GST-Genesis, History, Constitutional Background of GST, GST Bills, GST- Central and State Financial relations, Finance commissions, Salient features of GST, Tax Reforms and GST in India, Tax compliance, GST administrative structure both central and state level, Advantages of GST- Economy, Governments, dealers and consumers, E-Commerce and GST GST-Issues, challenges and problems.- **Legal case study.**

Module-3: Taxes under GST- levy and incidence of GST, Value of Tax event, Rates and Schedules, CGST, SGST, IGST, Criteria for GST, GST on Exports, Imports and SEZ supplies input credit, Payment of Taxes, Returns Filling, Assessment and Audit of Accounts, under GST, GST refund, Appeals and Revision, Prosecution and Appellate Tribunals. -**Case studies.**

Module: 4: Customs Duty: Customs Act, 1962 and Rules, regulations Circulars and Notifications; Customs Tariff Acts, and the related Rules. Principles governing levy of customs duty, types of duties at global scenario. Basic principles of classification of goods and valuation of goods, special provisions regarding baggage, goods imported or exported by post, and stores. Duty drawback schemes, GATT and WTO objectives principles in customs duty.- **Case studies.**

References:

1) Indirect Taxes- Law and Practice: V.S.Datey
2) Karnataka GST Manuals
3) GST Ready Reckoner
4) Bare Acts of Customs, Customs Tariff Acts, GST
5) Public Fiancé- Mahaveer Thagy
6) Public Finance Prof.H.Doltan
7) GST Bill/Act 2016
8) CST Law and Practice-SS Gupta
9) Basic of GST-Nitya Tax association Taxman
10) GST Manual- Taxman publication
11) Indian GST for Begineers –Jayaram Hiregange and Deepak Rao
12) CA Practical Manuals
13) www.gstindia.com

Paper-2: SC12: MCD230 CORPORATE TAX LAW AND PLANNING

1. Course Description: This course is focused on different heads of income, taxable in the hands of companies, computation of grass total income, deduction, exemptions, set off and carry forward of loss. Tax planning relating to various managerial decisions for reducing the tax burden, allocation of investments, and maximize the company wealth. As a tax consultant of the corporate tax laws of the company to give advice to the drawing officers regarding TDS, advance payment of tax and remittances of tax, for his employees.

2. Course Outcome:

CO1 Understand in detail with examples incidence of tax on residential status of the

	company
CO2	Deliberate in detail with examples different types of companies under corporate income tax
CO3	Understand the detail of different sources of income for corporate assesses
CO4	Specify in depth impudence of tax planning
CO5	Understand in depth procedure for assessment

3. Pedagogy: The course content is covered class room lecture, remedial class for non tax students, student's seminar, case discussion, and work out the problem on the company problems as student, as consultant and as a tax authority and also visiting company and tax office for practical exposure.

4. Course Content:

Module 1: Definition of company-Indian company, Domestic Company, Foreign Company, Widely Held Company, Closely held company, Residential Status of a company and incidence of Tax.

Module 2: Computation of Taxable incomeof companies- Computation of table income under different heads of income-House property, Profit and gain from business or profession, Capital gain and income other sources, carry forward and set off of losses in case of companies. Deduction from Gross Total income. Minimum Alternative Tax.

Module 3: Tax Planning- Tax avoidance and tax evasion. Tax planning with corporate dividend, Dividend policy-bonus shares. Tax planning with reference to specific managerial decisions- Make or Buy, Own or Lease, Purchase by installment or by Hire, Repair, Replace, Renewal or Renovation, shout down or continue.

Module 4: Procedure for assessment- Deduction of Tax at Source, Advance payment of Tax, Tax returns, refunds appeals and revision.

References:

Direct Taxes-Dr.H.C. Mehrotra and Dr.S.P.Goyal Sahitya Bhavn New Delhi.
Direct Taxes law and practice-Bhagavathi Prasad, Vishva Prakashana, New Delhi.
Direct Taxes Aggarval P.K "Tax Planning for Companies" Hind Law Publishers, New Delhi.
Corporate Tax Planning and Management, Lakhotia, Vision Publishers.
Taxman's Direct Tax Laws and Practice, Dr.Vinod K Singhania and Kapil Singania Taxman's Publications(p)Ltd., New Delhi.

GROUP D: MANAGEMENT ACCOUNTING

Elective Paper-1

SC13: MCC250: MARGINAL COSTING AND DECISION MAKING

1. Course Outcome:

CO1	Deliberate in depth skill relating to marginal costing
CO2	Identify the detail of wide range of managerial decisions
CO3	Deliberate the detail of techniques of controlling cost through standard costing
CO4	Understand the detail of managerial cost control decisions
CO5	Learn the detail of direct costing

2. Pedagogy:

Course activities consist of lectures, case study analysis, group discussions, seminar presentation, assignment writing and tests. Solving problems and evaluating decisions involving the financial and cost data of selected firms will be integral part of instruction

3. Course Contents:

Module 1: Introduction: Meaning- terminology- Scope & Concepts- Cost Behavior Analysis- Break Even Analysis- Approaches of Break Even Analysis in relation to cost & revenue. Factors- Multi-product Break Even Analysis- Assumptions Underlying Break Even Analysis- Limitations of Break Even Analysis- Case Studies.

Module 2: Contribution Concepts & Sort term Profitability Analysis: Profitability Analysis Under Constrained Conditions- Profit- Volume Ratio & its Uses- Profit Volume Graphs – Case Studies.

Module 3: Marginal Costing & Managerial Decisions: Profit Planning- Pricing Decision – Production Decision – Make and Buy Decision Joint & By-product Decision – Distribution Cost Analysis- Case Studies.

Module 4: Direct Costing: Meaning- Importance & Preparation of income statements- Comparison with Absorption Costing- Arguments in Favour of Direct Costing- Criticisms of Direct Costing. Value Analysis & Value Engineering: Basic Concept of Value- Constitution of a Value Analysis Team- Procedures Underlying Value Analysis Study- Benefits From & Resistance to Value Analysis Study- Reporting to Management- Objectives of Reporting- Reporting Needs of Different Management Levels- Types of Reports- General Principles of Reporting- Modes of Reporting- Reports to the Board of Directors- Reports to Top Management- Reporting to top Divisional Management- Reports to Junior Management Level- Preparation of Reports- use of Reports by Management- Case Studies.

References:

J. Batty : Management Accountancy, ELBS
C.T.Horngel : Cost Accounting- A Manorial Emphasis
M.R.S. Murthy : cost Analysis for Management Decisions, Tata Mc Graw Hill

Elective Paper-2

SC14: MCD250: TOOLS AND TECHNIQUES OF CONTROL

1. Course Outcome:

CO1	Specify the detail of cost control and management
CO2	Deliberate the detail of cost control and management tools
CO3	Learn in detail with examples costing system for job and process oriented manufacturing environments
CO4	Identify the classification and characteristics of uniform costing and inter-firm comparison
CO5	Learn in depth objectives and criticism of management audit

2. Pedagogy:

Course activities consist of lectures, case study analysis, group discussions, seminar presentation, assignment writing and tests. Analysis and evaluation of scope for cost reduction involving the value engineering and ABC activities of selected firms will be integral part of instruction.

3. Course Contents:

Module 1: Budgetary Control: Objectives of Budgetary Control-Preparation of the Budget-Functional Budgets-Sales Budgets-Production Budget-Cost Budget-Plant Utilization Budget Capital Expenditure Budget-Selling & Distribution Cost Budget-Purchasing Budget & Cost Budget-The Master Budget-Operation of Budgetary Control-Flexible Budgetary Control-Zero-Base Budgeting-Case Studies.

Module 2: Standard Costing: Objectives-Principles-Determination of Standards for Material-Labor-Direct Expenses & Overhead Costs-Variable and Fixed Costs-Case Studies.

Module 3: Variance analyses: Material, Labor, and Overhead Variances-sales & Profit Variances-Disposition of Variances-Assessing the Significance of Standard Cost Variance-Standard Cost Accounting-Case Studies.

Module 4: Uniform costing & Interfirm Comparisons: Objectives and Purposes Underlying Uniform Costing-Development of Uniform Costing-Cost Audit-Meaning & Definition-Inclusion of Clause B to Sec.208 to Sub Sec. (d) to Sec. 209-Indian Companies Act 1956-Appointment of Cost-Cost Audit Programme-Records Relating to Materials-Labor Overhead-Depreciation-Stores & Spare Parts-Work-in-progress and Incomplete Contracts-Cost Auditor's Report-Application of Cost Audit Report Rules, 1963-Sachar Committee's Report. Management Audit: Meaning & Definition-objectives & Criticisms-Types of Audits-Argurments for & Against Management Audit-Social Audit-Steps Underlying Social Audit Programme-Social Audit Report-Limitations of Social Audits-Case Studies.

References:

Welsh, Glenn A. : Profit, Planning and Control(prentice Hall)

J. Batty : Standard Costing

M.R.S. Murthy : Cost Analysis for Management Decisions, Tata Mc Graw Hill

Open Elective

OE01: 540 RETAIL BANKING

1. Course Description:

This course is designed to provide a basic understanding of Personal Banking. It focuses on functions of banks, banker and customer relationship, Opening of bank accounts and their operations, bank deposits and loans and banking technology.

2. Course Outcome:

CO1	Understand the detail of functions associated with banking principles and practices
CO2	Deliberate in detail with examples services provided by banks to individual customers
CO3	Learn in depth retail banking scenario
CO4	Understand in detail with examples different models and strategies adopted by the banks
CO5	Understand the detail of banking technologies

3. Pedagogy:

Method of instruction consists of lectures, case study design and analysis, group discussions, seminar presentation, writing assignments and tests. Interaction with customers of banks, managers and employees of banks.

4. Course Contents:

Module 1: Functions of Banks: Introduction, Types of Banks, Payment Bankers-Recent Developments. Functions of Reserve Bank of India, Commercial Banks, Private Sector Banks, and Grameena Banks.

Module 2: Banker and Customer Relationship: Different Customers-Special type of Customers, Know your Customer [KYC] guidelines- Opening of different bank accounts and procedures for their operations.

Module 3: Bank Deposits and Loans: Pledge, Hypothecation, Mortgage-Utility. Different Deposit and Loan Products of Banks, Rate of Interest- Fixed and Floating, Documentation Procedures.

Module 4: Banking Technology: Net Banking-Procedure-Safety, Digital Banking-Pro's and Con's. Electronic Banking, Core Banking Technology, Debit and Credit Cards, ATMs.

References:

Machiraju, H.R., Indian Financial System, Vikas, New Delhi.
Verma, J.C. Merchant Banking, TMH, New Delhi.
Mithani and Gordeon, Banking Theory and Practice, Himalaya, Bombay.
Bhole, L.B., Financial Institutions and Markets, TMH, New Delhi.

OE02:580 PERSONAL FINANCIAL MANAGEMENT

1. Course Description: This course is designed to provide a deeper understanding of Personal Financial Management It focuses on basics of personal financial management, personal savings and investment plans, computation of return and risk factor of personal savings and investments, retirement savings plans.

2. Course Outcome:

CO1	Understand in depth personal financial management process
CO2	Learn the detail of plan personal budget
CO3	Specify the detail of financial planning in the changing personal and financial environment
CO4	Identify in depth various investment alternatives of personal financial planning
CO5	Deliberate the detail of retirement savings plans

3. Pedagogy: Method of instruction consists of lectures, case study design and analysis, group discussions, seminar presentation, writing assignments and tests. Interaction individual investors with different profiles by age, income, sex, occupation, and region.

4. Course Contents:

Module 1: Basics of Personal Financial Management: Basics of Personal Financial Management: Budget, The Personal Financial Planning Process, Preparation of Personal Budget, Personal Financial Statements, Personal Income Tax Planning. Case studies on personal financial planning of individuals.

Module 2: Personal Savings & Investment: Investment Criteria- liquidity, safety and profitability. Savings instruments of Post Office and Banks. Chit Funds. Investment in Shares, Debentures, Corporate and Government Bonds, Mutual Fund. Investment in Physical Assets – Real Estate, Gold and Silver, Gold certificates. Risk and Return associated with these investments. Case studies on risk and return perception of retail investors on various investments.

Module 3: Computation of Return and Risk of Personal Investment: Present Value and Future Value of a Single Amount and an Annuity. Computation of interest, dividend and capital gains on personal investments. Impact of leverage on return. Personal tax planning,

Module 4: Retirement Savings Plans: Retirement Savings Plans:, Gratuity plans from the government. Life Insurance types. Health insurance. Pension Plans- Defined Contribution Plan and Defined Benefit Plan. Provident Fund, Gratuity. Life Insurance Plans. General Insurance Plans. Reverse Mortgage Plans.

References:

Personal Finance by Jack R. Kapoor, Les R. Dlabay and Robert J. Hughes, Tat McGraw-Hill Publishing Company Ltd. New Delhi.
Financial Education by Reserve Bank of India – rbi.org.
Personal Finance columns in The Economic Times, The Business Line and Financial Express Daily News Papers.
Information Broachers of Post Offices, Banks, Mutual Funds, Insurance Companies
Internet Sources- BSE, NSE, SEBI, RBI, IRDA, AMFI etc.

Question paper pattern (M.Com. 2016-17 Scheme) All courses except CTBC

Time: 3 Hours **Max Marks: 70**

Section A

Answer any five questions: 5X5= 25

1.
2.
3
4.
5.
6.
7.
8.

Section B

Answer any three questions: 10X3=30

9.
10.
11.
12.
13.

Section C

14. Case Study (Compulsory)

Note: In case problem subjects / working papers section A may comprise of two problems and section B may comprise of three problems. Section C shall be a problem only.

Question Paper pattern M.Com. 2016-17 Scheme for Current Trends in Business and Commerce

Time : 3 Hours **Max Marks: 70**

Section A

Answer any five questions: 5X5= 25

1.
2.
3
4.
5.
6.
7.
8.

Section B

Answer any three questions: 10X2=20

9.
10.
11.

Section C: 1X25= 25

Multiple choice questions (25 numbers) , each question carrying one mark

JSS COLLEGE OF ARTS, COMMERCE & SCIENCE

(AUTONOMOUS)

OOTY ROAD, MYSURU-570 025

(Autonomous under University of Mysore: Re-accredited by NAAC with 'A' Grade)

Choice Based Credit System and CGPA

MASTERS DEGREE

Syllabus

Postgraduate Department of Computer Science

JSS College of Arts, Commerce and Science

Ooty Road, Mysore-25

2018-2020

PROGRAMME: MASTER OF SCIENCE IN COMPUTER SCIENCE

2 Years /4 Semesters (under CBCS-CAGP)

ADMISSIONS:

i) 50% seats of the total intake for M.Sc., Computer Science Programme of the College will be filled-up by University of Mysore through Centralized Admission Cell as per University regulations.

ii) Remaining 50% seats will be filled-up by the College under College Quota.

ADMISSION REQUIREMENT

Eligibility - All students who have 45% (40% for SC/ST) in their B.Sc degree (from Recognised University/ Open University) with Mathematics as one subject and any one-two among Electronics, Instrumentation, Computer Science or Computer Maintenance and Physics as other subject. OR Student with B.Sc (IT) are permitted provided they have not studied Mathematics in their 2 years PUC. OR Diploma (in Electronics, Computer Science and Information Technology) holders with B.Sc (IT) are permitted if they have SSLC level Mathematics. OR BCA degree from recognized University OR equivalent to this from any other recognized University in India or abroad is also permitted.

PROGRAMME OUTCOMES:

After Completing the M.Sc Program Students will be able to:

PO1. Identify, formulate, and solve computer science problems.
PO2. Design, implement, test, and evaluate a computer system, component, or algorithm to meet desired needs
PO3. Receive the broad education necessary to understand the impact of computer science solutions in a global and societal context
PO4. Communicate effectively
PO5. Success in research or industry related to computer science
PO6. Have solid knowledge in computer science and engineering, including programming and languages, algorithms, theory, databases, etc.
PO7. Integrate well into and contribute to the local society and the global community related to computer science
PO8. Practice high standard of professional ethics
PO9. Draw on and integrate knowledge from many related areas

PROGRAMME SPECIFIC OUTCOMES:

PSO1. Programmers or the Software Engineers with the sound knowledge of practical and theoretical concepts for developing software.

PSO2. Serve as the Computer Engineers with enhanced knowledge of computers And its building blocks. Work as the Hardware Designers/Engineers with the knowledge of Networking Concepts.

PSO3. Work as the System Engineers and System integrators Serve as the System Administrators with thorough knowledge of DBMS.

PSO4. Work as the Support Engineers and the Technical Writers

PSO5. Work as IT Sales and Marketing person.

PSO6. Serve as the IT Officers in Banks and cooperative societies.

PSO7. Computer Scientist in research and R & D laboratories.

PSO8. Faculty for Graduate and under graduate Colleges**.**

MSc. in Computer Science – 2018

I Semester

Course Code	Course	L:T:P	Credit Value
CSC101	HC1 (Data Structures and Algorithms)	3:0:1	4
CSC102	HC2 (System Software)	2:1:1	4
CSC103	HC3 (Computer Networks)	2:1:1	4
CSC104	SC1		4
CSC105	SC2		4
	TOTAL		**20**

II Semester

Course Code	Course	L:T:P	Credit Value
CSC201	HC4 (Analysis and Design of Algorithms)	2:1:1	4
CSC202	HC5 (Operating System and Unix)	2:0:2	4
CSC203	HC6 (Computer Graphics)	3:0:1	4
CSC204	SC3		4
CSC205	SC4		4
	TOTAL		**20**

III Semester

Course Code	Course	L:T:P	Credit Value
CSC301	HC7 (Software Engineering)	3:1:0	4
CSC302	HC8 (Theory of Languages)	3:1:0	4
CSC303	HC9 (Database Management System)	2:1:1	4
CSC304	SC5 / Term Work		4
CSC305	SC6 (Open Elective ****)		4
	TOTAL		**20**

IV Semester

Course Code	Course	L:T:P	Credit Value
CSC401	HC10 (Major Project)	0:1:7	8
CSC402	SC7		4
CSC403	SC8		4
	TOTAL		**16**

****** Open Elective Course: III Semester**

Course Code	Course	L:T:P	Credit Value
CSC305	OE- Computer Fundamentals / Programming with C	2:0:2	4

HARD CORE:

Sl. No.	Course	L:T:P	Credit Value
1	Computer Networks	2:1:1	4
2	Computer Graphics	3:0:1	4
3	Data Structures and Algorithms	3:0:1	4
4	Analysis and Design of Algorithms	2:1:1	4
5	DBMS	2:1:1	4
6	Software Engineering	3:1:0	4
7	Theory of Languages	3:0:1	4
8	Operating System and Unix	2:0:2	4
9	System Software	3:1:0	4

SOFT CORE:

Sl. No.	Course	L:T:P	Credit Value
1	Principles of Programming Language and C	2:1:1	4
2	Internet Technology	2:0:2	4
3	Java Programming	2:0:2	4
4	Multimedia	3:1:0	4
5	Microcontroller	3:1:0	4
6	Discrete Mathematics	3:1:0	4
7	Simulation and Modeling	3:1:0	4
8	Operations Research	3:1:0	4
9	Mobile Communication	3:1:0	4
10	C++	2:0:2	4
11	Pattern Recognition	3:0:1	4
12	Image Processing	2:1:1	4
13	Software Testing	3:0:1	4
14	Computational Techniques	3:0:1	4
15	Graph Theory	3:1:0	4
16	OOAD	2:1:1	4

17	Probability and Statistics	3:1:0	4
18	Data Mining	2:1:1	4
19	Artificial Intelligence	3:1:0	4
20	.NET Technologies	2:0:2	4
21	Object Oriented Modeling and Design with UML	2:1:1	4
22	Android Application Development	2:0:2	4
23	Advanced Database Management Systems	2:1:1	4
24	Compiler Design	3:0:1	4

SCHEME OF EXAMINATION AND ASSESMENT:

In view of the CBCS syllabus, Each Course is assessed with Components. Component 1 (C1), Component 2 (C2), and Component 3 (C3),

The following is the scheme which will be followed for the assessment of marks for both theory (HC/ SC/ OE) as well as practicals (HC/ SC) irrespective of the Credits associated with each Course. Thirty percent of the marks will be assessed for the internals (C1 and C2) and remaining seventy percent will be for the semester end examinations (C3). Each Course carries 100 marks and hence thirty marks for internal assessment and remaining seventy marks will be for Semester End Examinations. Out of thirty marks for internals, fifteen marks will be allotted to each C1 and C2 components.

Each theory Course (HC/ SC/ OE) consists of three components namely C1, C2 and C3. C1 and C2 are designated as Internal Assessment (IA) and C3 as Semester End Examination. Each Course (HC/ SC/ OE) carries 100 Marks and hence the allotment of marks to C1, C2 and C3 Components will be fifteen, fifteen and seventy marks respectively. i.e.,

C1 Component : 15 Marks C2 Component : 15 Marks	Internal Assessment Marks
C3 Component : 70 Marks	Semester End Examination
Total : 100 Marks	

The above will be followed in common for all the theory (HC/ SC/ OE) Courses in all the four semesters.

DATA STRUCTURES & ALGORITHMS **3:0:1**

Course Code: CSA100

Course Outcome:

At the end of the course students will be able to:

CO1. Select appropriate data structures as applied to specified problem definition.

CO2. Implement operations like searching, insertion, and deletion, traversing mechanism etc. on various data structures.

CO3. Implement Linear and Non-Linear data structures.

CO4. Implement appropriate sorting/searching technique for given problem.

CO5. Design advance data structure using Non Linear data structure.

UNIT I: Introduction

Introduction to Stages in Problem Solving, Difference between Data Type, Data Structure and Storage Structure, Formal Definition of Data Structure, Classification of Data Structure

Analysis of Algorithms: Algorithm, Time Complexity and Space Complexity, O-Notation, Omega Notation and Theta Notation.

Primitive Data Structure: Integer, Real, Character and Boolean and Its Storage Representation

UNIT II: Non-Primitive Data Structures

Arrays: Introduction to Array Data Structure and Its Representation, Sparse Matrix Representation. Introduction to Structures

Stacks: Introduction, Implementation Using Arrays, Applications - Tower Of Hanoi, Expression Evaluation, Conversion of Expressions

UNIT III: Stacks and Queues

Queue: Introduction, Types – Ordinary, Circular, Doubly Ended, Priority, Implementation Using Arrays

Linked List: Introduction, Types, Operations, Implementation of Stacks and Queues Using Linked List

UNIT IV: Non-Linear Data Structures

Graphs: Introduction, Basic Terminologies, Graph Representation – Adjacency and Incidence Matrix Representation

Trees: Introduction, Binary Tree Representation – Array and Linked List Representations, Traversals – Preorder, In-order, Post order, Binary Search Tree, Introduction to B-Trees

Hash Tables: Direct Address Tables, Hash Tables, Hash Functions, Open and Closed Addressing

References:

1. Data Structures and Algorithms, 2nd Edition, 2006 , Andrew Tanenbaum
2. "An Introduction to Data Structures, with Applications" McGraw Hill, Kongakusha 1976, Trembley and Sorenson
3. "Data Structures" SBCS Publication, 1980, Horowitz and Sahni
4. Data Structures using c, A K Sharma
5. Data Structures and program design in C, Kruse Robert L
6. Data Structures and analysis in C, Mark Allen Weiss
7. Data Structures and Algorithms, Alfred V AHO and Jeffrey D Ullman

SYSTEM SOFTWARE **2:1:1**

Course Code: CSA110

Course Outcome:

At the end of the course students will be able to:

CO1. Understand fundamentals of language processing and grammar

CO2. Apply knowledge of compilation and code optimization steps to mimic a simple compiler

CO3. Demonstrate the working of various system software like assembler, loader, linker, editor and device driver

UNIT 1

Background: Machine Structure, Evolution of the components of a programming system, evolution of operating system, operating system user view point functions, facilities

General Machine Structure, General Approach to a new machine, Machine Structure – 360 and 370, Assembly Language

UNIT 2

Assemblers: General design procedure, design of an assembler.

Macro language and macro processor, macro instructions, features of macro, implementation

UNIT 3

Loaders, different types of loaders, loader schemes, design of an absolute loader, design of direct linking loader.

Compilers: Structure and phases

UNIT 4

Lex and yacc: The Simplest lex Program, Recognizing Words with Lex, Parser-Lexer Communication, Regular Expressions, Grammars, Shift/Reduce Parsing, Structure of lex and yacc Programs, Programs in lex and yacc

References:

1. Systems Programming by Donovan
2. Principles of Compiler design by Ullman
3. System programming by Dhamdhare
4. Lex and yacc by John R Levine, Tony Mason and Doug Brown
5. System Software- Prof. Liland L Beck.

6. System Software- Prof. John R Levine

COMPUTER NETWORKS **2:1:1**

Course code: CSA120

Course Outcome:

At the end of the course students will be able to:

CO1. Learn the classification and characteristics of network hardware

CO2. Write down the details of LAN.

CO3. Understand the details of service primitives

CO4. Specify the characteristics of wireless transmission.

CO5. Learn the classification and characteristics of medium access control sublayer.

CO6. Understand in depth domain name system

CO7. Deliberate in depth cryptography.

UNIT 1

USES OF COMPUTER NETWORK: Business Applications, Home Applications, Mobile Users, Social Issues

NETWORK HARDWARE: Local Area Networks, Metropolitan Area Networks, Wide Area Networks, Wireless Networks, Home Networks, Internetworks

NETWORK SOFTWARE: Protocol Hierarchies, Design Issues for the Layers, Connection-Oriented and Connectionless Service, Service Primitives, the Relationship of Services to Protocols

REFERENCE MODELS: The OSI Reference Model, The TCP/IP Reference Model, A comparison of OSI and TCP/IP Reference Model

UNIT 2

THE PHYSICAL LAYER

THE THEORETICAL BASIS FOR DATA COMMUNICATION: Fourier Analysis, Bandwidth-Limited Signals, The Maximum Data Rate of a Channel

GUIDED TRANSMISSION MEDIA: Magnetic Media, Twisted Pairs, Coaxial Cable, Fiber Optics

WIRELESS TRANSMISSION: The Electromagnetic Spectrum, Radio Transmission, Microwave Transmission, Infrared and Millimeter Waves, Light wave Transmission
COMMUNICATION SATELLITES: Geostationary Satellites, Medium-Earth Orbit Satellites, Low-Earth Orbit Satellites, Satellites versus Fiber
THE DATA LINK LAYER
DATA LINK LAYER DESIGN ISSUES: Services Provided to the Network Layer, Framing, Error Control, Flow Control
ERROR DETECTION AND CORRECTION: Error-Correcting Codes, Error-Detecting Codes
ELEMENTARY DATA LINK PROTOCOLS: A Utopian Simplex Protocol, A Simplex Stop-and-Wait Protocol
SLIDING WINDOW PROTOCOLS: A One-Bit Sliding Window Protocol, A Protocol Using Go-Back-N

UNIT 3

THE MEDIUM ACCESS CONTROL SUBLAYER
THE CHANNEL ALLOCATION PROBLEM: Static Channel Allocation, Dynamic Channel Allocation
MULTIPLE ACCESS PROTOCOLS: ALOHA, Carrier Sense Multiple Access Protocols, Collision-Free Protocols, Limited-Contention Protocols
ETHERNET: Ethernet Cabling, Manchester Encoding, The Ethernet MAC sub layer protocol, the binary exponential back off algorithm, Ethernet Performance, Switched Ethernet, IEEE 802.2: Logical Link Control
THE NETWORK LAYER
NETWORK LAYER DESIGN ISSUES: Store-and-Forward Packet Switching, Services Provided to the Transport Layer, Implementation of Connectionless Service, Implementation of Connection-Oriented Service, Comparison of Virtual-Circuit and Datagram Networks
ROUTING ALGORITHMS: The Optimality Principle, Shortest Path Algorithm, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing
CONGESTION CONTROL ALGORITHMS: Approaches to Congestion Control, Traffic-Aware Routing, Admission Control, Traffic Throttling, Traffic Shaping
INTERNETWORKING: How Networks Differ, How Networks Can Be Connected, Tunneling, Internetwork Routing, Fragmentation

THE NETWORK LAYER IN THE INTERNET: The IP Protocol, IP Addresses, IPv6

UNIT 4

THE TRANSPORT LAYER

THE TRANSPORT SERVICE: Services Provided to the Upper Layers, Transport Service Primitives

ELEMENTS OF TRANSPORT PROTOCOLS: Addressing, Connection Establishment, Connection Release, Error Control and Flow Control, Multiplexing, Crash Recovery

THE INTERNET TRANSPORT PROTOCOLS: UDP: Introduction to UDP, Remote Procedure Call, Real-Time Transport Protocols

THE INTERNET TRANSPORT PROTOCOLS: TCP: Introduction to TCP, The TCP Service Model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release, TCP Connection Management Modeling, TCP Sliding Window, TCP Timer Management

THE APPLICATION LAYER

DNS—THE DOMAIN NAME SYSTEM: The DNS Name Space, Resource Records, Name Servers

ELECTRONIC MAIL: Architecture and Services, The User Agent, Message Formats, Message Transfer, Final Delivery

NETWORK SECURITY:

CRYPTOGRAPHY: Introduction to Cryptography, Substitution Ciphers, Transposition Ciphers, Two Fundamental Cryptographic Principles

SYMMETRIC-KEY ALGORITHMS: DES—The Data Encryption Standard, Cipher Modes

PUBLIC-KEY ALGORITHMS: RSA, Other Public-Key Algorithms

DIGITAL SIGNATURES: Symmetric-Key Signatures, Public-Key Signatures

MANAGEMENT OF PUBLIC KEYS: Certificates

Reference Books:

1. Computer Networks, 5th Edition, Prentice Hall, 2006, Andrew S. Tanenbaum & David J. Wetherall

2. Data & Computer Communications, 6th Edition, Pearson Education, 2002, William Stallings
3. Computer Networks: 3rd Edition, Elserier, 2003, Larry L. Peterson & Bruce S. Davie
4. Data Communication & Networking, 4th Edition, Mc Graw Hill, 2006, Behrouza Forouzan
5. Computer & Networks with Internet Applications, 4th Edition, Pearson Education, 2004, Douglas E. Comer

ANALYSIS AND DESIGN OF ALGORITHMS **2:1:1**

Course Code: CSB060

Course Outcome:

At the end of the course students will be able to:

CO1. Learn in details with examples space complexity
CO2. Identify the classification and characteristics of recursive algorithms
CO3. Write down the details of nonrecursive algorithms
CO4. Write down the details of divide and conquer
CO5. Write down the details of nondeterministic algorithms
CO6. Write down the characteristics of 8 queens problem using backtracking

UNIT 1

INTRODUCTION**:** Algorithm specification, pseudo code conventions

PERFORMANCE ANALYSIS: Space Complexity, Time Complexity, Asymptotic Notation, Mathematical Analysis: Recursive and Non recursive algorithms

BRUTE FORCE – Bubble Sort, Selection Sort, Sequential Search, String Matching

UNIT 2

DIVIDE- AND – CONQUER: General Method, Binary Search, Finding the Maximum and Minimum, Merge Sort, Quick Sort, Strassen's Matrix Multiplication

THE GREEDY METHOD: The General Method, Knapsack Problem, Tree Vertex Splitting, Job Sequencing with Deadlines, Minimum-Cost Spanning Trees - Prim's Algorithm, Kruskal's Algorithm, Optimal Storage on Tapes, Optimal Merge Patterns, Single-Source Shortest Paths.

UNIT 3

DYNAMIC PROGRAMMING: The General Method, Binomial Coefficient, Multistage Graphs, All Pairs Shortest Paths Single-Source Shortest Paths: General Weights, String Editing, 0/1 Knapsack, the Traveling Salesperson Problem

BACKTRACKING: The General Method, the 8-Queens Problem, Sum of Subsets, Graph Coloring, Hamiltonian Cycles

UNIT 4

Elementary Graph Problems: Depth First Search, Breadth First Search, Topological Sort

NP-Hard and NP-Complete Problems: Basic Concepts, Nondeterministic Algorithms, The Classes NP-Hard And NP-Complete

NP-Hard Graph Problems: Clique Decision Problem (CDP), Node Cover Decision Problem, Chromatic Number Decision Problem (CNDP), Traveling Salesperson Decision Problem (TSP), AND/OR Graph Decision Problem (AOG)

References:

1. Analysis and Design of Algorithms: Horowitz Sahani
2. Analysis and Design of algorithms: Trembly
3. Introduction to Algorithms: Thomas H. Cormen
4. Analysis and Design of Algorithm: Padma Reddy
4. Introduction to the design and analysis of algorithm: Anany Levitin.
5. Design and analysis of algorithm: S Shridhar.

OPERATING SYSTEM and UNIX **2:0:2**

Course Code: CSB070

Course Outcome:

At the end of the course student will be able to:

CO1. Deliberate in details with examples introduction os

CO2. Deliberate in details with examples memory management

CO3. Identify in details with examples unix structure

CO4. Understand in details with examples global commands in vi

CO5. Identify the characteristics of shells

CO6. Identify in details with examples regular expression

UNIT 1

Introduction to Operating System, Operating System Structures

Process Management: Processes, CPU Scheduling

UNIT 2

Deadlocks, Storage Management: Memory management, Virtual Memory, File-System Interface

UNIT 3

Introduction: Why UNIX? The Unix Environment, UNIX Structure, accessing UNIX, UNIX commands

File Systems: File Names, File Types, Regular Files, Directories, File System Implementation, Operations unique to directories, Operations unique to regular files, Operations common to both.

Vi editor, local commands, range commands in vi, global commands in vi, rearrange text in vi, ex editor.

UNIT 4

Introduction to shells: Unix Session, Standard Streams, Redirection, pipes, tee command, command execution, command line editing, quotes, command substitution, job control, aliases, variables, predefined variables, options, shell/environment customization.

Security and file permission: User and groups, Security levels, changing permissions, User masks, Changing ownership and group, Regular expressions: Atoms, Operators, grep: operation, grep family, Searching for file content, sed and awk.

C Shell Programming: Basic script concepts, Expressions, Decision making selections,, Built in commands, Scripting techniques, Shell environment & Script, Script examples

References:

1. Unix and Shell Programming, Behrouz A Forouzan and Richard F.Gilberg, 2nd Edition, 2003, Thomson.
2. System Programming and Operating Systems, Dhamdhare. D.M., 4th Edition, TataMcGraw Hill, 2006
3. A Practical Guide to Linux, Mark G. Sobell, 1st Edition, 2002, Pearson Education (Chapters:1 to 5, 8, 10, 11, 15)
4. UNIX: The Complete Reference, Kenneth Rosen and others, 2nd Edition, 2002,Obsborne/McGraw Hill
5. Design of the UNIX Operating System, Maurice J Bach.
6. Operating System: A Modern Perspective , Gary J Nutt.

COMPUTER GRAPHICS **3:0:1**

Course code: CSB080

Course Outcome:

At the end of the course students will be able to:

CO1. Learn the characteristics of computer graphics

CO2. Understand the classification and characteristics of computer graphics

CO3. Identify the characteristics of tranformations

CO4. Write down the characteristics of 3D transformations

CO5. Specify in depth 3D transformations

CO6. Understand in details with examples fructals

UNIT 1

Introduction, Video Display Devices, Refresh Cathode-Ray Tubes, Raster-Scan Display, Random-Scan Displays, Color CRT Monitors, Flat-Panel Displays, Raster Scan Systems, Input devices.

Output primitives: Points & Lines, Line Drawing Algorithms, Loading the Frame Buffer, Circle Generating Algorithms, Pixel Addressing and Object Geometry

UNIT 2

Two dimensional transformations Basic & other transformations, Matrix representations, Homogeneous coordinates Composite transformations, General-pivot-point transformations.

Three Dimensional Transformations: Introduction to 3D Translation, Rotation & Scaling, Other Transformations, Modeling and Co-ordinate Transformations.

UNIT 3

Three Dimensional Viewing: Viewing Pipeling, window to viewport transformations, Projections, Types of projections.

Graphical User Interface & Interactive Input Methods : The User Dialogue, Windows & Icons, feedback, Input of Graphical Data, Interactive Picture Construction Techniques, Basic Positioning Methods, Constraints, Grids, Gravity Field, Rubber-Band Methods, Dragging, Painting & Drawing

UNIT 4

Curves & Surfaces: Properties, Bezier curves properties, Design techniques, Bezier surfaces, Displaying curves & surfaces

Hidden line removal algorithms

Introduction to fractals, Serpinsky's triangle, Construction, Koch curves.

Windowing & Clipping: Clipping operations, Line clipping algorithms, point clipping, text clipping, polygon clipping algorithms, Exterior clipping

Reference:

1. "Computer Graphics", Pearson Education, Donald D. Hern and M. Pauline Baker
2. " Principles of Interactive Computer Graphics" McGraw Hill 1989, W. M. Newman and Robert Sproull
3. "Computer Graphics a Programming Approach" McGraw Hill 1987, Steven Harrington
4. " Schaums outline of theory and problems of Computer Graphics" 2nd printing 1987, 1986 Edition, Roy A Plastock and Gardon Kelley
5. " Procedural Elements of Computer Graphics" McGraw Hill 2nd edition 1990, David F Frogers and J Alan Adams
6. Computer Graphics, James.D.Foley, A Vandam etal

SOFTWARE ENGINEERING **3:1:0**

Course Code: CSC040

Course Outcome:

At the end of the course students will be able to:

CO1. Deliberate the details of software

CO2. Deliberate in depth software development process models

CO3. Deliberate the characteristics of problem analysis

CO4. Learn the details of risk management

CO5. Understand in details with examples software metrics

CO6. Write down the details of testing fundamentals

UNIT 1

INTRODUCTION TO SOFTWARE ENGINEERING: Software and Software Engineering, phases in Software Development, Software Development Process models, Agile modeling, Introduction to metrics.

UNIT 2

SOFTWARE REQUIREMENT SPECIFICATION: Role of SRS, Problem Analysis, Requirement specification, validation, metrics, Monitoring and control

PLANNING A SOFTWARE PROJECT: Cost Estimation, Project Scheduling, Staffing personal planning, Team Structure, Software Configuration Management, Quality Assurance Plans, Project Monitoring plans, Risk Management.

UNIT 3

SYSTEM DESIGN: Design Objectives, design principles, Module level Concepts, Design methodology – object oriented approach Design Specification, Verification, Metrics, monitoring and control.

DETAILED DESIGN: Module Specification, Detailed design and process design Language, Verification

UNIT 4

CODING: Programming practice, Verification, Metrics

TESTING: Testing Fundamentals, Fundamental testing, Structural Testing. Testing process Clean Room approach

References:

1. "An Integrated approach to the Software Engineering" 2ed. Narosa Publishing House, New Delhi, 2002, Pankaj Jalote
2. Software Engineering Principles & Practice - 3rd Edition, Tata Mc Graw Hill Companies – 2006, Waman S Jawadekar
3. Software Engineering A Practitioner's Approach - 6th Edition
   McGraw Hill – 2005, Roger S Pressman
4. Software Engineering - 7th Edition : Pearson Education Ltd- 2006, Sommerville

THEORY OF LANGUAGES **3:1:0**

Course Code: CSC050

Course Outcome:

At the end of the course students will be able to:

CO1. Identify the details of regular languages

CO2. Learn in depth context free grammars

CO3. Learn the details of parse trees

CO4. Understand the characteristics of deterministic pushdown automata

CO5. Understand the details of finite automata

CO6. Write down in details with examples pushdown automata

CO7. Write down the classification and characteristics of turing machines

UNIT - 1

INTRODUCTION TO FINITE AUTOMATA**:** Introduction to Finite Automata; The central concepts of Automata theory; Deterministic finite automata; Nondeterministic finite automata.
FINITE AUTOMATA, REGULAR EXPRESSIONS: An application of finite automata; Finite automata with Epsilon-transitions; Regular expressions; Finite Automata and Regular Expressions

UNIT - 2

REGULAR LANGUAGES, PROPERTIES OF REGULAR LANGUAGES: Regular languages; Proving languages not to be regular languages; Closure properties of regular languages; Equivalence and minimization of automata.
CONTEXT-FREE GRAMMARS AND LANGUAGES: Context –free grammars; Parse trees; Ambiguity in grammars and Languages.

UNIT – 3

PUSHDOWN AUTOMATA: Definition of the Pushdown automata; the languages of a PDA; Equivalence of PDA's and CFG's; Deterministic Pushdown Automata.
PROPERTIES OF CONTEXT-FREE LANGUAGES: Normal forms for CFGs; The pumping lemma for CFGs; Closure properties of CFL

UNIT - 4

TURING MACHINE: The turing machine; Extensions to the basic Turing Machines; UNDECIDABILITY: A Language that is not recursively enumerable; An Undecidable problem that is RE; Post's Correspondence problem

REFERENCES:

1. Introduction to Automata Theory, Languages and Computation – John E.. Hopcroft, Rajeev Motwani, Jeffrey D.Ullman:, 3rd Edition, Pearson education, 2007.
2. Fundamentals of the Theory of Computation: Principles and Practice – Raymond Greenlaw, H.James Hoove, Morgan Kaufmann, 1998.
3. Introduction to Languages and Automata Theory – John C Martin, 3rd Edition, Tata McGraw-Hill, 2007.

DATABASE MANAGEMENT SYSTEM **2:1:1**

Course Code: CSC060

Course Outcome:

At the end of the course students will be able to:

CO1. Identify in details with examples enhanced entity relationship model

CO2. Learn in depth normalisation

CO3. Learn the classification and characteristics of entity sets

CO4. Specify in depth specialization and generalization

CO5. Understand the classification and characteristics of data mode

UNIT 1

Introduction and conceptual modeling databases and Database users, Data modeling using the entity relationship (ER) model, the enhanced entity – relationship (EER) model.

UNIT 2

Relational model: Concepts constraints, Languages, Design and programming.

The relational data model and relational database constraints, Relational algebra and relational calculus, Introduction to SQL Programming technique

UNIT 3

Database design theory and methodology functional dependencies and Normalization for relational database, Relational database design algorithms and further dependencies, practical database design methodology and use of UML diagrams.

UNIT 4

Introduction to transaction processing concepts and theory recovery

REFERENCES

1. Fundamentals of database system – 5th Edition – Ramez elmasri, Navathe – Person edition

2 .An introduction to database system – 8th Edition – C. J. Date, Kannan – Person Education

3.Database system concepts – 5th Edition – Korth, Sudarshan – McGraw Bill Edition

4. Database Management System- Raghuramakrishnan.

5. An Introduction to Database System- Bipin Desai

6. Principles of Database System- J D Ullman

Softcore:

PRINCIPLES OF PROGRAMMING LANGUAGES AND 'C' 2:1:1

Course Code: CSA020

Course Outcome:

At the end of the course students will be able to:

CO1. Analyze semantic issues associated with function implementations, including variable binding, scoping rules, parameter passing, and exception handling.

CO2. Implement techniques for interpreted functional languages.

CO3. Using object-oriented languages.

CO4. Familiar with design issues of object-oriented and functional languages.

CO5. Familiar with language abstraction constructs of classes, interfaces, packages, and procedures.

CO6. Familiar with implementation of object-oriented languages.

CO7. Familiar with using functional languages

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UNIT 1: Preliminaries

Reasons for studying concepts of programming languages, Programming domains, Language evaluation criteria, Implementation methods Names, Bindings, Type Checking, and Scopes Introduction, Names, Variables, The concept of Binding, Type Checking, String Checking, Type Compatibility, Scope, Scope and Lifetime, Referencing Environments, Named Constants, Variable Initialization.

UNIT 2: Data Types

Introduction, Primitive Data types, Character String Types, User-Defined Ordinal Types, Array Types and Associative Arrays, Record Types, Union Types, Set Types, Pointes Types.
Expression, Assignment Statements and Statement Level Control Structures
Introduction, Arithmetic Expressions, Overloaded Operators, Type Conversions, Relational And Boolean Expressions, Short-Circuit Evaluation, Assignment Statements, Mixed-Mode assignment.

UNIT 3

Compound Statements, Selection Statements, Iterative Statements, Unconditional Branching, Guarded Commands, Conclusion.

Subprograms: Introduction, fundamentals, design issues, local referencing environments, parameter passing methods, overloaded programs, generic subprograms, coroutines, user defined overloaded operators

UNIT 4

C LANGUAGE: C Fundamentals, Operation data input and output, Control statements, Function Storage classes, Arrays, Pointers, structures and unions, Enumeration, Command line parameters, Macros, 'C' processor.

Reference:

1. Concepts of Programming Languages, Eight Edition, Pearson, Robert W. Sebesta
2. Foundation for Programming Languages, John C Mitchell
3. Principles of Programming Language, Chopra Rajiv
4. Principles of Programming Language, Dowek
5. Types and Programming Languages, Benjamin C Pierce
6. Programming Languages: Principle and Practices ,3rd Edition, Kenneth C Louden

INTERNET TECHNOLOGY **2:0:2**

Course Code: CSD220

Course Outcome:

At the end of the course students will be able to:

CO1. Identify in depth event and event handling

CO2. Identify in depth moving elements in javascript

CO3. Specify the classification and characteristics of screen output and keyboard input

CO4. Specify the details of levels of stylesheet

CO5. Understand the details of tables in html

CO6. Write down in details with examples basic tags

UNIT 1

Fundamentals: introduction to the Internet, WWW, Web Browsers, Web Servers, URL, Multipurpose Internet Mail Extensions (MIME), HTTP, Security,

Introduction to HTML: Origins and Evolution, Basic Syntax, Document Structure, Basic tags, Images, Links, Lists, Tables, Forms, Frames.

UNIT 2

Introduction to XML: Syntax of XML, XML Document Structure, Document Type Definition.

Introduction to XHTML: Origins and Evolution, Basic Syntax, Document Structure, Basic tags, Images, Links, Lists, Tables, Forms, Frames, Syntactic difference between HTML and XHTML.

Cascading Style Sheets (CSS): Introduction, levels of style sheets, Selector Forms, Property value forms, Font properties, Color, Alignment of Text, Box model, Background Images, and tags.

UNIT 3

The basics of JavaScript: Overview, Object Orientation and JavaScript, General syntactic characteristics, Primitives, Operations and Expressions, Screen Output and Keyboard Input, Control Statements, Objects, Arrays, Functions, Constructors, Errors.

JavaScript and XHTML Documents: Element access, Events and Event Handling, Handling Events from Body elements, Handling Events from Button elements, Handling Events from Text Box and password elements.

Dynamic Documents with JavaScript: Introduction, Positioning Elements, Moving Elements, Element Visibility, Changing Colors and Fonts, Dynamic Content, Stacking Elements, Locating Mouse Cursor, Reacting to Mouse Click, Slow Movement of Elements, Dragging and Dropping Elements.

UNIT 4

Introduction to PHP: Origins and Uses, Overview, General Syntactic Characteristics, Primitive, Operations and Expressions, Output, Control Statements, Arrays, Functions, Form Handling, Cookies.

REFERENCES:

1. Programming the World Wide Web – by Robert W. Sabesta 4th Edition Pearson Publications
2. HTML and XHTML the Complete Reference.
3. How to program the World Wide Web – by Deitel and Deitel
4. Mastering in HTML – by Ray and Ray.
5. Web programming and Internet Technologies: An E Commerce approach- By Porter ` Seobey and Pawan Lingras.
6. Internet Technology and Information services by Joseph Miller

JAVA Programming **2:0:2**

Course Code: CSA270

Course Outcome:

At the end of the course students will be able to:

C01. Deliberate the characteristics of data types

C02. Specify in depth event handling

C03. Specify the details of packages

C04. Understand in details with examples java servlet

C05. Understand in details with examples JDBC objects

C06. Write down the details of exception handling

UNIT 1

History and evolution of Java, An overview of Java, Data types, variables and arrays, Operators, Control statements- Introducing classes ,A closer look at methods and classes, Inheritance, Packages and interfaces.

UNIT 2

Exception handling, Multithreaded Programming, Enumeration, Autotoxins, I/O, Applets

UNIT 3

Networking, Event handling, Swings.

UNIT 4

String handling, Collection framework, Introduction to J2EE, Java servlet, Java server pages (JSP) and HTML, JDBC objects.

REFERENCES:

1. The complete reference Java – 7th Edition – Herbert Schildt – Tata Mcgraw hill Edition.
2. The complete reference J2EE – Jem Keogh – Tata Mcgraw hill Edition.
3. Object Oriented Programming with Java- M T Somashekara, D S Guru and K S Manjunatha.
4. The Complete Reference 7th Edition Herbert Schiidt
5. Introduction to Java Programming – E Balaguruswamy

6. Head First Java – 2nd Edition

7. Core Java- Horst Mann, C S –8th Edition-Cornell.

8. Core Servelet and Java Server pages- Hall, M-Brown L

MULTIMEDIA **3:1:0**

Course Code: CSD210

Course Outcome:

At the end of the course students will be able to:

CO1. Understand various file formats for audio, video and text media.

CO2. Develop various Multimedia Systems applicable in real time.

CO3. Design interactive multimedia software.

CO4. Apply various networking protocols for multimedia applications.

CO5. Develop understanding of technical aspect of Multimedia Systems

UNIT 1

Introduction to Multimedia (MM) Communication, Scope, Range, Feasibility and Challenges of MM Communication Key aspects of MM: Compression, Coding, Transmission and Replay.

UNIT 2

Types of Compression: Quantization, Coding as PCM, DPCM, ADPCM. Simple Encoder and Decoders based on PCM Samples. Introduction to Transform domain Compression. Introduction to Audio part of MPEG, Psychoacoustics

UNIT 3

Compression in Spatial Domain Algorithms for Data Compression in Transform Domain: DCT. Variable Length Coding, Huffman code. Variable Length Coding: Arithmetic Coding. Introduction to JPEG 2000 Standard, Encoders-Decoders based on this. Audio Compression and MPEG Audio

UNIT 4

Fundamental concepts of Video. MPEG Architecture Details: Audio-Video- Systems. Video Coding standard related to H.263 and H. 264. MPEG- 1, 2 Video. MPEG- 4 : Video. Streaming and Transport Issues: Multiplexing, Synchronization and File formats. Errors in MPEG and Error handling, Concealment. Buffer structures and Buffer Management

Introduction to MPEG-7 and MPEG-21., HDTV. Content based Image Retrievals and Digital Libraries.

References:

1. Fundamentals of Multimedia, 2nd Ed, Pearson, 2005, Ze-Nian Li and Mark Drew
2. Multimedia Communications., Pearson, 2005, Fred Halsall
3. Introduction to Data Compression, 3rd Ed, Morgan Kaufman (India Ed), 2005, Khalid Sayood
4. The DATA compression; The Complete Reference, 3rd Ed, Springer (India Ed), 2006, David Solomon
5. Multimedia foundations: A Core Concepts of for Digital Design, Vic Cost Ello
6. Multimedia: Making it work, 9th edition, Tay Vaughan

MICROCONTROLLERS **3:1:0**

Course Code: CSC210

Course Outcome:

At the end of the course students will be able to:

CO1. Describe the architecture of 8051 microcontroller and write embedded program for 8051 microcontroller.

CO2. Design the interfacing for 8051 microcontroller.

CO3. Understand the concepts of ARM architecture.

CO4. Demonstrate the open source RTOS and solve the design issues for the same.

CO5. Select elements for an embedded systems tool.

CO6. Understand the concept and architecture of embedded systems

UNIT 1

Introduction, Numbering system and binary arithmetic,

UNIT 2

The 8051 Architecture, Basic assembly language programming concepts, Moving data,

UNIT 3

Logical operations, Arithmetic operations Jump and call instructions

UNIT 4

An 8051 Microcontroller design, Applications

References

1. "The 8051 Microcontroller", 3rd Edition, Thomson India edition, 2007, Kenneth Ayala
2. "Programming and customizing the 8051 microcontroller", Tata McGraw-Hill edition, 2006, Myke prick
3. "The 8051 Microcontroller and embedded systems", Pearson India, 2006, Muhammad Ali Mazidi & Janice Gillispie Mazidi,
4. Microcontroller and Embedded System, Mazidi, M A- Mazidi
5. Microcontroller: Architecture, Programming and application, Ayala, Kenneth

DISCRETE MATHEMATICS **3:1:0**

Course Code: CSA260

Course Outcome:

At the end of the course students will be able to:

CO1. Deliberate in details with examples set theory

CO2. Learn in depth duality

CO3. Learn in details with examples principles of inclusion and exclusion

CO4. Specify the classification and characteristics of relations

CO5. Specify the details of concept of probability

CO6. Write down in depth pigeonhole principle

CO7. Write down the details of proposition

UNIT 1

Set Theory: Sets and Subsets. Operations on sets, Countable and uncountable sets, The addition principal, the concept of probability.

Mathematical Logic: Propositions, Logical Connectives, Tautologies; Contradictions, Logical equivalence, Application to switching networks, Duality, Commentates NAND and NOR, Converse, Inverse and Contrapositive, Rules of inference.

UNIT 2

Open statements; Quantifiers, Logical Implication involving Quantifiers, Statements with more than one variable, Methods of proof and disproof, Mathematical Induction.

UNIT 3

Relations and Ordering: Cartesian products of sets, Relations, Paths in relations and digraphs, Operations on relations, Composition of relations, Properties of relations, Equivalence relations, Partial orders, Total Orders, External elements in posets, Lattices.

Functions: Functions, Types of functions, Composition of function, Invertible functions, Permutation Function.

UNIT 4

Fundamental principles of counting: Principles of inclusion and exclusion: The rule of sum and product, Permutations, combinations: The binomial theorem, combinations with repetition, Ramsey number, the Catalan numbers, sterling number and bell numbers, Generalizations of principles, the pigeonhole principle, Derangements-Nothing is in its Right place, Rook polynomials, Arrangements with Forbidden positions.

References:

1. Discrete Mathematics by Dr. Chandrashekar S .
2. Discrete and combinational Mathematics by Ralph P. Grimaldi, 5th edition, Addison Wesley, 2004
3. Discrete mathematical structures by Kolman, Robert C Busby and Sharon., 6th Edition, Prentice Hall, 2008
4. Discrete Mathematics and Application by Kenneth H Rosen.
5. Discrete Mathematics by Norman L Biggs.

SIMULATION & MODELLING **3:1:0**

Course Code: CS/A/B/C/D300

Course Outcome:

At the end of the course students will be able to:

CO1. Understand the definition of simulation and learn how to develop and analyze a simulation model

CO2. Understand the fundamental logic, structure, components and management of simulation modeling

CO3. Demonstrate knowledge of how to use Arena

CO4. Build a simulation model with basic operations and inputs

CO5. Build a simulation model with detailed operations

CO6. Perform statistical analysis of output from terminating simulation

UNIT 1

Introduction, Simulation of prepursuit problem, A system & its model, Simulation of an inventory problem, The basic nature of simulation

Simulation of continuous systems: A chemical reactor, Numerical integration vs continuous system simulation, Selection of an integration formula, Runge Kutta integration formulas, simulation of a servo system, Simulation of a water reservoir system, Analog vs digital simulation

UNIT 2

Discrete system simulation

Fixed time-step vs event to event model, On simulating randomness, Generation of random numbers, Generation of non uniformly distributed random numbers, Monte Carlo computation vs stochastic simulation

UNIT 3

Simulation of queuing systems

Rudiments of queuing theory, simulation of single server queue, Simulation of two server queue, Simulation more general queues.

Simulation of PERT network

UNIT 4

Network model of a project, Analysis of an activity network, Critical path computation, Uncertainties in activity duration, Simulation of an activity network, Computer program for simulation, Resource allocation and cost considerations, Inventory control & forecasting Elements of inventory theory, More complex inventory models, simulation examples, Generation of Poisson & erlang variates, Forecasting & regression analysis

Design and Evaluation of Simulation Experiments

Length of simulation runs, Variance reduction techniques, Experimental layout, validation

References:

1. System Simulation with Digital Computer Narsingh Deo
2. System Simulation and Modeling - Sengutta
3. Computer Methods for solving Dynamic Seperation problems- C D Holland and A I Liapis.
4. Fundamentals of Modeling separation Process- C D Holand.
5. Process Modeling-M M Denn

OPERATIONS RESEARCH **3:1:0**

Course Code: CS A/B/C/D 310

Course Outcome:

At the end of the course students will be able to:

CO1: Formulate and solve mathematical model (linear programming problem) for a physical situations like production, distribution of goods and economics.

CO2: Apply the concept of simplex method and its extensions to dual simplex algorithm.

CO3: Solve the problem of transporting the products from origins to destinations with least transportation cost.

CO4: Convert and solve the practical situations into non-linear programming problem.

CO5: identify the resources required for a project, generate a plan, and work schedule

UNIT 1

Introduction: formulation of LP problems, graphical solution of LP problems, General formulation of L P problems, Slack & Surplus variables, Standard form, Matrix form, Simplex method, Revised Simplex method, Dual simplex

UNIT 2

Assignment model, Transportation model, Game theory

Probability: Introduction, Basic terms of probability, The Addition law of probability, discrete & continuous, variables, random variables, probability distribution of random variables, Mean variance& standard deviation, Mathematical expectation of a random variable.

UNIT 3

Queuing theory

Introduction, queuing system, distribution, Kendall's Notation, Classification, model I (m/m/1).

UNIT 4

Project management by PERT CPM

Introduction, history, Applications, Basic steps, Network diagram representation, rules of drawing network diagram, labeling Fulkerson's I-J rule, Time estimates & Critical path, PERT, Resource allocation, Uses of PERT/CPM.

References:

1. Operations Research - S D Sharma
2. Operations Research - R K Gupta & D S Hira
3. Introduction to Operation research – Frederick S Hillier ,Gerald J and Liberman.
4. Operation research: An Introduction by Hamdy A Taha.
5. Operation research: Application and algorithm by Wayne L Winston.

MOBILE COMMUNICATION **3:1:0**

Course Code: CS A/B/C/D 320

Course Outcome:

At the end of the course students will be able to:

CO1. Design a mobile cellular network

CO2. Optimize a radio channel system

CO3. Select the apt diversity scheme for a given wireless system to improve the performance.

CO4. Perform efficient spectral allocation using multiple access techniques such as CDMA, and OFDM.

CO5. Select the correct MAC protocol and routing algorithm for mobile ad-hoc networks.

CO6. Optimize the mobile ad-hoc network, MAC protocols and routing algorithms as per application.

UNIT 1

Introduction, Applications, History of wireless communication, reference model,
Wireless transmission, Frequencies for radio transmission, signals, Antennas, Signal propagation Multiplexing, Modulation, Spread spectrum

UNIT 2

Cellular Systems, Medium Access control, Motivation for a specialized MAC, SDMA, FDMA, TDMA, CDMA, Comparison.

UNIT 3

Telecommunications Systems, GSM, DECT, TETRA, UMS & IMT 2000
Satellite Systems, history, Applications, Basics, Classical TCP improvements, TCP over 2.5/3G wireless networks, performance enhancing proxies

UNIT 4

Support for mobility, File Systems World Wide Web, Wireless Application protocol

References:

1. Cellular and Mobile Communication- Krishna.
2. Cellular Mobile Communication – V S Bhagat
3. Cellular and Mobile Communication- V Jeyasri Arokiamary.
4. Wireless Communication and Networks – William Stallings.

5. Cellular Communication; A Comprehensive and practical guide- Nishith Tripathi and Jeffreyhreed.

C++ 2:0:2

Course Code: CSA250

Course Outcomes:

At the end of the course students will be able to:

CO1. Understand the features of C++

CO2. Understand the relative merits of C++ as an object oriented programming language

CO3. Understand how to produce object-oriented software using C++

CO4. Understand how to apply the major object-oriented concepts to implement object oriented programs in C++, encapsulation, inheritance and polymorphism

CO5 Understand advanced features of C++ specifically stream I/O, templates and operator overloading

Unit I

Quick overview of C : Expressions - Statements - Arrays and Null-Terminated Strings – Pointers - Functions – Structures, Unions, Enumerations and User-Defned Types – C Style Console I/O – File I/O -.

Unit II

An Overview of C++ - Classes and Objects – Arrays, Pointers, References, and the Dynamic Allocation Operators

Unit III

Function Overriding, Copy Constructors and Default Arguments – Operator Overloading - Inheritance – Virtual Functions and Polymorphism

Unit IV

Templates – Exception Handling - The C++ I/O System Basics

References :

1. The Complete Reference C++, 4th Edition, Tata-McGraw-Hill, 2003, Herbert Schildt
2. Object Oriented Programming with C++ , M T Somashekara, D S Guru, H S Nagendraswamy and K S Manjunatha
3. C++ Premier, 5th Edition. Stanley B Lippman
4. C++ Programming language, E Balaguruswamy
5. The C++ programming language, 4th Edition, Bjarne Stroustrup

PATTERN RECOGNITION **3:0:1**

Course Code: CAC230

Course Outcome:

At the end of the course students will be able to:

C01. Explain and compare a variety of pattern classification, structural pattern recognition, and pattern classifier combination techniques.
C02. Summarize, analyze, and relate research in the pattern recognition area verbally and in writing.
C03. Apply performance evaluation methods for pattern recognition, and critique comparisons of techniques made in the research literature.
C04. Apply pattern recognition techniques to real-world problems such as document analysis and recognition.
C05. Implement simple pattern classifiers, classifier combinations, and structural pattern recognizers.

UNIT 1

Machine perception, pattern recognition systems, Design Cycle, Learning and adaption, models of Pattern recognition

UNIT 2

Bayesian Decision Theory

Introduction, Bayesian, Decision theory- Two category classification, classifiers-Two category case and multi category case, missing and noisy features.

UNIT 3

Nonparametric Techniques

Introduction, Density estimation, Parzen window, KN neighbor estimation, The nearest neighbor rule, Metrics and Nearest Neighbor Classification, Error analysis of nearest decision rule

UNIT 4

Introduction, Heirarchical clustering techniques, partitional clustering techniques Dimensionality reduction techniques Introduction, principle component analysis, Fisher Linear Dicriminant Analysis, Spectral clustering based dimensionality reduction

References:

1. Pattern Classification, 2nd edition, Wiley publications, R. O Duda, P.E. Hart and D G Stork,
2. Pattern Recognition and Image Analysis, Prentice Hall of India, Pvt Ltd, Earl Gose, Richard, Johnsonbaugh, Steve Jost
3. Pattern Recognition and machine Learning, Cristopher M Bishop,
4. Pattern Recognition (Blue Ant) – Willian Gibsom.
5. Pattern Recognition, 4th Edition- Sergios Theodoridis and Konstantios Koutroumbas

IMAGE PROCESSING **2:1:1**

Course Code: CS A/B/C/D 330

Course Outcome:

At the end of the course students will be able to:

C01. Analyze general terminology of digital image processing.

C02. Examine various types of images, intensity transformations and spatial filtering.

C03. Develop Fourier transform for image processing in frequency domain.

C04. Evaluate the methodologies for image segmentation, restoration etc.

C05. Implement image process and analysis algorithms.

C06. Apply image processing algorithms in practical applications.

UNIT I

Introduction, digital image fundamentals

UNIT II

Image enhancement in the spatial domain, Image enhancement in the frequency domain

UNIT III

Image restoration, color image processing

UNIT IV

Wavelets and multi-resolution processing image compression

References:

1. Digital Image Processing-Rafel C.Gonzalez and Richard E Words.
2. The Image Processing hand Book- John C Cruss.
3. Fundamentals of Digital Image Processing- Anil K Jain.
4. Digital Image Processing –Jayaraman S.
5. Digital Image Processing- Sanjay M Shah Munesh Chandra Trivedi

SOFTWARE TESTING **3:0:1**

Course Code: CSC440

Course Outcome:

At the end of the course students will be able to:

CO1. Check various test processes and continuous quality improvement

CO2. Verify types of errors and fault models

CO3. Check methods of test generation from requirements

CO4. Check behavior modeling using UML: Finite state machines (FSM)

CO5. Test generation from FSM models

CO6. Input space modeling using combinatorial designs

UNIT 1

Assessing Testing Capabilities and Competencies, Building a software Testing Environment: Building a software Testing Strategy, Establishing a Software Testing Methodology, Determining your Software Testing Techniques, Selecting and Installing Software Testing Tools.

UNIT 2

The Eleven-Step Testing Process: Eleven-Step Testing Process Overview, Step1: Access Project Management Development Estimate and status, Step2: Develop Test Plan, Step3: Requirement Phase Testing,

UNIT 3

Step4: Design Phase Testing, step 5: Requirement Phase Testing, Step6: Execute Test and Record Results,

UNIT 4

Step7: Acceptance Test Results Step8: Report Test Results, Step9: Testing Software Installing, Step10: Test Software Changes, Step11: Evaluate Test Effectiveness.

.

REFERENCES:

1. Effective Methods for Software Testing, William E. Perry, 2nd Edition 2003, Wiley
2. *Surviving the Top Challenges of Software Testing*, New York: Dorset House, 1997., Rice, Randall and Peery, William E.,
3. A practitioner's Guide to Software Test Design, By Lee Copelane.
4. The Art of Software Testing By Glenford Myers.
5. Testing Object System: Models, Patterns and Tools by Robert V Binder.

GRAPH THEORY **3:1:0**

Course Code: CSB270

Course Outcome:

At the end of the course students will be able to:

CO1. Understand in details with examples Planar Graph

CO2. Write down in depth Hamiltonian path

CO3. Write down the classification and characteristics of Euler's graph

CO4. Write down the classification and characteristics of Euler's graph

UNIT 1

Introduction to Graph theory: Basic terminologies—direst & undirect graphs, walks, paths & circuits, sub-graphs and complements, Graph Isomorphism, vertex degree and regular graphs,

UNIT 2

Konigsberg bridge problem & Euler graphs. Hamilton graphs & traveling salesman problem, planar graphs- definition & examples, Bipartite & Kuratowskis graphs, Euler's formula & detection of planarity, Dual of Planar graphs,

UNIT 3

Graph Coloring: Proper coloring & chromatic number of graphs, Chromatic polynomial, four color problems, Trees: Optimization & Matching: Trees; Definition & Properties, Rooted & binary rooted trees, ordered trees & trees sorting. Weighted trees & prefix codes

UNIT 4

Spanning trees, optimization, Networks, Cutset, Edge & Vertex connectivity of a graph, Max-flow Min-cut thermo and its applications, Matching theory and its applications

References:

1. Graph Theory, V.K Balakrishnan, Schaum Series, McGrawHill, 1997
2. Graph Theory, by Frank Harary, Westview Press, 1994.

3. Introduction to Graph Theory, Douglas B west.
4. Hand Book of Graph Theory, Jonathan L Gross and Jay Yellen.
5. Graph Theory with application to Engineering and Computer science, Narsingh Deo.

OOAD **2:1:1**

Course Code: CSB210

Course Outcome

At the end of the course students will be able to:

CO1. Analyse, design, document the requirements through use case driven approach.

CO2. Identify, analyse, and model structural and behavioural concepts of the system.

CO3. Develop, and explore the conceptual model into various scenarios and applications.

CO4. Apply the concepts of architectural design for deploying the code for software

UNIT I

Implementation of Object Oriented concepts using C++

UNIT II

Introduction, Object orientation, OO development, OO themes, OO modeling ,History. Modeling, Abstraction, Models .Class Modeling Object & class, Link & Association concepts, Generalization & Inheritance, sample Class Model, Navigation of class models. Advanced class modeling: advanced object & class concepts, Association end N ary Association, Aggregation, Abstract Classes, Multiple Inheritance, Meta Data, Reification, Constraints, Derived Data.

UNIT III

State modeling: Events, States, Transitions & Conditions, State Diagrams, State Diagram behavior. Advanced state modeling, interaction modeling.

UNIT IV

System design: Overview of System design, Estimating performance, making a Reuse plan, Breaking a System into Subsystems, Identifying concurrency, Allocation of subsystems, Management of Data Storage.

Reference:

1. Object Oriented Analysis and Design – Blaha, Rambaugh.

2. Object Oriented Analysis and Design with the Unified Process- W Satzinger, Robert B Jackson and Stephen D Burd.

3. Object Oriented Analysis and Design with application, 3rd edition- Grady Booch, Robert A Maksimchuk, Michael W Engel

4. Object Oriented Analysis and Design with application- Grady Booch.

PROBABILITY AND STATISTICS **3:1:0**

Course Code: CS A/B/C/D 340

Course Outcome

At the end of the course students will be able to:

CO1. Apply probability theory to set up tree diagrams
CO2. Apply probability theory via Bayes' Rule
CO3. Describe the properties of discrete and continuous distribution functions
CO4. Use method of moments and moment generating functions
CO5. Assess the consistency, efficiency and unbiasedness of estimators
CO6. Apply method of maximum likelihood estimation
CO7. Apply the Central Limit Theorem
CO8. Use statistical tests in testing hypotheses on data

UNIT 1

Introduction, basic terminology, Interpretation of probability: Axioms of probability, Some elementary theorems, Conditional probability, Mathematical Exception

UNIT 2

Probability Distributions: Introduction, Discrete probability distributions continuous probability distributions, The expected value of a random variable Chebyshev's Theorem

UNIT 3

Sampling distributions, Populations and samples, Sampling distribution, The sampling distribution of the mean, sampling distributions of proportions, sampling distributions of mean, chi squared distribution, F distribution.

UNIT 4

Estimation and inference theory, introduction, point estimation, interval distribution, bayesian estimation, test of hypot, Introduction to ANOVA.

References:

1. Probability and Statistics: Bheeshma Rao
2. Probability and Statistics, 4th edition, Degroot, Schervish.
3. Probability and Statistics for Engineering and Science, 8th edition, Jay L Devore.
4. Probability and Statistics, Michael Akritas.
5. An Introduction to Probability and Statistics,3rd edition, Vijay K Rohatgi and A K MD Ehsanes Saleh.

DATA MINING **2:1:1**

Course Code: CSD230

Course Outcome:

At the end of the course students will be able to:

CO1. Identify the characteristics of data visualisation

CO2. Learn the details of data objects and attributes

CO3. Specify in depth KDD process

CO4. Specify the details of Clustering of Data

UNIT 1

Introduction, what kind of patterns can be mined? which technologies are used? which kind of applications are targeted?, major issues in Data mining.

Getting to know your data: Data objects and attribute types, basic statistical description of data, Data Visualisation, Measuring Data similarity and dissimilarity.

UNIT 2

Data Preprocessing: data cleaning, Data integration, Data Reduction, Data transformation and Data Discretization

UNIT 3

Mining frequent patterns, Associations and correlations: Basic concepts, Frequent mining methods, pattern Evaluation methods, Pattern mining in Multilevel multi dimensional space, Decision tree induction.

UNIT 4

Cluster analysis, partioning methods, heirarchical methods, density based methods, grid based methods, evaluation of clustering.

References:

1. Data Mining: Concepts and Techniques, Third Edition, Jaiwei Han, Micheline Kamber, Jian Pei.

2. Learning Data Mining with Python, 2nd edition, Robert Layton.

3. Data Mining; The Text book, Charu C Aggarwal.

4. Data Mining, 4th edition: Practical Machine learning Tools and Techniques by Lan H Witten and Fibe Frank.

5. Introduction to Data Mining – Pang- Ning Tan and Micheal Steinbach

ARTIFICIAL INTELLIGENCE **3:1:0**

Course Code: CS A/B/C/D 350

Course Outcome

CO1. At the end of the course students will be able to:

CO2. Create appreciation and understanding of both the achievements of AI and the theory underlying those achievements.

CO3. Know concepts of a Rational Intelligent Agent and the different types of Agents that can be designed to solve problems.

CO4. Review the different stages of development of the AI field from human like behavior to Rational Agents.

CO5. Impart basic proficiency in representing difficult real life problems in a state space representation so as to solve them using AI techniques like searching and game playing.

CO6. The basic issues of knowledge representation and Logic and blind and heuristic search, as well as an understanding of other topics such as minimal, resolution, etc. that play an important role in AI programs.

CO7. Introduce advanced topics of AI such as planning, Bayes networks, natural language processing and Cognitive Computing.

UNIT 1

AI problems, AI techniques, defining the problem as state space search, production systems, problem characteristics

Heuristic Search: Generate and test, hill climbing, BFS, Problem Reduction, Constraint Satisfaction, Means-End Analysis

UNIT 2

Knowledge Representation: Representations and mappings, approaches to knowledge representation

procedural v/s declarative knowledge, normal forms in predicate logic and clausal forms, non-monotonic reasoning

Declarative Representations: semantic nets, conceptual dependency, frames, scripts

UNIT 3

Game playing: minimax search procedure, adding alpha-beta cut offs

Planning: An Example Domain – the blocks world, Components, goal stack planning

UNIT 4

Expert systems: expert systems v/s conventional computers, expert system shells, explanation based learning.

Learning: Learning from observation - Inductive learning – Decision trees – Explanation based learning – Reinforcement Learning, Neural Networks, Introduction to Natural Language Processing.

References:

1.Artificial Intelligence, Third Edition, Elaine Rich, Kevin Knight, Shivashankar B Nair, Tata McGraw-Hill.

2. Introduction to Artificial Intelligence, Wolfgang Ertl.

3. Artificial Intelligence,2nd edition, Stuart Russel, peter Norvig.

4. Artificial Intelligence, Jeorge F Luger

5. Artificial Intelligence, Saroj kaushik

.NET TECHNOLOGIES **2:0:2**

Course Code: CSB280

Course Outcome

At the end of the course students will be able to:

CO1. Deliberate the characteristics of polymorphism

CO2. Deliberate the classification and characteristics of c# preprocessors directives

CO3. Identify in depth jagged arrays

CO4. Identify the details of encapsulation

CO5. Specify in details with examples tree view control

CO6. Understand in depth event handling

CO7. Write down in details with application, if applicable, scope resolution

CO8. Write down the details of architecture of .net

Unit 1

Benefits of .NET Framework, Architecture of .NET Framework 4.0, Components of .NET Framework 4.0: CLR, CTS, Metadata and Assemblies, .NET Framework Class Library, Windows Forms, ASP .NET.

Need of C#, C# Pre-processor Directives, Creating a Simple C# Console Application, Identifiers and Keywords. Data Types, Variables and Constants: Value Types, Reference Types, Type Conversions, Boxing and Unboxing, Variables and Constants. Expression and Operators: Operator Precedence, Using the :: (Scope Resolution) Operator and Using the ***is*** and ***as*** Operators. Control Flow statements: Selection Statements, Iteration Statements and Jump Statements.

Unit 2

Arrays and Strings: One Dimensional and Multidimensional Arrays, Jagged Arrays

Classes and Objects: Creating a Class, Creating an Object, Using this Keyword, Creating an Array of Objects, Using the Nested Classes, Defining Partial Classes and Method, Returning a Value from a Method and Describing Access Modifiers. Static Classes and Static Class

Members. Properties: Read-only Property, Static Property, Accessibility of accessors and Anonymous types. Indexers, Structs: Syntax of a struct and Access Modifiers for structs. Strings: Constructing Strings, Operating on Strings, Arrays of Strings, The String Class

Unit 3

Encapsulation: Encapsulation using accessors and mutators, Encapsulation using Properties. Inheritance: Inheritance and Constructors, Sealed Classes and Sealed Methods, Extension methods. Polymorphism: Compile time Polymorphism/Overloading, Runtime Polymorphism/ Overriding. Abstraction: Abstract classes, Abstract methods. Interfaces: Syntax of Interfaces, Implementation of Interfaces and Inheritance.

Delegates: Creating and using Delegates, Muticasting with Delegates. Events: Event Sources, Event Handlers, Events and Delegates, Multiple Event Handlers. Exception Handling: The try/catch/finally statement, Checked and Unchecked Statements.

Unit 4

Introduction, Windows Forms, Life Cycle, Event Handling: A Simple Event- Driven GUI, Visual Studio Generated GUI Code, Delegates and Event- Handling Mechanism, Another Way to Create Event Handlers, Locating Event Information. Control Properties and Layout, Labels, TextBoxes and Buttons, GroupBoxes and Panels, CheckBoxes and RadioButtons, ToolTips, Mouse-Event Handling, Keyboard-Event Handling. Menus, MonthCalendor Control, ListBox Control, CheckedListBox Control, ComboBox Control, TreeView Control, ListView Control, TabControl Control ; Building an Multiple Document Interface (MDI) Application. Introduction to ADO.NET

References:

1. Programming in C# 4.0, Tata McGraw Hill, Hebert Shildt
2. C# with .net 4.0 by Andrew Troelsen
3. Programming in C# , 3rd Edition, E Balaguruswamy
4. The Complete Reference C#, Herbert Schildt.
5. The Complete Reference ASP.NET, Robert Standefer III

OBJECT ORIENTED MODELING AND DESIGN WITH UML 2:1:1

Course Code: CSA/B/C/D 360

Course Outcome

At the end of the course students will be able to:

CO1. Design & Programming course is a unique course that teaches students how to use object-oriented techniques to build software.
CO2. Gathering requirements & end with implementation.
CO3. Analyze and design classes, their relationships to each other in order to build a model of the problem domain.
CO4. Use common UML diagrams throughout this process, such as use-case, class, activity & other diagrams.
CO5. Create the diagrams through a free tool.
CO6. Capture and manage requirements.

Unit I

INTRODUCTION : Object-Oriented Analysis and Design - Iterative, Evolutionary, and Agile. - Case Studies : The NextGen POS System - INCEPTION : Inception is Not the Requirements Phase – Evolutionary Requirements - Use Cases – Other Requirements:NextGen Example

Unit II

ELABORATION ITERATION 1: Basics – Domain Models – System Sequence Diagrams – Operation Contracts – Requirements to Design-Iteratively – Logical Architecture of UML Package Diagrams

Unit III

On to Object Design – UML Interaction Diagrams – UML class Diagrams - GRASP : Designing Objects with Responsibilities – Object Design Example with GRASP:NextGen POS system – Designing for Visibility – Mapping Designs to Code

Unit IV

ELABORATION ITERATION 2: UML Tools and UML as Blueprint – Quick Analysis Update: NextGen POS – Iteration 2: More Patterns – GRASP: More Objects with Responsibilities – applying GoF Design Patterns

Reference:

1. "Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development", Third Edition, Pearson Education, 2005, Craig Larman,
2. Advanced Object Oriented Analysis and Design using UML , James J Odell.
3. Object Oriented Analysis and Design , Mike O-Docherty.
4. Object Oriented Modeling and Design with UML, 2nd edition, Michael R Blaha, James R Rumbauh.
5. Object Oriented Systems and Analysis and Design using UML, Simon Bennetth, Steve McRovv and Ray Farmer.

ANDROID APPLICATION DEVELOPMENT **2:0:2**

Course Code: CSA/B/C/D 370

Course Outcomes

At the end of the course students will be able to:

CO1. Describe and compare different mobile application models/architectures and patterns.

CO2. Apply mobile application models/architectures and patterns to the development of a mobile software application.

CO3. Describe the components and structure of a mobile development framework (Google's Android Studio).

CO4. Apply a mobile development framework to the development of a mobile application.

CO5. Demonstrate advanced Java programming competency by developing a maintainable and efficient cloud based mobile application

Unit 1

Introduction to Android & Open Handset Alliance

Installation of Android Studio and other Development Environments like Gradle.

Understanding Android File System.

Creating First Android Application

Understanding Intent, Activity, Service, Content Providers, Broadcast Receivers.

Understanding Android Application, Manifests, Layouts, Drawables, Styles, Android

Activity, View

Understanding Android XML based layout (Linear Layout, Relative Layout, Frame Layout).

Introduction to Android Life Cycle Events

initialization and Button Click Listeners.

Unit 2

Development of Simple app containing Dialog Box, Intents,Toast, Spinners, Listeners examples.

Android Listview / GridView and Adapters

Android Date Picker Dialog, Time Picker Dialog

Launching sub Activity

Building Custom ListView and Understanding Adapters in detail

Understanding SQLite database. Populating database.

Developing simple app by using SQLite database (insert, delete, update)

Unit 3

Working with web server basics

Background loading, AsyncTask , Using Threads

Developing simple app by downloading image from web and showing it in ImageView

Understanding Importance of External Libraries and demonstration of simple external library

Image lazy loading, Image loading in list view, grid view

Unit 4

Working with Google Maps

ViewPager

Introduction to fragment, add, remove, replace fragment

ViewPager

Side Navigation Drawer

Action bar/ Toolbar

ViewPager Adapter / Swipe View

References:

1. Android Programming for Beginners by John Horton.

2. Professional Android 4 application development by Reto Meir.

3. Android Book by Lan F Darwin.

4. Learning Android Building application for The Android Market by Marko Gargenta.

5. Programming Android Java programming for the new generation of Mobile Devises by Zigurd Mellieks

ADVANCED DATABASE MANAGEMENT SYSTEM **2:1:1**

Course Code: CS A/B/C/D 380

Course Outcome

At the end of the course students will be able to:

CO1. Evaluate and Apply Advanced Database Development Techniques.

CO2. Evaluate Database Systems.

CO3. Administer Database Systems.

CO4. Design & Implement Advanced Database Systems.

Unit 1

Disk storage, Basic file Structures and hashing, indexing structures for files.

Algorithms for query optimization.

Unit 2

Physical database design and tuning, Introduction to transaction, Concurrency control techniques.

Concept for object databases, Object databases standard and design, database security.

Unit 3

Enhanced datamodels for advanced applications, distributed databases and client server architectures, Emerging database technologies and applications.

Unit 4

Definition of NoSQL, History of NoSQL and Different NoSQL products, NoSQL Basics. Exploring one among MongoDB/CouchDB/Cassandra along with Java/Ruby/Python interface : Interfacing and Interacting with NoSQL, NoSQL Storage Architecture, CRUD operations, Querying, Modifying and Managing NoSQL Datastores, Indexing and ordering datasets

References:

1. Fundamentals of Database System :5th Edition ,Navathe
2. Database Management System, Panneerselvam R.

3. Database Management System, Raghu Ramakrishnan and Johannes Gehrke.
4. Data Schemes: Models and algorithms (Advances in Database Systems), Charu C Aggarwal.
5. Multilevel secure Transaction Processing (Advances in Database system), Vijay Atluri and Sushin Jajodia.

COMPILER DESIGN **3:0:1**

Course Code: CS A/B/C/D 390

Course Outcome

At the end of the course students will be able to:

CO1. Construct a parse tree, or explain why no parse tree exists, given a BNF grammar and a string over the appropriate alphabet.

CO2. Implement a lexical analyzer from a specification of a language's lexical rules.

CO3. Compute the FIRST set for a BNF grammar.

CO4. Compute the FOLLOW set for a BNF grammar.

Unit-1

Introduction, Classification of grammars. Contextfree grammars. Deterministic finite state automata (DFA) Non-DFA.

Lexical analysis : Language processors; The structure of a Compiler; The evolution Of programming languages; The science of building a Compiler; Applications of compiler technology; Programming language basics. Lexical analysis: The Role of Lexical Analyzer; Input Buffering; Specifications of Tokens; Recognition of Tokens.

Unit-2

SyntaxAnalysis

Introduction; Context-free Grammars; Writing a Grammar. Top-down Parsing; Bottom-up Parsing.

Introduction to LR Parsing: Simple LR; More powerful LR parsers (excluding Efficient construction and compaction of parsing tables) ; Using ambiguous grammars; Parser Generators.

Unit-3

Intermediate Code Generation

Variants of syntax trees; Three-address code; Translation of expressions; Control flow; Back patching; Switch-statements; Procedure calls.

Run-Time Environments

Storage Organization; Stack allocation of space; Access to non-local data on the stack; Heap management; Introduction to garbage collection.

Unit-4

Code Generation

Issues in the design of Code Generator; The Target Language; Addresses in the target code; Basic blocks and Flow graphs; Optimization of basic blocks; A Simple Code Generator

Code optimization. Folding, redundant sub-expression evaluation. Optimization within iterative loops.

References:

1. Compilers Principles, Techniques and Tools, 2nd Edition, Addison-Wesley, 2007, Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D Ullman

2."The Theory and Practice of Compiler Writing". McGraw Hill, New York, 1985, Tremblay, et. al

3. Principles, Techniques and Tools of Compilers.- Allen I Holob.

4. Elements of Compiler Design.- Meduna

5. Compiler Design - K Muneeswaran.

OPEN ELECTIVES **2:0:2**

OP1: COMPUTER FUNDAMENTALS

Course Code: PHC/CHC/BCC/BTC/BOC/MAC/SWC/KAC/ENC/MCC/ZOC 640

Course Outcome:

At the end of the course students will be able to:

CO1. Deliberate in details with examples word document

CO2. Identify in details with examples input devices

CO3. Identify the characteristics of internet

CO4. Identify the classification and characteristics of introduction to computers

CO5. Identify the details of programing languages

CO6. Learn in details with examples application software

CO7. Learn the characteristics of nudi

CO8. Write down in depth css stylesheet

UNIT 1

INTRODUCTION

Computer, Characteristic of Computer, History of Computer, Components of Computer
Key Factors of Computers: Hardware, Software - types of Software (Application and system), forms of software (firmware, shareware, freeware), Translator - Assembler, Compiler and Interpreters. Computer Application – Business, Scientific, Entertainment and educational.

CLASSIFICATION OF COMPUTERS

Mode of operations – Analog, Digital and hybrid Computers
Size and capabilities – Micro, Mini, Main frame and Super computer

UNIT 2

MEMORY UNITS

Primary memory - RAM, ROM, PROM, EPROM, EEPROM, Flash memory

Secondary memory – Magnetic disk (Hard disk, Zip disk, Jaz disk, Super disk)
Optical disk (CD, CD – R, CD – RW, DVD), Magneto-optical disk device

COMPUTER PERIPHERALS DEVICES AND INTERFACES

Input devices – Working principle of Keyboard and mouse, Functional capabilities of Scanner, Digital Camera, OMR, OCR, touch pad, touch screen. Output Devices – Monitor, Printer, Plotter and projector.

Processors, Classification of Processors on speed, Motherboard, Power Supply, I/O Ports and its Maintenance

PROGRAMMING LANGUAGES

Machine, Assembly language and High Level Language

UNIT 3

Introduction to Windows, Elements of Word Processing, Spread Sheet, Presentations
Nudi/Baraha.

UNIT 4: INTERNET

Basics of Internet: www, HTTP, DNS, IP address, Email, Web browsers, Search Engines
HTML: Introduction to HTML, CSS
E-Commerce: Introduction, Types, Advantages of e-commerce, Applications, survey on popular e-commerce sites
E-governance, Introduction to Cyber Ethics

References:

1. Computer Fundamentals (6th Edition) – Rajaraman.
2. Computer's Today – Suresh K Basandra.
3. Computer Fundamentals-P K Sinha
4. Computer System Architecture (3rd Edition) PHI-2002. Chapters 3.3 & 3.4- Morris Mano,
5. Digital Principles and application (4th Edition) – Malvino Leach, Tata Mc Graw-Hill Edition
6. Computer System Architecture (3rd Edition) – Morris Mano, PHI
7. Microsoft office 365-Katherine Murray.

8. Microsoft office 2016- **Nita Rutkosky**, **Denise Seguin**, **Audrey Rutkosky Roggenkamp**

9. The Complete reference HTML by Herbert Schildt

10. Learn to program HTML and CSS for beginners

11. HTML black book –Steven Holzner.

eÉJ¸ïJ¸ï ªÀÄ»¼Á «zÁå¦ÃoÀ

eÉJ¸ïJ¸ï PÀ¯Á, ªÁtÂdå ªÀÄvÀÄÛ «eÁÕ£À PÁ¯ÉÃdÄ

(¸ÁéAiÀÄvÀÛ)

©.J£ï. gÀ¸ÉÛ, ªÉÄÊ¸ÀÆgÀÄ – 570 025

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ZÁ®ÄÛ ¸ÀAiÀÄÄPÀÛ AiÉÆÃd£É(¹©J¸ï-¹Jf¦)

2018-19

Programe Outcomes

PO1: Demonstrate critical reading, writing, and thinking skills. Write well-developed, focussed and effective paragraphs, which support a clear thesis statement, and demonstrate competence in Standard Kannada usage.
PO2: Get the opportunity to opt for career in the field of social media
PO3: Helps to pursue reserach work at M.phil and Doctoral level
PO4: Help to communicate effectively and fluently at various occassions
PO5: Analyse and interpret text written in Dravidian Language.
PO6: Learn to write logical and informative papers
PO7: Imbibe good ethics explored in the works of great writers.
PO8: Learn to participate effectively in debates, group discussions, seminars.

Programe Specific Outcomes

PSO 1: Equipped to work efficiently in various positions of Social Media.
PSO 2: Good communicative leads to huge career opportunitis
PSO 3: Able enough to work as researcher in the field of Kannada Literature and other Dravidian Languages
PSO 4: Capable to work as teachers, trainers and Faculthy of Kannada.
PSO 5: Learn to interpret text with attention to ambiguity, complexity and aesthetic value

ZÀÄÜ ¸ÀÄiÉÄ£É(¹©¹J¸ï-¹Jf¦)

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¥ÀÀ¥ÁoÀPÀÄ ªÀÄ¥ÀÄPÉAiÉÄ£É

¥ÀÄ ¸ÀASÉ	¥ÀwæPÉAiÀÄ ºÉ¸ÀgÀÄ	PÉærmï «£Áå¸À	PÉærmïUÀ¼ÀÄ	¨ÉÆÃzsÀ£Á UÀAmÉUÀ¼ÀÄ ªÁgÀPÉÌ		¥ÀjÃPÉëAiÀÄ CªÀ¢ü (UÀAmÉUÀ¼À°è)	¥ÀjÃPÉë CAPÀUÀ¼ÀÄ	DAvÀjPÀ ªÀiË®åªÀiÁ¥À£À CAPÀUÀ¼ÀÄ	MlÄÖ CAPÀUÀ¼ÀÄ
				G¥À£Áå¸À	læ÷åmÉÆÃjAiÀÄ¯ï				
	ಪ್ರಧಾನ ವಿಷಯ UÀ¼ÀÄ (Hard core)								
1	¥ÁæaãÀ PÀ£ÀßqÀ ¸Á»vÀå: ¥ÀA¥À-Dz¥ÀgÀ ¸ÀAUÀæºÀ (KNA 050)	3:1	4	3	2	3	70	30	100
2	¥ÁæaãÀ PÀ£ÀßqÀ ¸Á»vÀå ªÀÄvÀÄÛ £ÉÃ (KNA 020)	2:1	3	2	2	3	70	30	100
3	PÀ£ÀßqÀ ¨sÁµÉAiÀÄ EwºÁ¸À (KNA 030)	3:1	4	3	2	3	70	30	100
4	«ªÀIÉðAiÀÄ EwºÁ¸À (KNA 040)	2:1	3	2	2	3	70	30	100
5	ಉಪ ಪ್ರಧಾನ ವಿಷಯಗಳು (Soft core) ವಿದ್ಯಾರ್ಥಿ ಈ ಕೆಳಗಿನ ಯಾವುದಾದರೂ ಒಂದು ವಿಷಯವನ್ನು ಆಯ್ಕೆ ಮಾಡಿಕೊಂಡು ಮುಂದಿನ ಮೂರು ಚತುರ್ಮಾಸಗಳಲ್ಲಿಯೂ ಅದೇ ವಿಷಯವನ್ನು ಮುಂದುವರಿಸತಕ್ಕದ್ದು								
5.1	ಭಾಷಾವಿಜ್ಞಾನ ಅಧ್ಯಯನ : ಭಾಷಾ «eÁÕ£ÀzÀ ªÀÄÆ®vÀvÀéUÀ¼ÀÄ (KNA 210)	3:1	4	3	2	3	70	30	100
5.2	eÁ£À¥ÀzÀ CzsÀåAiÀÄ£À: eÁ£À¥ÀzÀ ¸Á»vÀå vÁwéPÀ CzsÀåAiÀÄ£À (KNA 210)	3:1	4	3	2	3	70	30	100
5.3	ZÀjvÉæ CzsÀåAiÀÄ£À: PÀ£ÁðlPÀ ¸ÁA¸ÀÌøwPÀ ZÀjvÉæ (KNA 210)	3:1	4	3	2	3	70	30	100

Jgq£ÉAiÀÄ ZÀvÀÄgï ªÀiÁ¸À
¥ÀoÀå¥ÀæPÀÆªÀÄ ªÀÄvÀÄÛ ¥ÀjÃPÉëAiÀÄ«¢ü£É

¥ÀæPÀæ ¸ÀASÉå	¥ÀwæPÉAiÀÄ ±ÃµÀðPÉ	PÉæqïmï «£Áå¸À	PÉæqïmïUÀ¼ ¸ÀASÉå	¨ÉÆÃzsÀ£Á UÀAmÉUÀ¼ÀÄ ªÁgÀPÉÌ		¥ÀjÃPÉëAiÀÄ CªÀ¢ü (UÀAmÉUÀ¼À°è)	¥ÀjÃPÉë CAPÀUÀ¼ÀÄ	DAvÀjPÀ ªÀiË®åªÀiÁ¥À£À CAPÀUÀ¼ÀÄ	MlÄÖ CAPÀUÀ¼ÀÄ
				G¥À£Áå¸À	¥ÁæAiÉÆÃV				
	ಪ್ರಧಾನ ವಿಷಯUÀ¼ÀÄ (Hard core)								
1	ªÀÄzsÀåPÁ°Ã£À PÀ£ÀßqÀ ¸Á»vÀå: ¥ÀzÀå (KNB 010)	3:1	4	3	2	3	70	30	100
2	ªÀÄzsÀåPÁ°Ã£À PÀ£ÀßqÀ ¸Á»vÀå: UÀzÀå (KNB 020)	2:1	3	2	2	3	70	30	100
3	ದ್ರಾವಿಡ ಭಾಷಾವಿಜ್ಞಾನ (KNB 030)	2:1	3	2	2	3	70	30	100
4	PÀ£ÀßqÀ «ªÀÄ±Éð : DAiÀÄÝ ¯ÉÃR£ÀUÀ¼ÀÄ (KNB 040)	3:1	4	3	2	3	70	30	100
5	ಉಪ ಪ್ರಧಾನ ವಿಷಯಗಳು (Soft core) PÉÆnÖgÀÄªÀ ¥ÀwæPÉUÀ¼À°è «zÁåyðAiÀÄ C©ügÀÄaUÉ C£ÀÄUÀÄtªÁV PÉÆqÀ¯ÁzÀ ¥ÀwæPÉUÀ¼À°è AiÀiÁªÀÅzÁzÀgÀÆ MAzÀ£ÀÄß DAiÉÄÌ ªÀiÁqÀ§ºÀÄzÀÄ								
5.1	ಭಾಷಾವಿಜ್ಞಾನ ಅಧ್ಯಯನ : ಕನ್ನಡ ªÁåPÀgÀtUÀ¼À vË®¤PÀ CzsÀåAiÀÄ£À (KNB 210)	3:1	4	3	2	3	70	30	100
5.2	eÁ£À¥ÀzÀ CzsÀåAiÀÄ£À: d£À¥ÀzÀ ¸Á»vÀå ªÀÄvÀÄÛ ¸ÀA¸ÀÌøw CzsÀåAiÀÄ£À (KNB 210)	3:1	4	3	2	3	70	30	100
5.3	ZÀjvÉæ CzsÀåAiÀÄ£À: PÀ£ÀßqÀ ¸Á»vÀå ZÀjvÉæ (13 £ÉÃ ±ÀvÀªÀiÁ£À) (KNB 210)	3:1	4	3	2	3	70	30	100
6	ವಿಶೇಷ ಉಪ ಪ್ರಧಾನ ವಿಷಯಗಳು (Special Soft core) «zÁåyðUÀ¼ÀÄ F ZÀvÀÄgï ªÀiÁ¸ÀzÀ°è F PɼÀV£À ಒಂದು ವಿಶೇಷ ಉಪ ಪ್ರಧಾನ ವಿಷಯವನ್ನು DAiÉÄÌ ªÀiÁqÀ§ºÀÄzÀÄ								
6.1	PÀ£ÀßqÀ ¸Á»vÀå ªÀÄvÀÄÛ ¸ÀA¸ÀÌøw (DAiÀÄÝ ¯ÉÃR£ÀUÀ¼ÀÄ) (KNB 220)	3:1	4	3	2	3	70	30	100
6.2	ªÀÄ»¼É ¸Á»vÀå-¸ÀA¸ÀÌøw (DAiÀÄÝ ¯ÉÃR£ÀUÀ¼ÀÄ) (KNB 220)	3:1	4	3	2	3	70	30	100

ªÀÄÆgÀ£ÉAiÀÄ ZÀvÀÄgïªÀiÁ¸À

¥ÀoÀå¥ÀæªÀÄÄR ¥ÀvÀæ¥ÀæPÁgÀUÀ¼ÀÄ

¥ÀvÀæ¸ÀASÉå	¥ÀvÀæzÀ ²ÃµÀðPÉ	PÉærmï «£Áå¸À	PÉærmïUÀ¼À ¸ÀASÉå	¨ÉÆÃzsÀ£Á UÀAmÉUÀ¼ÀÄ ªÁgÀPÉÌ		¥ÀjÃPÉë CªÀ¢ü (UÀAmÉUÀ¼À°è)	¥ÀjÃPÉë CAPÀUÀ¼ÀÄ	DAvÀjPÀ ªÀiË®åªÀiÁ¥À£À CAPÀUÀ¼ÀÄ	MlÄÖ CAPÀUÀ¼ÀÄ
				G¥À£Áå¸À	¸ÀAªÁzÀ				
	ಪ್ರಧಾನ ವಿಷಯUÀ¼ÀÄ (Hard core)								
1	vË®¤PÀ ¸Á»vÀå: ¥ÀoÀå: ªÀÄvÀÄÛ ªÀiÁ£ÀPÀ (KNC 050)	2:1	3	2	2	3	70	30	100
2	DzsÀÄ¤PÀ PÀ£ÀßqÀ ¸Á»vÀå £ÉÆÃl (KNC 020)	2:1	3	2	2	3	70	30	100
3	¨sÁgÀwÃAiÀÄ PÁªÀå «ÄÃªÀiÁA¸É (KNC 030)	2:1	3	2	2	3	70	30	100
4	¸ÀA±ÉÆÃzsÀ£Á «zsÁ£À ªÀÄvÀÄÛ PÀæªÀÄ (KNC 040)	2:1	3	2	2	3	70	30	100
5	G¥À¥ÀæzsÁ£À ವಿಷಯಗಳು (Soft core) PÉÆnÖgÀÄªÀ ¥ÀvÀæUÀ¼À°è «zÁåyð DAiÀÄÝ ªÀiÁrPÉÆAqÀ MAzÀÄ ¥ÀvÀæªÀ£ÀÄß ªÀiÁvÀæ DzsÀåAiÀÄ£À ªÀiÁqÀvÀPÀÌzÀÄÝ								
5.1	ಭಾಷಾ ವಿಜ್ಞಾನ ಅಧ್ಯಯನ ಉಪಭಾಷಾ ವಿಜ್ಞಾನ (PÀ£ÀßqÀ) (KNC 210)	3:1	4	3	2	3	70	30	100
5.2	eÁ£À¥Àz DzsÀåAiÀÄ£À PÉëÃvÀæ PÁAiÀÄð ªÀÄvÀÄÛ ¤gÀÆ¥ÀuÉ (KNC 210)	3:1	4	3	2	3	70	30	100
5.3	ZÀjvÉæ DzsÀåAiÀÄ£À ±Á¸À£ÀUÀ¼ÀÄ DAiÀÄÝ ¥ÀoÀåUÀ¼ÀÄ (KNC 210)	3:1	4	3	2	3	70	30	100
6	ªÀÄÄPÀÛ DAiÉÄÌ (Open Elective)								
6.1	ಕನ್ನಡ ಭಾಷೆ ಸಾಹಿತ್ಯ (¥ÁæxÀ«ÄPÀ ªÀÄlÖzÀ ¸ÀAªÀºÀ£À DzsÀåAiÀÄ£À) (KNC 530)	3:1	4	3	2	3	70	30	100

£Á®Ì£ÉAiÀÄ ZÀvÀÄxÀð ¸É«Ä¸ÀÖgï

¥ÀoÀå¥ÀĸÀÛPÀUÀ¼ÀÄ ªÀÄvÀÄÛ ¥ÀjPÀ®à£É

¥ÀwæPÉ ¸ÀASÉå	¥ÀwæPÉAiÀÄ ²Ã¶ðPÉ	PÉærmï «£Áå¸À	PÉærmïUÀ¼ÀÄ	¨ÉÆÃzsÀ£Á UÀAmÉUÀ¼À ªÉÄÃgÉ		¥ÀjÃPÁë CªÀ¢ü(UÀAmÉUÀ¼À°è)	¥ÀjÃPÁë CAPÀUÀ¼ÀÄ	DAvÀjPÀ ªÀiË®å CAPÀUÀ¼ÀÄ	MlÄÖ CAPÀUÀ¼ÀÄ
				G¥À£Áå¸À	læÆmÉÆÃjAiÀÄ¯ï				
	ಪ್ರಧಾನ ವಿಷಯ UÀ¼ÀÄ (Hard core)								
1	DzsÀĤPÀ PÀ£ÀßqÀ ¸Á»vÀå: ¥ÀzÀå: PÁªÀå PÁzÀA§j (KND 050)	2:1	3	2	2	3	70	30	100
2	¥ÁæaãÀ PÁªÀå ªÀÄvÀÄÛ ±Á¸ÀÛç (KND 020)	2:1	3	2	2	3	70	30	100
3	¸ÀªÀiÁd ªÀÄvÀÄÛ ¸Á»vÀå (KND 030)	2:1	3	2	2	3	70	30	100
4	C£ÀÄ¨sÀªÀ PÁªÀå (KND 040)	1:2	3	1	4	3	70	30	100
5	G¥À¥ÀæzsÁ£À ವಿಷಯಗಳು (Soft core) PÉ¼ÀV£À ¥ÀwæPÉUÀ¼À°è «zÁåyðUÀ¼ÀÄ AiÀiÁªÀÅzÁzÀgÀÆ MAzÀ£ÀÄß DAiÉÄÌ ªÀiÁrPÉÆ¼Àî§ºÀÄzÀÄ								
5.1	ಭಾಷಾವಿಜ್ಞಾನ ಅಧ್ಯಯನ : ಕನ್ನಡ ಭಾಷಾಸ್ವರೂಪ : ಆಯ್ದ ಪಠ್ಯಗಳು (KND 210)	3:1	4	3	2	3	70	30	100
5.2	eÁ£À¥ÀzÀ CzsÀåAiÀÄ£À: PÀ£ÀßqÀ d£À¥ÀzÀ ¸Á»vÀå (DAiÀÄÝ ¥ÀoÀåUÀ¼ÀÄ) (KND 210)	3:1	4	3	2	3	70	30	100
5.3	ZÀjvÉæ CzsÀåAiÀÄ£À: PÀ£ÁðlPÀ ¸ÀA¸ÀÌøw (DAiÀÄÝ ¥ÀoÀåUÀ¼ÀÄ) (KND 210)	3:1	4	3	2	3	70	30	100

ಪ್ರಧಾನ ವಿಷಯ	: 52 PÉærmï
ಉಪಪ್ರಧಾನ ವಿಷಯ	: 16 PÉærmï
ವಿಶೇಷ ಉಪಪ್ರಧಾನ ವಿಷಯ	: 04 PÉærmï
ªÀÄÄPÀÛ aAiÀÄ	: 04 PÉærmï
MlÄÖ	: 76 PÉærmï

læÆmÉÆÃjAiÀÄ¯ï ªÀÄvÀÄÛ ¥ÁæAiÉÆÃVPÀ vÀgÀUÀwUÀ¼ÀÄ

DAiÀiÁ ¥ÀwæPÉUÀ½UÉ C£ÀÄUÀÄtªÁV F PÉ¼ÀV£À ¥ÁæAiÉÆÃVPÀ CA±ÀUÀ¼À£ÀÄß ¥ÀwæPÉAiÀÄ MlÄÖ ¥ÀjzsÀ¬ÄAzÀ gÀÆ¦¸À¯ÁUÀÄvÀÛzÉ

1. ಪದ್ಯ ಓದುವ ಕ್ರಮ, ಅರ್ಥೈಸುವ ಕ್ರಮ, ವಿಶ್ಲೇಷಣೆ ಮತ್ತು ವಿಮರ್ಶೆ
2. ಭಾವಸ್ವಾರಸ್ಯ, ಸಂಭಾಷಣಾ ಕೌಶಲ, ಸನ್ನಿವೇಶಗಳ ಪರಿಚಯ
3. ವಸ್ತು, ಪಾತ್ರ, ಭಾಷೆ ಬಳಕೆ, ರಚನೆ, ತಂತ್ರಗಾರಿಕೆ

ªÉÄzÀ®£ÉÃ ÃZÀÄÄ ìÁõ¸ÀÌDUÀÌì¸Ûr ¸ÉÜgï 2017)

¥ÀæzsÁ£À ವಿಷಯಗಳು (Hard Core)

KNA 050: ¥ÀwæPÉ1 ¥ÁæaÃ£À PÀ£ÀßqÀ ¸Á»vÀå: ¥ÀA¥À (3:1=4 PÉærmï)

Course Outcome

CO1: Study in depth Adipurana
CO2: Understand the characteristic feature of Adipurana
CO3: Learn in details with examples Pampa Poet's writings
CO4: Understand in depth about Pampa

¥À¥À »£ÉßÉ Ew ªÀÈvÀÛ PÀÈwUÀ¼Ä

¥ÀA¥À Dç¥ÀÄgÁt ¸ÀAUÀæºÀ (¸À) J¯ï. UÀÄAqÀ¥Àà ¥ÀæÁgÁAUÀ ªÉÄÊ¸ÀÆgÀÄ «.«., ªÉÄÊ¸ÀÆgÀÄ ¥ÀgÁªÀÄ±Àð£À PÀÈwUÀ¼Ä

1. £ÁqÉÆÃd ¥À¥À	: ªÀÄÄ½AiÀÄ wªÀÄä¥ÀàAiÀÄå
2. ¥À¥ÀMAzÀÄ CzsÀåAiÀÄ£À	: f .J¸ï. ²ªÀgÀÄzÀæ¥Àà
3. ¥À¥ÀPÉÆªÀÄªÀÄÄRUÀ¼Ä	: ¹.¦. ಕೃಷ್ಣಕುಮಾರ್
4. PÀ£ÀßqÀ ¸Á»vÀå «±ÀèÉÃ	: ¹.¦. ¹zÀÞ¥Àà
5. ªÀÄvÉª ÀÄvÉ¥À¥À	: f .JZï. £ÁAiÀÄPÀ
6. Dç¥ÀÄgÁt ¢Ã¦PÉ	: ¥À. £ÁUÀgÁdAiÀÄå vÀ¸ÀÄ ±ÁªÀÄgÁAiÀÄ

KNA 020: ¥ÀwæPÉ2 ¥ÁæaÃ£À PÀ£ÀßqÀ ¸Á»vÀå À»£ÉßÉ (2:1=3 PÉærmï)

Course Outcome

CO1: Identify the details of ashtadasha Varnane
CO2: Deliberate the classification and characteristics of Kannada Jaina Puraana, Ramayana, Mahabarartha
CO3: Study in depth Boudha, Jaina, Shaiva and Vaidika
CO4: Understand the classification and characteristics of Champu Kavya

1. ¸Á»vÀå À»£ÉßÉAiÀÄ gÀªÀ ÀCA±ÀUÀ¼Ä : ಕಾಡು, ಕಡಲು, ಪರ್ವತ, ಅಷ್ಟಾದಶ ವರ್ಣನೆಗಳು ªÀÄÄvÁzÀªÀÅUÀ¼À ¨sÉÆÃUÉÆÃ½PÀ £ÉÃAiÀÄ ègÀÄÉ vÀÁzÀ ¸Á»vÀå
2. ««zsÀ PÁªÀåUÀ¼À ¸ÁªÀiÁfPÀ ªÀÄvÀÄÛgÁdQÃAiÀÄ ¹ÜwUÀ¼Ä ಹಾಗೂ ವಿಶೇಷವಾಗಿ ಬಾದಾಮಿ ಚಾಲುಕ್ಯರು, ಗಂಗರು, ರಾಷ್ಟ್ರಕೂಟರ ಕಾಲದ ಕನ್ನಡ ಸಾಹಿತ್ಯ, ಹೊಯ್ಸಳರ ಕಾಲದ ಚಂಪೂ PÀÈwUÀ¼Ä- EªÀÅUÀ¼À»£ÉßÉAiÀÄ ègÀÄÉ vÀÁzÀ ¸Á»vÀå¥ÀgÀA¥ÀgÉ
3. zsÁ«ÄðPÀ»£ÉßÉ: ¨ËzÀÞ eÉÊ£À ªÉÊPÀ ±ÉÊ ÀzsÀÄðUÀ¼À»£ÉßÉAiÀÄ ègÀÄÉ vÀÁzÀ ¸Á»vÀå ¥ÀgÀA¥ÀgÉ
4. ¸À¸ÀÌöÈvÀ ¥ÁæPÀÈvÀ ಭಾಷಾ ¸Á»vÀåUÀ¼À¥ÀæªÀÄÄR¥ÀæPÁgÀUÀ¼À»£ÉßÉ F »£ÉßÉAiÀÄ ègÀÄÉ vÀÁzÀ ±Á¸ÀÛçUÀ¼Ä, PÀ£ÀßqÀ eÉÊ£À¥ÀÄgÁt UÀ¼Ä, gÁªÀiÁAiÀÄt UÀ¼Ä, ªÀÄºÁ¨sÁgÀvÀUÀ¼Ä

¥ÀgÁªÀÄ±ÀðPÀ UÀæAxÀUÀ¼ÀÄ

1. PÀ£ÀßqÀ bÀAzÉÆÃ«PÁ¸À - ¸ÀA. ¦ü. ©. ¯ÉÆÃPÉñÀ
2. ¸ÀÄ¨sÀÄ vÀuÁ KªÀÄ£ÀÄß ¸ÀA¥ÀÄl UÀ¼ÀÄ, ¨ÉAUÀ¼ÀÆgÀÄ «±ÀéªÀzÁå®AiÀÄ
3. PÀ£ÀßqÀ ¸Á»vÀå ¸ÀAQëAiÀÄ : ².ZÉ£ÀßªÀÄ® ±ÀªÀÄð
4. PÀ£ÁðlPÀ ¸ÀA¸ÀÌøw ¸ÀªÀiÁPÉÆÃ¸À : JZï. w¥ÉàgÀÄzÀæ¸Áé«Ä
5. PÀ£ÀßqÀ ±Á¸À£ÀUÀ¼À ¸ÁA¸ÀÌøwPÀ CzsÀåAiÀÄ£À : JA. azÁ£ÀAzÀªÀÄÆwð
6. eÉÊ£À zÀ±Àð£À : «ÄxÀÄ CuÁÚgÁAiÀÄ
7. ¨sÁgÀwÃAiÀÄ ¸ÀA¸ÀÌøw : (¸À) ಅ.ನ. ಕೃಷ್ಣರಾಯ
8. PÀ£ÁðlPÀ¥ÀgÀA¥ÀgÉ : ¨sÁUÀ1 ªÀÄvÀÄÛ2, PÀ£ÀßqÀ ªÀÄvÀÄÛ ¸ÀA¸ÀÌøw E¯ÁSÉ
9. ZÀA¥ÀÆ ¸Á»vÀå : ¦. «. £ÁgÁAiÀÄt
10. PÀ£ÁðlPÀ ¸Á»vÀå CPÁqÉ«ÄAiÀÄ PÀ£ÀßqÀ ¸Á»vÀå ¥ÀjZÀAiÀÄ ªÀiÁ°PÉUÀ¼À ªÀiÁ¯ÉAiÀÄ ¸ÀA¥ÀÄl UÀ¼ÀÄ
11. PÀ£ÀßqÀ ¸Á»vÀå ZÀjvÉæ (¨ÉÃAzÉæ ªÀgÀ¢ªÀgÉUÉ) : ¹.«ÃgÀtÚ

KNA 030: ¥ÀwæPÉ3 PÀ£ÀßqÀ bÀAzÀ¸ÀìAzsÀåAiÀÄ£À (3:1=4 PÉærrmï)

Course Outcome

CO1: Specify in details with examples Chandassu
CO2: Learn the details of Sonnet
CO3: Learn the characteristics of 'Praasa'
CO4: Understand in depth 'Kanda'

1. ಅ) ಛಂದಸ್ಸಿನ ಉಗಮ, ನಿಷ್ಪತ್ತಿ ಮತ್ತು ಪ್ರಯೋಜನ
   D) ªÀiÁvÉæ, ªÀiÁvÁæUÀt ªÀÄvÀÄÛ CA±ÀUÀtUÀ¼À ¸ÀégÀÆ¥À
   E) AiÀÄwAiÀÄ ¸ÀégÀÆ¥À ªÀÄvÀÄÛ ¥ÀæAiÉÆÃUÀ
2. C) ¥Áæ¸ÀzÀ ¸ÀégÀÆ¥À, ¥ÀæPÁgÀ ªÀÄvÀÄÛ ¥ÀæAiÉÆÃUÀ
   D) SÁåvÀPÀ£ÁðlPÀUÀ¼À ¸ÀégÀÆ¥À
   E) PÀAzÀzÀ GUÀªÀÄ ªÀÄvÀÄÛ ¸ÀégÀÆ¥À
3. C) wæ¥À¢AiÀÄ ®PÀët ªÀÄvÀÄÛ ¥ÀæPÁgÀUÀ¼ÀÄ
   ಆ) ಷಟ್ಪದಿಯ ಮೂಲ, ಲಕ್ಷಣ ಮತ್ತು ಪ್ರಭೇದಗಳು
   E) ¸ÁAUÀvÀå ªÀÄÆ® ªÀÄvÀÄÛ ®PÀët
4. ಅ) ಹೊಸಗನ್ನಡ ಛಂದಸ್ಸು : ತತ್ತ್ವಗಳು, ಪರಿಭಾಷೆ
   D) ¸ÀgÀ¼ÀgÀUÀ¼ÉAiÀÄ ªÀÄÆ® ªÀÄvÀÄÛ ¸ÀégÀÆ¥À
   E) ¸Á£ÉmïUÀ¼À ªÀÄÆ® ªÀÄvÀÄÛ ¸ÀégÀÆ¥À

¥ÀgÁªÀÄ±ÀðPÀ UÀæAxÀUÀ¼ÀÄ

1. PÀ£ÀßqÀ bÀAzÀ¸Àì¥ÀÄ : (¸À) J¯ï §¸ÀªÀgÁdÄ
2. PÀ£ÀßqÀ PÉÊ¦r ¸ÀA¥ÀÄl 1 ¨sÁUÀ2 : ªÉÄÊ¸ÀÆgÀÄ «±ÀéªÀzÁå®AiÀÄ
3. dAiÀÄzÁªÀÄ£ï : (¸À) JZï.r. ªÉÆÃt PÀgÀï
4. PÀ£ÀßqÀ bÀAzÉÆÃ«PÁ¸À : r.J¸ï. PÀgÀÌ
5. ¸ÀAiÀÄ¯ÉÆÃPÀ£À : wÃ£À²æÃ

6. PÀ£ÀßqÀ bÀAzÉÆÃ«PÁ¸À : n.«. ªÉAPÀmÁZÀ®±Á¹ç
7. ¦ÃpPÉUÀ¼ÀÄ ¨ÉÆÃ£ÀÄUÀ¼ÀÄ : r.J¯ï. £ÀgÀ¹AºÁZÁgï
8. PÀ£ÀßqÀ bÀAzÉÆÃ«ºÁgÀ : n.«. ªÉAPÀmÁZÀ®±Á¹ç
9. bÀAzÉÆÃUÀw : ಸೇಡಿಯಾಪು ಕೃಷ್ಣಭಟ್ಟ
10. PÀ£ÀßqÀ bÀAzÀ¸ÀÄ : ¸ÉÃ AiÀiÁ¥ÀÄ ಕೃಷ್ಣಭಟ್ಟ
11. ºÉÆ¸ÀUÀ£ÀßqÀ PÁªÀåzÀ bÀAzÀ¸ÀÄ : PÉ. £ÁgÁAiÀÄt ¥ÀAqÀvï
12. ¨ÁgÀÄªÀiÁAiÀÄ bÀAzÉÆÃ¯ÉÆÃPÀ : ¥ÀÄjÃ PÀÄ®PÀtÂ
13. bÀAzÉÆÃªÀgÀuÉ : JA. azÁ£ÀAzÀªÀÄÆwð
14. ಹೊಸಗನ್ನಡ ಕವಿತೆಯ ಮೇಲೆ ಇಂಗ್ಲಿಷ್ ಕಾವ್ಯದ ಪ್ರಭಾವ : J¸ï. C£ÀAvÀgÁªÀÄAiÀÄå
15. The Commonness in the Meters of the Dravidian Languages : S.Subrahmanyan
16. A Study of Metre : T.S. Omond
17. Metre, Rhyme and Free verse : G.S. Fraser

KNA 040: ¥ÀæAiÉÆÃV4 «ªÀÄ±ÉðAiÀÄ CzsÀåAiÀÄ£À (2:1=3 PÉærmïUÀ¼ÀÄ)

Course Outcome

CO1: Identify the classification and characteristics of Practical Criticism

CO2: Write down the details of Post-Colonial criticism

CO3: Deliberate the classification and characteristics of Marxian criticism

CO4: Understand in depth Preface to Lyrical Ballads

1. (C) Preface to Lyrical Ballads : W. Wordsworth

   (D) Literature & Pshychology : Carl Jung. S

2. (C) ¥ÁæAiÉÆÃVPÀ «ªÀÄ±ÉÃ, ¸ÀAzÀ¨sÀð ªÁzÀ

   (D) ªÀ¸ÁºÀvÀÄ DzsÀÄ¤PÉÆÃvÀÛgÀ «ªÀÄ±ÉðUÀ¼ÀÄ (£ÀªÀåZÁjvÀæPÀ, £ÀªÀå zÀAvÀPÀxÁ AiÀÄ)

3. (ಅ) ರೂಪನಿಷ್ಠ ವಿಮರ್ಶೆ, ಮಾಕ್ಸ್ðªÁzÀ «ªÀÄ±ÉÃ, ¹ÛçÃªÁzÀ «ªÀÄ±ÉÃ

4. (C) ªÀ¸ÁºÀvÀÄ- ªÀ¸ÁºÀvÉÆÃvÀÛgÀ «ªÀÄ±ÉÃ

¥ÀgÁªÀÄ±ÀðUÀæAxÀUÀ¼ÀÄ

1. ¥Á±ÁÑvÀå PÁªÀå«ÄÃªÀiÁA¸É : «.JA. E£ÁªÀÄzÁgï
2. ¸Á»vÀå«ªÀÄ±ÉðAiÀÄ vÀvÀÛUÀ¼ÀÄ : JZï. w¥ÉàÃgÀÄzÀæ¸Áé«Ä (¸À±ÉÆÃzsÀ JZï.n)
3. ಇಂಗ್ಲಿಷ್ ಭಾಷೆಯಲ್ಲಿ ಆಧುನಿಕ ಸಾಹಿತ್ಯ ವಿಮರ್ಶೆ : ಎಲ್.ಎಸ್. ಶೇಷಗಿರಿರಾವ್
4. ¥ÀoÀå±Á¸ÀÛç : Vjr ØUÉÆÃ« AzÀgÁdÄ
5. PÁªÀå±Á¸ÀÛç aAvÀ£À : f.J¸ï. ²ªÀgÀÄzÀæ¥Àà
6. ¸Á»vÀå«ªÀÄ±ÉÃ : ¹.J£ï. gÁªÀÄZÀAzÀæ£ï
7. ವಿಮರ್ಶೆಯ ಪರಿಭಾಷೆ : ಓ.ಎಲ್. ನಾಗಭೂಷಣಸ್ವಾಮಿ
8. «ªÀÄ±ÉðAiÀÄ vÀvÀÛUÀ¼ÀÄ «zÉÃ±ÀUÀ¼ÀÄ : (¸À) «.PÉ. UÉÆÃPÁPï & PÀÄ®PÀtÂ
9. ¥ÁæAiÉÆÃVPÀ «ªÀÄ±ÉÃ : (¸À) f.J¸ï. ²ªÀgÀÄzÀæ¥Àà J£ï.J¸ï. ®PÀëöäãÁgÁAiÀÄt ¨sÀlÖ
10. NzÀÄUÀgÀ ªÀÄvÀÄÛ NzÀÄ«PÉ : ¹.J£ï. gÁªÀÄZÀAzÀæ£ï
11. ªÀ¸ÁºÀvÉÆÃvÀÛgÀ aAvÀ£É : ¹.J£ï. gÁªÀÄZÀAzÀæ£ï

12. ¹ÀÜ ÁzÀ : ¸Ã«ÄvÁæ¬Ä©.J£ï
13. Literary Criticism – A Short History : W.K.Wimsatt & Cleanth Brooks
14. Contemporary Criticism : (Ed) Sethuraman V S

G¥ÀåÉÆÃ¸ÀÀ ವಿಷಯಗಳು (Soft Core)

KNA 210: ¥ÀwæPÉ 5.1 ಭಾಷಾ ವಿಜ್ಞಾನದ ಮೂಲತತ್ತ್ವಗಳು (3:1=4 PÉæræmï)

Course Outcome

CO1: Identify the details of Lanugage
CO2: Understand the characteristics of Phonetics
CO3: Learn in details with examples Bashe mattu Baraha
CO4: Write down in details with examples Morphology

1. ಭಾಷೆ: ªÁåSÁå£ÀUÀ¼ÀÄ ®PÀëtUÀ¼ÀÄ, ¸ÀégÀÆ¥À; ಭಾಷಾ ವಿಜ್ಞಾನದ ಸ್ವರೂಪ- ªÁå¦Û ಪ್ರಯೋಜನಗಳು, ಭಾಷೆಯ GUÀªÀÄ ¹zÁÞAvÀUÀ¼ÀÄ, ಭಾಷೆಗಳ ವರ್ಗೀಕರಣ zÀæµÁ×AvÀUÀ¼ÀÄ ಭಾರತೀಯ ಭಾಷೆಗಳ ªÀVÃðPÀgÀt
2. zÀé-G¥ÀzÀé :ªÁåSÁå£À ¸ÀégÀÆ¥À; zÀé«eÁÕ£ÀzÀ ±ÁSÉUÀ¼ÀÄ, zÀéªÀÄ : ªÁåSÁå£À ¸ÀégÀÆ¥À zÀéªÀÄ ¤tðAiÀÄzÀ vÀvÀéUÀ¼ÀÄ
3. DPÀÈwªÀiÁ : ªÁåSÁå£À ¸ÀégÀÆ¥À ªÁå¦Û DPÀÈwªÀiÁ ¤tðAiÀÄ, £ÉÃjÁ vÀvÀéUÀ¼ÀÄ, DPÀÈwªÀiÁzÀ §UÉUÀ¼ÀÄ
4. ಭಾಷಿಕ ಬದಲಾವಣೆ ; ಭಾಷಿಕ ಸ್ವೀಕರಣ, ಭಾಷೆ ಮತ್ತು ಬರಹ

¥ÀgÁªÀÄ±Àð UÀæAxÀUÀ¼ÀÄ

1. ªÀåvÀ£ÁvÀäPÀ ªÁåPÀgÀt : JZï.J¸ï. ©½j
2. ಭಾಷಾವಿಜ್ಞಾನದ ªÀÄÆ®vÀvÀéUÀ¼ÀÄ : J.J. azÁ£ÀzÀªÀÄÆwð
3. ಭಾಷೆ ಮತ್ತು ಭಾಷಾವಿಜ್ಞಾನ : PÉ.PÉñÀªÀ±ÀªÀÄð
4. ಸಾಮಾನ್ಯ ಭಾಷಾವಿಜ್ಞಾನ : PÉ.PÉñÀªÀ±ÀªÀÄð
5. ಆಧುನಿಕ ವರ್ಣನಾತ್ಮಕ ಭಾಷಾವಿಜ್ಞಾನ : gÁeÉñÀéj ªÀÄ.±ÀªÀiÁð
6. ಭಾಷೆ : (¸À) PÉ. £ÁgÁAiÀÄt
7. Language : Leonard Bloomfield
8. Language : Edward Sapir
9. A Course in Modern Linguistics : C.F. Hackett
10. Modern Linguistics : S Potter
11. Introduction to theoretical Linguistics : J. Lyons
12. Historical Linguistics An Introduction : W.P. Lehmann

KNA 210: ¥ÀwæPÉ 5.2 eÁ£À¥ÀzÀ CzsÀåAiÀÄ£À eÁ£À¥ÀzÀ ¸Á»vÀå ªÀÄvÀÄÛ CzsÀåAiÀÄ£À

Course Outcome

CO1: understood the knowledge of Kannada Folklore
CO2: Students must learn the Ancient and Present styles of Kannada Folklore
CO3: Helps the students to undertake Research in the field of Kannada Folklore
CO4: understood the importance of Kannada Folklore

1. d£ÀPÀzÀ– eÁ£À¥ÀzÀ ªÁåSÁå£À¸ gÀÆ¥À ªÁå¦Û ªÀÄÄvÀÛ ¥ÀgÀA ; D¢ªÁ¹ (§ÄqÀPÀlÄÖ) ªÀÄvÀÛ£ÀUÀgÀ eÁ£À¥ÀzÀ,eÁ£À¥ÀzÀ ªÀÄvÀÛEvÀgÀ «eÁÕ£ÀUÀ¼ÀÄ, eÁ£À¥ÀzÀ ªÀÄvÀÛ zÉÃ²Ã ¸Àz,À d£À¥ÀzÀ ¸Á»vÀå ªÀÄÄvÀÛ ¥ÀgÀA,
ಶಿಷ್ಟ ಮತ್ತು ಜನಪದ ಸಾಹಿತ್ಯ

2. d£À¥ÀzÀ VÃvÉ PÀxÉ PÁªÀå ¨ÁªÀ Â d£À¥ÀzÀ ªÀÄ ÁPÁªÀå d£À¥ÀzÀ PÀxÉUÀ¼ÀÄ – Eª ÀÄUÀ¼À ¸gÀÆ¥À,®PÀët,
»£ÉßÉ¯É¥ÀågÀ

3. d£À¥ÀzÀ UÁzÉ– d£À¥ÀzÀ MUÀÄ, Mq¥ÀÄ, zÀvÀÛPÀÉ Lw ºÀå¸À Áq À¥ÀÄgÁt Eª ÀÄUÀ¼À ¸gÀÆ¥À,®PÀët,
»£ÉßÉ¯É¥ÀågÀ

4. d£À¥ÀzÀ PÉ Év ÀæÁAiÀÄ : ¸gÀÆ¥À– PÉ Év Àæ gÀÆ¥À ªÀÄvÀÛ ªÀÄvÀÛUÀ¼À UÀ¼ÀÄ – PÉÉv ÀæÁAiÀÄ zÀ ¥Àæ¨sÉ¢zÀ¼ÀÄ PÉÉv ÀæÁAiÀÄ zÀ ¥À jPÀ®à£ÀÄ

¥ÀgÁªÀÄ±Àð£À UÀæAxÀUÀ¼ÀÄ

1. eÁ£À¥ÀzÀ vÀvÀÛ¼ÀÄ : (¸À) CgÀ ÁzÀªÀ ¼Áè®UÀAÛ
2. eÁ£À¥ÀzÀ CzÀåAiÀÄ£À : zÉÃdUËÃ
3. d£À¥ÀzÀ ¥ÀÄgÁt UÀ¼ÀÄ : gÁUË
4. eÁ£À¥ÀzÀ : f Ã±À. ¥ÀgÀÀªÀÄ ªÀ AiÀÄå
5. eÁ£À¥ÀzÀ ¸gÀÆ¥À : ºÁªÀÄ £ÁAiÀÄPÀ
6. ¨sÁgÀvÃAiÀÄ eÁ£À¥ÀzÀ ¸À ÀÄÄPÉ : zÃUÁå¨sÉ PÀ ï C£À PÉªÀÄgÀ ½ zÀ¥Àð
7. ¨sÁgÀvÃAiÀÄ ¥ÀgÀ¥ÀgÉº ÁUÀ ¸Á»vÀå PÀ ÀèMUÀ ÄÄ : zÃUÁå¨sÉ PÀ ï C£À ©.J. «ªÉÃPÀgÊ
8. £À ÃÄUÁzÉ¼ÀÄ : gÁUË
9. d£À¥ÀzÀ PÀ ªÀÄUÀ¼ÀUÀ¼ÀÄ : ».².gÁªÀÄZÀ zÉÃUËqÀ
10. d£À¥ÀzÀ DI UÀ¼ÀÄ : PÀ ÁÕI PÀ eÁ£À¥ÀzÀ AiÀÄPÀë£À CPÁqÉ«Ä
11. eÁ£À¥ÀzÀ CzÀåAiÀÄ£À– ¸À ÁÕ¤ÛEwºÁ¸À : £À. vÀÄ¼À¹ÃªÀÄä
12. eÁ£À¥ÀzÀ PÉ®ªÀ ªÀÄR UÀ¼ÀÄ : f Ã±À. ¥ÀgÀÀªÀÄ ªÀ AiÀÄå
13. d£À¥ÀzÀ ¸Á»vÀå gÀÆ¥ÀUÀ¼ÀÄ : gÁUË
14. eÁ£À¥ÀzÀ ¥ÀæÉÃ±À : ZÀzÃæPÁAvÀ PÀ ÀÄ
15. eÁ£À¥ÀzÀ ¸ÀA ªÀÄ ÉÃ±À : (¸À) f Ã±À. ¥ÀgÀÀªÀÄ ªÀ AiÀÄå
16. eÁ£À¥ÀzÀ ªÁ»¤ : zÉÃ dªÀgÃÉUËqÀ
17. zÀQë PÀ ÁÕI PÀ d£À¥ÀzÀ ¥ÀæÁgÀUÀ¼ÀÄ : f Ã±À. ¥ÀgÀÀªÀÄ ªÀ AiÀÄå
18. eÁ£À¥ÀzÀ ¸À ÀÄÄPÉ : CA§½PÉ» j AiÀÄt Ú
19. PÀ ÁÕI PÀ eÁ£À¥ÀzÀ : (¸À) f.J ¸ï. ²ªÀgÀÄzÀæ¥Àà
20. eÁ£À¥ÀzÀ ªÀÄE®¨sÉvÀvÀvÀ¼ÀÄ : zÉÃ ÉzÀ¥ÉÃ ªÀÄgÀº ÀÄj
21. PÀ£ÀqÀ eÁ£À¥ÀzÀ PÉ®ªÀ ªÀÄR UÀ¼ÀÄ : n.J ¸ï. ¸ÀvÀå£ÁxÀ
22. eÁ£À¥ÀzÀ ªÉ ÁÕ PÀ PÉÉvÀæÁAiÀÄ : ¹.¹.J.¥Ê
23. zÁåqÀ eÁ£À¥ÀzÀ : (¸À) JZï. eÉ®PÀ¥ÀÃUËqÀ
24. ªÀÄ ÉÁqÀÄ eÁ£À¥ÀzÀ : (¸À) JZï. eÉ®PÀ¥ÀÃUËqÀ
25. eÁ£À¥ÀzÀ ¸Á»vÀå zÀ±À£À ¸À¥ÀÄI UÀ¼ÀÄ : PÀ ÁÕI PÀ «±Àé zÁå®AiÀÄ, zÁgÀªÁqÀ
26. eÁ£À¥ÀzÀ «« zÀ ªÀÄR UÀ¼ÀÄ : (¸À) ¥ÉæÃªÀÄ ²ÃPÀ oPÀÆgÀ UÉ
27. ¸ÉÃ ÁAwPÀ eÁ£À¥ÀzÀ : CA§½PÉ» j AiÀÄt Ú
28. Folklore and Folk life : Ed. Richard M Dorson
29. The study of Folklore : Ed: Alan Dundes
30. Folklore Genres : Dass Ben Amos
31. The Folktale : Stith Thompson

32. Current Trends in Folklore : Jawaharlal Handoo
33. Story Performance and Event : Richard Bauman

KNA 210 : ¥ÀwæPÉ 5.3 ZÁjwæPÀ CzsÀåAiÀÄ£ÀzÀ»£ÉßAiÀÄ°è PÀ£ÀßqÀ ¸ÁA¸ÀÌøwPÀ ZÀjvÉæ

Course Outcome

CO1: Understood the Concept of Culture and Kannada-Karnataka culture

CO2: Learn the History of Kannada Literature

CO3: Understood the relationship between historical events and Kannada Literature from 9[th] to 14[th] Century.

CO4: understood the importance of Kannada Culure

1. ¸ÀA¸ÀÌøw JAzÀgÉãÀÄ? PÀ£ÁðIPÀ ¸ÁA¸ÀÌøwPÀ ZÀjvÉæAiÀÄ CzsÀåAiÀÄ£ÀzÀ ªÀÄºÀvÀé ¸ÁªÀiÁ£ÀåªÁV PÀ£ÁðIPÀzÀ ¥ÁæaÃ£ÀvÉ – zÉÃgÉAiÀÄ°è ªÀiÁvÀÈ¨sÁµÉAiÀiÁV PÀ£ÀßqÀ ªÀÄvÀÄÛ CªÀÅUÀ¼À ¸ÀgÀºÀ¢gÀÄ.
2. PÀzÀA§gÀÄ : ªÀÄAiÀÄÆgÀªÀªÀÄð, PÁPÀÄvÀìªÀÄð ;
   ಗಂಗರು: ದುರ್ವಿನೀತ, ಶ್ರೀಪುರುಷÀ
   ¨ÁzÁ«ÄAiÀÄ ZÁ®ÄPÀågÀÄ: Eªï ¥ÀÄ®PÉÃ¹, Eªï «PÀæªÀiÁ¢vÀå
3. ರಾಷ್ಟ್ರಕೂಟರು: ಮುಮ್ಮಡಿ ಗೋವಿಂದ, ಅಮೋಘವರ್ಷ ನೃಪತುಂಗ, ಮುಮ್ಮಡಿ ಕೃಷ್ಣ
   PÀ®å¸ÀzÀ ZÁ®ÄPÀågÀÄ: Eªï vÉÊ®¥À, Eªï dAiÀÄ¹AºÀ, DgÀ£ÉAiÀÄ «PÀæªÀiÁ¢vÀå
   ºÉÆAiÀÄì¼ÀgÀÄ: ವಿಷ್ಣುವರ್ಧನ, ಇಮ್ಮಡಿ ಬಲ್ಲಾಳ
4. ವಿಜಯನಗರ: ಇಮ್ಮಡಿ ದೇವರಾಯ, ಕೃಷ್ಣದೇವರಾಯ; ಮೈಸೂರು ಒಡೆಯರು, ಚಿಕ್ಕದೇವರಾಯ, ಮುಮ್ಮಡಿ ಕೃಷ್ಣರಾಜ

2, 3 ªÀÄvÀÄÛ 4£ÉÃ WÀlPÀUÀ¼À°è £ÀªÀÄÆ¢¹gÀÄªÀ gÁdgÀÄUÀ¼ÀÄ, zÉÃªÁ®AiÀÄ ¥ÀgÀA¥ÀgÉ, PÀ£ÀßqÀ ¨sÁµÉ ªÀÄvÀÄÛ ¸ÁAUÀvÀå ¨ÉÃ¼ÀªÀtÂUÉ ¸À°è¹gÀÄªÀ PÉÆqÀÄUÉAiÀÄ£ÀÄß ZÁjwæPÀ «ªÀgÀuÉUÀ¼À DzsÁgÀzÀ°è «ªÀgÀuÁvÀäPÀªÁV ¥Àæ¸ÀÄÛvÀ¥Àr¸ÀÄªÀÅzÀÄ; zÉÃªÁ®AiÀÄ «±ÉÃµÀ ªÁ¸ÀÄÛ ²®àzÀ «ªÀgÀuÉUÀ¼ÀÄ, ¸Á»vÀå ¸ÁA¸ÀÌøwPÀ PÀ¯Á, DqÀ½vÁvÀäPÀ ªÀåªÀ¸ÉÜ ºÁUÀÆ ¥ÀæeÁªÀiÁ£ÀåzÀ §zÀÄPÀÄ ªÀÄÄAvÁzÀªÀÅUÀ¼À£ÀÄß ªÀiÁqÀ¯ÁUÀÄªÀÅzÀÄ

¥ÀgÁªÀÄ±Àð UÀæAxÀUÀ¼ÀÄ

1. PÀ£ÀßqÀ ¸Á»vÀå ZÀjvÉæ 1,2,3,4,5 : PÀ£ÀßqÀ CzsÀåAiÀÄ£À ¸ÀA¸ÉÜ ªÉÄÊ¸ÀÆgÀÄ
2. PÀ£ÁðIPÀ ¸ÀA¸ÀÌøw ¸ÀªÉÃPÉë : JZï. w¥ÉàgÀÄzÀæ¸Áé«Ä
3. PÀ£ÀßqÀ±Á¸À£ÀUÀ¼À ¸ÁA¸ÀÌøwPÀ CzsÀåAiÀÄ£À : JA. azÁ£ÀAzÀªÀÄÆwð
4. ªÀiÁUÀð 1, 2, 3 : JA.JA. PÀ®§ÄVð
5. PÀ£ÁðIPÀzÀ CgÀ¸ÀÄªÀÄ£ÉvÀ£ÀUÀ¼ÀÄ : J£ï. ®QëöäÃ£ÁgÁAiÀÄt gÁªï ªÀÄvÀÄÛ gï.J¸ï. ¥ÀAZÀªÀÄÄT
6. PÀ£ÁðIPÀ EwºÁ¸À : JA. «. ಕೃಷ್ಣರಾವ್ ಮತ್ತು ಕೇಶವಭಟ್ಟ
7. PÀ£ÁðIPÀ ¥ÀgÀA¥ÀgÉ 1, 2 : PÀ£ÀßqÀ ªÀÄvÀÄÛ ¸ÀA¸ÀÌøw E¯ÁSÉ
8. PÀ£ÁðIPÀ ZÀjvÉæ : PÀ£ÀßqÀ «±Àé«zÁå®AiÀÄ, ºÀA¦
9. ವಿಷಯ ವಿಶ್ವಕೋಶ : ಕರ್ನಾಟಕ : PÀ£ÀßqÀ CzsÀåAiÀÄ£À ¸ÀA¸ÉÜ
10. Karnataka Darshana : R.R. Diwakar
11. The Heritage of Karnataka : R.S. Mugali
12. A History of south India : K.A. Nilakntha Shastry
13. Early History of Deccan I & II : Yazdani
14. Administration and Social Life Under Vijaynagar : T.V. Mahlingam

JgÀqÀ£ÉAiÀÄ ZÀvÀÄ¸ÀìªÀÄ¸À

ಪ್ರಧಾನ ವಿಷಯ UÀ¼ÀÄ (Hard core)

KNB 010: ¥ÀwæPÉ 1 ªÀÄzsÀåPÁ°Ã£À PÀ£ÀßqÀ ¸Á»vÀå ªÀZÀ£À ¸Á»vÀå (3:1=4 PÉæqïmï)

Course Outcome

CO1: Specify in depth Vachanas' of Jedara Dasimayya
CO2: Understand the characteristics of Vachanas' of Basavanna
CO3: Specify in details with examples Vachanas' of Akkamahadevi
CO4: Deliberate the details of Vachanas' of Ambigara Chowdayya

»£ÉßÉ£AiÀÄ¯ÉèÃ ¸ÀªÀÄUÀæ PÀ£ÀßqÀ ¸Á»vÀåPÉÌ ªÀZÀ£À ¸Á»vÀå zÉÆqÀØ PÉÆqÀÄUÉ ¤ÃrzÉ. eÉÃqÀgÀ zÁ¹ªÀÄAiÀÄå, §¸ÀªÀtÚ, CPÀÌªÀÄºÁzÉÃ«, CA©UÀgÀ ZËqÀAiÀÄå - F £Á®ÄÌ ªÀÄA¢ ªÀZÀ£ÀPÁgÀgÀ »£ÉßÉ ªÀÄvÀÄÛ ªÀZÀ£À

1. eÉÃqÀgÀ zÁ¹ªÀÄAiÀÄå£À ªÀZÀ£ÀUÀ¼ÀÄ (DAiÀÄÝ ¥ÀoÀåPÉÌ ªÀZÀ£ÀUÀ¼ÀÄ)

721, 722, 742, 744, 764, 765, 768, 774, 785, 793, 799, 801, 808, 810, 818, 831, 838, 841, 853, 862, 866, 878, 880, 884, 893

2. §¸ÀªÀtÚ£À ªÀZÀ£ÀUÀ¼ÀÄ (DAiÀÄÝ ¥ÀoÀåPÉÌ ªÀZÀ£ÀUÀ¼ÀÄ)

26, 29, 34, 59, 62, 83, 92, 93, 97, 115, 129, 130, 155, 161, 183, 208, 212, 223, 235, 241, 291, 436, 438, 447, 557,

CPÀÌªÀÄºÁzÉÃ«AiÀÄ ªÀZÀ£ÀUÀ¼ÀÄ (DAiÀÄÝ ¥ÀoÀåPÉÌ ªÀZÀ£ÀUÀ¼ÀÄ)

28, 33, 52, 95, 125, 143, 163, 196, 268, 290, 303, 307, 321, 330, 340, 364, 365, 398, 411, 412, 413, 419, 426, 429, 432

3. CA©UÀgÀ ZËqÀAiÀÄå£À ªÀZÀ£ÀUÀ¼ÀÄ (DAiÀÄÝ ¥ÀoÀåPÉÌ ªÀZÀ£ÀUÀ¼ÀÄ)

6, 7, 9, 17, 25, 27, 35, 53, 54, 79, 88, 106, 110, 139, 157, 158, 169, 187, 189, 242, 243, 244, 245, 247, 252

¥ÀoÀåªÀÄÆ®:

1. ¸ÀAQÃtð ªÀZÀ£À ¸ÀA¥ÀÄl 2 : (¸À) J¸ï. «zÁå±ÀAPÀgÀ, PÀ£ÀßqÀ ªÀÄvÀÄÛ ¸ÀA¸ÀÌøw E¯ÁSÉ, ¨ÉAUÀ¼ÀÆgÀÄ
2. §¸ÀªÀtÚ£ÀªÀgÀ ªÀZÀ£À ¸ÀA¥ÀÄl : (¸À) JA.JA. PÀ®§ÄVð, PÀ£ÀßqÀ ªÀÄvÀÄÛ ¸ÀA¸ÀÌøw E¯ÁSÉ, ¨ÉAUÀ¼ÀÆgÀÄ
3. ²ªÀ±ÀgÀtAiÀÄgÀ ªÀZÀ£À ¸ÀA¥ÀÄl : (¸À) «ÃgÀ±ÉÊªÀ CzsÀåAiÀÄ£À PÉÃAzÀæ, ¨ÉAUÀ¼ÀÆgÀÄ
4. ¸ÀAQÃtð ªÀZÀ£À ¸ÀA¥ÀÄl 1: (¸À) JA.JA. PÀ®§ÄVð, PÀ£ÀßqÀ ªÀÄvÀÄÛ ¸ÀA¸ÀÌøw E¯ÁSÉ, ¨ÉAUÀ¼ÀÆgÀÄ

¥ÀgÁªÀÄ±Àð£ÀUÀæAxÀUÀ¼ÀÄ

1. ªÀZÀ£À¸ÁºÀvÀå¸ÁgÀ : J.Dgï. ²æÃªÀÄÉ ªÀÄAiÀÄåMð
2. ªÀZÀ£À¸Á»vÀågÀ¸À : gÀ.gÁ ¢ªÁPÀgÀ
3. ಬಸವಣ್ಣನವರ ಷಟ್‌ಸ್ಥಲದ ವಚನಗಳು : J¯ï. §¸ÀªÀgÁdÄ
4. §¸ÀªÀtÚ£ÀªÀgÀ ªÀZÀ£ÀªÁ¼À¸ÀUÀ1 ªÀÄvÀÄÛ2 : J¯ï. §¸ÀªÀgÁdÄ
5. §¸ÀªÀtÚ£ÀªÀgÀ ªÀZÀ£ÀUÀ¼ÀÄ : ¥ÀæÃ. ºÀA¥À£ÁÖ
6. ¨sÀQÛ¨sÀAqÁj §¸ÀªÀtÚ£ÀªÀgÀÄ : J.Dgï. ²æÃªÀÄÉ ªÀÄAiÀÄåMð
7. ±ÀgÀt gÀC£ÀÄ ¸ÁªÀÄ¸Á»vÀå : JZï. w¥ÉàgÀÄzÀæ¸Áé«Ä
8. §¸ÀªÉÃ±ÀégÀªÀZÀ£À¢Ã¦PÉ : JZï. w¥ÉàgÀÄzÀæ¸Áé«Ä
9. CPÀÌªÀZÀ£À aAvÀ£À : C£ÀÄ¥ÀÄ±ÀgÀ¸Áé«ÄUÀ¼ÀÄ
10. Sri Basaveswara and His contemporaries : A R Jayaram
11. The thoughts of Basava : N K Sanakalmath
12. Hand book of Veerashavism : S C Nadimath
13. Speaking of Siva : A.K. Ramanujan

KNB 020: ¥ÀwæPÉ2 ªÀÄzsÀåPÁ® PÀ£ÀßqÀ¸Á»vÀå ¸ÀA¸ÀÌøw (2:1=3 PÉærrmï)

Course Outcome

CO1: Deliberate in depth Religios background of Medival Kannada Lieterature
CO2: Identify in details with examples Political background of Medival Kannada Lieterature
CO3: Identify the characteristics of Kinds of Medival Kannada Lieterature
CO4: Deliberate in depth Influence of Dravidian Languages on Medival Kannada Lieterature

1. gÁdQÃAiÀÄ »£ÉßÉ: PÀÀ¼À ZÁ®ÄPÀågÀÄ ¤Ãrz À¸Á»vÀå¥ÉÆæÃvÀì¨É- ಪೋಷಣೆ, ºÉÆAiÀÄ¼ÀgÀÄ ¤Ãrz À¸ÀºÀPÁgÀ– ವೈಷ್ಣವ ಸಾಹಿತ್ಯ ಪೋಷಣೆ, PÀÁZÀÄj UÀ¼ÀªÀ ZÀ£ÀÁAzÉÆÃ®£À Jz ÀÄj¹ zÀ¥ÀæwÃvÀ«gÉÆÃ¢ü¤®ÄªÀÄUÀ¼ÀÄ - ಪ್ರತಿಭಟನೆ, ಸಮಾನತೆಯ ಘೋಷಣೆ; «dAiÀÄ£ÀUÀgÀ ÀCgÀ¸ÀgÀPÁ®zÀªÀ ÉÊPÀ– «ÃgÀ±ÉÊªÀzÀ ¸ÀÄÖUÀ¼À¥ÀÄ£ÀgÀÄvÁÜ£À
2. ಧಾರ್ಮಿಕ ಹಿನ್ನೆಲೆ : ಶೈವ, ವೀರಶೈವ, ವೈಷ್ಣವ, ಜೈನ ಧರ್ಮಗಳು: ಸ್ವರೂಪ¸À¹ ÀÜUÀw ¸ÀÀÀ É, eÉÊAzÀÀ¸ÀÜ Jz ÀÄj¹ zÀDvÀÀPÀUÀ¼ÀÄ: ªÉÊPÀ zÀ¸ÀÜzÀ¥ÀÄ£ÀgÀÄvÁÜ£À
3. ªÀZÀ£ÀgÀUÀ¼É ¸Á»vÀåUÀ¼À£ÀÄ£À¼É¸ÁªÀiÁfPÀ¤®ÄªÀÄUÀ¼ÀÄ: gÀUÀ¼Éಷಟ್ಪದಿ ಕೃತಿಗಳಲ್ಲಿ ಬಂದ ಕರ್ನಾಟಕದ ಧಾರ್ಮಿಕ ಪುರುಷರ ಚರಿತ್ರೆ : ಭಾಗವತ - ¨sÀQÛ¸Á»vÀåÀ ¥ÀÄ£ÀgÀÄvÁÜ£À,QÃvÀð£À¸Á»vÀåÀ ¸ÁªÀiÁfPÀ£ÉÆÃlUÀ¼ÀÄ
4. ಕನ್ನಡ ಭಾಷೆ- ¸Á»vÀåªÀÄÉÃ É vÀÀÄ¼À, vÉÀÄUÀÄ, ¸À¸ÀÌöÀ¨sÁµÉ- ¸Á»vÀåUÀ¼ÀÄ ©ÃgÀ zÀ ¥Àæ¨sÁªÀ¥ÀgÀ¸ÀàgÀ¸À§AzsÀ

¥ÀgÁªÀÄ±Àð£ÀUÀæAxÀUÀ¼ÀÄ

1. PÀ£ÀßqÀCzsÀåAiÀÄ£À¸À¸ÀA¸ÉÜAiÀÄ PÀ£ÀßqÀZÀjvÉæ¸ÀA¥ÀÄI UÀ¼ÀÄ 1, 2 ªÀÄvÀÄÛ 3
2. ¸ÀªÀÄUÀæPÀ£ÀßqÀ¸Á»vÀåZÀjvÉæ¸À¥ÀÄI UÀ¼À, ¨ÉAUÀ¼ÀÆgÀÄ «±Àé zÁå®AiÀÄ

3. PÀ£ÀßqÀ£Á£ÀzsÁå¬ÄUÀ¼ÀÄ : ²æ.ZÉ£Àß¥Àà ªÀÄoÀ
4. PÀ£ÁðlPÀ¸À¸ÀÌøw¸ÀªÀÄ¥ÉÃPÉë : JZï. w¥ÉàgÀÄzÁæ¸Áé«Ä
5. PÀ£ÀßqÀ±Á¸À£ÀUÀ¼À¸ÁA¸ÀÌøwPÀCzsÀåAiÀÄ£À : JA. azÁ£ÀAzÀªÀÄÆwð
6. eÉÊ£ÀzsÀªÀÄð : «ÄÃð CuÁÚgÁAiÀÄ
7. ¨ËzÀÞzsÀªÀÄð¸À¸ÀÌøw : (ಸಂ) ಅ.ನ. ಕೃಷ್ಣರಾಯ
8. PÀ£ÁðlPÀ¥ÀgÀA¥ÀgÉ : ¨sÁUÀ1 ªÀÄvÀÄÛ2
9. ZÀ¥ÀÆ¸Á»vÀå : ¦. «. £ÁgÁAiÀÄt
10.PÀ£ÁðlPÀ¸Á»vÀåCPÁqÉ«ÄAiÀÄ PÀ£ÀßqÀ¸Á»vÀå¥ÀæZÁgÀ ªÀiÁ°PÉAiÀÄ gÀ ªÀiÁ¯É¬ÄAiÀÄ¸À¥ÀÄl UÀ¼ÀÄ
11. ºÀjzÁ¸À¸Á»vÀå : Dgï. J¸ï. ¥ÀAZÀªÀÄÄT
12. ªÀZÀ£À¸Á»vÀå¸ÁgÀ : JA.Dgï. ²æÃ¤ªÁ¸ÀªÀÄÆwð

KNB 030: ಪತ್ರಿಕೆ: ೩ ದ್ರಾವಿಡ ಭಾಷಾವಿಜ್ಞಾನ (2:1=3 PÉærmï)

Course Outcome

CO1: Learn the details of Dravidian Lingustics
CO2: Specify in depth Dravida
CO3: Specify in details with examples Dravidian Phonetics
CO4: Identify in details with examples Dravidian Morphology

1. ದ್ರಾವಿಡ ಪದದ ನಿಷ್ಪತ್ತಿ – ದ್ರಾವಿಡ ಭಾಷೆಗಳ ಸಂಖ್ಯೆ, ಸ್ವರೂಪ ಮತ್ತು ವರ್ಗೀಕರಣ
2. ದ್ರಾವಿಡ ಭಾಷಾವಿಜ್ಞಾನದ ಇತಿಹಾಸ - ¸ÀA¸ÀÌøvÀ«ÄÃªÀiÁA¸ÀPÀgÀ – zÁæqÀ«ÄA¸ÁªÀiÁ£ÀåZÀjvÉæ – PÁ, Zï, mï, ¥ï. ¾ï, ¿ï
3. DPÀgÀªÀiÁUÀ¼ÀCzsÀåAiÀÄ£À: ¸ÀªÀÄ£Á¥ÀÄ°AUÀ ªÀZÀ£À«¨sÀQÛ¸ÀSÁå ªÁZÀPÀUÀ¼À ¸ÀªÀÄð£ÁªÀÄZÀjvÉæ:QæAiÀiÁ¥ÀzÀ ªÀÄvÀÄÛPÀÈzÀAvÀ ¥ÀæwÃPÀUÀ¼À
4. ಭಾಷಾವಿಜ್ಞಾನದ ದೃಷ್ಟಿಯಿಂದ ಮುಖ್ಯ ಕೆ¹zÀPÉëÃªÀ ¥ÀzÀUÀ¼À ¥ÀjZÀAiÀÄ

¥ÀgÁªÀÄ±Àð£ÀPÀÈwUÀ¼ÀÄ

1. ಭಾಷಾವಿಜ್ಞಾನದ ಮೂಲತತ್ತ್ವಗಳು : azÁ£ÀAzÀªÀÄÆwð. JA
2. ದ್ರಾವಿಡ ಭಾಷಾವಿಜ್ಞಾನ : ºÀ¥À£ÁUÀgÁdAiÀÄå
3. zÁæqÀ¸ÀASÁåªÁZÀPÀUÀ¼ÀÄ : ºÀ¥À£ÁUÀgÁdAiÀÄå
4. ದ್ರಾವಿಡ ಭಾಷಾವ್ಯಾಸಂಗ : ¸ÀUÀÄuÁ±À¸ÀªÀÄzsÀåªÀÄoÀ
5. ದ್ರಾವಿಡ ಭಾಷೆಗಳು : ¸ÀUÀÄuÁ±À¸ÀªÀÄzsÀåªÀÄoÀ
6. ಕನ್ನಡ ಭಾಷಾವ್ಯಾಸಂಗ : ¸ÀUÀÄuÁ±À¸ÀªÀÄzsÀåªÀÄoÀ
7. D¯ÉÃPÀ : JZï.J¸ï. ©¼Àj
8. ಕನ್ನಡ ಭಾಷೆಯ ರೂಪರೇಷೆಗಳು : «°AiÀÄA ªÀiÁqÀÄß
9. ಕನ್ನಡ ಭಾಷೆಯ ಸಂಕ್ಷಿ¥ÀÛZÀjvÉæ : r.J£ï. ±ÀAPÀgÀ¨sÀmÖ
10. PÀ£ÀßqÀ¨sಾಷೆಯ ಚರಿತ್ರೆ : ¥ÀÆuÉÃPÀgÀPÀæªÀÄ
11. ಕನ್ನಡ ಭಾಷೆಯ ಸ್ವರೂಪ : ಕೆ.ಎಂ. ಕೃಷ್ಣರಾವ್
12. ಐತಿಹಾಸಿಕ ಭಾಷಾವಿಜ್ಞಾನ : eÉ¸ï. PÀÄ¿î
13. ವರ್ಣನಾತ್ಮಕ ಭಾಷಾವಿಜ್ಞಾನ : eÉ¸ï. PÀÄ¿î
14. ದ್ರಾವಿಡ ಭಾಷೆಗಳ ತೌಲನಿಕ ಅಧ್ಯಯನ : n. ªÀÄÄÂAiÀÄ£ï
15. ತಮಿಳು ಭಾಷಾಚರಿತ್ರೆ : n. ªÀÄÄÂAiÀÄ£ï
16. ತೌಲನಿಕ ದ್ರಾವಿಡ ಭಾಷಾವಿಜ್ಞಾನ ಪರಿಚಯ : PÉ.PÀÄ¥ÀÄàUËqÀ
17. ಸಂಕ್ಷಿಪ್ತ ಕನ್ನಡ ಭಾಷಾ ಚರಿತ್ರೆ : ಎಂ.ಎಚ್. ಕೃಷ್ಣಯ್ಯ

18. A Comparative Grammar of the Dravidian Languages : R. Caldwell
19. History of Kannada Language : R Narasimahacharaya
20. Collected Papers on Dravidian Lingusistics : T. Burrow
21. Dravidian Comparative Phonology – A sketch : M.B. Emeneau
22. Dravidian Nouns : S.V. Shanmugam
23. Dravidian Verb Morphology : P.S. Subramanyam

KNB 040: ¥ÀvÉæ 4 PÀ£ÀßqÀ «ªÀıÉð - ¥ÀæÀ: DAiÀÄ¯ É¶R£ÀìÀÄ (3:1=4 PÉæqïì)

Course Outcome

CO1: Identify in depth Feminism
CO2: Write down in details with examples Modern Criticism
CO3: Identify the characteristics of Protest Literature
CO4: Specify the classification and characteristics of Kannada Criticism

DzÀ¤PÀ PÀ£ÀßqÀ «ªÀıÉð DAiÀÄ ¸ÀAzÀ¨sÀð ¥ÉæÃA ÀÛÉ «« zÀë¥ÀxÀìÀÄ zÉÃgÀÀÉìÀÄ

1 ªÀÄ½AiÀÄ wªÀÄä¥ÀàAiÀÄå: PÁªÀå±ÁÃ ªÀÇ zÀ±ÁÃ ªÀÇ
2 PÀªÀÄ¥ÀÄ : ºÉ¸À ¸Á»vÀåªÀÄvÀÄÛ ºÉ¸À ÀzÀ¶Ö
3 ¤gÀAd£À: ¥ÀæÀ²ÃÀ® ¸Á»vÀåUÉÆvÀÛUÀÀÄ UÀÀÄ
4 ±ÀAPÀgÀ ªÉÆPÁ ¥ÀÄu ÉÃPÀgÀ: ¸ÁéAvÀAvÀæÉ ÀÛ ºÉ¸ÀÀzÀ¸À ¸Á»vÀå
5 ZÀAzÀæÉRgÀ PÀA¨ÁgÀ: ªÀiÁvÀÄ PÀ¥ÀgÀ¥ÉÃªÀÄvÀÄÛ ÁgÀÀÃAiÀÄ ¸Á»vÀå
6 £ÁUÀgÁeï.r .Dgï. : PÀªÀÄ¥ÀÄ PÁªÀå À¥ÀæÉ zÀÀ£ÀªÀÄvÀÄÛ ÀÉ«ÃÄ
7 §gÀUÀgÀÄ gÁªÀÄZÀAzÀæÀ: §AqÁAiÀÄ ¸Á»vÀå ÀÄªÀÄA¸É
8 zÉÃªÀAiÀÄå ºÀgÀÉ: zÀ°vÀ ¸Á»vÀå: PÉ®ªÀÅ vÁwéPÀ aAvÀ£ÉUÀ¼ÀÄ
9 «dAiÀÄ zÀÀ§: ºÉ£ÀÄÀ ÀQ«ªÀÄÀwUÉMAzÀÄ ¥ÀæÉÃ±À
10 CgÀAzÀªÀÄ®UÀÂ: ¹ÛçÃ ÁzÀzÀ ªÀÀzÀ ÁzÀ— zÀªÀÀ¹ÛçÃ ÁzÀÀ¢UÉ

¥ÀgÁªÀıÀð£À ¸Á»vÀå

1 VgÀÃ¶ ÉÃ«AzÀgÁd : ¥ÀæÀÀt À¸ PÀ« ºÀ¦ , 2003
2 ©. zÁªÉÃzÀgÁªï : DAiÀÄ ÀÄUÀ¼À ¥À¸ÀgÀ¸Á»vÀå¥ÀæÀªÀÃÉUÀ 1992
3 gÀªÀÄvï vÀÀÄgÉ(¸À) : PÀ£ÀßqÀ ¸Á»vÀå«ÀÄªÀÄA¸ÉPÀ«, ºÀ¦ , 2001
4 gÀªÀÄvï vÀÀÄgÉ(¸À) : ªÀÄvÀÄvÀÉJvÀÄÛ À§UÉPÀ«, ºÀ¦ , 2005
5 ®PÀÀä PÉÆqÀÉ(¸À) : PÀ£ÀßqÀ «ªÀıÁð «ªÉÃPÀ¸ÀªÀÄÀR ¥ÀæÀ¨ É 2008
6 QÃwð£Áx ÀPÀÄvÀÀPÉÆÃn : AiÀÄUÀzÀ±ÁÃ ªÀÄvÀÄÛ ¸Á»vÀå zÀÀ£À
7 CgÀAzÀªÀÄ®UÀÂ(¸À) : ¹ÛçÃªÁzÀvÀÀPÀ£ÀßqÀ ¸Á»vÀå ZÀjvÉæ ¥ÀÄ UÀÀÄ

G¥À£Àå¸ÀPÀ ವಿಷಯಗಳು (Soft Core)

KNB 210: ಪತ್ರಿಕೆ: ೫.೧ ಭಾಷಾವಿಜ್ಞಾನ ಅಧ್ಯಯನ: ಕನ್ನಡ ªÁåPÀgÀtUÀ¼À vÀÄ®£ÁvÀäPÀ CzsÀåAiÀÄ£À

Course Outcome

CO1: Specify the classification and characteristics of Old Kannada Grammar and Works
CO2: Specify in details with examples Kannada Grammar
CO3: Identify in details with examples Samasa
CO4: Identify the classification and characteristics of Tense

F PÉÆæÃqÀ¥ÀvÀæzÀ «µÀAiÀÄUÀ¼À£ÀÄß ±À¨ÁÝ£ÀÄ±Á¸À£ÀzÀ DzsÁgÀzÀ ªÉÄÃ¯É CzsÀåAiÀÄ£ÀzÀ ªÀÄÆ®PÀ C¨sÁå¸À ಅಭ್ಯಾಸ ಮಾಡಬೇಕು. ಇತರ ವ್ಯಾಕರಣಗಳ ಸೂತ್ರಗಳನ್ನು ಅನುಷಂಗಿಕವಾಗಿ ಪ್ರಸ್ತಾಪಿಸಬೇಕು.

1. ಹಳಗನ್ನಡ ವ್ಯಾಕರಣಗಳು : ಕರ್ತೃ, ಕಾಲ, ಸ್ವರೂಪ, ಸ್ಥಾನ, ವೈಶಿಷ್ಟ್ಯ, ಕನ್ನಡ ವರ್ಣಸಮಾಮ್ನಾಯ- ªÀÄÆ® ¸ÀégÀUÀ¼ÀÄ – ¾¿- PÁ¼À PÁåPÀ« ZÁgÀ ²y®¢é
2. ¸ÀAzsÀ¢ü– ªÀåd£À¸ÀA¢ü; °AUÀ ®PÀët, ¸ÀAzsÁå£À ªÁZÀPÀ ®PÀët, ¸ÀAzsÁå£À ¥ÀæwAiÀÄUÀ¼ÀÄ, «¨sÀQÛ ®PÀët, ¸ÀAzsÁå£À ¥ÀæwAiÀÄUÀ¼ÀÄ
3. ¸ÀªÀÄ¸À ®PÀët, ¸ÀAzsÁå¸À ತತ್ಪುರುಷ, ಕರ್ಮಧಾರೆಯ, ದ್ವಿಗು, ಅಂಶಿ, ಬಹುವ್ರೀಹಿ, ದ್ವಂದ್ವ, ಗಮಕ ªÀÄvÀÄÛ CjÀ¸ÀªÀÄ¸À
4. Dಖ್ಯಾತ ಪ್ರತ್ಯಯ, ಪುರುಷತ್ರಯ, ಕಾಲತ್ರಯ – vÀzÀÞw ¸ÀªÀÄ¸À ¸ÀA¢ü– C¥ÀªÁzÀgÀvÀß§Ä

¥ÀgÁªÀÄ±Àð£À UÀæAxÀUÀ¼ÀÄ

1. ¦æAiÀÄPÀ, ¨ÉÆÃ£ÀUÀ¼ÀÄ : r .J¯ï. £ÀgÀ¹AºÁZÁgï
2. D¯ÉÆÃPÀ : JZï.J¸ï. ©½j
3. ¥ÁæaãÀPÀ£ÀßqÀ ªÁåPÀgÀtUÀ¼ÀÄ : J A«. ¹ÃvÁgÁªÀÄAiÀÄå
4. ªÁåPÀgÀtUÀ¼ÀÄ : «. ¹ÃvÁgÁªÀÄAiÀÄå
5. ಕನ್ನಡ ವ್ಯಾಕರಣ ಪರಂಪರೆಯ ಮೇಲೆ ಸಂಸ್ಕೃತದ ಪ್ರಭಾವ : ಪಿ. ಶ್ರೀಕೃಷ್ಣಭಟ್
6. ಕನ್ನಡ ಭಾಷಾವಲೋಕನ : PÉ PÀÄ±Á®¥Àà UËqÀ
7. ಕನ್ನಡ ಭಾಷೆ ಮತ್ತು ವ್ಯಾಕರಣಗಳ ಅಧ್ಯಯನ : PÉ PÀÄ±Á®¥Àà UËqÀ
8. ±À¨ÁÝ£ÀÄ±Á¸À£ÀzÀ «ªÀÄ±Áð PÀªÀÄ¯ÁPÀgÀ PÀ±ÉÃ UÀ¼ÀÄ : «. ²ªÁ£ÀAzÀ
9. ±À¨ÁÝ£ÀÄ±Á¸À£À : (¸À) n.«. ªÉAPÀlZÀ®±Á¹ÛçÃ
10. PÀ«gÁd PÀ±ÀÄÀ¸ÁÛ£À«ªÀÄ±ÉÃ : G¥ÀzÀÄUÀgÀ ªÀÄÄ±ÀÖ
11. ಕನ್ನಡ ವ್ಯಾಕರಣಗಳ ತೌಲನಿಕ ವಿಶ್ಲೇಷಣೆ : zÉÃqÀÄÁ°Ä
12. ±ÉÃzÀ ÉÆÃPÀ : J£ï.J¸ï. vÁgÁ£ÁxÀ
13. PÀ£ÀßqÀ ªÁUÀÝ±Àð£ÀUÀ¼ÀÄ : r .J£ï. ±ÀAPÀgÀ¨sÀÖ
14. ಭಾಷೆಯ ಸುತ್ತಮುತ್ತ : PÉ«.£ÁgÁAiÀÄt
15. ಕನ್ನಡ ಭಾಷಾ ಕೈಪಿಡಿ : ¸ÀA¥ÁzÀPÀgÀÄ
16. ಭಾಷೆ : ¸À : PÉ«. £ÁgÁAiÀÄt
17. PÀ£ÀßqÀ PÉÊ r : ©JA²æÃ

KNB 210: ¥ÀwæPÉ 5.2 eÁ£À¥ÀzÀ PÀ¯ÉUÀ¼ÀÄ

Course Outcome

CO1: Understood the concept of Folk theatre setting
CO2: Able to understand the different forms of Folk arts
CO3: Able to understand the significance of various Folk festivels
CO4: Understand the concept of Folk Culture

1. ¸À¸ÀÌøw JAzÀgÉãÀÄ? ¸ÀA¸ÀÌøwAiÀÄ ®PÀëtUÀ¼ÀÄ, £ÁUÀjPÀvÉ ªÀÄvÀÄÛ ¸À¸ÀÌøw, d£À¥ÀzÀ ¸À¸ÀÌøw ªÀÄvÀÄÛ ¸À¸ÀÌøwÃPÀgÀt, d£À¥ÀzÀ zÀÈ¶Ö
2. eÁ£À¥ÀzÀgÀAUÀ¨sÀÆ«ÄAiÀÄ ¥ÀjPÀ®à£É, ¸ÀA¸ÀÌøw¸ÀªÀÄÄzÀæ d£À¥ÀzÀ ¸ÀªÀÄÄzÁAiÀÄ, ¨sËvÁgÀ¸ÀÄ, eÁvÉæ ªÀÄvÀÄÛ G¯ÉèÃR, £ÀA©PÉ ¸ÀA¥ÀæzÁAiÀÄ DZÀgÀuÉ ªÀÄvÀÄÛ ªÀiÁ£À
3. (ಅ) ಕರ್ನಾಟಕ ಜನಪದ ಕಲೆಗಳು : ಹಿನ್ನೆಲೆ, ಸ್ವರೂಪ, ಮಹತ್ವದ ಪ್ರಕಾರಗಳು : ವೇಷಗಾರರು, ¤ÃgÀUÁgÀgÀÄ, vÉÆUÀ®Ä ¨ÉÆA¨É, ZÉÆÃ PÉÆÃ® gÀ, qÉÆ¼ÀîÄ PÀÄtÂvÀ ¸ÀA¼É
(D) PÀ£ÁðlPÀ d£À¥ÀzÀ gÀAUÀ¨sÀÆ«Ä - »£É߯É, ¸ÀA¸ÀÌøw¸ÀªÀÄÄzÀæAiÀÄ ªÀÄ£ÀgÀAd£É , zÉÃqÁØ, ¸ÀtÚ
4. ¨sËwPÀ eÁ£À¥ÀzÀ d£À¥ÀzÀ DAiÀÄÄzsÀUÀ¼ÀÄ PÉÃ¸À§ÄzÀÝgÀ, d£À¥ÀzÀ DlUÀ¼ÀÄ, d£À¥ÀzÀ ªÉÊzÀå DPÁ±À eÁ£À¥ÀzÀ

¥ÀgÁªÀÄ±Àð£À UÀæAxÀUÀ¼ÀÄ

1. PÀ£ÁðlPÀ eÁ£À¥ÀzÀ	: PÀ£ÁðlPÀ eÁ£À¥ÀzÀ CPÁqÉ«Ä
2. PÀ£ÁðlPÀ d£À¥ÀzÀ PÀÆlUÀ¼ÀÄ	: UÉÆgÀÄ ZÀ£ÀߧøÀªÀ
3. ಕರ್ನಾಟಕ ಕಲೆಗಳು ೩ನೇ ಸಂಪುಟ ಕರಕುಶಲ ಕಲೆಗಳು : ಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಿಷvÀÛ ¨ÉAUÀ¼ÀÆgÀÄ	
4. ¸ÀªÀÄUÀæ eÁ£À¥ÀzÀ ¨sÁUÀ- 1, 2	: PÀ£ÁðlPÀ eÁ£À¥ÀzÀ CPÁqÉ«Ä
5. £ÀªÀÄä ¸ÀÄwÛ£À £ÀA©PÉUÀ¼ÀÄ	: r.PÉ.gÁeÉÃAzÀæ
6. PÀ£ÁðlPÀ ºÀ§âUÀ¼ÀÄ	: ¹.J¸ï. ²ªÀPÀÄªÀiÁgÀ¸Áé«Ä
7. eÁ£À¥ÀzÀ ¸Á»vÀå ¸ÀA¥ÀÄlUÀ¼ÀÄ	: PÀ£ÁðlPÀ «±Àé«zÁå®AiÀÄ, zsÁgÀªÁqÀ
8. eÁ£À¥ÀzÀ ¸ÀA±ÉÆÃzsÀ£É	: gÁUËå

KNB 210: ¥ÀwæPÉ 5.3 ZÀA¥ÀÆ PÁªÀå ¸Á»vÀå (PÀ£ÀßqÀ ¸Á»vÀå ZÀjvÉæ 13 £ÉÃ ±ÀvÀªÀiÁ£À)

Course Outcome

CO1: Able to understand the historical background of Kannada Poets
CO2: Understand the attitudes of Kannada Poets
CO3: Understand the different forms of Kannada Chandasu
CO4: Understand the relastionship between religion and Literature

¥ÀoÀåUÀ¼ÀÄ ªÀÄvÀÄÛ PÀÈwUÀ¼ÀÄ

1. ¥ÀæªÀÄÄR PÀÈwUÀ¼ÀÄ : ¸ÀªÀÄPÁ°Ã£À zÀÈ¶Ö, ¨sÀQÛಮತನಿಷ್ಠೆ, ಧಾರ್ಮಿಕ ಶಾಸ್ತ್ರ ಒಲವು, ಪ್ರಸಾರಾಕಾಂಕ್ಷೆ, ¯ËQPÀ ¸ÀÄSÉÆÃªÀÄ G¥ÀAiÀÄÄPÀÛvÉ
2. ¥ÀæPÁgÀ ZÀA¥ÀÆ, ಷಟ್ಪದಿ, ರಗಳೆ ಇತ್ಯಾದಿ ನೆಲೆಯಲ್ಲಿ: d£À¥ÀPÁªÀå, zÉÃ¹ PÀ, ºÁ¸Àå gÀ, PÉÆÃ¥À¸ÀªÀÄÄzÀæ ªÀÄvÀÄÛ ªÀiÁ£À, gÀ¸ÀªÁPÀ

3. PÀxÉUÀ¼ÀÄ : DAqÀAiÀÄgÀ ªÀÄUÀ¼ÀÄ, PÀ¼ÉzÀ ¥ÀzÀ, ¥ÀÄlÖªÀÄä£À ªÀÄUÀ, ¸ÉÆÃªÀÄ, gÁªÀÄ, PÀ¯Áå, ZÉÆAqÉ, ¥ÀÄgÀÄµÀ, PÉ¸ÀgÀÄ ªÀÄ£ÀÄµÀå

4. ºÉÆ¸À PÁªÀå ªÀÄvÀÄÛ zÉÃ¹ PÀxÉUÀ¼ÀÄ : PÉÆAiÀÄÝ ÚÁªÀÄ ZÀAzÀæ£ÀAiÀÄ ªÀÄÄÛ, CªÀÄÈvÀ

¥ÀgÁªÀÄ±Àð£ÀUÀæAxÀUÀ¼ÀÄ

1. PÀ£ÀßqÀ CzsÀåAiÀÄ£À ¸À¸ÀÜAiÀÄ PÀ£ÀßqÀ ¸Á»vÀå ZÀjvÉæ ¸ÀA¥ÀÄl 4, ¨sÁUÀ 2 : ªÉÊ¸ÀÆgÀÄ «
2. ¸ÀªÀÄUÀæ PÀ£ÀßqÀ ¸Á»vÀå ZÀjvÉæ ¸ÀA¥ÀÄl UÀ¼ÀÄ ¸ÀA¥ÀÄl 4 : ¨ÉAUÀ¼ÀÆgÀÄ ««
3. PÀ£ÀßqÀ ¸Á»vÀå ZÀjvÉæ : gÀA²æÃ ªÀÄÄUÀ½
4. ZÀA¥ÀÆ PÀxÉUÀ¼ÀÄ (¸ÀªÀÄUÀæ PÀ£ÀßqÀ ¸Á»vÀå ZÀjvÉæ ¸ÀA.2) : ¨ÉAUÀ¼ÀÆgÀÄ ««
5. ಷಟ್ಪದಿ ಸಾಹಿತ್ಯ (ಸಾಮಾನ್ಯನಿಗೆ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ ಸಂ. ೫) : ¨ÉAUÀ¼ÀÆgÀÄ ««
6. ±Á¸À£À ¸Á»vÀå (¸ÀªÀÄUÀæ PÀ£ÀßqÀ ¸Á»vÀå ZÀjvÉæ ¸ÀA.3) : ¨ÉAUÀ¼ÀÆgÀÄ ««
7. «ÃgÀ±ÉÊªÀzsÀªÀÄð zÀ±Àð£À ¨sÁUÀ 2 ªÀÄvÀÄÛ 3 : eÉ.¸ï.J¸ï. UÀÄgÀÄ¸ÁéªÀÄ
8. ¦ÃpPÉUÀ¼ÀÄ, ¨ÉÆÃzsÀ£ÉUÀ¼ÀÄ : r.J¯ï. £ÀgÀ¹AºÁZÁgï
9. ºÀjºÀgÀ zÉÃªÀ : PÀ£ÁðlPÀ ¸ÀAWÀ gÁªÀÄ PÁ¯ÉÃdÄ, PÉÆ¥Àà ±ÁgÀ
10. ®QëöäÃ±À gÀZÀ£ÁPÀ : JZï. w¥ÉàgÀÄzÀæ¸Áé«Ä
11. ¸Á»vÁå«ÄÃPÀ : J.Dgï. ²æÃªÀÄAvÀAiÀÄå
12. ºÀUÀÄ¼ÀAiÀÄ CzsÀåAiÀÄ£ÀUÀ¼ÀÄ : J.A. azÁ£ÀAzÀªÀÄÆwð

<u>ವಿಶೇಷ ಉಪ ಪ್ರಧಾನ ವಿಷಯ UÀ¼ÀÄ</u> **(Special Soft core)**

KNB 220: <u>¥ÀwæPÉ 6.1. PÀ£ÀßqÀ ¸À¸ÀÌøw ªÀÄvÀÄÛ £ÁUÀjÃPÀvÉ(DAiÀÄÝ ¯ÉÃR£ÀUÀ¼ÀÄ) (3:1=4 PÉærrmï)</u>

Course Outcome

CO1: Learn the details of Culture
CO2: Understand the details of Kannada Culture
CO3: Write down the details of Kannada Culture and Civilization
CO4: Write down the characteristics of Karnataka Culture
CO5: Learn the relationship between Women and Culture

1. ¸À¸ÀÌøw JAzÀgÉÃ£ÀÄ? - zÉÃªÀ£ÀÆgÀÄ £ÀgÀ¹AºÀ±Á¹Ûç
2. ¸À¸ÀÌøw ªÀÄvÀÄÛ £ÁUÀjÃPÀvÉ - qÁ. J£ï. ²æÃPÀAoÀ±Á¹Ûç
3. ¸À¸ÀÌøw ªÀÄvÀÄÛ ¸Á»vÀå - J.J£ï. ªÀÄÆwðgÁªï
4. PÀ£ÁðlPÀ ¸À¸ÀÌøw - JZï. w¥ÉàgÀÄzÀæ¸Áé«Ä
5. «ZÁgÀPÁæAwUÉ DºÁé£À - PÀÄªÉA¥ÀÄ
6. PÀ£ÀßqÀ ªÀÄvÀÄÛ vÀÀªÀÄ£ÀvÀ£ÀUÀ¼ÀÄ ¸ÀUÉ - ©.J.²æÃ
7. ºÉÆ¸À ¸ÀAUÀvÀzÉÆqÉ ªÀÄvÀÄÛ ªÀÄlÖ ªÉÆÃªÀiÁ¸À ªÀÄPÀ ºÀ£ÀÄ¸ÀAzÀå ¸ÀÄAzÀgÀvÁqÀ - ¥ÀÆZÀAvÉÃ
8. d£À¥ÀzÀgÀ ªÀÄvÀÄÛ Ew¸À ºÁ¸À - ಕೃಷ್ಣಮೂರ್ತಿ ಹನೂರು
9. ಆಧುನಿಕ ಸಾಹಿತ್ಯ ಮತ್ತು ಸಾಮಾನ್ಯ ಮನುಷ್ಯ - r .Dgï. £ÁUÀgÁeï
10. zÀ°vÀ ªÀÄvÀÄÛ ªÀÄ»¼É - ¸Á gÁ C§÷Ä¯ï PÀgÀ

¥ÀoÀåªÀ ÄÄR® :

1. ¸ÀA¸ÀÌøv PÀ£ÀßqÀ ªÀÄvÀÄÛ ¸ÀA¸ÀÌøv E¯ÁSÉ PÀ£ÀßqÀ ¨sÀ£ÀÀeÉ. gÀ¸ÉÛ¨ ÉUÀ¼ÀÆgÀ 2007,
2. ¨sÁgÀwÃAiÀÄ ¸ÀA¸ÀÌøw , qÁ J¸ï. ²ªÀPÀÄªÀÄ¹ é¥ÀæÁgÁAUÀ ªÉÊ¸ÀÆgÀÄ «.«. ªÉÊ¸ÀÆgÀÄ 1969
3. UÀzÀå« ºÁgÀ 2, PÀ£ÀßqÀCzÀåAiÀÄ£À ¸À¸ÉÜ ªÉÊ¸ÀÆgÀÄ «.«. ªÉÊ¸ÀÆgÀÄ 1983
4. PÀAiÁðI PÀ ¸ÀA¸ÀÌøw ¸ÀAÃÃPÉë– JZï. w¥ÉàgÀÄzÀæ¸Áé ÀÄ 2011, r .«.PÉ ªÀÄÆwð ¥ÀæPÁ±À£À ªÉÊ¸ÀÆgÀÄ
5. PÀÄ ÉÆ¥ÀÄ ¸ÀªÀÄUÀæ UÀzÀå ¸À¥ÀÄ -2, 2013, ರಾಷ್ಟ್ರಕವಿ ಕುವೆಂಪು ಪ್ರತಿಷ್ಠಾನ, ಕುಪ್ಪಳ್ಳಿ, ಶಿವಮೊಗ್ಗ
6. ªÀiÁvÀÄvÀÄ ÉÆvÀÄÛ ÀÄ§UÉ (PÀ£ÀßqÀ ¸Á»vÀå« ÀÄgÀ ÀiÁ¸É) - ¸À: gÀ ªÀÄÄvï vÀÄ ÃPÉgÉ PÀ«, ºÀ¦ 2011,
7. «ªÀÄ±ÉðAiÀÄ «ªÀÄ±Éð – PÉ. ¥ÀÄ ðZÀzÀæ±ÉÃRgï ¹é¥À ÀÄ ¥ÀæPÁ±À£À ªÉÊ¸ÀÆgÀÄ 2009
8. ºÉÆ¸ÀUÀ ÀÄ ¥ÉæÆlZï.eÉ®PÀ ÀÄÉqÀ ÀC©£ÀzÀ£À UÀ æ À 2004, vÀÄQ£À ªÉPÀ Ài ÀÄ ¸ÁgÀPÀ UÀæ ÀiÀÄ É ªÉÊ¸ÀÆgÀÄ
9. Cª ÀÄzÀ ª ÀÄvÀÄÛ UÀ ÀÄqÀ r .Dgï. £ÁUÀgÁeï, 2009, CPÀëgÀ¥ÀæPÁ±À£À ºÉUÉÎÆqÀ ¸ÁUÀgÀ PÀAiÁðI PÀ
10. ªÀÄ»¼É ªÀÄvÀÄÛ PÀ£ÀßqÀ ¸Á»vÀå ¸À: f .J¸ï. ²ªÀgÀÄzÀæ¥Àà 1979, ¥ÀæÁgÁAUÀ ¨ÉAUÀ¼ÀÆgÀÄ ««, ¨ÉAUÀ¼ÀÆgÀÄ

¥ÀgÁªÀ ÄÀ±ÀðPÀ UÀæAxÀUÀ¼ÀÄ

1. PÀAiÁðI PÀ ¸ÀA¸ÀÌøw ¸ÀAÃÃPÉë : JZï. w¥ÉàgÀÄzÀæ¸Áé ÀÄ
2. ±ÀÆ Û±ÁgÀzÀ ÀiÀÄ ªÀiÁ¼À : r .Dgï. £ÁUÀgÁeï
3. ¸ÁA¸ÀÌøwPÀCzÀåAiÀÄ£À : gÀ ªÀÄÄvï vÀÄ ÃPÉgÉ
4. ²µÀÖ¸Á»vÀå : ©.JA.²æÃ
5. ¸À¸ÀÌøw : r .«.f
6. f ÃªÀ£À ËAzÀAiÀÄð ªÀÄvÀÄÛ ¸Á»vÀå : r .«.f
7. ¸À¸ÀÌøv PÀ«UÀ¼À : r .Dgï. £ÁUÀgÁeï
8. ¨sÁgÀwÃAiÀÄ ¸À¸ÀÌøw : (ಸಂ) ಅ.ನ.ಕೃಷ್ಣರಾಯ

KNB 220: ¥ÀwæPÉ 6.2 ªÀÄ»¼É ¸ÀA«zsÁ£À-¸Á»vÀå (DAiÀÄÝ PÀ«vÉUÀ¼ÀÄ)

Course Outcome

CO1: Able to understand the different arguments regarding women status
CO2: Students must learn the concept of Feminism
CO3: Learn the different types of Feminism
CO4: Learn the contribustion of Kannada Poets for feminism in 20th and 21st century

1. ªÀÄ»¼Á ªÁzÀ ªÀÄvÀÄÛ ªÀÄ»¼Á ¸Á»vÀå - «dAiÀiÁzÀ§¨ÉÃ
2. ಹೆಣ್ಣು ಮತ್ತು ಭಾಷೆ : ಅಭಿವ್ಯಕ್ತಿ - JZï.J¸ï. gÁWÀªÉÃAzÀæ ¸Áé ÀÄ ï
3. ¨sÁgÀwÃAiÀÄ ¹ Ûçà ÁzÀ(¦ ÃvÀÈPÁ ¨sÁUÀªÉÆzÀ® ¨sÁUÀ) - ªÀÄ£ÀÄ ZÀPÀæªÀwð
4. PÀ ÀÄ¤¹ Ûçà Á¢ «ªÀÄ±Éð - «dAiÀiÁzÀ§¨ÉÃ
5. ¥ÁqÀðUÀ¼À ÀÄè¹ Ûçà ÀÄvÀ ÀÄ¥ÀæwgÉÆÃzsÀ - UÁAiÀÄwæ£ÁªÀqÀ
6. d£À¥ÀzÀPÁªÀå UÀ¼ÀÄ : ºÉtÂ£À¥ÀæªÀÄÄ¸À ÀÄ ªÀÄ ªÀÄ±À±À ÀÆ ÀiÀÄ PÀ£ÀßqÀ - ¸À«vÁ ¨sÀ£ÀÄ ÀÄ¸ÀªÀÄÄ ÀÄÉqÀ
7. ಚಕ್ರಾಧಿಪತ್ಯ, ರಾಷ್ಟ್ರ ಮತ್ತು ಸಾಹಿತ್ಯಕ ಪಠ್ಯ - ¸ÀA xÁgÀÄ ªÀÄvÀÄÛ PÉ®ºÀ vÀ C£ÀÄ JZï.J¸ï. gÁWÀªÉÃAzÀæ¸Áé ÀÄ ï
8. ªÀÄÄ¹èA ªÀÄ»¼Á ¸À ªÀÄ¸ÉåUÀ¼ÀÄ ªÀÄvÀÄÛ ¥ÀjºÁgÉÆÃ¥Á AiÀÄUÀ¼ÀÄ – ಕೆ. ಷರೀಫಾ

9. zÀvÀ¸Á›vÀâÀèª Ã›¼É - zÀgÀÀ¥ÁÉ‹ ªÀÁ®UÀÀÛ

10. ªÁ¸ÀÄÀÉ¸Á›vÀåª ÄvÀÄÛ ÆRQ - C£Ã¥ÀiÀÄÁ ¤gÀd£À

¥ÀoÀå ªÀÄÆ®:

1. **£Á :zÁ-¢UÀvÀ** – «dAiÀÄÁzÀ‰¼É 1997, gÀªÀÁ ¥ÀæÁ±À£À ªÀÄÉ¸ÀÆgÀÄ
2. **¨sÁgÀwÃAiÀÄ ¹çÃÁzÀ** – CPÀgÀ¥ÀæÁ±À£À 1993, ºÉUÉÎÆqÀ, ¸ÁUÀgÀ
3. **ಹೆಣ್ಣು ಮತ್ತು ಭಾಷೆ** - ¸À: JZï.J¸ï. ²æÃÀÄw, ²ª ÁÉ£ÀzÀJ¸ï. «gÀÀÀÄbÀ 2007, ªÃ›¼Á CzÀåAiÀÄ£À PÉÃAzÀæPÀÀÀ «±ÀzÁ®AiÀÄ, ºÀA
4. ¹çÃ Á¢ ¥ÀæÃ PÉ ¸À: ©.J£ï. ¸ÄªÀvÁææÁ¬Ä, J£ï.UÁAiÀÄwæ 1995, PÀÁðI PÀ¯ÁRQAiÀÄgÀ¸ÀAWÀ ZÁª ÀÄgÁd¥ÃmÉ¨ ÉAUÀÀÆgÀÄ
5. «**gÀÀÀÉ** – UÁAiÀÄwæ£Áª ÀÀ 1997, J£ï.Dgï.J.JA. JZï. ¥ÀæÁ±À£À PÉÃmÉ±ÀgÀ zÀÉ PÀÀÀ
6. **§UÉ** ¸À© º Á¨ ÀÉ«ÃUÉqÀ 2001, ¯ÉÃ›AiÀÄÁ ¥ÀæÁ±À£À §¼Á
7. ¹**çÃ Á¢ ¸Á›vÀå«ª ÀÄ±É** (¸À) vÉd¹é ¤gÀd£À 1994, PÀÀÀ¸ÀAWÀ PÉ¸ïÖPÁ Ééï, ¨ ÉAUÀÀÆgÀÄ
8. ª**ÀÄÀª Ã›¼Á¸ÀªÉzÀÉ** – ಕೆ. ಷರೀಪಾ, ೨೦೧೧, ಅಂಕಿತ ಪುಸ್ತಕ, ಬೆಂಗಳೂರು
9. ¹**çÃ ÁzÀª ÄvÀÄÛ ¨sÁgÀwÃAiÀÄvÉ** – zÀgÀÀÃzÉ‹ ªÀÁ®UÀÀÛ 1998, ZÉvÀÀ§ÄPï ºË¸ï, ªÄÉ¸ÀÆgÀÄ
10. ¸Á›vÀåª ÄvÀÄÛ ¥ÀÀ – C£Ã¥ÀiÀÄÁ ¤gÀd£À 2008, r.«.PÉ ªÀÄÆwð, ªÄÉ¸ÀÆgÀÄ

¥ÀgÁª ÀÄ±ÀÀ£ÀUÀæAxÀUÀ¼ÀÄ

1. ªÃ›¼Á¸Á›vÀåZÀjvÉæ : (¸À) JZï.J¸ï. ²æÃÀÄw
2. ಹೆಣ್ಣು ಮತ್ತು ಭಾಷೆ **: (¸À)** JZï.J¸ï. ²æÃÀÄw, ²ª ÁÉ£ÀzÀJ¸ï. «gÀÀÀÄbÀ
3. ¹**çÃ Á¢ ¥ÀæÃ PÉ** **: (¸À) ©.J£ï. ¸ÄªÀvÁææÁ¬Ä, J£ï. UÁAiÀÄwæ**
4. «gÀÀÀÉ : UÁAiÀÄwæ£Áª ÀÀ
5. ವಿಜಯಾನ್ವೇಷಣಂ : (¸À) J¸ï.r. ±ÀPÀÀÁ

ªÀÄgÀªÀiÁ±ÀðPÀ ¥ÀjZÀAiÀÄ

ಪ್ರಧಾನ ವಿಷಯ UÀ¼ÀÄ (Hard core)

KNC 050: ¥ÀwæPÉ 1 vËî¤PÀ ¸Á»vÀå: ¥ÁæaãÀ ªÀÄºÁPÁªÀå ªÀÄvÀÄÛ £ÁlPÀ (2:1=3 PÉærrmï)

Course Outcome

CO1: Learn in depth Homer's Illiad
CO2: Understand in details with examples Hamlet
CO3: Understand the classification and characteristics of Compartive Literature
CO4: Understand in depth Girish Karnad's Tughlaq

1. vËî¤PÀ ¸Á»vÀåzÀ ¸ÀégÀÆ¥À - gÁ¶ÖçÃAiÀÄ ¸Á»vÀå eÁUÀwPÀ ¸Á»vÀåªÀÄvÀÄÛ ¸ÁªÀiÁ£Àå ¸Á»vÀå - vËî¤PÀ ¸Á»vÀåzÀ¥ÀxÀ¢±ÉUÀ¼ÀÄ, ¹zÁÞAvÀgÀÆ¥ÀªÀÄvÀÄÛ¥ÀæAiÉÆÃUÀ
2. vÀÄWÀèPï – PÀ£ÀßqÀ, PÀ«vÉ UÀ½ - D®ãïð PÀÄÄ (C£ÀÄ r.J. ±ÀAPÀgï)
3. ºÁåªÀÄèmï – PÉ.J¸ï. ¨sÀlÖ£À, gÀÄvÉÆÃ – PÀªÀÄé¥ÀÄ
4. (C) Illiad – Homer Prescribed Books 1,7
   (D) Aeneid – Virgil Prescribed Books 5, 6

¥ÀgÁªÀÄ±Àð£À UÀæAxÀUÀ¼ÀÄ

1. ¥Á±ÁÑvÀå ªÀÄºÁPÁªÀåUÀ¼ÀÄ : ²æÃPÀAoÀvÀÃxÀð UÉ(¸À) ¥ÀæPÁ±À£À «
2. ªÀÄºÁPÁªÀå ¸ÀégÀÆ¥À : f.J¸ï. ²ªÀgÀÄzÀæ¥Àà
3. ªÀÄºÁPÁªÀå®PÀë : n. «. ªÉAPÀlZÀ®±Á¹ÛçÃ
4. Comparative Literary studies : S.S. Pawar
5. Comparative Literary and Literary Theory : Ulrich Weisstein
6. Comparative Literature Method & perspective : (Ed) Newton P Stalknecht
7. Method and perspective Discriminations
   (First two Essays on Comparative Literature) : Horst Frenz

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KNC 020: ¥ÀwæPÉ 2 DzsÀÄ¤PÀPÀ£ÀßqÀ ¸Á»vÀå ZÀ½ªÀ½ (2:1=3 PÉærrmï)

Course Outcome

CO1: Learn in details Romaneticism
CO2: Learn the classification and characteristics of Progressive Liteature
CO3: Learn the characteristics of Modern Literature
CO4: Understand in details with examples Dalit Literature

1. £ÀªÉÆÃzÀAiÀÄ ¸Á»vÀå: ¥ÀæªÀÄ ¸À¥ÀÆgÀÛ, ÉgÉÆÃªÀiÁåAn¹ ¸À, gÁ¶ÖçÃAiÀÄvÉ ¸ÀÄzsÁgÀuÁªÁzÀ, zÉÃ±ÃAiÀÄvÉ £ÁqÀÄ £ÀÄr
2. ¥ÀæUÀw²Ã® ¸Á»vÀå: ¥ÀæªÀÄ ¸À¥ÀÆgÀÛ, ªÀiÁPÀìð ªÁzÀ, ªÀ Á¸ÀÛªÀÁzÀ

3. £ÀªÀå¸Á»vÀå: ¥ÀæªÀÈwÛ¥ÀæªÀÄÄRgÀÄ,EC¹ÛvÉéAzÀ,AC¸ÀAUÀvÀªÁzÀ
4. zÀ°vÀ§AqÁAiÀÄ: ¥ÀæªÀÈwÛ¥ÀæªÀÄÄRgÀÄ,ÉªÀÄPÀÌÁzÀ,CA¨ÉÃqÀÌgïªÁzÀ,¯ÉÆÃ»AiÀÄªÁzÀ, ¹ÛçÃªÁzÀ

¥ÀgÁªÀÄ±ÀðUÀæAxÀUÀ¼ÀÄ

1. ºÉÆ¸ÀUÀ£ÀßqÀ PÁªÀåzÀ C¨sÀÄåzÀAiÀÄ	: ²æÃªÀiÁ£À ªÀiÁzsÀªÀgÀÄ
2. ಹೊಸಗನ್ನಡ ಕವಿತೆಯ ಮೇಲೆ ಇಂಗ್ಲಿಷ್ ಕಾವ್ಯದ ಪ್ರಭಾವ	: J¸ï. C£ÀAvÀ£ÁgÁAiÀÄ
3. AiÀÄÄUÀzsÀªÀÄð ºÁUÀÆ ¸Á»vÀåzÀ±Àð£À	: QÃvÀð£ÁxÀ PÀÄvÀðPÉÆÃn
4. ¥ÀæUÀw²Ã® ¸Á»vÀå	: C£ÀPÀÈ(¸À)
5. ¨sÁgÀwÃAiÀÄ ¥ÀæwªÉÄAiÀÄ±Á¸ÀÛç	: ನಾಡಿಗ ಕೃಷ್ಣಮೂರ್ತಿ
6. ºÉÆ¸ÀUÀ£ÀßqÀ¸Á»vÀå	: ಎಲ್.ಎಸ್. ಶೇಷಗಿರಿರಾವ್
7. 20£ÉÃ±ÀvÀªÀiÁ£ÀzÀ PÀ£ÀßqÀ¸Á»vÀå	: qÁ §¸ÀªÀgÁd ¸ÁzÀgÀ
8. PÀªÁåI PÀ¸ÀAUÁw	: PÀ£ÀßqÀC©üªÀÈ¢Þ¥ÁæzsÁPÁgÀ¥ÀæPÀluÉ
9. Impact of Marxism on Indian life and Literature	: H.M. Nayak (Ed)
10. Heritage of Karnataka	: R.S. Mugali

KNC 030: ¥ÀwæPÉ3 ¨sÁgÀwÃAiÀÄ PÁªÀåªÀÄÄ«ÄÃªÀiÁA¸É (2:1=3 PÉærrmï)

Course Outcome

CO1: Write down the characteristics of Sanskrit Poetics
CO2: Learn in details with examples Kannada Poetics
CO3: Learn in details with examples Tamil Poetics
CO4: Identify the characteristics of Folk Poetics

1. ¸ÀA¸ÀÌøvÀPÁªÀåªÀÄÄ«ÄÃªÀiÁA¸É PÀÀ-PÁªÀå¸ÀégÀÆ¥ÀAiÀÄ, PÀÀvÉðAiÀÄ DPÀgÀ ¥ÀæAiÉÆÃd£À, ªÀÄvÀÄÛ ¥ÀæªÀÄÄR ¹zÁÞAvÀUÀ¼ÀÄ: gÀ¸ÀzsÀé, Oavàå
2. PÀ£ÀßqÀPÁªÀåªÀÄÄ«ÄÃªÀiÁA¸É: PÀgÁdªÀiÁUÀð ªÀÄvÀÄÛ EvÀgÀ ¥ÁæaÃ£À®PÀët UÀæAxÀUÀ¼ÀÄ, DzsÀÄ¤PÀ PÀ£ÀßqÀ PÁªÀåªÀÄÄ«ÄÃªÀiÁA¸ÉAiÀÄ««zsÀ avÀ£ÉUÀ¼ÀÄ: £ÀªÉÆÃzÀAiÀÄ, £ÀªÀå,¥ÀæUÀwÀ²Ã®, zÀ°vÀ,§AqÁAiÀÄ, ¹ÛçÃªÁzÀ
3. PÀ£ÀßqÀPÀAUÀ¼À PÁªÀå±Á¸ÀÛç ¥ÁæaÃ£À,DzsÀÄ¤PÀ
4. vÀÀ«ÄÀ PÁªÀåªÀÄÄ«ÄÃªÀiÁA¸É ªÀÄvÀÄÛ PÀ£ÀßqÀ eÁ£À¥ÀzÀ PÁªÀåªÀÄÄ«ÄÃªÀiÁA¸É

¥ÀgÁªÀÄ±ÀðUÀæAxÀUÀ¼ÀÄ

1. ¨sÁgÀwÃAiÀÄ PÁªÀåªÀÄÄ«ÄÃªÀiÁA¸É	: w.£À²æÃ
2. vË®¤PÀ PÁªÀåªÀÄÄ«ÄÃªÀiÁA¸É	: JZï. w¥ÉàgÀÄzÀæ¸Áé«Ä
3. PÁªÀå aAvÀ£À	: f.J¸ï. ²ªÀgÀÄzÀæ¥Àà
4. PÀ£ÀßqÀPÀAUÀ¼ÀPÁªÀå±Á¸ÀÛç	: f.J¸ï. ²ªÀgÀÄzÀæ¥Àà
5. PÀ£ÀßqÀªÀÄè¸ÀgÀ¸ÀéwÃ vÀvÀé	: f.J¸ï. ²ªÀgÀÄzÀæ¥Àà
6. PÁªÀå ¥ÀæwªÉÄ±À	: f.J¸ï. ²ªÀgÀÄzÀæ¥Àà
7. ವಿಮರ್ಶೆಯ ಪರಿಭಾಷೆ	: ಓ.ಎಲ್. ನಾಗಭೂಷಣಸ್ವಾಮಿ
8. PÀ£ÀßqÀzÀ ¸ÁªÉÄÃPÀ ¯ÉÃRPÀgÀ¸ÀAUÀgÀ	: ಕೆ.ಕೃಷ್ಣಮೂರ್ತಿ
9. Oavàå«ZÁgÀZÀZÉð	: ಕೆ. ಕೃಷ್ಣಮೂರ್ತಿ
10. vÀÀ«ÄÀ PÁªÀå«ÄÃªÀiÁA¸É	: qÁ PÁ®ÄðÉ¸ï

KNC 040: ¥ÀwæPÉ4 ¸ÀA±ÉÆÃzsÀ£À«zsÁ£À ªÀÄvÀÄÛ UÀtPÀAiÀÄ (2:1=3 PÉæräl)

Course Outcome

CO1: Learn in details with examples Computer application
CO2: Write down the details of Synopsis
CO3: Understand in depth Field Work
CO4: Learn the characteristics of Thesis
CO5: Understand the classification and characteristics of Research methodology

¸ÀA±ÉÆÃzsÀ£À«zsÁ£À

1. ¸ÀA±ÉÆÃzsÀ£É CxÀð ªÀåUÀÛ¥ÀæªÉÃgÀuÉUÀ¼ÀÄ, ¸ÀA±ÉÆÃzsÀPÀgÀ°ègÀ¨ÉÃPÁzÀ UÀÄtUÀ¼ÀÄ, ¸ÀA±ÉÆÃzsÀ£À ¯ÉÃR£À (Research Paper), ¤§AzsÀ (Dissertation), ªÀÄºÁ¥Àæ§AzsÀ (Thesis) – EªÀÅUÀ¼À ¸ÀégÀÆ¥À ªÀÄvÀÄÛ ¸ÀA±ÉÆÃzsÀ£À ¸ÀgÀÆ¥ÀgÉÃSÉ (Synopsis)

2. ಸಂಶೋಧನೆಯ ಭಾಷೆ ಮತ್ತು ಶೈಲಿ, ಉದ್ಧರಣೆ, ಅಡಿಟಿಪ್ಪಣಿ, ಅನುಬಂಧ, UÀæAxÀ¸ÀÆa, PÉëvÀæPÁAiÀÄðzÀ ¸ÀégÀÆ¥À ºÁUÀÆ «zsÁ£À

UÀtPÀAiÀÄ

3. PÀA¥ÀÇålgï UÀtPÀAiÀÄ §¼ÀPÉ JA.J¸ï. D¦üùï, N¥À£ï D¦üùï –ªÀqïð –gÉèÃrï, ¥ÀªÀgï¥Á¬ÄAmï, ¸ÁªÀiÁfPÀ eÁ® vÁt UÀ¼ÀÄ, CªÀÅUÀ¼À G¥ÀAiÉÆÃUÀ ªÀÄvÀÄÛ ¸Á»vÀå¸ÀA§AzsÀ

4. CAvÀgïeÁ® vÁt UÀ¼ÀÄ PÀA¥ÀÆålgï UÀ¼ÀÄ «-CAZÉ «-¸ÀAzÉñÀ «-¥ÀÄ¸ÀÛPÀUÀ¼ÀÄ, PÀA¥ÀÆålgï ¸ÀA±ÉÆÃzsÀ£É ªÀÄvÀÄÛ UÀtPÀ ªÀÄvÀÄÛ CAvÀeÁð®zÀ §¼ÀPÉ

¥ÀgÁªÀÄ±Àð UÀæAxÀUÀ¼ÀÄ

1. ¸ÀA±ÉÆÃzsÀ£É : JA. azÁ£ÀAzÀªÀÄÆwð
2. PÀ£ÀßqÀ ¸ÀA±ÉÆÃzsÀ£Á ¸ÀÆa : JA.JA. PÀ®§ÄVð
3. ¸ÀA±ÉÆÃzsÀ£À ¸ÀégÀÆ¥À : ©.«. ²gÀÆgÀ
4. ¸ÀA±ÉÆÃzsÀ£À ¥ÀæªÉÃ : (ಸಂ) ಹೇರಂಜೆ ಕೃಷ್ಣಭಟ್ಟ
5. ¸ÀA±ÉÆÃzsÀ£É vÁwéPÀ «ZÁgÀ : gÀªÀiÁ¤ï vÀjÃPÉgÉ
6. CzsÀåAiÀÄ£À «¢üzsÁ£ÀUÀ¼ÀÄ : PÉ.gÀAUÀAzsÁªÀÄ
7. ªÀÄºÁªÀiÁUÀð : JA.JA. PÀ®§ÄVð
8. CzÀÈµÀÖ¢ÃPÉë : f.«.¤ªÀÄð®, J¸ï. PÀÄªÀiÁ
9. ªÀiÁ£ÀªÀ PÉë : f.«.¤ªÀÄð®, J¸ï. PÀÄªÀiÁ
10. PÁæAw AiÀÄÄUÀ : f.«.¤ªÀÄð®, J¸ï. PÀÄªÀiÁ
11. PÀ¥ÀÆålgï : ¥ÀæPÁ±ï

G¥À¥ÀoÀåPÀ«ಷಯಗಳು (Soft core)

KNC 210: ಪತ್ರಿಕೆ: ೫.೧ ಭಾಷಾವಿಜ್ಞಾನ ಅಧ್ಯಯನ : ಉಪಭಾಷಾವಿಜ್ಞಾನ (ಕನ್ನಡ)

Course Outcome

CO1: Specify in details with examples Dialects
CO2: Learn the characteristics of Kannada Dialects
CO3: Identify the classification and characteristics of Dialectology
CO4: Write down the details of Survey of Dialects

1. ಉಪಭಾಷಾವಿಜ್ಞಾನ : ಸ್ವರೂಪ ಮತ್ತು ವ್ಯಾಪ್ತಿ, ಭಾಷಾಭೂಗೋಳ, ಉಪಭಾಷಾಭೂಗೋಳ ಮತ್ತು ಭಾಷಾ ಭೂಪಟ- ಈ ಶಬ್ದಗಳ ಅರ್ಥ ಮತ್ತು ವ್ಯಾಪ್ತಿ; ಕನ್ನಡದ ಸಾಮಾಜಿಕ ಉಪಭಾಷೆಗಳು ಮತ್ತು ಪ್ರಾದೇಶಿಕ ಉಪಭಾಷೆಗಳು
2. ಉಪಭಾಷಾವಿಜ್ಞಾನದ ಸಂಕ್ಷಿಪ್ತ ಇತಿಹಾಸ : ಭಾರತ, ಫ್ರಾನ್ಸ್, ಅಮೆರಿಕÀ EAUÉÉqï, ªÀÄvÀÛÄd ªÀÄð¤ ದೇಶಗಳಲ್ಲಿ ಉಪಭಾಷಾ ಅಧ್ಯಯನಗಳು, 'ಲಿಂಗ್ವಿಸ್ಟಿಕ್ ಸರ್ವೆ ಆಫ್ ಇಂಡಿಯಾ'ದ ಮಹತ್ವ
3. ಅ) ಭಾಷೆ, ಉಪಭಾಷೆ, ವ್ಯಕ್ತಿಭಾಷೆ, ಪ್ರಮಾಣ ಭಾಷೆ, ಭಾಷಾಗುಂಪು, ಪರಸ್ಪರ ಅರಿವು, ಸಾಮಾನ್ಯ wgÀ¼À

   ಆ) ಉಪಭಾಷಾವಿಜ್ಞಾನದ ವಿಧಾನಗಳು: ಏಕಕಾಲಿಕ, ದ್ವಿಕಾಲಿಕ
4. ಭಾಷಾವಿಜ್ಞಾನದಲ್ಲಿ ಕ್ಷೇತ್ರಕಾರ್ಯದ ಸ್ವರೂಪ ಮತ್ತು ಪ್ರಯೋಜನ, ವಕ್ತೃ, ಪ್ರತಿವ್ಯಕ್ತೃ-Cº ÀvÉ PÁAiÀÄð¤ªÀðºÀuÉ zÀvÀÛÀA±À ¸ÀAUÀæºÀuÉ ¥ÀæÀ±ÁߪÀ½ ¸ÀAUÀæºÀuÉ ¥ÀæÀ²ßÃ®£ÀÀj Ãw ªÀÄvÀÛÄ ¸ÀAUÀæºÀuÉ«zsÁ£À ºÀvÀÄÛUÀ¼À, ¸ÀAUÀæºÀPÁAiÀÄðzÀ°è ¥ÀæAiÉÆÃf¸À¨ÉÃPÁzÀ ªÀÄvÀÄÛ EvÀgÀ G¥ÀPÀgÀtUÀ¼À.

¥ÀgÁªÀÄ±Àð£À UÀæAxÀUÀ¼À

1. ಉಪಭಾಷೆ : ಕೃಷ್ಣ ಪರಮೇಶ್ವರ ಭಟ್ಟ
2. ಉಪಭಾಷಾ ಅಧ್ಯಯನ : ±Áº¤ gÀAUÁZÁgÀå
3. ಭಾಷಾಕ್ಷೇತ್ರಕಾರ್ಯ : J¸ï.J¸ï. CAUÀr
4. PÉëÃvÀæPÁAiÀÄðzÀ ºÁ¢AiÀÄ°è : PÁ¼ÉÃUËqÀ £ÁUÀªÁgÀ
5. ºÁ¢AiÉÄ¼ÀUÀ£À eÉÆvÉAiÀÄ°è : ಹನೂರು ಕೃಷ್ಣಮೂರ್ತಿ
6. ಸಾಮಾಜಿಕ ಉಪಭಾಷೆ : ªÀÄ°èPÁdÄð£À ªÀÄAiÀÄÆgÀ
7. ¸ÀªÀiÁd ¸ÀAZÀAiÀÄ : (¸ÀA) zÉÃdªÀÄ»¼É gÀAUÀ£Áxï
8. PÀ£ÁðlPÀ ¨sÁµÁ : (¸ÀA) ¸ÀAPÁ¥ÀÄgÀ J A. J¸ï.
9. Field Linguistics : William J Samarien
10. The Structure of Karnataka : R.C. Hiremath
11. An Outline of Colloquial Kannada : William Bright
12. Kannada –Literary and colloquial : H.M. Nayak
13. Field Study : Sen Gupta
14. World Geography of the Eastern United States : H Kurath
15. Handbook of the Linguistic Geography of New England : H Kurath
16. Reading in American Dialectology : Allen and Underwood
17. The Study of dialect : K.M. Petyt
18. A course in Modern Linguistics : Charles F Hockett

KNC 210: ¥ÀwæPÉ5.2 eÁ£À¥ÀzÀ gÀAUÀ¨sÀÆ«Ä PÀ¯ÉUÀ¼ÀÄ ªÀÄvÀÄÛ d£À¥ÀzÀ PÀ¯ÉUÀ¼ÀÄ

Course Outcome

CO1: Understand the concept of Folk theatre.
CO2: Able to understand the various forms of Folk arts
CO3: Able to understand the significance of Folk festivels
CO4: Understood the concept of Folk Culture

1. vÁwéPÀ ºÉ£É: d£À¥ÀzÀ PÀ¯ÉUÀ¼À G UÀUÀªÀÄ, ¸ÀégÀÆ¥À ªÀÄvÀÄÛ ªÀVÃðPÀgÀt. PÀ¯ÉUÀ¼À, UÁæ«ÄÃt ಜನಪದ ಕಲೆಗಳು, ಶಿಷ್ಟಕ¯Á ¥ÀæPÁgÀUÀ¼À, d£À¥ÀzÀ PÀ¯ÉUÀ¼À «zÀå ªÀÄvÀÄÛ DzsÀÄ¤PÀvÉAiÀÄ ªÀÄÄSÁªÀÄÄT
2. ¥ÀæzÀ±ÀðPÀ PÀ¯ÉUÀ¼ÀÄ : ªÀÄzÀÄªÉ ¸ÀA¨sÀæªÀÄzÀ «ÃgÀUÁ¸É ºÀgÀPÉ, vÀªÀÄmÉ ¸ÀAzÀ¨sÀðzÀ ªÀÄ¤ÃgÀUÁgÀ, ªÀÄAR«ÃuÉ

3. DgÁzÀ£ÉÃ ¥ÀzÀåUÀ¼ÀAiÀiÁzÀ: ªÀÄ£ÉÆÃgÀzsÀ, DnPÀ¼Àd, «ÃgÀ¨sÀzÀæ£À PÀÄtÂvÀ, UÉÆgÀªÀgÀ PÀÄtÂvÀ UÉÆAzÀ°UÀgÀ, ºÁ®QÌ PÀÄtÂvÀ D¸Ágª ºÁqÀÄUÀ¼À, ¨sÀÆvÁgÁzsÀ£É

4. gÀAUÀ¨sÀÆ«Ä: ºÀUÀ®ªÉõÀ, eÉÆÃ¼À, §ºÀÄgÀÆ¥À, PÀÈµÀÚ¥ÁjeÁvÀ, zÉÆqÀØ¸ÁvÀÕzÀ DlUÀ¼ÀÄ, vÉÆUÀ®Ä UÉÆA¨ÉAiÀiÁl, PÉÆÃ¯Ál, ªÀÄÄRªÀlzÀ ¥ÀzÀåUÀ¼ÀÄ AiÀÄPÀëUÁ£À (vÉAPÀÄ w®ÄÖ §qÀUÀÄw®ÄÖ)

¥ÀgÁªÀÄ±ÀðPÀ UÀæAxÀUÀ¼ÀÄ

1. GvÀÛgÀPÀ£ÁðlPÀzÀ d£À¥ÀzÀ gÀAUÀ¨sÀÆ«Ä : ZÀAzÀæ±ÉÃRgÀ PÀA¨ÁgÀ
2. zÀQët PÀ£ÁðlPÀzÀ d£À¥ÀzÀ gÀAUÀ¨sÀÆ«Ä : r.PÉ gÁeÉÃAzÀæ
3. PÀgÀ¥Á® ªÉÄÃ¼À : r.PÉ gÁeÉÃAzÀæ
4. PÀ£ÁðlPÀ d£À¥ÀzÀ PÀ¼ÀUÀ¼ÀÄ PÉÆÃ±À : (¸À) ».a. ¨ÉÆÃgÀ°AUÀAiÀÄå
5. PÀ£ÁðlPÀ d£À¥ÀzÀ PÀ¼ÀUÀ¼ÀÄ : UÉÆgÀÄ ZÀ£ÀßgÀ¸À¥Àà
6. ºÉÆ£À߀vÀÛ CªÀÄ ºÉÆ®PÉÃj : UÉÆgÀÄ ZÀ£ÀßgÀ¸À¥Àà
7. PÀ£ÀßqÀ eÁ£À¥ÀzÀ «±ÀéPÉÆÃ±À : (¸À) ZÀAzÀæ±ÉÃRgÀ PÀA¨ÁgÀ
8. ¨sÀÆvÁgÁzsÀ£É : PÉ.a£Àß¥Àà UËqÀ
9. ªÀÄÆrPÀÄPÀÄå : f.Dgï. w¥ÉàÃ¸Áé«Ä
10. eÁ£À¥À¢ ¨sÁgÀvÀ : f.Dgï. w¥ÉàÃ¸Áé«Ä
11. zÀQët PÀ£ÁðlPÀ d£À¥ÀzÀ PÁªÀå¥ÀgÀA¥ÀgÉ : f Ã±À ¥ÀgÀªÀÄ ªÀÄAiÀÄå
12. AiÀÄPÀëUÁ£À : PÉ² ªÀgÀªÀÄ PÁgÀAvÀ
13. PÀ£ÀßqÀ eÁ£À¥ÀzÀ PÀÄ ¥ÀzÀåUÀ¼À : ZÀPÉgÉ² ªÀÄAPÀgÀ
14. The Encyclopedia of folk culture of Karnataka : Krishna Murthy Hanur

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KNC 210: ¥ÀwæPÉ 5.3 ZÁ¸ÀwæÃAiÀÄ ±Á¸À£À¸ÀA¥ÁzÀ£É ªÀÄvÀÄÛ CzsÀåAiÀÄ£À

Course Outcome

CO1: Learn to read inscription.
CO2: Understand_kannada culture through inscription.
CO3: Gain knowledge to explore and to save Inscription through field work.
CO4: Understand research works done in the field of epigraphy.

1. ±Á¸À£ÀUÀ¼À CzsÀåAiÀÄ£À PÀ£ÁðlPÀzÀ ±Á¸À£ÀUÀ¼À CzsÀåAiÀÄ£ÀzÀ EwºÁ¸À- ±Á¸À£ÀUÀ¼À ¥ÁæªÀÄÄRå ±Á¸À£ÀUÀ¼À ªÀUÃðPÀgÀt

2. ±Á¸À£À PÀ«, °¦PÁgÀ, gÀZÀ£Á ºÀ - ಶಾಸನಗಳ ವಿಷಯಾನುಪೂರ್ವಿ – zÁ£À ±Á¸À£À PÀÈ ±Á¸À£À «ÃgÀUÀ®è ªÀiÁ¹ÛPÀè ¤¹¢UÀ®è

3. ºÀ¼É ±Á¸À£À- ¨ÁzÁ«ÄAiÀÄ PÀzÀA§gÀ ±Á¸À£À±Á¸À£À- PÀÄPÁð®zÀ vÀf £ÀAzÀzÀ ±Á¸À£À±Á¸À£À

4. ®PÀÄÌAr AiÀÄ CwÛÛªÀÄ ±Á¸À£À- §½UÁ«AiÀÄ PÉÆÃl ªÀÄÄzÀæ±Á¸À£À- ±ÀªÀt ¨É¼ÀUÉÆ¼À §AzsÀÄAiÀÄ ±Á¸À£À

¥ÀgÁªÀÄ±ÀðPÀ UÀæAxÀUÀ¼ÀÄ:

1. ±Á¸À£À ªÁå¸ÀAUÀ1, 2 : JA.JA PÀ®§ÄVð
2. PÀ£ÀßqÀ ±Á¸À£ÀUÀ¼À ¸ÁA¸ÀÌøwPÀ CzsÀåAiÀÄ£À : JA azÁ£ÀAzÀªÀÄÆwð
3. PÀ£ÁðlPÀ ±Á¸À£À¸À«ÄÃPÉë PÉ.gÀªÉÄÃ±À
4. PÀ£ÀßqÀ °¦AiÀÄ GUÀªÀÄ ªÀÄvÀÄÛ «PÁ¸À J.«.£ÀgÀ¹AºÀªÀÄÆwð
5. PÀ£ÀßqÀ ±Á¸À£À¸ÀAUÀæºÀ : PÀ£ÀßqÀ ¸Á»vÀå ಪರಿಷತ್ತು

6. ±Á¸À£ÀUÀ¼À ¸ÀA¥ÁzÀ£É : ¹¦ PÉ
7. ¨sÁgÀwÃAiÀÄ ±Á¸À£ÀUÀ¼À C¢üAiÀÄ£À: (C£ÀÄ) ¹¦ PÉ
8. ±Á¸À£À¥ÀzÀ PÀÄjvÀÄ (¥ÀæªÉÃ±ÀPÉ): (¸À) JA. azÁ£ÀAzÀªÀÄÆwð
9. Indian Epigraphy : D.C. Sircar
10. Indian Epigraphy and South Indian Scripts : C. Shivaramamurthy
11. Indian Paleography : Ahmed Hussain Dani
12. The Alphabet : David Diringer

ªÀÄÄPÀÛ LaÒPÀ (Open Elective)

KNC 530: ಪತ್ರಿಕೆ: ೬.೧ ಕನ್ನಡ ಭಾಷೆ ಮತ್ತು ಸಾಹಿತ್ಯ

(¥ÁæaÃ£À, ªÀÄzsÀåPÁ°Ã£À, DzsÀÄ¤PÀ (3:1=4 PÉærrmï))

Course Outcome

CO1: Specify in depth Vachanas' of Basavanna
CO2: Learn the details of Kavirajamarga
CO3: Write down in depth Vachanas' of Akkamahadevi
CO4: Learn the characteristics of Short Stories

1. **¥ÁæaÃ£À ¸Á»vÀå:**
   - **(C) PÀ«gÁdªÀiÁUÀð** - £ÁqÀÄ £ÀÄr AiÀÄ ªÀtð£É¥ÀzÀåUÀ¼ÀÄ ¥ÀjZÉÒzÀ ªÀÄÆgÀ ¥ÀzÀå¸ÀASÉå 36, 37,38,39,40. ªÀÄÆgÀ£ÉAiÀÄ ¥ÀjZÉÒzÀ ªÀÄÆgÀ 174, 176, 177, 179£É ¥ÀzÀå (¸À): JA«. ¹ÃvÁgÁªÀÄAiÀÄå
   - **(D) ªÀqÁØgÁzsÀ£É** 'PÁwÃðPÀj ¹AiÀÄ PÀxÉ (¸À) r.J¯ï. £ÀgÀ¹AºÁZÁgï
   - **(E) ¥ÀA¥À¨sÁgÀvÀ** ಭೀಷ್ಮರ ಪಟ್ಟಾಭಿಷೇಕ ಪ್ರಸಂಗ – «PÀæªÀiÁdÄð£À «dAiÀÄ (¸À) n.«. ªÉAPÀl¸ÀÄé±Á¹Ûç zÀ±ÀªÀiÁ±Àé¸À ¨sÁUÀzÀ ¥ÀzÀå¸ÀASÉå 15 jAzÀ 25 gÀªÀgÉUÉ
2. **ªÀÄzsÀåPÁ°Ã£À ¸Á»vÀå-1 :**
   - **(C) §¸ÀªÀtÚ£ÀªÀgÀ ªÀZÀ£ÀUÀ¼ÀÄ (¸À) JA.JA. PÀ®§ÄVð**
     ªÀZÀ£À¸ÀASÉå 105, 158, 194, 235, 241, 345, 447, 638, 821, 580
   - **(D) CPÀÌªÀÄºÁzÉ«: ²ªÀ±ÀgÀuÉAiÀÄgÀ ªÀZÀ£ÀUÀ¼ÀÄ (¸À) «ÃgÀtÚ gÁdÆgÀ**
     ªÀZÀ£À¸ÀASÉå 78, 143, 196, 197, 206, 211, 268, 364, 365, 413
3. **ªÀÄzsÀåPÁ°Ã£À ¸Á»vÀå-2 :**
   - **(C) ¸ÀªÀðdÕ¸ÀªÀðdÕ£À ªÀZÀ£ÀUÀ¼ÀÄ (¸À) GvÀÛAV ZÉ£Àß¥Àà**
     ªÀZÀ£À¸ÀASÉå: 531, 534, 545, 563, 893, 1239, 1145, 1148, 1155, 1275,
   - (D) **QÃvÀð£ÉUÀ¼ÀÄ:**
     ¥ÀÄgÀAzÀgÀzÁ¸ÀgÀ ¸ÀAzÉÃºÀ ªÉÃdAiÀÄªÉÃ§ ¢ªÀåªÀÄAvÀæ
     PÀ£ÀPÀzÁ¸ÀgÀ PÀÄ®PÀÄ® PÀÄ®ªÉAzÀÄ ºÉÆqÉzÁqÀzÀj
4. **DzsÀÄ¤PÀ ¸Á»vÀå:**
   - (C) **PÁªÀåUÀ¼ÀÄ** : PÀÄªÉA¥ÀÄ – CRAqÀ PÀ£ÁðlPÀ

f.J¸ï. ²ªÀgÀÄzÀæ¥Àà – ªÀÄ©ãAzÀªÀÄ©ãUÉ

(D) DzÀå¸ÀPÀPÀvÀðgÀÄ: PÀÄA. «ÃgÀAzÀæ¥Àà – zÀª ÀgÀ¨É

¸ÁgÁ C§ÆE§PÀgï – ZÀæA zÀUÀÄ

¥ÀjÁ ÄªÀÆ£ÀPÀÉUÀÄ

1. PÀxÀ¸À Á vÀÆZÀjvÉæ gÀ²ãªÀÄUÀ½
2. ªÀÄ¸ÀgÀÄ «±ÀézÀå®AiÀÄzÀ¸À Á vÀÆZÀjvÉæÀ¸ÀAÀ¥ÀÄ UÀÄ
3. ¸Áª ÀÄ£ÀUÉ¸Á vÀÆZÀjvÉæÀ¸ÀA¥ÀÄ UÀÄ: ¨ÉUÀ¼ÀgÀÄ««
4. PÀxÀ¸À Á vÀÆZÀjvÉæ PÉª ÀPÀgÀÄ ÄªÀ
5. PÀxÀ¸À Á vÀÆZÀjvÉæ v¸ÀÄ ±ÁªÀ ÃgÁAiÀÄ
6. PÀxÀ¸À Á vÀEwº Á¸À gÀ²ãªÀÄUÀ½

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£ÁªÀÄ£ÉÆÃAzÀtÂAiÀiÁzÀ ¸À

ಪ್ರಧಾನ ವಿಷಯಗಳು (Hard core)

KND 050: ¥ÀvÉæ1 DzsÀÄ¤PÀ PÀ£ÀßqÀ ¸Á» vÀå: ¥ÀzÀå: PÁªÀå, PÁzÀA§j, ¥ÀgÀªÀzÀ

Course Outcome

CO1: Learn the details of Selected Poems
CO2: Learn in depth Purnachandra Tejaswi
CO3: Understand in depth Modern Kannada Poetry
CO4: Identify in depth Kannada Novel

1-2. PÁªÀå: 12 ¤UÀ¢vÀ PÀ«UÀ¼ÀÄ

1. ²æ±ÉÊ®ªÀÄ±ÀªÁå¥ÀÄ	:	©¢üAiÀÄ ¨ÉÃªÀÄzÀÄQ
2. zÀgÀÁ ¨ÉÃAzÉæ	:	£ÀgÀ§°
3. PÀÄªÉA¥ÀÄ	:	ºÉÆÃUÀÄªÉ£ÀÄ £Á
4. ¨ÉÃAzÉæ ÁAPÀæÁAvÀ	:	ZÀPÀ±Á¸ÀÛ
5. PÉ.J¸ï.£ï	:	¨ÁUÉ‹ ÄªÁvÀÀ
6. ಗೋಪಾಲಕೃಷ್ಣ ಅಡಿಗ	:	¨ÁvÀ
7. fJ¸ïJ¸ï	:	¸ÀeÉÁ
8. gÀeÁ£ï zÀÆvÁ	:	¥ÀqÉÁ½PÉ
9. ¹zÀÝ°AUÀAiÀÄå	:	¸Á«gÁgÀÄ £À¢UÀ¼ÀÄ
10. ªÉÄÃUÀ¼À UÀuÉÃ±ï	:	C£Á¢AiÀÄ KPÁAvÀªÀÃvÉ
11. ±ÀAPÀgÀ ªÉÆPÁ¹	:	UÉÆ©ªÀÄ
12. ಸ. ಉಷಾ	:	ºÀÄqÀÄUÀ ÁzÀ ºÉÃvÀÄÛ

3.4. PÁzÀA§j

¥ÀÆtð: PÀ ÁÕð¯É : PÉ. ¥ÀÆtðZÀAzÀæ vÉÃd¹é

¥ÀoÀå ªÀÄÄ®: (PÀvÉUÀ¼ÀÄ)

1. ²æ±ÉÊ®ªÀÄ±ÀªÁå¥ÀÄgÀ ªÀÃvÉUÀ¼ÀÄ : ¸À. qÁ. ²ªÁ£ÀAzÀ UÁ§â UÀgÀ, PÀ£ÀßqÀ ªÀÄvÀÄÛ ¸À¸ÀÌöÈw ¤zÉÃð±À£Á®AiÀÄ, ¨ÉA :1985
2. ±ÀªÀÄ±ÀAPÀgÀ ¨ÁAiÀiÁPÉ : ¸À. a. ²æÃªÀÄ ¸ÀgÀÁdÄ EvÀgÀgÀÄ, £ÀªÀPÀ£ÁðlPÀ ¥ÀæPÁ±À£À ¨ÉA : 1986
3. PÀÄªÉA¥ÀÄ ¸ÀªÀÄUÀæPÁªÀå ¸ÀA¥ÀÄl-1 : ರಾಷ್ಟ್ರಕವಿ ಕುವೆಂಪು ಪ್ರತಿಷ್ಠಾನ (ರಿ), ಕುಪ್ಪಳಿ, :2013
4. ¨ÉÃAzÉæ ÁAPÀæÁAvÀ§zÀÄPÀÄ §gÀºÀ : ¸À. £ÉÃ«ÄZÀAzÀæ, PÀ£ÁðlPÀ ¯ÉÃRQAiÀÄgÀ ¸ÀAWÀ ¨ÉAUÀ¼ÀÆgÀÄ : 1988
5. ªÀÄ¯ÉAiÀÄ ªÀÄAvÉ :
6. ºÉÆ¸ÀUÀ£ÀßqÀ PÀvÉ :ಸಂ. ಜಿ. ಎಚ್. ನಾಯಕ, ಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಿಷತ್ತು, ಬೆಂಗಳೂರು : 1985
7. CzÉ
8. ¸ÀªÀÄÀð PÁªÀå :¸À. ©.J. ¸À£ÀÄ, PÀ£ÀßqÀ ¸À¸ÀÌöÈw E¯ÁSÉ ¨ÉA : 2006
9. §AqÁAiÀÄ PÁªÀå :¸À. §gÀUÀÆgÀÄ gÁªÀÄZÀAzÀæ¥Àà, PÀ£ÀßqÀ ªÀÄvÀÄÛ ¸À¸ÀÌöÈw ¤zÉÃð±À£Á®AiÀÄ, ¨ÉA : 1990

10. ¸Ã»vÀå PÁªÀå :¸À. ©.J. ¸ÀÄvÀ, PÀ£ÀßqÀ ¸Á»vÀå ¥ÀjµÀvÀÄ, É¨ÉAUÀ¼ÀÆgÀÄ: 2006
11. ºÉƸÀUÀ£ÀßqÀ PÁªÀå :ಸಂ. ಜಿ. ಎಚ್. ನಾಯಕ, ಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಿಷತ್ತು, ಬೆಂಗಳೂರು: 1985
12. ©qÀÄUÀqÉAiÀÄ ºÉeÉÓ :¸À. a. ²æÃªÀÄvÀ, ¸Á»vÀå CPÁqÉ«Ä, ¨ÉA :2012

¥ÀÆgÀPÀ NzÀÄUÀ¼ÀÄ

1. 20£ÉÃ ±ÀvÀªÀiÁ£ÀzÀ PÀ£ÀßqÀ ¸Á»vÀå ZÀjvÉæ : qÁ § ¸ÀªÀÄqÀ ¸ÁzÀgÀ
2. PÀÄ¸ÀÄ PÀ ¸Á»vÀå CPÁqÉ«ÄAiÀÄ PÀ£ÀßqÀ ¸Á»vÀå ¥ÀjZÀAiÀÄ ªÀiÁ¯ÉAiÀÄ ¸À¥ÀÛ UÀ¼ÀÄ
3. ºÁqÀÄ ºÀ¢AiÀÄ vÉÆÃgÀ vÀ : JZï.J¸ï. gÁWÀªÉÃAzÀæ gÁªï
4. Eº À¥À ªÀÄ zÀ ªÁ¢ : £ÀgÀ¹AºÀ ¨Á®¸ÀÄ§æ ªÀÄtå
5. UÀUÉÆÃwæ : PÀªÉÃ¥ÀÄ C©£ÀAzÀ£À UÀæAxÀ
6. ²æÃPÀªÉ¥ÀÄ : ¸À: f.J¸ï. ²ªÀgÀÄzÀæ¥Àà
7. PÀªÉ¥ÀÄ PÁªÀå «ªÀÄ±Éð : ¸À: CgÀ«AzÀ ªÀiÁ®UÀwÛ, PÀªÉ¥ÀÄ PÀ£ÀßqÀ CzsÀåAiÀÄ£À ¸À¸ÉÜ ªÀÄ£À¸ÀUÀAUÉÆÃwæ
8. ¸Á»vÀå ªÀÄvÀÄÛ ¸ÀAiÀÄÄUÀzÀ ¸ÀAzÀ : QÃwð£Á xÀ PÀÄvÀðPÉÆÃn
9. ºÉƸÀUÀ£ÀßqÀ PÁªÀå ÀJgÀqÀÄ ªÀiÁUÀðUÀ¼ÀÄ : ¸À: f.J¸ï. ²ªÀgÀÄzÀæ¥Àà

KND 020 ¥ÀwæPÉ2 ¥Á±ÁÑvÀå PÁªÀå«ÄÃªÀiÁA¸É (2:1=3 PÉærmï)

Course Outcome

CO1: Learn in depth Psychic distance
CO2: Understand in depth Aristotle
CO3: Specify in depth Theory of Communication and Values
CO4: Write down in depth Western Poetics

1. Cj¸ÁÖ¯ï, ºÉÆgÉÃ¸ï, ¯ÁAf£Àï
2. §ÄèÉÆ : ªÀiÁ£À¹PÀ zÀÆgÀ
3. (C) n.J¸ï. J°AiÀÄmï : ¥ÀgÀA¥ÀgÉ ªÀÄvÀÄÛ ªÉÊAiÀÄQÛPÀ ¥Àæw¨sÉ
   (D) L. J. jZÀqïð : ªÀiË®å¹zÀÝAvÀ ªÀÄvÀÄÛ ¸ÀA ªÀºÀ£À¹zÀÝAvÀ
4. eÉÆÃ£ï PÁæ£ï : gÀZÀ£Á ªÁzÀ ªÀÄvÀÄÛ PÁªÀå«ÄÃªÀiÁA¸É

¥ÀÆgÀPÀ NzÀÄUÀ¼ÀÄ

1. Cj¸ÁÖl®£À PÁªÀå«ÄÃªÀiÁA¸É : J£ï. ¨Á®¸ÀÄ§æ ªÀÄtå
2. ºÉÆgÉÃ¸À£À ¸Á»vÀå «ªÀÄ±Éð : J£ï. ¨Á®¸ÀÄ§æ ªÀÄtå
3. Of£À¸À «ZÁgÀ ZÀ¼ÉÛ : J£ï. ¨Á®¸ÀÄ§æ ªÀÄtå
4. vË®¤PÀ PÁªÀå«ÄÃªÀiÁA¸É : JZï. w¥ÉàgÀÄzÀæ¸Áé«Ä
5. ¥Á±ÁÑvÀå PÁªÀå«ÄÃªÀiÁA¸É : «.JA. E£ÁªÀÄzÁgï
6. ಇಂಗ್ಲಿಷ್ ಭಾಷೆಯಲ್ಲಿ ಆಧುನಿಕ ಸಾಹಿತ್ಯ ವಿಮರ್ಶೆ : ಎಲ್.ಎಸ್. ಶೇಷಗಿರಿರಾವ್
7. PÁªÁå xÀð aAvÀ£É : f.J¸ï. ²ªÀgÀÄzÀæ¥Àà
8. ¸Á»vÀå «ªÀÄ±Éð : ¹.J£ï. gÁªÀÄZÀAzÀæ£ï
9. n.J¸ï. J°AiÀÄmï PÀAiÀÄ «ªÀÄ±ÉðAiÀÄ «ZÁgÀUÀ¼ÀÄ : JZï.©. «ÄdV
10. Structuralist Poetics : Jonathan Culler
11. On Deconstruction : Jonathan Culler

12.The Pursuit of Signs : Jonathan Culler
13. Linguistics and Poetics : Roman Jacobson
14. Principles of litatray Critisism : I A Richards

KND 030: ¥ÀwæPÉ 3 ¸ÀAªÀºÀ£À ªÀiÁzsÀåªÀÄ(2:1=3 PÉærrmï)

Course Outcome

CO1: Understand in details with examples Mass media
CO2: Identify the characteristics of Audio and Visual media
CO3: Identify in depth Press media
CO4: Learn in depth Trasalation

1. ¸ÀAªÀºÀ£À ªÀiÁzsÀåªÀÄ ¥ÀjPÀ®à£É ªÁåS Áå£ÀUÀ¼ÀÄ, ¸ÀéªÀ¥À ªÀÄ ºÀvÀé ¥ÀæÃgÀUÀ¼ÀÄ : eÁ£À¥ÀzÀ ªÀÄvÀÄÛ DzsÀÄ¤PÀ ¥ÀæÃgÀUÀ¼ÀÄ, PÁAiÀÄðUÀ¼ÀÄ, C©üªÀåQÛ ªÀÄvÀÄÛ ¸ÀªÀÄÆºÀ ÁUÀÆ ¸Áª ÀiÁf PÀ§zÀÞÁ vÉ ºÀAUÀÆ ¸ÀªÀiÁfÉ
2. ¥ÀwæPÉº ÁUÀÆ ¥ÀvÀæ ªÀiÁzsÀåªÀÄ : ¥ÀwæPÉUÀ¼À ªÀÄvÀÄÛ ¥ÀvÀæUÀ¼À ¸ÀéªÀ¥À ªÀÄ ºÀvÀé ¥ÀæÃgÀUÀ¼ÀÄ, PÁAiÀÄðUÀ¼ÀÄ, ¸À»vÀåUÀ¼ÀÄ, ºÀÄ ÄÖªÀÄvÀÄÛ ¨É¼ÀªÀtÂUÉ ¥ÀwæPÉªÀÄvÀÄÛ ¥ÀvÀæPÀvÀðgÀ PÁAiÀÄðPÀëÃgÀÄ ಗುಣಗಳು ಮತ್ತು ಇತಿಮಿತಿ, ಬರಹ, ಭಾಷೆ, ಸಾಹಿತ್ಯ, ವಿಮರ್ಶೆ, ವರದಿ, ಸುದ್ದಿ, ಲೇಖನ, ¸À¥ÁzÀQÃAiÀÄ, CªÀÄÈvÀPÀ CAPÀ, ¥ÀÄgÀªÀtÂUÀ¼ÀÄ, eÁ»gÁvÀÄ, ªÀiÁzsÀå ¤ÃwAiÀÄ »£É ªÀÄvÀÄÛ «PÁ¸À ¥ÀæÁgÀº ÁUÀÆ ªÀiÁgÁl
3. DPÁ±ÀªÁt Â- zÀÆgÀzÀ±À£À- ZÀ®£ÀavÀæ ¸ÀéªÀ¥À ªÀÄ ºÀvÀé ¸À»vÀå ºÀÄ ÄÖªÀÄvÀÄÛ ¨É¼ÀªÀtÂUÉ Ew«ÄwUÀ¼ÀÄ, PÁAiÀÄðPÀæªÀÄgÀ, DqÀ¼ÀvÀ ªÀåªÀ¸ÉÜ, ಬರಹ, ಭಾಷೆ, ಸಾಹಿತ್ಯ, ವಿಮರ್ಶೆ, (ಸಂಭಾಷಣೆ, ನಿರೂಪಣೆ, ವಾರ್ತೆ, ವರದಿ, ಕಾರ್ಯಕ್ರಮಗಳು) ಧ್ವನಿ, ಉಚ್ಚಾರಣೆ, ಸ್ಪಷ್ಟತೆ, ಉಡುಪು, «£ÁåªÀ¤ªÀiÁðt zÀÈPÀå ¸ÀAVÃvÀ, ¸À¥ÁzÀ£É PÀ¯ÉUÀ¼ÀÄ
4. ಸಂವಹನ ಮಾಧ್ಯಮಗಳು ಮತ್ತು ಭಾಷಾಂತರ : ಭಾಷಾಂತರದ ಮಹತ್ವ, ವಿವಿzsÀ PÉëÃvÀæUÀ¼À°è CzÀgÀ CUÀvÀå ªÀÄvÀÄÛ ¥ÀæAiÉÆÃd£Àº ÁUÀÆ ¸ÀªÀÄ¸ÉåUÀ¼ÀÄ (I AUÉèÃµï-PÀ£ÀßqÀ-¥ÁæAiÉÆÃVPÀ ªÀiÁzÀjUÀ¼À C¨sÁåªÀ ªÀiÁr ¸ÀÆPÀÛ)

¥ÀgÁªÀÄ±Àð UÀæAxÀUÀ¼ÀÄ

1. ¥ÀwæPÉ ¸Á»vÀå : ಸರಜೂ ಕಾಟ್ಕರ್, ಅನ್ವೇಷಣೆ ಪ್ರಕಾಶನ, ಬೆಂಗಳೂರು
2. ¨sÁgÀwÃAiÀÄ ¥ÀwæPÉÆÃzsÀåªÀÄ : ನಾಡಿಗ ಕೃಷ್ಣಮೂರ್ತಿ, ಪ್ರಸಾರಾಂಗ, ಮೈವಿವಿ
3. DzsÀÄ¤PÀ ¨sÁgÀvÀzÀ°è ¥ÀwæPÉÆÃzsÀåªÀÄ : gÉÆÃ. ÉÃmï E H ¯ïº Àä (ªÀÄÆ®) ²æÃgÀAUÀ ¯ï. ¨sÀqÀÆgÀPÀgï (C£ÀÄ) ¥ÀæPÁ±ÀPÀgÀ ªÀÄÆ«
4. ¨sÁgÀvÀzÀ°è ¥ÀvÀæUÀ¼À ¨É¼ÀªÀtÂUÉ : C§ÄÝ¯ï º À¦Ã¸ï (ªÀÄÆ®) f .¦ . ²ªÀgÁA (C£ÀÄ), ªÀÄÆ«
5. ¥ÁæAiÉÆÃVPÀ ¥ÀwæPÉÆÃzsÀåªÀÄ : (¸À) ©.«. ªÉÊPÀÄAoÀgÁdÄ, ¨ÉAUÀ¼ÀÆgÀÄ ««
6. ¸ÀAªÀºÀ£À ªÀiÁzsÀåªÀÄUÀ¼ÀÄ : r .©. £ÁAiÀÄPÀ UÀÄ®§UÁð ««
7. ಬ್ರಿಟಿಷ್ ಪತ್ರಿಕೋದ್ಯಮ : ನಾಡಿಗ ಕೃಷ್ಣಮೂರ್ತಿ, ಮೈವಿವಿ
8. ¦æÃ£ïï ¥ÀwæPÉÆÃzsÀåªÀÄ : ¤gÀAd£À ªÁ£À½î ªÀÄÆ«
9. ¸ÀAªÀºÀ£À ªÀiÁzsÀåªÀÄUÀ¼ÀÄ ªÀÄvÀÄÛ gÁµÀ×ÃAiÀÄ C©üªÀåQÛ: J.J¸ï. ¨Á®¸ÀÄ§æªÀÄtåA PÀÄA¨sÀI PÀÄ««
10. ¥ÀwæPÉÆÃzsÀåªÀÄ : ಎಂ. ಚಲಪತಿರಾವ್ (ಮೂಲ) ನಾಡಿಗ ಕೃಷ್ಣಮೂರ್ತಿ (ಅನು)

11. UÀzÀå¸ÁÃ»vÀå : ¸ÀAgÀAzÀ ªÀiÁ®UÀ¼À¥À¢ÞÁgÀAiÀÄ ªÀÄ« «
12. PÀ£ÀßqÀ¥À¦ÛÁ¸ÀÌ : ¸À²zÀ ªÁ¸À ª Á¸ÀAgÀ¥ÀjÁgÀAiÀÄ ªÀÄ« «
13. eÁ£À¥ÀzÀ ªÀiÁUÀð ªÀÄzÀ ªÀiÁzÀåA : PÀ£ÁðI PÀ eÁ£À¥ÀzÀ ªÀiÁ¼ÀÑ ÀCPÁqÉÄ ¨ÉAUÀ¼ÀÆgÀÄ
14. ¸Àª ÀÄzÀÀª ÀiÁzÀåA : J¸ï.J A»gÉ ÄÄAª ÀiÁUÀ .©.£ÁAiÀPÀ
15. PÀ£ÁðI PÀ ¸ÀUÁw : PÀ£ÀßqÀ C©üªÀÈ¢Þ ¥ÁæPÁgÀ ¥ÀæªÀÄuÉ

KND 040: ¥ÀæªÉÃ± C¢sÀåAiÀÄ£À /ªÀÄÄRå ¥ÁæAiÉÆÃVPÀ (1:2=3 PÉærrmï)

Course Outcome

CO1: Write down in details with examples Project work
CO2: Understand the details of information collection
CO3: Learn in depth Disseration
CO4: Understand the details of editing and Proof reading

PÉëÃvÀæAiÀÄ£À, ªÀiÁ»w ¸ÀAUÀæºÀuÉ ªÀiÁqÀÄªÀ gÀÄ

WÀlPÀ 1: C) C¢sÀåAiÀÄ£À ªÀiÁqÀÄªÀ gÀÄ
D) «ZÁgÀ¸ÀAQÃtð/ ZÀZÉð / ¥ÀæwÃPÀ£À

WÀlPÀ 2: C) PÀëÃvÀæ ªÀÄÄ
D) ¥Àæ±ÁߪÀ½AiÀÄ ºÁUÀÆ CAwªÀÄ ªÀÄÄ

WÀlPÀ 3: ¸ÉÃ¸À ÈÖ CAvÀåPÀÀe ªÀÄAiÀÄ ªÀiË®å ªÀiÁ¥À£À ªÀiÁqÀÄªÀ ªÀÄÆ® PÀ¥ÀjÃPÉëAiÀÄ£ÀÄß MA§vÀÄÛ CAvÀjPÀ ºÁUÀÆ MA§vÀÄÛ ¨ÁºÀå ¥ÀjÃPÀëPÀgÀ ¸ÀªÀÄÄäRzÀ°è ¸ÀAzÀ±Àð£À - 70 CAPÀUÀ¼ÀÄ

G¥ÀæzsÁನ ವಿಷಯಗಳು (Soft core)

KND 210: ಪತ್ರಿಕೆ: ೫.೧ ಭಾಷಾವಿಜ್ಞಾನ ಅಧ್ಯಯನ : ಕನ್ನಡ ಭಾಷಾಸ್ವರೂಪ : ಆಯ್ದ ಪಠ್ಯಗಳು

Course Outcome

CO1: Learn the characteristics of History of Kannada Language
CO2: Learn in depth relationship between Liteature and Language
CO3: Write down in details with examples the usage of Technology and Kannada Language
CO4: Understand the details of Mothertongue

1. ±À¨Á eÁÕ£À	: PÀ£ÀßrAiÀÄ M¼ÀÄ¥À
2. ಎ.ಆರ್. ಕೃಷ್ಣಶಾಸ್ತ್ರಿ	: EA¢£À d£ÀgÀ ªÀiÁvÀÄ PÀ£ÀßqÀ
3. r.J¯ï.J£ï	: ¥ÀzÀUÀ¼À ºÀÄlÖÄ ªÀÄ
4. PÀªÉ¥ÀÄ	: ¸ÀA¸ÀÌøw PÀ£ÁðI PÀ
5. f.J¸ï. ²ªÀgÀÄzÀæ¥Àà	: PÀ£ÀßqÀ ¸Á»w ªÀiÁUÀðPÀ£ÀßqÀ
6. f. ªÉAPÀ ¸ÀÄ§âAiÀÄå	: EUÀÎ PÀ£ÀßqÀ
7. AiÀÄÄDgï. C£ÀAvÀªÀÄÆwð	: PÀ£ÀßqÀ ªÀÄÆgÀÄ ºÀªÀ ÀUÀ¼ÀÄ
8. PÉ.. £ÁgÁAiÀÄt	: vÀvÀìªÀÄ ªÀiÁUÀð PÀ£ÀßqÀ

9. wgÀÄªÀ ÃÄ ÄÉ±ï : PÀ£ÀßqÀ ¥ÀæªÀÄ£ÀºÀ ÀÜ ¢ÃÖ ÀÄ°è
10. §gÀUÀÆgÀÄ gÁªÀÄZÀAzÀæ¥Àà : PÀ£ÀßqÀ ÁªÀÄ£À

¥ÀgÀªÀÄ±À :

1. ±À ¨Á eÉÆÃ¶ : PÀ£ÀßrAiÀÄ ºÀ ÄÖ ¸ÀA¸ÀÌÈw ¥ÀæPÁ±ÀAiÀÄ, zsÁgÀªÁqÀ 1945
2. ಎ.ಆರ್. ಕೃಷ್ಣಶಾಸ್ತ್ರಿ : ಭಾಷಣಗಳು ಲೇಖನಗಳು, ಶಾರದಾ ªÀÄA¢gÀ ªÉÄÊ¸ÀÆgÀÄ
3. rJ¯ïJ£ï : ¦ÃpPÉUÀ¼ÀÄ ¯ÉÃR£ÀUÀ¼ÀÄ
4. (¸À) ²ªÁgÉØ : PÀ£ÀßqÀ ¸ÀA±ÉÆÃzsÀ£À, PÀ£ÀßqÀ «±Àé«zÁå®AiÀÄ, ºÀA¦
5. ¸À gÀªÀÄvï vÀjÃPÉgÉ : ªÀÄvÀÄ vÀvÀé ¸À§UÉ ¸ÀA¥ÀÄl 1, PÀ«, ºÀA¦ 2011,
6. ¸À JA.J¸ï. vÁgÁ£ÁxÀ : ±À²ªÀÄ£À ¸À±ÉÆÃzsÀPÉ PÀÈÒI PÀ¸Á» vÀå CPÁqÉ«Ä, ¨ÉAUÀ
7. AiÀÄÄDgï. C£ÀAvÀªÀÄÆwð : ªÁ°äÃQAiÀÄ£ÉÆÃzÀAiÀÄ
8. PÉ«. £ÁgÁAiÀÄt : PÀ£ÀßqÀ dUÀwÛ Czsà±ÀæªÀÄ£À, PÀ£ÀßqÀ ««
9. PÉ. wgÀÄªÀ ÃÄ ÄÉ±ï : £ÀªÀÄä PÀ£ÀßqÀ
10. ºÉï.J¸ï. ©½î : ªÀÄgÀÄzÀÄÛG ¥ÀæÁå¸ÀUÀ¼ÀÄ

KND 210: ¥ÀwæPÉ 5.2 eÁ£ÀAzÀ ÀCzsÀåAiÀÄ£À: PÀ£ÀßqÀ d£ÀAzÀ ¸Á» vÀå(DAiÀÄ¥ÀoÀåUÀ¼ÀÄ)

Course Outcome

CO1: Understood the concept of Folk theatre setting
CO2: Able to understand the different forms of Folk arts
CO3: Able to understand the signification of different Folk festivels
CO4: Understood the concept of Folk Culture

1. **vÁwéPÀ:** eÁ£ÀAzÀ ¸Á» vÀå¥ÀæPÁgÀUÀ¼ÀÄ PÀÄvÀÄ F ªÀiÁUÉÆ£ÉAzÀ CzsÀåAiÀÄ£À ¸ÀA§zsÀ ¥ÀæAiÉÆÃUÀ ¸Á» vÀå¥ÀæPÁgÀ CzsÀåAiÀÄ£À ªÀÄvÀÄ zÀ¥ÀðtÁR «zÁå¸ÀA¥ÀjZÀAiÀÄ

¥ÀoÀåUÀ¼ÀÄ

2. C) PÀ£ÀßqÀ d£ÀAzÀ PÀxÉUÀ¼ÀÄ : f Ã±À ¥ÀgÀªÀÄ ªÀAiÀÄå(¥ÀæUÀA¦ £ÀªÉÆÃzÀ Jgq£À PÀxÉUÀ¼ÀÄ)
   D) UÀgÀAiÀÄ ºÁqÀÄ : ºÀ¸ÀV UÉÆÃgÀÄ
3. C) UÀUÉjzÀ£À®Ä : (¸À) PÁ¼ÉÃUËqÀ£ÁUÀªÁgÀ – f.«. D£ÀzÀªÀÄÆwð
   (¤UÀvÀ¨sÁUÀ¥ÀÄ 1 jAzÀ 107 ªÀÄvÀÄÛ 251 jAzÀ 300 gÀªÀgÉUÉ)
4. C) £ÀªÀÄä ¸ÀªÀÄÛUÁzÉUÀ¼ÀÄ : ¸ÀzsÁPÀgÀ
   D) ¸Á«gÀzÀ MUÀÄUÀ¼ÀÄ : ¸ÉÆªÀÄ±ÉÃRgÀ EªÀÄæ¥ÀÄgÀ

KND 210: ¥ÀwæPÉ 5.3 ZÁj wæPÀ CzsÀåAiÀÄ£À PÀ£ÀßqÀ ¸À ¸ÀÌöw: DAiÀÄ¥ÀoÀåUÀ¼ÀÄ

Course Outcome

CO1: Able to understand the historical background of Kannada Poets
CO2: Students must learn the attitudes of Kannada Poets
CO3: Understood the different forms of Kannada Chandasu
CO4 : Understood the concept of Kannada Literature

1. **PÀgÁdªÀiÁUÀð** : **£ÁqÀÄ £ÀÄr ªÀÄð£É**
   (D±Á¸À 1, ¥ÀzÀåUÀ¼ÀÄ 1 jAzÀ 43, D±Á¸À 2 ¥ÀzÀå 28)
2. **ªÀqÁØgÁzsÀ£É** : **¨sÀzÀæ ÀÄ ¨sÀlÁgÀPÀgÀ PÀxÉ**

3. Cf vÀÄgÁt : CwÛÃ ¥ÀæzÉñÀ

(D±Áé¸À 1, ¥ÀÄlÖ¸ÀASÉå 20 jAzÀ 75)

4. §¸ÁÌgÀ ¨sÀgÀÆ¥ÀÄ vÀ 12 ªÀiÁUÀðUÀ¼À :

1. ¸ÀdÀ ÀÄ ¨ ÉÆ¼À ªÀiÁr
2. ¯ÉÃPÀ À qÉÃPÀ¤ÃªÀPÉ
3. º¸ÀgÉ vÀzÀ º¸ÀgÉÆÃ PÀ
4. ºÁª ÀwAzÀ ¸ÀgÀ£Àr ¸Àº ÀzÀ
5. zÉª ÀÉÃPÀª Àv À ¯ÉÃPÀÉ§ ÀzÀ
6. ª Àv À ¯ÉÃPÀÉ§ ÀzÀ PÀÁgÀÀPÀ ª ÀiÁå
7. ª ÁzÀÉzÀª É®£ÀvÀzÀÉ
8. PÀ£ÁUÀÀ
9. ª ÉzÀÉMgÉiÀ¤PÀª É
10. C¥ÀÄ qÉÃº ÀPÀÀiÀå
11. GvÀÄ PÀ®zÀ º ÀnzÉ§
12. CgÀ ÀªÀÉÃiÀ èCgÀAiÀÁ¥ÀjAzÀ

5. PÉgÁd zÀÁÃgÀ gÀÉ(º jÀº gÀ

6. ¹zÀÁª ÀZÁj vÀ£ÁÉ®ÉÃ¸À¢ü

7. **§¸ÀÀgÁ : ¸ÀÁzÉ« ºÁÀEzÁ ª ÀiÀÀÀPÀÉ**(¸À¢ü 51)

8. gÁª ÀzÉ£ÀZjvÉ PÀÀÁ¸À

9. **gÁª À£ÁxÀZjvÉ ±ÀÉ®zÀ§â**(D±Áé¸À 6, ¸À¢ü 2, ¥ÀÄlÖ 1 jAzÀ 104)

10. gÁeÁª ÀÀPÀÁ¸ÁgÀ £ÀÀÀ¢ÃgÀ

11. ¦ gÀ¸ÀUÀ¹zÀLzÀLwº ÁPÀ Áª ÀÀÀ: ºÀUÀAiÀ¨ÉqÀÀ

12. PÉ¦Ã ÃvÀÜ G¥À §t f UÀÉPÉ¦Ã ÃvÀÜ

DAvÀjPÀ ªÀiË®åªÀiÁ¥À£À (30 CAPÀUÀ¼ÀÄ)

¥ÀæÀ ZÀÄAiÀÄ «µÀAiÀÄPÉÌ ¸ÀA§A¢ü¹zÀAvÉ F PɼÀV£À jÃwAiÀÄ ªÀiË®åªÀiÁ¥À£ÀªÀ£ÀÄß ¤ÃrzÀÄÝ ªÀÄÆ®åªÀiÁ¥À£À £Àq¸À¨ÉÃPÀÄ.

mÉ¸ïÖ	C£ÀÄ	CAPÀUÀ¼ÀÄ
mÉ¸ïÖ-1	¥ÀæÀ ZÀÄAiÀÄ «µÀAiÀÄ 2£É WÀlPÀzÀ CAvÀåzÀ°è (MAzÀÄ UAmÉ)	10
mÉ¸ïÖ-2	¥ÀæÀ ZÀÄAiÀÄ «µÀAiÀÄ 4£É WÀlPÀzÀ CAvÀåzÀ°è (MAzÀÄ UAmÉ)	10
	¥ÀæÀ ZÀÄAiÀÄ «µÀAiÀÄ ªÉÆzÀ®£É CªÀ¢üAiÀÄ gÀZÀ£ÁvÀäPÀ ªÀiË®åªÀiÁ¥À£À (I ¸ÉÊQëzÀ¸ï)	05
	¥ÀæÀ ZÀÄAiÀÄ «µÀAiÀÄ JgÀqÀ£É CªÀ¢üAiÀÄ gÀZÀ£ÁvÀäPÀ ªÀiË®åªÀiÁ¥À£À (I ¸ÉÊQëzÀ¸ï)	05
	MlÄÖ	30

3 «ZÁgÀUÉÆ¶×/ ZÀZÁðUÉÆ¶×/ ¥Àæ§AzsÀ ªÀÄAqÀ£É EAvÀºÀ ZÀlĪÀnPÉUÀ¼ÀÄ

ವಿಷಯ ಸಂಗ್ರಹಣೆ, ಪ್ರಬಂಧ ರಚನೆ, ಮಂಡನೆ ಮತ್ತು ಚರ್ಚೆಯಲ್ಲಿ ಭಾಗವಹಿಸುವಿಕೆ – ಗರಿಷ್ಠ 5 ಅಂಕಗಳು

4. ªÀiË®åªÀiÁ¥À£À WÀlPÀ: 3 : «zÁåyðAiÀÄ ZÀÄAiÀÄ «µÀAiÀÄ ಅಂತ್ಯದಲ್ಲಿ ಮೂರು ಗಂಟೆ ಅವಧಿಯ ಗರಿಷ್ಠ 70 CAPÀUÀ¼À ¥ÀjÃPÉë £ÀqɸÀvÀPÀÌzÀÄÝ.

5. C) C£ÀÄ¥ÀAiÉÆÃV / ªÀiÁ£À¹PÀ ¥ÀgÁªÀıÀð (4 PÁAiÀÄðUÀ¼ÀÄ) ªÀiË®åªÀiÁ¥À£À PÉÃAzÀæ, ªÀiÁ»w ¸ÀAUÀæºÀuÉ ªÀÄvÀÄÛ ªÀgÀ¢

WÀlPÀ1:	C) C£ÀÄ¥ÀAiÉÆÃV ªÀÄvÀÄÛ ªÀgÀ¢	- 7.5 CAPÀUÀ¼ÀÄ
	D) «ZÁgÀUÉÆ¶×/ ZÀZÉð / ¥Àæ§AzsÀ	- 7.5 CAPÀUÀ¼ÀÄ
WÀlPÀ2:	C) PÉëÃvÀæ ªÀgÀ¢	- 7.5 CAPÀUÀ¼ÀÄ
	D) ¥ÀævÁåQëPÉ ºÁUÀÆ CAwªÀÄ ªÀgÀ¢	- 7.5 CAPÀUÀ¼ÀÄ

WÀlPÀ3: ZÀÄAiÀÄ «µÀAiÀÄ CAvÀåzÀ°è ªÀgÀ¢AiÀÄ ªÀiË®åªÀiÁ¥À£À ªÀÄvÀÄÛ ªÀiËTPÀ ¥ÀjÃPÉëAiÀÄ£ÀÄß MAzÀÄ DAvÀjPÀ ºÁUÀÆ MAzÀÄ ¨ÁºÀå ¥ÀjÃPÀëPÀgÀÄ eÉÆvÉUÀÆr £Àqɸ¨ÉÃPÀÄ. – 70 CAPÀUÀ¼ÀÄ

WÀlPÀ4: ವಿದ್ಯಾರ್ಥಿಯು ಮೂರನೆಯ ಚತುರ್ಮಾಸದಲ್ಲಿ ವಿಭಾಗದ ಅಧ್ಯಾಪಕರೊಂದಿಗೆ ಚರ್ಚಿಸಿ ವಿಷಯ DAiÉÄÌ ªÀiÁr PÉëÃvÀæPÉÌ ºÉÆÃV ZÀÄAiÀÄ «µÀAiÀÄ CAvÀåzÀ°è «¨sÁUÀPÉÌ ¸À°è¸À¨ÉÃPÀÄ. J-4 C½vÉAiÀÄ PÁUÀzÀzÀ°è 12 ¥Á¬ÄAmï CPÀëgÀUÀ¼À°è 50 ¥ÀÄl UÀ½UÉ PÀªÀÄä EgÀzÀAvÉ ªÀÄvÀÄÛ 80 ¥ÀÄl UÀ½UÉ «ÄAgÀzÀAvÉ C£ÀÄ¥ÀAiÉÆÃV «gÀ¨ÉÃPÀÄ.

WÀlPÀ5: ZÀÄAiÀÄ «µÀAiÀÄ CAvÀåzÀ°è ªÀgÀ¢AiÀÄ ªÀiË®åªÀiÁ¥À£À ªÀÄvÀÄÛ ªÀiËTPÀ ¥ÀjÃPÉëAiÀÄ£ÀÄß Czsï·AiÀÄ£À ªÀÄAqÀ½/ Czsï·AiÀÄ£À «¨sÁUÀ/ ¥ÀjÃPÁ ªÀÄAqÀ½ Czsï·PÀëgÀÄ CxÀªÁ C£ÀÄ£ÀªÀiÁw¸À¯ÁÝ ªÀåQÛ ºÁUÀÆ EvÀgÀ «zÁåyðAiÀÄ / Gzï·ÃUÀ / ¸ÀA±ÉÆÃzsÀ / ¸ÀA¸ÀÜAiÀÄ ¸ÀzÀ¸ÀågÀ DºÁé¤vÀgÀ MAzÀÄ ¨ÁºÀå ¥ÀjÃPÀëPÀgÀ eÉÆvÉUÀÆr £Àqɸ¨ÉÃPÀÄ. – 10 CAPÀUÀ¼ÀÄ (60+10=70)

4£É ZÀÄAiÀÄ «µÀAiÀÄªÀÅ ವಿಷಯವಾದ 'ಅವಧಿಕ ಕಾರ್ಯ' ಬರಹದ ಮೌಲ್ಯಮಾಪನವನ್ನು 60 CAPÀUÀ½UÉ £Àqɸ¯ÁUÀĪÀÅzÀÄ 10 CAPÀUÀ½UÉ ªÀiËTPÀ ¥ÀjÃPÉëAiÀÄ£ÀÄß £Àqɸ¯ÁUÀĪÀÅzÀÄ.

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ªÀiÁzÀj ¥Àæ±Éß¥ÀwæPÉ

2018-19 £Éà ¸Á°£À ¸ÁªÀiÁ£Àå vÀgÀUÀwAiÀÄ PÀ£ÀßqÀ ªÀiÁzsÀåªÀÄzÀ ¥ÀoÀåPÉÌ

(¹©¹J¸ïE¹Jf¦ ªÀiÁzÀj)

¥ÀæxÀªÀÄ ¨sÁµÉ

¸ÀªÀÄAiÀÄ 3 UÀAmÉUÀ¼ÀÄ **CAPÀUÀ¼ÀÄ** 70

¸ÀEZÀ£É: J¯Áè ¥Àæ±ÉßUÀ½UÀÆ GvÀÛj¹

(J) CxÀðªÀÁ (©) CAPÀUÀ¼ÀÄ : 14

(¹) CxÀðªÀÁ (r) CAPÀUÀ¼ÀÄ : 14

(E) CxÀðªÀÁ (J¥sï) CAPÀUÀ¼ÀÄ : 14

(f) CxÀðªÀÁ (JZï) CAPÀUÀ¼ÀÄ : 14

AiÀiÁªÀÅzÁzÀgÀÆ K¼ÀÄ ¥Àæ±ÉßUÀ½UÉ GvÀÛj¹ **CAPÀUÀ¼ÀÄ: 7X2=14**

(L)	(M)
(eÉ)	(¦)
(PÉ)	(PÀÆ)
(J¯ï)	(Dgï)
(JªÀiï)	(J¸ï)
(J£ï)	(n)

¥Àæ±ÉßUÀ¼À ¥ÀæPÁgÀ J¯Áè CAPÀUÀ½UÉ GvÀÛj¸ÀÄ vÀÄA¨Á ªÀÄÄRå

JSS COLLEGE OF ARTS, COMMERCE & SCIENCE

(AUTONOMOUS)

OOTY ROAD, MYSURU-570 025

(Autonomous under University of Mysore: Re-accredited by NAAC with 'A' Grade)

MASTERS OF VOCATIONAL COURSE

M.Voc. (Software Development)

Department of M.Voc.

JSS College of Arts, Commerce and Science

Ooty Road, Mysore-25

2018

PROGRAMME

MASTER OF VOCATIONAL COURSE - Software Development

2 Years/4 Semesters

PROGRAMME OUTCOMES:

After Completing the M.Voc. Program Students will be able to:

PO1. Contribute to the design of embedded software modules
PO2. Develop software code to specification
PO3. Create documents for knowledge sharing
PO4. Manage your work to meet requirements
PO5. Work effectively with colleagues
PO6. Maintain a healthy, safe and secure working environment
PO7. Provide data/information in standard formats
PO8. Develop knowledge, skills and competence

Contribute to the design of embedded software modules

C++, Embedded C#

NOS Code : SSC/N6004

Course Outcomes: At the end of the course students will be able to:

CO1. Establish your role and responsibilities in contributing to the design of embedded software modules.
CO2. Establish clearly module requirements and constraints
CO3. Identify any issues with module requirements or constraints and clarify these with appropriate people
CO4. Document designs using standard templates and tools
CO5. Update your organization's knowledge base with new designs.
CO6. Obtain advice and guidance on designing embedded software modules from appropriate people, where required.

Amazon web services **Hr:-15**

- Introduction to cloud computing
- What is AWS
- Success stories
- AWS services
    - EC2
    - ELB
    - S3
    - CLOUD FRONT
    - OTHER SERVICES

Develop Software code to specification

C, Java

NOS Code : SSC/N0502

Course Outcomes: At the end of the course students will be able to:

CO1. Check your understanding of the Business Requirements specification (BRS), Software Requirements Specification (SRS), High Level Design (HLD) and Low Level Design (LLD) with appropriate peopleaccess reusable components, code generation tools and unit testing tools from your organization's knowledge base.

CO2. Convert technical specifications into code to meet the requirements, leveraging reusable components, where available

CO3. Create appropriate Unit test cases (UTCs)

CO4. Review codes and UTCs with appropriate people

CO5. Analyze inputs from appropriate people to inform future designs

CO6. Submit tested code for approval by appropriate people

Mango DB on AWS **Hr:-15**

- Introduction
- Creating, reading and updating data
- Schema design

- Performance
- Aggregation framework
- Application engineering
- Case studies

Create documents for knowledge sharing

TCL, Squirrel

NOS Code : SSC/N0703

Course Outcomes: At the end of the course students will be able to:

CO1. Establish with appropriate people the purpose, scope, formats and target audience for the documents
CO2. Access existing documents, language standards, templates and documentation tools from your organization's knowledge base.
CO3. Liaise with appropriate people to obtain and verify the information required for the documents
CO4. Create documents using standard templates and agreed language standards
CO5. Review documents with appropriate people and incorporate their inputs
CO6. Publish documents in agreed formats
CO7. Update your organization's policies, procedures and guidelines when creating documents for knowledge sharing

R programming language **Hr:-15**

- A first session in R
- Getting data into R
- Basic data manipulation
- Basic plotting 1
- Basic plotting 2
- Loops and functions
- Basic stats1
- Basic stats2
- Advance data manipulation

- Final project presentation

Manage your Work to meet requirements

NOS Code : SSC/N9001

Course Outcomes: At the end of the course students will be able to:

CO1. establish and agree your work requirements with appropriate people
CO2. keep your immediate work area clean and tidy
CO3. utilize your time effectively
CO4. use resources correctly and efficiently
CO5. treat confidential information correctly
CO6. work in line with your organization's policies and procedures
CO7. work within the limits of your job role
CO8. obtain guidance from appropriate people, where necessary
CO9. ensure your work meets the agreed requirements

Business English **Hr:-30**

- Understanding company structures
- Developing relationships in the work place
- Correspondence- E-mailing written Reports and telephoning
- Public speaking and presentations
- Meeting and Negotiations

Work effectively with colleagues

NOS Code : SSC/N9002

Course Outcomes: At the end of the course students will be able to:

CO1. communicate with colleagues clearly, concisely and accurately
CO2. work with colleagues to integrate your work effectively with theirs
CO3. pass on essential information to colleagues in line with organizational requirements
CO4. work in ways that show respect for colleagues
CO5. carry out commitments you have made to colleagues
CO6. let colleagues know in good time if you cannot carry out your commitments, explaining the reasons

CO7. identify any problems you have working with colleagues and take the initiative to solve these problems

CO8. follow the organization's policies and procedures for working with colleagues

Presentation skills **Hr:-30**

- Understand basic patterns of an effective presentation
- Create an deliver an effective presentation
- Asking questions
- Answering questions
- Evaluate presentation
- Case study- Entrepreneurship development

Meeting management skills

- Understanding meeting management
- Types of meeting
- Setting meeting objectives
- Greetings
- Conduct of meeting
- Meeting closure
- Minutes of meeting
- Meeting follow up

Maintain a healthy safe and secure working environment

NOS Code : SSC/N9003

Course Outcomes: At the end of the course students will be able to:

CO1. comply with your organization's current health, safety and security policies and procedures

CO2. report any identified breaches in health, safety, and security policies and procedures to the designated person

CO3. identify and correct any hazards that you can deal with safely, competently and within the limits of your authority

CO4. report any hazards that you are not competent to deal with to the relevant person in line with organizational procedures and warn other people who may be affected

CO5. identify and recommend opportunities for improving health, safety, and security to the designated person

CO6. complete any health and safety records legibly and accurately

Time management skills **Hr:-30**

- Beginnings
- Values and beliefs
- Goals and benchmarks – The ladders of success
- Managing projects and commitments
- Prioritizing your to DO's
- Designing the projects that matters
- Inspired action- getting results you need
- Tracking projects
- Managing for Accomplishment
- Tools that work

Provide data/information in standard formats

NOS Code : SSC/N9004

Course Outcomes: At the end of the course students will be able to:

CO1. establish and agree with appropriate people the data/information you need to provide, the formats in which you need to provide it, and when you need to provide it
CO2. obtain the data/information from reliable sources
CO3. check that the data/information is accurate, complete and up-to-date
CO4. obtain advice or guidance from appropriate people where there are problems with the data/information
CO5. carry out rule-based analysis of the data/information, if required
CO6. insert the data/information into the agreed formats

Term work skills

- Team structure
- Stages of team
- Traditional teams VS Collaborative teams
- Taking team action and problem solving
- Team communication
- Conflict resolution
- Mediation
- Role-specific issues
- Projects presentation

Develop your knowledge , skills and competence

NOS Code : SSC/N9005

Course Outcomes: At the end of the course students will be able to:

CO1. obtain advice and guidance from appropriate people to develop your knowledge, skills and competence
CO2. identify accurately the knowledge and skills you need for your job role
CO3. identify accurately your current level of knowledge, skills and competence and any learning and development needs

CO4. agree with appropriate people a plan of learning and development activities to address your learning needs

CO5. undertake learning and development activities in line with your plan

CO6. apply your new knowledge and skills in the workplace, under supervision

Communication skills

- Communication in English
- Listening skills
- Reading skills
- Writing skills
- Speaking skills.

General Education Component3:

- Project estimation skills
- Understanding project estimation
- How to estimate time accurately
- Methods of estimating time
- Preparing your scheduling

JSS MAHAVIDYAPEETHA

JSS COLLEGE OF ARTS, COMMERCE & SCIENCE

(An Autonomous College of University of Mysore)

B N ROAD, MYSURU-570 025 KARNATAKA

MA IN ENGLISH

SYLLABUS
2018-19

JSS MAHAVIDYAPEETHA

JSS COLLEGE OF ARTS, COMMERCE & SCIENCE

(An Autonomous College of University of Mysore)

B N ROAD, MYSURU-570 025 KARNATAKA

MA ENGLISH

Programme Code: ENG

Choice Based Credit System & Continuous Assessment Grading Pattern

2018-19 ONWARDS

DEPARTMENT OF STUDIES IN ENGLISH
JSS COLLEGE, B N ROAD, MYSURU - 25

MA ENGLISH COURSE STRUTURE

I SEMESTER

Course I – (Hard Core-I) English Literature from Chaucer to Milton	**ENA 010**
Course II – (Hard Core-II) Elizabethan Age	**ENA 020**
Course III – (Hard Core-III) 17th and 18thCentury English Literature	**ENA 030**
Course IV – (Hard Core-IV) 19th Century English Literature	**ENA 040**
Course V – *(Soft Core-I) Indian Diaspora Fiction	**ENA 230**
***(Soft Core-II) Contemporary Indian Novels in English**	**ENA 220**

II SEMESTER

Course I - (Hard Core – I) The Modern Age-I	**ENB 040**
Course II - (Hard Core-II) Literary Criticism-I	**ENB 020**
Course III – (Hard Core-III) Indian Writing in English – I	**ENB 030**
Course IV – (Hard Core-IV) 20th Century Women's Writing: Theory & Practice	**ENB 050**
Course V – *(Soft Core-I) Indian Drama	**ENB 230**
***(Soft Core-II) English Essayists**	**ENB 220**

Note: * Soft Core Elective Courses

III SEMESTER

Course I – (Hard Core-I) The Modern Age-II	**ENC 010**
Course II – (Hard Core-II) Indian Writing in English-II	**ENC 020**
Course III – (Hard Core-III) New Literatures in English	**ENC 030**
Course IV (Open Electives) A Course in Written and Spoken English	**OE**
Course V –* (Soft Core-I) Indian English Poetry After Independence	**ENC 230**
***(Soft Core-II) Feminism**	**ENC 220**

IV SEMESTER

Course I – (Hard Core-I) Literary Criticism-II	**END 010**
Course II – (Hard Core-II) American Literature	**END 020**
Course III – (Hard Core) Major Project Work leading to a Dissertation	**END 030**
Course IV – *(Soft Core I) Dalit Literature	**END 210**
***(Soft Core II) Post-Colonial African Fiction**	**END 220**

Note: * Soft Core Elective Courses

MA ENGLISH COURSE STRUCTURE

Semester	Type of Course		Course Title	L	T	P	Credits	Credits required
First Semester	Hard Core	1.	English Literature from Chaucer to Milton	3	1	0	4	16
		2.	Elizabethan Age	3	1	0	4	
		3.	17th and 18thCentury English Literature	3	1	0	4	
		4.	19th Century English Literature	3	1	0	4	
	Soft Core Electives	1.	Indian Diaspora Fiction	3	1	0	4	4
		2.	Contemporary Indian Novels in English	3	1	0	4	
						Total Credits		**20**
Second Semester	Hard Core	1.	The Modern Age-I	3	1	0	4	16
		2.	Literary Criticism-I	3	1	0	4	
		3.	Indian Writing in English – I	3	1	0	4	
		4.	20th Century Women's Writing: Theory & Practice	3	1	0	4	
	Soft Core Electives	1.	Indian Drama	3	1	0	4	4
		2.	English Essayists	3	1	0	4	
						Total Credits		**20**

Semester	Type of Course		Course Title	L	T	P	Credits	Credits required
Third Semester	Hard Core	1.	The Modern Age-II	3	1	0	4	12
		2.	Indian Writing in English-II	3	1	0	4	
		3.	New Literatures in English	3	1	0	4	
	Soft Core Electives	1.	Indian English Poetry After Independence	3	1	0	4	4
		2.	Feminism	3	1	0	4	
	Open Elective	1.	A Course in Written and Spoken English	3	1	0	4	4
							Total Credits	**20**
Fourth Semester	Hard Core	1.	Literary Criticism-II	3	1	0	4	12
		2.	American Literature	3	1	0	4	
		3.	Major Project Work leading to Dissertation	0	0	4	4	
	Soft Core Electives	1.	Dalit Literature	3	1	0	4	4
		2.	Post-Colonial African Fiction	3	1	0	4	
							Total Credits	**16**
							Total Credits at the end of the Course	**76**

Programme Outcomes

After completing the Post-graduation in the Master of Arts, the students are able to:

- Learn English language explored through literature.
- Demonstrate critical reading, writing, and thinking skills. Write focused, organized, well-developed, and text-based essays using effective paragraphs, which support a clear thesis statement, and demonstrate competence in Standard English grammar and usage.
- Learn to participate effectively in debates, group discussions, seminars.
- Gain knowledge from various literatures taught during the programme to pursue research at Doctoral level.
- Get the opportunity to opt for career in the fields of journalism and communication with the command over English language.
- Acquire a thorough grounding in the basics of the subject - English language and literature.
- Learn to think logically and relate to real life scenario.
- Imbibe good ethics explored in the works of great writers.

Programme Specific Outcomes

- Acquire the competence to serve as English Language teacher at primary, secondary, higher secondary and pre-university level.
- Gain basic knowledge needed to become a researcher.
- Get good grounding in value-based learning.
- Improve academic achievement.
- Foster communication skill development.
- Apply knowledge in analysing real life situations.

Course I – (HC-I) ENGLISH LITERATURE FROM CHAUCER TO MILTON

Course Code: ENA 010 **Credits: 4**

Course Outcomes

Students able to do at the end of the course:

- Develop historical perspective of the age based on the knowledge acquired through representative texts of the period.
- Acquire the knowledge and appreciate the use of various literary devices by the writers of this period.
- Develop aesthetic sensibility.
- Develop a cognitive base to understand the evolution of British Literature from Medieval period.

UNIT –I

1. Background – 14th Century – 1658
2. Renaissance, Reformation, Puritan Upsurge
3. Jacobean, Metaphysical School

UNIT – II

1. Chaucer -- Prologue to the Canterbury Tales
2. John Milton – Paradise Lost: Book-I
3. Book of Job

UNIT – III

1. Sidney: Sonnets I, V &VI (Astrophel and Stella)
2. Spenser: Prothalamion, Epithalamion
3. Surrey: 1. Love that liveth and reigneth in my thought
   2. Set me whereas the sun doth parch the green
4. Wyatt: 1. Who so list to hunt 2. They flee from me

UNIT – IV

1. John Donne – The Goodmorrow, Song: Go and Catch a Falling Star, Death be Not Proud, At the Round Earth's Imagined Corner, Sunne Rising, Resurrection
2. George Herbert – The Pulley, The Collar, Virtue, Discipline
3. Andrew Marvell – To His Coy Mistress, Thoughts in a Garden
4. Robert Herrick- To the Virgins, To Find God.

Suggested Reading

1. David Daiches –*A Critical History of English Literature*- Four volumes
2. Boris Ford (Ed) - *Pelican Guide to English Literature*- Eight volumes
3. Herbert Grierson - *Metaphysical Poets*
4. Abrams M H et al. *The Norton Anthology of English Literature*. New York: W.W. Norton,2006
5. Al Poplaski: *English Literature in Context*

Course II – (HARD CORE-II) ELIZABETHAN AGE

Course Code: ENA-020 **Credits: 4**

Course Outcomes

Students able to do at the end of the course:

- Develop deeper understanding of the period.
- Inculcate interest among students for theatre.
- Develop zeal to attend enactment of dramas
- Promote aesthetic sensibility to understand human nature depicted in the works of this period.

UNIT –I
Background – Elizabethan Age

Elizabethan theatre and audience Shakespeare- Tragedy and Comedy

UNIT – II
Marlowe: *Dr. Faustus* Ben Jonson: *Volpone*

Thomas Kyd: *Spanish Tragedy*

UNIT – III
William Shakespeare: 1*) Macbeth, 2) Julius Caesar*, 3) *As you Like It*

UNIT – IV
Shakespeare's Sonnets: **18, 29, 30, 33, 60, 71, 73, 114, 116.**

On Love: 29,114, and 116, On Death: 18, 19, and 55 On Time: 33, 60, and 73

On Dark Lady: 130, 131, and 133

Suggested Reading

1. A.C. Bradley – *Shakespearean Tragedy*
2. F R Leavis – *The Common Pursuit*
3. Wilson Knight – *The Wheel of Fire*
4. Stewart Justman – *Shakespeare: The Drama of Generations*
5. S. Vishwanathan - *Exploring Shakespeare*
6. Cleanth Brooks - *Understanding Drama*
7. Toropov - Shakespeare for Beginners

Course III – (HARD CORE-III) 17th and 18th CENTURY ENGLISH LITERATURE
Course Code: ENA 030 Credits: 4

Course Outcomes

Students able to do at the end of the course:

- Develop deeper understanding of the period (17th and 18th century).
- Learn and understand popular genres of the period- Satires, Prose essays and Comedy of Manners.
- Learn to appreciate the representative works of the age in comparison with the works of previous era.

UNIT –I
Background – Restoration, Neo-Classical, Augustan Satire, Comedy of Manners Spectator Essays

UNIT – II
Dryden – *Absalom and Achitophel*

Alexander Pope – *The Rape of the Lock*

Bunyan – *Pilgrim's Progress Book-1*

UNIT – III
William Congreve - *The Way of the World*

Sheridan – *The School for Scandal*

Aphra Behn- *Ooroonoko (Royal Author)*

UNIT – IV
Daniel Defoe: *Robinson Crusoe*

Jonathan Swift – *Gulliver's Travels – Book IV* (Voyage to the Land of Houyhnhnms)

Addison & Steele: Spectator Essays

Addison: (1) Sir Roger at Church, (2) Sir Roger at Assizes

Steele: (1) The Gentleman 2) The Spectator Club

Suggested Reading

1. M.H. Abrams (Ed) *The Norton Anthology of English Literature* (Vol.1 & 2)
2. David Daiches – *A Critical History of English Literature* –Four volumes
3. Arnold Kettle- *The English Novel*- Two volumes
4. Ian Jack – *The Augustan Satire: Intention and Idiom in English poetry 1660-1750*
5. Pramod Nayyar (ed) – *English Poetry 1660-1780: An Anthology*

Course IV (Hard Core – IV) – 19th CENTURY ENGLISH LITERATURE
Course Code: ENA 40 Credits: 4

Course Outcomes

Students able to do at the end of the course:

- Understand the period with an overview of the Romantic and Victorian age
- Learn the impact of industrialization and urbanization on the life of people in general and middle class people in particular.
- Nurture and develop spiritual affinities with Nature, and a sense of compassionate aesthetics that promotes social conscience
- Develop the love for Nature and aesthetic sense to relish the beauty of abundant nature around us
- Understand aesthetics of 19thCentury poetry and prose

Unit I: Background:

1. French Revolution;
2. The Romantic Movement in Literature with special reference to leading Romantic poets; Influence of German Philosophy on Romanticism (Schiller and Kant)
3. Introduction to 19th Century Prose and Victorian Poetry
4. Women Question with reference to J S Mill and Mary Wollstonecraft

Unit II: Poetry

1. William Blake: 1) Tyger; 2) London 3) The Chimney Sweeper
2. William Wordsworth: Tintern Abbey, Ode to Immortality, Lucy Poems: A Slumber Did My Spirit Seal, She Dwelt Among Untrodden Ways.
3. S T Coleridge: The Rime of the Ancient Mariner
4. P B Shelley: Ode to the West Wind; To A Skylark
5. John Keats: Ode on the Grecian Urn, Ode to Autumn
6. Robert Browning: My Last Duchess

4 Tennyson: Ulysses, Lotus Eaters

Unit III: Fiction

1. Jane Austen: Emma
2. Emily Bronte: Wuthering Heights
3. Charles Dickens: Hard Times
4. Thomas Hardy: Jude the Obscure

Unit IV: Prose

1. J. Ruskin: *Unto this Last* (Chs.1 and 2)
2. J.S. Mill: "On Liberty"
3. Mathew Arnold: Culture and Anarchy (chapter 1: Sweetness & Light chapter 2: Hellenism & Hebraism)

Suggested Reading

1. Russell Noyes (Ed.): *English Romantic Poetry and Prose*
2. Harold Bloom and Lionel Trilling: *Romantic Poetry and Prose*
3. M. Bowra: *The Romantic Imagination*
4. William D. Templeman and Charles F. Harrold: *English Prose of the Victorian Era*

Any one of the soft cores to be chosen for earning 4 credits

SOFT CORE-I: INDIAN DIASPORA FICTION

Course Code: ENA-210 **Credits: 4**

Course Outcomes

Students able to do at the end of the course:

- Promote an understanding of the cultural conflict faced by immigrants in Indian diaspora and a sensibility to understand various cultures, breaking the barriers between different countries
- Explore human relationships across the countries
- Promote understanding of the process of glocalization, which helps in spreading universal peace

Unit I:
1. Salman Rushdie: Midnight Children
2. Tanuja Desai Hidier: Born Confused

Unit II:
1. Jhumpa Lahiri: The Namesake
2. Chitra Banerjee Divakaruni: The Mistress of Spices

Unit III:
1. Kiran Desai: Inheritance of Loss
2. Rohinton Mistry: A Fine Balance

Unit IV:
1. Aravind Adiga: White Tiger
2. Hari Kunzru: Gods without Men

***Note: Two lectures to introduce India Diaspora**

SOFT CORE II: Contemporary Indian Novels in English

Course Code: ENA-240 **Credits: 4**

Course Outcomes

Students able to do at the end of the course:

1. Explore the paradigm shift in thematic concerns in the writings of men and women writers
2. Students learn to appreciate the postmodern literary devices employed by the writers exploring the conscious and subconscious of their characters
3. Enhances understanding and sensibility of students as they read prescribed Indian novels published in 2000 and after.
4. By reading the representative works of Anurag Mathur, Anita Desai, Vikram Seth, Shashi Deshpande, Amit Chaudhuri, Anita Nair, Upamanyu Chatterjee and Manju Kapur, this course enriches students' understanding of life in contemporary Indian society

Unit I:

1. Anurag Mathur: The Inscrutable Americans (1991)
2. Anita Desai: Fasting, Feasting (1999)

Unit II:

1. Vikram Seth: A Suitable Boy (1993)
2. Shashi Deshpande: *A Matter of Time* (2000)

Unit III:

1. Amit Chaudhuri: *A New World (2000*)
2. Anita Nair: Ladies Coupe (2001)

Unit IV:

1.Upamanyu Chatterjee: Way to Go (2010)
2. Manju Kapur: Custody (2011)

***Note: Two lecture to introduce new themes and techniques of Contemporary Indian writing**

Suggested Reading

1. K.R. Srinivasa Iyengar: *Indian Writing in English,* 1994.
2. Mukherjee, Meenakshi, C. Vijayshree and Vijay Kumar, Eds. *The Nation Across the World: Postcolonial Literary Representations*. New York: OUP, 2008.
3. P K Dhawan and Veena Noble Das, ed. Fiction of the Nineties. 1990.
4. Shukla, Sheo Bhushan and Anu Shukla, ed. The Novels of Amit Chaudhuri: An Exploration in the Alternative Tradition, Sarup and Sons, 2012.

II SEMESTER

Course I – (HARD CORE-I) THE MODERN AGE- Part I

Course Code: ENB 040 **Credits: 4**

Course Outcomes:

- Introduces the students to the social, political and cultural milieu of the age
- Students learn the impact of World War I and II on 20th Century poetry.
- Brings deeper understanding of representative poets and the concern in their poetry.
- Students learn and appreciate the use of various literary devices by 20th Century poets.

UNIT – I

World Wars – I & II, Imagism, Surrealism, Symbolism, Free Verse, Existentialism, Phenomenology

UNIT – II

G.M. Hopkins: The Wreck of Deutschland, Windhover

W.B Yeats: Sailing to Byzantium, Byzantium, Second Coming, Easter 1916

Thomas Hardy: The Darkling Thrush, The Man He Killed

Wilfred Owen: Strange Meeting, Insensibility

UNIT – III

T.S. Eliot – The Wasteland, The Journey of the Magi

W H Auden – In Memory of W. B. Yeats, Muse des Beaux Arts

Sylvia Plath: The Arrival of the Bee Box: Lady Lazarus

UNIT – IV

Dylan Thomas: After the Funeral, Fern Hill

Seamus Heaney: Tollund Man, Digging, Casuality

Philip Larkin: Church Going, Next Please

Ted Hughes: Thought Fox, Hawk Roosting

Suggested Reading:

1. F. R. Leavis. *New Bearings in English Poetry*
2. Faber Book of Modern Verse
3. Norton Anthology of English Literature

II SEMESTER

Course II (Hard Core-II) - LITERARY CRITICISM-I

Course Code: ENB 020 **Credits: 4**

Course Outcomes:

- Facilitate students with Aristotle's Poetics and basics of literary criticism.
- Creates interest in students to read and understand the basics of literary/ critical theories.
- Bring awareness on the importance of criticism as a part of literature and its importance in the interpretation of the literary works.

Unit I:
Origin, growth, and development of Literary Criticism, Various Posits and Literary Contexts

Principles of Literary and Practical Criticism

Unit II:
1. Aristotle: *Poetics*

2. Longinus: *On the Sublime*

3. Plato on Mimesis in *A Short History of English Literary Criticism* by Wimsatt& Brooks

Unit III:
1. Sidney: *Apology for Poetry*

2. Samuel Johnson: *Preface to Shakespeare*

3. Dryden: *On Dramatic Poesy*

Unit IV:
1. W. Wordsworth: *Preface to Lyrical Ballads*

2. Coleridge: *Biographia Literaria* Chapters 13, 14, 17

3. Arnold: *The Function of Criticism at the Present Time*

Books for Reference and Further Reading:

1. I.A. Richards. Principles of Literary Criticism
2. C.T. Indira et al. English Literary Criticism
3. M.S. Nagarajan. English Literary Criticism and Theory
4. Vernon Hall. A short history of literary criticism

Course III – (HC-II) INDIAN WRITING IN ENGLISH - I

Course Code: ENB 030 **Credits: 4**

Course Outcomes:

- This course introduce the students to the social, political and cultural milieu of India during the colonial period.
- Promotes the understanding of growth and development of Indian novel in English.
- Brings a deeper understanding of representative Indian writers of prose, poetry, playwrights and their concerns.
- Students learn appreciate the use of various literary devices by Indian writers.

Unit I

Anglicists and Orientalists Debates, *Macaulay's Minute*, Rajaram Mohan Roy's *Letter to Lord Amherst*, The Rise of the Indian English Novel, Novel as a Social Act.

Unit II: Poetry

1. Toru Dutt: Prahlad; Our Casuarina Tree;

2. R. Tagore: Gitanjali: First five and last five poems

3. Sarojini Naidu: Coromandel Fishers, Indian Weavers

Unit III: Drama

1. Girish Karnad: *Hayavadhana*

2. Vijay Tendulkar: *Silence! The Court is in Session*

3. Mahesh Dattani: *The Final Solution*

4. Aurobindo: *Savitri* Canto-I

Unit IV: Fiction

1. Mulk Raj Anand: *Untouchable*

2. Raja Rao: *Kanthapura*

3. R.K. Narayan: *The Man Eater of Malgudi*

Unit IV: Criticism

1. Hiryanna: *Art Experience*: Indian Aesthetics (Chs. 1 and 2)

2. Ananda Coomaraswamy: "The Dance of Shiva"

3. Aurobindo: The Poets of Dawn -1&2 (From Future Poetry)

Books/Texts for Reference and Further Reading:

K.R. Srinivasa Iyengar: *Indian Writing in English*
C.D. Narasimhaiah: "Towards an Understanding of the Species Called Indian Writing in English"
Meenakshi Mukherjee: *The Perishable Empire* Chapter on: "The Anxiety of Indianness"

Course IV – (HC-IV) 20th CENTURY WOMEN'S WRITING: THEORY AND PRACTICE

Course Code: ENB-040 **Credits: 4**

Course Outcomes:

- Introduces students to feminism as a movement and brings awareness about gender issues.
- Familiarizes students with the themes, concerns and challenges faced by the representative women poets, and novelists of the 20th Century British, American, Nigerian, Afro-American, Canadian and Indian literatures.
- Awakens gender sensibility among students as they learn the injustices towards women in patriarchal society.
- This course has the scope for comparative study of writings of different literatures viz. African, African American, Canadian, and Indian. Apart from this, it also focuses on feminism as a movement awakening consciousness among women for their rights and rightful living on par with men in patriarchal societies.

Unit I (Background Study)

Feminism, History of Feminism, Feminist Movements, Sex and Gender, Society and Gender, Women's rights

Unit II (Novel)

Buchi Emecheta: *The Joys of Motherhood*
Mahasweta Devi: *Imaginary Maps* (A Collection of Short Stories)
Margaret Atwood: *Edible Woman*

Unit III (Prose)

Simone de Beauvoir: *Second Sex*
Virginia Woolf: *A Room of One's Own*
Showalter Elaine: *"Feminist Criticism in Wilderness"*

Unit IV (Poetry)

Kamala Das: *An Introduction, My Grandmother's House, Words, Suicide*
Maya Angelou: *Phenomenal Woman, Caged Bird, Human Family, Women Work*

Books for Reference and Further Reading:

1. The Female Imagination: Patricia Mayor Spack
2. Gender Trouble: Feminism and Subversion of Identity: Judith Butler
3. The Feminine Mystique: Betty Friedan
4. Feminism and Recent Fiction in English: Sushila Singh
5. The New Feminist Criticism: Essays on Women's Literature and Theory: Elaine Showalter

6. Sexual / Textual Politics: Toril Moi

Any one of the soft cores to be chosen for earning 4 credits

PAPER- V – (SOFT CORE-I) INDIAN DRAMA

Course Code: ENB-210 **Credits: 4**

Course Outcomes:

- Introduces students to Classical Dramas in general and Indian Classical Dramas in particular.
- The intensive study of the classical dramas chosen in this course promote understanding of Indian aesthetics.
- All the works chosen under this course promotes a sensibility to understand various cultural practices followed in India during 13th century.
- This course promotes spiritual and philosophical values among students and awakens human values in them.

1.	Abhijnana Shakuntalam:	Kalidasa
2.	SvapnaVasavadattam:	Bhasa
3.	Mudrarakshasa:	Vishakadatta
4.	Mrucchakatika:	Shudraka

Books/Texts for Reference and Further Reading

1. Translations made by Prof. M R Kale
2. Global Sanskrit Literature Series in English

(SOFT CORE-II) ENGLISH ESSAYISTS

Course Code: ENB-220 **Credits: 4**

Course Outcomes:

- Introduces students to the genre of prose essays and the large element of truth expressed in essayist's artistic statements.
- Enhances their sensibility to appreciate the feelings expressed by the essayists.
- Students learn to appreciate the literary devices employed by the essayists.
- Intellectual and literary worth of ideas expressed by the essayists instils valued based understanding among students.
- It also gives a thorough understanding of the importance of essays as a genre to bring social change among people as students read various essayists under this course with their observations on society.

1. Francis Bacon:	a) Of Studies
	b) Of Ambition
2. Joseph Addison:	a) Ladies Hair dress
	b) Sunday in the Church
3. Hazlitt:	a) On Going a Journey
	b) On the Ignorance of the Learned
4. Charles Lamb:	a) Poor Relations
	b) Chimney Sweepers
5. Bertrand Russell:	a) Behaviorism and Values
	b) Freedom versus Authority in Education
6. Mathew Arnold:	a) Wordsworth
	b) John Keats

Books/Texts for Reference and Further Reading:

1. The English Critical Tradition: An Anthology of English Literary Criticism, Vol-2, Edited by S. Ramaswamy & V.S. Sethuraman

2. Wimsatt and Brook, Literary Criticism: A Short History
3. G. Tillostone, Criticism and the Nineteenth Century

III SEMESTER

Course I – (HARD CORE-I) THE MODERN AGE-II

Course Code: ENC 010 **Credits: 4**

Course Outcomes:

- This course introduce the students to the social, political and cultural milieu of the age
- Develops interest among students when they learn more about the impact of World War I and II on 20th century fiction.
- Familiarizes the students and brings a deeper understanding of perspectives of representative writers of the age.
- Students learn the use of various literary devices and postmodern techniques like the Stream of Consciousness, Dark Humour in modern writings.

UNIT – I

Post World War Scenario, Twentieth Century Social Milieu, Twentieth Century Theatre, Twentieth Century Novel, Great Economic Depression, Stream of Consciousness, Postmodernism

UNIT – II

DH Lawrence: *The Rainbow*
Virginia Woolf: *To the Lighthouse*
E.M. Forster: *A Passage to India*
Doris Lessing: *The Golden Notebook*

UNIT – III

Samuel Beckett- *Waiting for Godot*
John Osborne: *Look Back in Anger*

UNIT – IV

Virginia Woolf: "On Modern Fiction"
George Lukacs: "The Meaning of Contemporary Realism" (chapters on Kafka & Modernist Fiction)
Raymond Williams: "When was Modernity"

Books for Reference and Further Reading:

1. Norton Anthology of English Literature
2. Vasudevan. *Perspectives: Selection from Modern English Prose and Fiction*

II – (HARD CORE-II) INDIAN WRITING IN ENGLISH-II

Course Code: ENC 020 **Credits: 4**

Course Outcomes:

- This course introduce the students to the social, political and cultural milieu of India during Postcolonial period.
- Introduces the students to the scope and dimensions of Indian Writing in English and promotes their understanding on growth and development of postcolonial Indian novel in English.
- Familiarizes students to the representative texts and writers of the period and background of the age
- Students learn and appreciate the use of various literary devices by Indian writers.

UNIT –I

Colonization and its aftermath, Culture Vs Modernity: The Indian Context, The Modern Indian Psyche vis a vis Indian Writing in English and in Translation,

UNIT – II

1. Arundhati Roy: *God of Small Things*
2. Amitav Ghosh: *Shadow Lines* (Partition)
3. Jahnavi Barua: *Next Door*

UNIT – III

1. M. *1*. M. K. Gandhi: *My Experiments with Truth*
2. Amrita Pritam: *Revenue Stamp*
3. Dom Moreas: *My Son's Father*

UNIT – IV

1. Gayathri Spivak: "Can the Subaltern Speak?"
2. Meenakshi Mukherjee: "The Anxiety of Indianness"
3. Aijaz Ahamed: *In Theory* (Chapter 7 on Indian Literature)

SUGGESTED READING:

1. K R Srinivasa Iyengar – *Indian Writing in English*
2. M. K Naik – *Critical Essays in Indian Writing in English*
3. Ramakrishnan E V- *Locating Indian Literature*
4. A K Mehrotra (ed): *A Concise History of Indian Literature in English*,
5. Saleem Peeradina (ed): *Contemporary Indian Poetry in English*

6. Makarand Paranjape (ed): *Indian Poetry in English*

7. Girish Karnad – *Fire and Rain*

Course III – (HARD CORE-III) NEW LITERATURES IN ENGLISH

Course Code: ENC 030 **Credits: 4**

Course Outcomes:

- This course introduce the students to the social, political and cultural milieus of various Commonwealth countries.
- Students learn the impact of colonisation on native people and their literature.
- Familiarizes the students with the representative texts of various literatures like African, Australian, Canadian and Caribbean countries.
- Students learn to appreciate the perspectives and concerns of representative writers of commonwealth countries.
- Students learn the use of various literary devices by commonwealth writers.

UNIT 1

Philosophy and Aesthetics of Commonwealth Literature, paradigm shifts from commonwealth to New Literatures

UNIT II- African Literature

Chinua Achebe: *A Man of the People*
Ngugi Wa Thiong'o: *Homecoming* Part-II (a) The Writer and His Past (b) The Writer in a Changing Society
Wole Soyinka: *The Lion and the Jewel*
Denis Brutus: If This Life is All That We Have, I am the tree...
I must conjure from my Past
2) David Diop: *Africa, Vultures*
3) Gabriel Okara: *Piano and Drums, Once Upon A Time*

UNIT III- Canadian and Australian Literature

Alice Munro*: Lives of Girls and Women*
Northrop Frye: "Conclusion" to *Literary History of Canada*
AJM Smith: *The Lonely Land E.J. Pratt: The Dying Eagle*
Patrick White: *Solid Mandala*
Judith Wright: *Preoccupations in Australian Poetry* (Chapter 13 on A.D. Hope)
Judith Wright: *Woman to Man, A.D. Hope: Australia*

UNIT- IV- Caribbean Literature

V S Naipaul: *Half a Life*
Wilson Harris: *Tradition and the West Indian Novel*
Derek Walcott: *Almond Trees, A Far Cry from Africa*
Braithwaite: *Starvation, Caliban*

Books/Texts for Reference and Further Reading:

1. Anna Rutherford. Commonwealth

2. Oxford Companion to Canadian Literature
3. Macaulay. *A Map of Australian Verse*
4. Arnold. *Companion to Postcolonial Literature*
5. Helen Tiffin et al. *The Empire Writes Back*

Any one of the soft cores to be chosen for earning 4 credits

Course IV – (SOFT CORE-I) INDIAN ENGLISH POETRY AFTER INDEPENDENCE

Course Code: ENC 230 **Credits: 4**

Course Outcomes:

- Introduces students to modern Indian Poets and their poetry.
- Promotes the understanding of paradigm shift in Indian aesthetics.
- Develops a sensibility to understand various cultural practices followed in modern India.
- Promotes spiritual and philosophical values among students and awakens human values through the poems focused on human predicament in modern Indian life.
- Provides the knowledge on trend setting themes explored in contemporary Indian poetry

Unit-I

1. Nissim Ezekiel: Night of the Scorpion, Enterprise, Urban, Philosophy
2. Sarojini Naidu: Autumn Song, The Bangle Sellers, In The Forest, Transience

Unit II

3. Keki N Daruwalla: The Unrest of Desire, The Mistress, The Ghaghra in Spate
4. Eunice de Souza: Bequest, Advice to Women, My Mother Feared Death, Landscape

Unit III

5. Jayanta Mahapatra: Hunger, Freedom, Ash, The Exile
6. R Parthasarathy: Rough Passage: Homecoming, Exile, Trial, Under another Sky

Unit IV

7. Anita Nair Happenings On the London Underground**,** The Last Rites
   Hello Lust, How Men Eat
8. Vikram Seth How rarely all these few years, From California, The Wind

***Note:** Two lectures to introduce new themes and techniques of recent Indian poetry in English

Books/Texts for Reference and Further Reading:

1. King Bruce (ed): *Modern Indian Poetry in English*
2. *The Oxford Anthology of Modern Indian Poetry*

3. Saleem Peeradina (ed): *Contemporary Indian Poetry*
4. Zenia Mitra (ed): *Indian Poetry in English: Critical Essays*
5. R. Parthasarathy (ed): *Ten Twentieth Century Indian Poets*

Course V – (SOFT CORE-II) FEMINISM

Course Code: ENC 220 **Credits: 4**

Course Outcomes:

- Introduces students to Feminism as a new area of study in literature.
- Enhances their sensibility to appreciate the feelings expressed by the feminists.
- Students learn to appreciate the literary theories employed by the feminists to bring gender justice in the society and in literary representation.
- Intellectual and literary worth of ideas expressed by the feminists instils moral and valued based understanding among students.
- Helps students to understand the challenges faced by women in various countries having diverse cultural backgrounds.

1. Shoshona Felman: "Women and Madness: The Critical Fallacy"

2. Elaine Showalter: "The Female Tradition"

3. Toril Moi: Feminist, Female, Feminine

4. Susie Tharu: Problems for a Contemporary Theory of Gender

Suggested readings:

The Female Imagination: Patricia Mayor Spack

Gender Trouble: Feminism and Subversion of Identity: Judith Butler

The Feminine Mystique: Betty Friedan

Feminism and Recent Fiction in English: Sushila Singh

The New Feminist Criticism: Essays on Women's Literature and Theory: Elaine Showalter

Sexual / Textual Politics: Toril Moi

OPEN ELECTIVES COURSE

A COURSE IN WRITTEN AND SPOKEN ENGLISH

Dept. code 520 **Credits: 4**

Course Outcomes:

- This course introduces the students to the four language skills of English – Listening, Reading, Speaking and Writing, which are essential for effective communication in English.
- Enhances the ability to explain and present one's ideas in clear English.
- Provides an opportunity to better the skills of Listening and Reading.
- Learn the ability to write effectively for different purposes, with a good command of the English language.
- Apart from the above stated skills, this course also provides a good practice in grammar by focusing on various elements of grammar.

UNIT I

Basic Grammar

1. Noun: Kinds of nouns, noun number, noun gender and correct usage.
2. Pronoun: Types of pronouns and their correct usage.
3. Adjective: Kinds of Adjectives, Degrees of comparison and correct usage.
4. Verb:
    1. Different kinds of verbs, Forms of Verbs: Present. Past and Past participle
    2. Tenses: Present, Past and Future and their correct usage.
    3. Subject Verb Agreement (Concord)
5. Adverb: Kinds of Adverbs and their correct usage
6. Conjunction
7. Preposition: Kinds of preposition and Correct usage
8. Articles
9. Active and Passive voice
10. Direct and Indirect Speech
11. Punctuation

UNIT II

Oral communication is the ability to explain and present one's ideas in clear English, to diverse audiences; Speaking effectively, Effective **Listening** and Readings kills to be taught.

a. Listening skills and Speaking skills to be taught with audiotapes.
b. Short and long conversation involving two or more people: Greeting, introducing, making an enquiry, casual/formal telephone conversation, Conversation at the bank, at the department store, at the post office, at the doctor's, at the travel agent, at the railway station/bus stop etc.
Informal conversation between friends.

c. Storytelling: the construction of fictional examples to illustrate a point, can be used to effectively in teaching listening and speaking skills.

Unit-III

Written communication: The ability to write effectively in a range of contexts and for different audiences and purposes, with a good command of the English language is taught.

1. Idioms and Phrases
2. Antonyms, Synonyms, Homonyms, Homophones
3. Figures of Speech

Unit - IV
Writing skills to be taught through:

A. Guided Composition
B. Expansion of an Idea/ Proverb
C. Letter Writing:
   Personal letters
   Leave note
   Application for a job
   Letter to the editor
   Letters of complaints
   Placing orders
D. Precise Writing
E. Short Essay writing
F. Comprehension

Books for Reference and Further Reading:

1. Sidney Green Baum, The Oxford English Grammar, Oxford University Press,
2. Cowie, A.P. & R. Macklin, Oxford Dictionary of Phrasal verbs, Oxford University Press,
3. Cowie, A.P. & R. Macklin& I.R. Mc Caig, Oxford Dictionary of Phrasal English Idioms, Oxford University Press,
4. Stuart Redman, English Vocabulary in Use pre-intermediate and intermediate; low price editions, Oxford University Press,
5. Rosemary T., Fruehling& Joan M. Lacombe, Communication for Results, A.I.T.B.S. Publishers and Distributors,
6. How to write and speak better, Reader's Digest

7. Modern Grammar with Practical Exercises, Vikas Publishing House Pvt. Ltd.

IV SEMESTER

Course I – (HARD CORE-I) LITERARY CRITICISM-II

Course Code: END 010 **Credits: 4**

Course Outcomes:

- Students learn the basics of the cross-disciplinary dimensions of modern/contemporary critical theories.
- Upgrades students' knowledge on modern literary/ critical theories.
- Develops inquiring attitude among students for better interpretation of the literary texts.
- Helps the students to express and support their views on the original literature.
- This course prepares students for practical criticism.

Unit I

Russian Formalism, Psychoanalysis, Structuralism, Deconstruction, Post colonialism, Phenomenology and certain other forms of Hermeneutics. The Archetypes of Literature‟ Marx, Nietzsche, Freud, Gramsci

Unit II:

1. T.S. Eliot: Tradition and Individual Talent
2. F.R. Leavis: Literature and Society, Tragedy and the Medium (From The Common Pursuit)
3. Carl Jung: "Psychology and Literature"

Unit III:

1. Northrop Frye: Architypes of Literature
2. G. Genette: "Structuralism and Literary Criticism
3. J. Derrida: "Structure, Sign and Play in the Discourse of Human Sciences"

Unit IV:

1. Elaine Showalter: Towards a Feminist Poetics
2. Helene Cixous: The Laugh of the Medusa
3. Sara Suleri: Woman Skin Deep: Feminism and Postcolonial Condition

Books for Reference and Further Reading:

Eagleton, Terry: *Theory – An Introduction*

Selden, Raman: *A Reader's Guide to Contemporary Literary Theory* Belsey, Catherine.

Critical Practice: Culler, Jonathan.

Structuralist Poetics: Structuralism, Linguistics and the Study of Literature Newton,

K.M. *Twentieth Century Literary Theory: A Reader*

Course II – (HARD CORE-II) AMERICAN LITERATURE

Course Code: END 020 **Credits: 4**

Course Outcomes:

- Introduces students to American Social, Political and Cultural temper.
- Familiarizes the students with the representative Poets and Prose Pieces of the period.
- Encourages them to compare the aesthetic values, and themes of British and American writers.
- Students learn the use of various literary devices by American writers.
- Interpretation of the various American literary works provides students the ability to explore human condition in countries which are culturally, socially, economically, technologically, philosophically apart, but up to some extent is the same.

UNIT –I

American Renaissance, Journey as Metaphor, Westward Movement, Transcendentalism

UNIT – II

Emerson: American Scholar, Nature
Thoreau: Walden (Chapters on Economy & Where I Lived and What I Lived For)
Emily Dickinson: Because I Could Not Stop for Death, The Soul Selects her Own Society,
Wallace Stevens: Emperor of Ice-Cream, Anecdote of The Jar
Walt Whitman: When Lilacs Last in the Dooryard Bloomed, A Noiseless Patient Spider,
Robert Frost: Mending Wall, The Road Not Taken

UNIT III

Mark Twain: *Huckleberry Finn*
Ernest Hemingway: *The Old Man and the Sea*
Ray Bradbury: *Fahrenheit 451*

UNIT – IV

Toni Morrison: *The Bluest Eye*
Jamaica Kincaid: *Lucy*
Fredrick Douglas: *Narrative of the Life of an American Slave*

Suggested Reading:

Norton Anthology of American Literature
Richard J Gray. *A History of American Literature*
The Cambridge History of American Literature. Vol. 1 to 4

Any one of the soft cores to be chosen for earning 4 credits

Course IV – (SOFT CORE-II) DALIT LITERATURE

Course Code: END-220 **Credits: 4**
Course Outcomes:

- Familiarize the student with the emergence of "Dalit Movement" in the context of post-independent India.
- Students learn to interrogate the concept of "Dalit" in its socio-political and cultural dynamics in literature.
- Students learn to oppose biased practices in lives to build a healthy, wealthy and a strong nation.

Unit I:
Background, Dalit Movement in post independent India, Dalit Movement with respect to Social Political and Cultural dynamics. Dalit Movement in Karnataka and Bandaya Literature.

Kannada:	Devanoora Mahadeva	Those Who Sold Themselves
	Arvinda Malagatti	Copper Coin and Well Water
Poetry:	Govindaiah	"In The Soil of Tears"
		"A Letter to Father Searching for Me"
	Laxmipathi Kolar	"The Bat", Trans. M K Shankar
Unit II		
Punjabi:	Bhura Singh Kaler	"Severed Leaves"
	Prem Gorkh	"Angel and Not Demon"
Poetry:	Gurudas Aalam	"For Freedom" (From The *Core of Untouchable's Heart*)
		"Treatment of Untouchables"
	Manjit Quada.	"A Song"
Unit III		
Gujarathi:	Dalpat Chauhan.	"Measure For Measure"
	PathikParmar.	"Naked Feet"
Poetry:	Bipin Gohel.	"To The Fading Man I Sing"
		"To A Poet At A Mushara
	Kisan Sosa.	"The Last Man On Golgotha"
		"Dousing The Fire In Heart
Unit IV		
Tamil:	Raghavan Atoli:	The Poet with A Forest Fire Inside
	Sukirtharani:	Paraia God (The Exercise of Freedom)
Telugu:	Challapalli Swaroopa Rani:	Water
	M.M. Vinodini:	The Parable of Lost Daughter –Luke15

Note: Two Lectures On Origin, Growth and Development of Dalit Literature.

Suggested Reading:
D.R. Nagaraj: The Flaming Feet, Eleanor Zellot: From Untouchable to Dalit
Mulk Raj Anand: Apology for Heroism, Arjun Dangle: Poisoned Bread

(SOFT CORE-III) POST-COLONIAL AFRICAN FICTION

Course Code: END-230 **Credits: 4**

Course Outcomes:

- Introduces students to the social, political and cultural milieu of the Postcolonial African Fiction.
- Enhances their sensibility to appreciate the feelings expressed by the contemporary African writers on various problems like decolonization, gender issues, family problems, urban living, marital issues, cultural issues etc.
- Students learn to appreciate the literary theories employed by the postcolonial African writers to bring gender justice in the society through their writings.

Objectives:

1. To introduce the students to the social, political and cultural milieu of the African Fiction

2. To familiarize the students with the representative texts of the Post-Colonial period, to enthuse interest in them to read and understand the problems arising in contemporary African society.

Unit I: Chinua Achebe: "Anthills of the Savannah"

Unit II: Ngugi wa Thiong'o: "The River Between"

Unit III: Buchi Emecheta: "The Bride Price"

Unit IV: Ama Ata Aidoo: "Changes: A Love Story"

Suggested Reading:

Butler, Judith. *Gender Trouble*: *Feminism and the Subversion of Identity*. New York: Routledge, 1990.
Ogundipe-Leslie, Omolara. *Re-Creating Ourselves African Women and Critical Transformations*. Trenton, NJ: Africa World P, 1994.
Palmer, Eustace (ed.). An Introduction to the African Novel. A Critical Study of Twelve Books. London: Heinemann, 1979.
Ashcroft, Bill. *Post-Colonial Transformation*. London and New York: Routledge, 2001.
Ashcroft, Bill, Gareth Griffiths, and Helen Tiffin. Eds. *The Post-Colonial Studies Reader*. London and New York: Routledge, 2002.

Course – IV – Major Project Work Leading to a Dissertation (Hard Core)

Course Code: END 030 **Credits: 4**

Students will be encouraged to undertake a major project work in disciplines related to literature of contemporary interest.

Suggested Areas:

1. Folklore
2. Performing Arts
3. Popular Culture
4. Gender and Sexuality
5. Dalit and Subaltern Discourses
6. Media Studies
7. World Literatures in English

The distribution of marks for The Project Work will be as per the stipulations laid down by the university.

SOFTCORES OFFERED

1. Cross Cultural Women Writers
2. Caribbean Literature
3. Novels of Childhood
4. Indian Classics in Translation
5. Folklore and Literature-I
6. Folklore and Drama
7. Myth and Drama-I
8. Myth and Drama-II
9. Cultural Theory
10. Canada and the World
11. Feminist Theory-I
12. Australian Poetry
13. Folk Epics of Karnataka
14. Postcolonial Theory
15. Writers from African Diaspora
16. Canadian Science Fiction by Women
17. Theories on Culture: An Introduction
18. Postcolonial Criticism
19. Travel Literature
20. Popular Culture and Censorship
21. Adventure Novels
22. Novels and Metropolis

23. Short Fictions of Russia and USA
24. Contemporary Indian Novels in English
25. Translations
26. Dalit Literature-I
27. Recent Indian Poetry in English
28. Dalit Literature-II
29. Women Writings from the Margins
30. English Essayists
31. Post 1990 Indian Women Narratives
32. Indian Novels in English: 2000 and after
33. Twentieth Century Indian Poets in English
34. Contemporary Indian Regional Poetry in English Translation
35. Realism and Fiction
36. Indian Women Novelists
37. African Fiction in English
38. Jewish American Fiction
39. Introduction to Canadian Literature
40. South Asian Immigrant Literature in Canada
41. Introduction to Australian Literature.
42. Feminist Theory-II
43. Indian Classics in Translation
44. Shakespeare Criticism
45. Literature and Popular Culture
46. Postcolonial African Fiction
47. Arab Women Short Stories
48. Indian Diaspora Fiction

POSTGRADUATE DEPARTMENT OF ENGLISH

Question Paper Pattern

END SEMSETER EXAM (C 3)

Course Code Title of the Course (HC/ SC)

Max Marks: 70 Time: 3 Hours

Instruction: Answer all sections.

SECTION – I

I. Answer the following questions in **one or two** sentences 10X1= 10

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

SECTION-II (from Unit-I)

II. Answer any one of the following. 1x15=15

1.
2.
3.

SECTION-III (from Unit-II)

III. Answer any one of the following. 1x15=15

1.
2.
3.

SECTION-IV (from Unit-III)

IV. Answer any one of the following. 1x15=15

1.
2.
3.

SECTION-V (from Unit-IV)

V. Answer any one of the following. 1x15=15

1.
2.
3.

INTERNAL ASSESSMENT

Component 1 and 2

Component 1

Based on Units 1 and 2

Component 2

Based on Units 3 and 4

- In each Semester, **two IA Exams (C 1 and C 2)** will be conducted for **30 Marks**
- In each Semester Internal Assessment (for 15 marks) is based on
  1. **Assignment** prepared on a given topic and **presentation** of the same for 5 marks
  2. **Written test** for 10 marks

JSS MAHAVIDYAPEETA

JSS COLLEGE OF ARTS, COMMERCE & SCIENCE

(Affiliated to University of Mysore)

Autonomous, NAAC 'A' grade and College with Potential for Excellence

B N Road, Mysuru – 570025

PROPOSED SCHEME of INSTRUCTION

and

SYLLABI

for

M.Sc. MATHEMATICS

under

CHOICE BASED CREDIT SYSTEM (CBCS)

PG DEPARTMENT OF MATHEMATICS

2017 – 18

1. **Scheme of Admission**:
   - 50% seats of the total intake for M.Sc. Mathematics Programme of the College will be filled by the University of Mysore through Centralized Admission Cell as per University regulations.
   - Remaining 50% seats will be filled by the College under College Quota.

2. **Eligibility**: B.Sc. degree with Mathematics as Major/Optional subject with 45% or B.Sc.Ed., degree of Regional Institute of Education with Mathematics as a special subject.

3. **Scheme of Examination**:
   (i) Theory paper of 03 hours duration (C_3 component) : **70** marks
   (ii) Internal Assessment: **30** marks
   (C_1 Component: 15 marks, C_2 Component: 15 marks)

4. **Pattern of Question Paper**: **Theory paper**: There are 5 questions. All questions must be answered. Each question carries 14 marks.

5. Minimum Marks for Securing Credits: 40% (with minimum of 30% in C_1 and C_2 and minimum of 30% in C_3).

6. Minimum Credits for getting the M.Sc. Mathematics degree: 76 credits.

7. Scheme of study for Masters:

Total No. of credits to be earned	76 credits
Minimum No. of credits to be earned from Hard Core papers	44 credits
Minimum No. of credits to be earned from Soft Core papers	28 credits
Minimum No. of credits to be earned from Open elective papers	4 credits

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE

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Autonomous, NAAC 'A' grade and College with Potential for Excellence

B N Road, Mysuru – 570025

PG DEPARTMENT OF MATHEMATICS

CBCS - M.Sc. Mathematics

List of courses with credit pattern

Sl. No.	Code	Type of the paper	Title of the Paper	Credit pattern in L:T:P	Credit Value	No. of hrs
			FIRST SEMESTER			
1	MAA 010	HC	Algebra I	3 : 1 : 0	4	5
2	MAA 020	HC	Real Analysis I	3 : 1 : 0	4	5
3	MAA 030	HC	Real Analysis II	3 : 1 : 0	4	5
4	MAA 040	HC	Complex Analysis I	3 : 1 : 0	4	5
5	MAA 210	SC	Linear Algebra	3 : 1 : 0	4	5
			SECOND SEMESTER			
6	MAB 010	HC	Algebra II	3 : 1 : 0	4	5
7	MAB 020	HC	Real Analysis III	3 : 1 : 0	4	5
8	MAB 030	HC	Complex Analysis II	3 : 1 : 0	4	5
9	MAB 210	SC	Ordinary and Partial Differential Equations	3 : 1 : 0	4	5
10	MAB 230	SC	Graph Theory	3 : 1 : 0	4	5
			THIRD SEMESTER			
11	MAC 010	HC	Elements of Functional Analysis	3 : 1 : 0	4	5
12	MAC 020	HC	Topology I	3 : 1 : 0	4	5
13	MAC 210	SC	Commutative Algebra	3 : 1 : 0	4	5
14	MAC 220	SC	Theory of Numbers	3 : 1 : 0	4	5
15	CSC/MCC/ZOC/ BTC/BOC/BCC 580	OE (For others)	Basic Mathematics	3 : 1 : 0	4	5
			FORTH SEMESTER			
16	MAD 010	HC	Measure and Integration	3 : 1 : 0	4	5
17	MAD 020	HC	Topology-II	3 : 1 : 0	4	5
18	MAD 220	SC	Theory of Partitions	3 : 1 : 0	4	5
19	MAD 230	SC	Differential Geometry	3 : 1 : 0	4	5
			Total Credits		76	

Program Outcomes

PO1 : Apply the underlying unifying structures of mathematics (i.e. sets, relations and functions, logical structure) and the relationships among them

PO2 : To include methods of facilitating learning such as projects, group work and participative learning.

PO3 : To Innovate, invent and solve complex mathematical problems using the knowledge of pure and applied mathematics.

PO4 : To impart knowledge of some basic concepts and principles of the discipline.

PO5 : To establish inter-disciplinarily between mathematics and other subjects from Humanities and the Social Sciences.

PO6 : To encourage collaborative learning through group activities and hands-on learning.

PO7 : To provide in-service training for school teachers. To learn to apply mathematics to real life situations and help in problem solving

Program Specific Outcomes

PSO1 : Explain the importance of mathematics and its techniques to solve real life problems and provide the limitations of such techniques and the validity of the results

PSO2 : Propose new mathematical and statistical questions and suggest possible software packages and/or computer programming to find solutions to these questions

PSO3 : Continue to acquire mathematical and statistical knowledge and skills appropriate to professional activities and demonstrate highest standards of ethical issues in mathematics

PSO4 : Ability to use computer calculations as a tool to carry out scientific investigations and develop new variants of the acquired methods, if required by the problem at hand.

PSO5 : Crack lectureship and fellowship exams approved by UGC like CSIR – NET and SLET.

PSO6 : Apply knowledge of Mathematics, in all the fields of learning including higher research and its extensions.

First Semester

Course Code MAA 010	Algebra I

Course Outcome

Students are able to

CO1 Define and interpret the concepts of divisibility, congruence, greatest common divisor, prime, and prime-factorization

CO2 Apply the Law of Quadratic Reciprocity and other methods to classify numbers as primitive roots, quadratic residues, and quadratic non-residues

CO3 Assess properties implied by the definitions of groups.

CO4 Analyze Permutation groups

CO5 Uses various canonical types of groups and canonical types of rings

CO6 Analyze and demonstrate examples of subgroups, normal subgroups and quotient groups.

CO7 Use the concepts of isomorphism and homomorphism for groups

CO8 Demonstrate knowledge of conjugates, the Class Equation and Sylow theorems.

COURSE CONTENT

Unit I

Number theory - Congruences, residue classes, theorems of Fermat, Euler and Wilson, linear congruences, elementary arithmetical functions, primitive roots, quadratic residues and the law of quadratic reciprocity.

Unit II

Groups - Lagrange's Theorem, homomorphism and isomorphism, normal subgroups and factor groups.

Unit III

The fundamental theorem of homomorphism, two laws of isomorphism.

Unit IV

Permutation groups and Cayley's theorem, Sylow's theorems.

Books for Reference:

1. D. M. Burton – Elementary Number Theory, Tata McGraw-Hill, New Delhi, 6th Ed.,

2. I. Niven, H. S. Zuckerman and H. L. Montgomery – An Introduction to the Theory of Numbers, New York, John Wiley and Sons, Inc., 2004, 5th Ed.,

3. G. A. Jones and J. M. Jones – Elementary Number Theory, Springer, 1998.

4. Thomas W. Hungerford – Algebra, Springer International Edition, New York.

5. Michael Artin – Algebra, Prentice-Hall of India, New Delhi.

6. J. A. Gallian – Contemporary Abstract Algebra, Narosa Publishing House, 4th Ed.,

7. D. S. Dummit and R. M. Foote – Abstract Algebra, John Wiley and Sons, 1999.

8. I. N. Herstein – Topics in Algebra, Vikas Publishing House, New Delhi.

9. J. B. Fraleigh – A First course in Abstract Algebra, Addison-Wesley,

10. N. S. Gopalakrishnan – University Algebra, New Age International, 2nd Ed.

Course code MAA020	**Real Analysis I**

Course Outcome

Students are able to

CO1 Describe fundamental properties of the real numbers that lead to the formal development of real analysis

CO2 Describe the real line as a complete ordered field

CO3 Acquire knowledge extended real number system, the n-dimensional Euclidean space

CO4 Study the types of mean inequalities and application

CO5 Use the definitions of convergence as they apply to sequences, series, and functions

CO6 Use the definitions of convergence as they apply to re-arrangements. Double series, infinite products

COURSE CONTENT

Unit I

The extended real number system, the n-dimensional Euclidean space, the binomial inequality, the inequality of the arithmetic and geometric means, the inequality of the power means, Cauchy's, Holder's inequality and Minkowski's inequality.

Unit II

Numerical sequences, convergent sequences, Cauchy sequences, upper and lower limits.

Unit III

Series of real numbers series of non-negative terms, the number `e', tests of convergence.

Unit IV

Multiplications of series, re-arrangements. Double series, infinite products.

Books for Reference:

1. W. Rudin – Principles of Mathematical Analysis, International Student edition, McGraw Hill, 3rd Ed.

2. T. M. Apostal – Mathematical Analysis, Addison Wesley, Narosa, New Delhi, 2nd Ed.

3. R. R. Goldberg – Methods of real Analysis, Oxford and IBH, New Delhi.

4. Torence Tao – Analysis I, Hindustan Book Agency, India, 2006.

5. Torence Tao – Analysis II, Hindustan Book Agency, India, 2006.

6. Kenneth A. Ross – Elementary Analysis: The Theory of Calculus, Springer International Edition, 2004.

Course code MAA 030	**Real Analysis II**

Course Outcome

Students are able to

CO1 Determine the basic topological properties of subsets of the real numbers

CO2 Analyze Sets and functions , distinguish between finite, countable and uncountable sets

CO3 Determine the Riemann integrability and the Riemann-Stieltjes integrability of a bounded function and prove a related of theorems concerning integration

CO4 Apply the Mean Value Theorem and the Fundamental Theorem of Calculus to

problems in the context of real analysis

CO5 Prove Taylor's theorem, determine maxima and minima, study the Functions of bounded variation

CO6 Produce rigorous proofs of results that arise in the context of real analysis.

COURSE CONTENT

Unit I

Finite, countable and uncountable sets, the topology of the real line.

Unit II

Continuity, uniform continuity, properties of continuous functions, discontinuities, monotonic functions.

Unit III

Differentiability**, mean value theorems**, L' Hospital rule, Taylor's theorem, maxima and minima, Functions of bounded variation.

Unit IV

The Riemann-Stieltje's integral, criterion for integrability. Properties of the integral, classes of integrable functions. The integral as the limit of a sum. First and second mean value theorems. Integration and differentiation.

Books for Reference:

1. W. Rudin – Principles of Mathematical Analysis, International Student edition, McGraw-Hill, 3rd Ed..

2. Torence Tao – Analysis I, Hindustan Book Agency, India, 2006.

3. Torence Tao – Analysis II, Hindustan Book Agency, India, 2006.

4. T. M. Apostal – Mathematical Analysis, Addison Wesley, Narosa, 2nd Ed.,

5. R. R. Goldberg – Methods of real Analysis, Oxford and IBH Publishing Company, New Delhi.

6. Kenneth A. Ross – Elementary Analysis: The Theory of Calculus, Springer International Edition, 2004.

Course code MAA 040	Complex Analysis I

Course Outcome

Students are able to

CO1 Represent complex numbers algebraically and geometrically,

CO2 Define and analyze limits and continuity for complex functions as well as consequences of continuity

CO3 Apply the concept and consequences of analyticity and the Cauchy-Riemann equations and of results on harmonic and entire functions including the fundamental theorem of algebra

CO4 Analyze sequences and series of analytic functions and types of convergence.

CO5 Apply Cauchy's theorem for disk and the integral formula.

CO6 Understand Local properties of Analytic functions

COURSE CONTENT

Unit I

Algebra of complex numbers, geometric representation of complex numbers. Riemann sphere and Stereographic projection, Lines, Circles. Limits and Continuity.

Unit II

Analytic functions, Cauchy-Riemann equations, Harmonic functions, Polynomials and Rational functions. Elementary theory of power series - sequences, series, uniform convergence of power series, Abel's limit theorem, The elementary functions.

Unit III

Topology of the complex plane. Linear fractional transformations, Cross-ratio, Symmetry, Elementary conformal mappings. Complex integration – Line integrals, Rectifiable arcs.

Unit IV

Cauchy's theorem for a rectangle. Cauchy's theorem in a Circular disk, Cauchy's integral formula. Local properties of analytic functions.

Books for Reference:

1. L. V. Ahlfors – Complex Analysis, McGraw-Hill, Kogakusha, 1979.

2. J. B. Conway – Functions of one complex variable, Narosa, New Delhi.

3. R. P. Boas – Invitation to Complex Analysis, The Random House, 1987

4. B. C. Palka – An Introduction to Complex Function Theory, Springer, 1991.

5. S. Ponnusamy – Foundations of Complex Analysis, Narosa, 1995.

Course code MAA 210	**Linear Algebra**

Course Outcome

Students are able to

CO1 Solve systems of linear equations,

CO2 Analyze vectors in R^n geometrically and algebraically,

CO3 Recognize the concepts of the terms span, linear independence, basis, and dimension, and apply these concepts to various vector spaces and subspaces,

CO4 Use matrix algebra and the related matrices to linear transformations,

CO5 Compute and use determinants, and use eigenvectors and eigenvalues,

CO6 Determine and use orthogonality, have thorough understanding of the Linear Transformations

CO7 Study Inner Products and Norms, The Gram-Schmidt Orthogonalization Process and Orthogonal Complements.

CO8 Analyze the elementary canonical forms, rational and Jordan forms, Apply the inner product space

COURSE CONTENT

Unit I

Vector Spaces, Subspaces, Linear Combinations and Systems of Linear Equations, Linear Dependence and Linear Independence, Bases and Dimension, Maximal Linearly Independent Subsets; Linear Transformations, Null Spaces, and Ranges, The Matrix Representation of a Linear Transformation, Composition of Linear Transformations and Matrix Multiplication, Invertibility and Isomorphisms, The Change of Coordinate Matrix, The Dual Space; Elementary Matrix Operations and Elementary Matrices, The Rank of a Matrix and Matrix Inverses, Systems of Linear Equations.

Unit II

Properties of Determinants, Cofactor Expansions, Elementary Operations and Cramer's Rule, Eigenvalues and Eigenvectors, Diagonalizability, Invariant Subspaces and the Cayley-Hamilton Theorem;Inner Products and Norms, The Gram-Schmidt Orthogonalization Process and Orthogonal Complements.

Unit III

The Adjoint of a Linear Operator, Normal and Self-Adjoint Operators, Unitary and Orthogonal Operators and Their Matrices, Orthogonal Projections and the Spectral Theorem; Bilinear and Quadratic Forms;

Unit IV

The Diagonal form, The Triangular form; The Jordan Canonical Form; The Minimal Polynomial; The Rational Canonical Form.

Books for Reference:

1. S. Friedberg, A. Insel, and L. Spence - Linear Algebra, Fourth Edition, PHI, 2009.
2. Jimmie Gilbert and Linda Gilbert – Linear Algebra and Matrix Theory, Academic Press, An imprint of Elsevier.

3. I. N. Herstein – Topics in Algebra, Vikas Publishing House, New Delhi.

4. Hoffman and Kunze – Linear Algebra, Prentice-Hall of India, 1978, 2nd Ed.,

5. P. R. Halmos – Finite Dimensional Vector Space, D. Van Nostrand, 1958.

6. S. Kumeresan – Linear Algebra, A Geometric approach, Prentice Hall India, 2000.

SECOND SEMESTER

Course code MAB 010	**Algebra II**

Course Outcome

Students are able to

CO1 Assess properties implied by the definitions of rings.

CO2 Analyze and demonstrate examples and properties of ideals and quotient rings

CO3 Demonstrate knowledge of polynomial rings and associated properties

CO4 Derive and apply Gauss Lemma, Eisenstein criterion for irreducibility of rationals

CO5 Demonstrate the characteristic of a field and the prime subfield.

COURSE CONTENT

Unit I

Rings, Integral domains and Fields, Homomorphisms, Ideals and Quotient Rings, Prime and Maximal ideals.

Unit II

Euclidean and principal ideal rings, Polynomials, Zeros of a polynomial, Factorization, Irreducibility criterion.

Unit III

Adjunction of roots, algebraic and transcendental extensions, Finite fields.

Unit IV

Separable and inseparable extensions, Perfect and imperfect fields. Theorem on the primitive element.

Books for Reference:

1. Thomas W. Hungerford – Algebra, Springer International Edition, New York.

2. Michael Artin – Algebra, Prentice-Hall of India, New Delhi.

3. Joseph A. Gallian – Contemporary Abstract Algebra, Narosa, 4th Ed.,

4. D. S. Dummit and R. M. Foote – Abstract Algebra, John Wiley and Sons,1999, 2nd Ed.,

5. I. N. Herstein – Topics in Algebra, Vikas Publishing House, New Delhi.

6. J. B. Fraleigh – A First course in Abstract Algebra, Addison-Wesley,

7. N. S. Gopalakrishnan – University Algebra, New Age International, 2nd ed.,

Course code MAB 020	Real Analysis III

Course Outcome

Students are able to

CO1 Understand the concept of sequences and series with respect to the real numbers system and establish whether a given series/ sequences is convergent/ divergent at a specified point or interval

CO2 Recognize the difference between pointwise and uniform convergence of a sequence/series of functions

CO3 Illustrate the effect of uniform convergence on the limit function with respect to continuity, differentiability, and integrability

CO4 Derive and apply properties of convergence of power series.

CO5 Analyze Functions of several variables, partial derivatives, continuity and differentiability

CO6 Uunderstand the importance of the Implicit function theorem, Taylor's theorem, the Maxima and Minima, Lagrange's multipliers

COURSE CONTENT

Unit I

Sequences and series of functions, Uniform convergence, Uniform convergence and continuity, Uniform convergence and integration, Uniform convergence and differentiation.

Unit II

Power series, The exponential and logarithmic functions, The trigonometric functions. Improper integrals and their convergence.

Unit III

Functions of several variables, partial derivatives, continuity and differentiability, the chain rule, Jacobians.

Unit IV

The Implicit function theorem, Taylor's theorem, the Maxima and Minima, Lagrange's multipliers.

Books for Reference:

1. W. Rudin – Principles of Mathematical Analysis, International Student edition, McGraw-Hill, 3rd Ed.,

2. T.M. Apostal – Mathematical Analysis, Addison Wesley, Narosa, 2nd Ed.,

3. R.R. Goldberg – Methods of Real Analysis, Oxford and IBH, New Delhi.

4. D.V. Widder – Advanced Calculus, Prentice Hall of India, New Delhi, 2nd Ed.,

5. Torence Tao – Analysis I, Hindustan Book Agency, India, 2006.

6. Torence Tao – Analysis II, Hindustan Book Agency, India, 2006.

7. Kenneth A. Ross – Elementary Analysis: The Theory of Calculus, Springer International Edition, 2004.

Course code MAB 030	**Complex Analysis II**

Course Outcome

Students are able to

CO1 Classify singularities and poles, find residues and evaluate complex integrals using the residue theorem.

CO2 Apply the Cauchy integral theorem in its various versions, and the Cauchy integral formulas

CO3 Evaluate complex contour integrals directly and by the fundamental theorem

CO4 Study Residue theorem and the argument principle

CO5 State and prove the Cauchy Riemann Equation and use it to show that a function is Analytic

CO6 Represent functions as Taylor, power and Laurent series

CO7 Study properties of Partial fractions, Infinite products, Canonical products, The Gamma and Beta functions

COURSE CONTENT

Unit I

The Calculus of Residues – The residue theorem, argument principle, Evaluation of definite integrals.

Unit II

Harmonic functions – Definition and basic properties, mean value property, Poisson's formula, Schwarz's theorem, reflection principle.

Unit III

Power series expansions – The Weierstrass theorem, The Taylor series, The Laurent series.

Unit IV

Partial fractions and factorization – Partial fractions, Mittag - Leffer's theorem, Infinite products, Canonical products, The Gamma and Beta functions, Sterling's formula. Entire functions – Jensen's formula, Hadamard's theorem.

Books for Reference:

1. L. V. Ahlfors – Complex Analysis, McGraw-Hill, Kogakusha, 1979.

2. J. B. Conway – Functions of one complex variable, Narosa, New Delhi.

3. R. P. Boas – Invitation to Complex Analysis, The Random House, 1987.

4. B. C. Palka – An Introduction to the Complex Function Theory, Springer, 1991.

5. S. Ponnusamy – Foundations of Complex Analysis, Narosa, 1995.

Course code MAB 210	**Ordinary and Partial Differential Equations**

Course Outcome

Students are able to

CO1 Solve problems in ordinary differential equations, dynamical systems, stability theory, and a number of applications to scientific and engineering problems

CO2 Study of Differential focuses on the existence and uniqueness of solutions also emphansizes the rigorous justification of methods for approximating solutions in pure and applied mathematics.

CO3 Implement solution methods using appropriate technology

CO4 Investigate the qualitative behavior of solutions of systems of differential equations

CO5 Recognize the major classification of PDEs and the qualitative differences between the classes of equations

CO6 Solve linear PDEs using classical solution methods.

CO7 Solve differential equations widely used in formulating many fundamental laws of physics and chemistry.

COURSE CONTENT

Unit I

Linear Second Order Equations - Initial value problem, Existence and Uniqueness by Picard's Theorem, Wronskian, separation and comparison theorems, Poincare phase plane, variation of parameters.

Unit II

Power series solutions - Solution near ordinary and regular singular point. Convergence of the formal power series, applications to Legendre, Bessel, Hermite, Laguerre and hypergeometric differential equations with their properties.

Unit III

Partial differential equations - Cauchy problems and characteristics, Classification of Second order PDE's, reduction to canonical forms, derivation of the equations of mathematical physics and their solutions by separation of variables.

Unit IV

Boundary value problems - Transforming Boundary value problem of PDE and ODE, Sturm - Liouvile system, eigen values and eigen functions, simple properties, expansion in eigen functions, Parseval's identity, Green's function method.

Books for Reference:

1. E. A. Coddington and N. Levinson – Theory of Ordinary Differential equations, Tata McGraw-Hill, New Delhi.

2. R. Courant and D. Hilbert – Methods of Mathermatical Physics, Vol. I. & II, Tata McGraw-Hill, New Delhi, 1975.

3. G. F. Simmons – Differential Equations with applications and Historical Notes, Tata McGraw-Hill, New Delhi,
1991.

4. I. N. Sneddon – Theory of Partial differential equations, McGraw-Hill, International Student Edition.

5. S. G. Deo and V. Raghavendra – Ordinary Differential Equations and Stability Theory, Tata McGraw-Hill, New Delhi.

Course code MAB 230	**Graph Theory**

Course Outcome

Students are able to

CO1 Construct examples and proofs pertaining to the basic theorems.

CO2 Understand the definitions of cut vertex, bridge, blocks and Automorphism group of a graph.

CO3 Study the properties of trees and connectivity

CO4 Discuss and understand the importance of the concepts Matchings and Menger's theorem

COURSE CONTENT

Unit I

Types of Graphs, Walk and connectedness, degrees, Extremal graphs, Intersection graph, Operations on graphs.

Unit II

Cutpoints, Bridges and Blocks, Block graphs and cutpoints.

Unit III

Characterization of trees, Centers and Centroids, Spanning Tree .

Unit IV

Connectivity and line connectivity, Menger's theorem, Coverings Independence, Critical points and lines.

Books for Reference:

1. F. Harary – Graph Theory, Addition Wesley Reading Mass, 1969.

2. N. Deo – Graph Theory With Applications to Engineering and Computer Science, Prentice Hall of India, 1987.

3. K. R. Parthasarathy – Basic Graph Theory, Tata McGraw-Hill, New Delhi, 1994.

4. G. Chartand and L. Lesniak – Graphs and Diagraphs, Qwadsworth and Brooks, 2nd Ed.,

5. Clark and D. A. Holton – A First Look at Graph Theory, Allied publishers.

6. D. B. West – Introduction to Graph Theory, Pearson Education Inc., 2001, 2nd Ed.,

7. J. A. Bondy and U. S. R. Murthy – Graph Theory with applications, Elsevier, 1976.

THIRD SEMESTER

Course code MAC 010	**Elements of Functional Analysis**

Course Outcome

Students are able to

CO1 Explain the fundamental concepts of functional analysis.

CO2 Understand the approximation of continuous functions.

CO3 Understand concepts of Hilbert and Banach spaces

CO4 Understand the definitions of linear functional and prove the Hahn-Banach theorem, open mapping theorem, uniform boundedness theorem, etc.

CO5 Define linear operators, self adjoint, isometric and unitary operators on Hilbert spaces.

COURSE CONTENT

Unit I

Metric completion. Banach's contraction mapping theorem and applications, Baire' category theorem, Ascoli - Arzela theorem.

Unit II

Linear spaces and linear operators, Norm of a bounded operator, The Hahn – Banach extension theorem, Stone - Weirstrass theorem.

Unit III

Open mapping and Closed Graph theorems. The Banach - Steinhaus Principle of Uniform Boundedness.

Unit IV

Hilbert spaces- The orthogonal projection, Nearly orthogonal elements, Riesz's lemma, Riesz's representation theorem.

Books for Reference:

1. G. F. Simmons – Introduction to Topology and Modern Analysis, Tata McGraw-Hill, New Delhi.

2. A. E. Taylor – Introduction to Functional Analysis, Wiley, New York, 1958.

3. A. Page and A. L. Brown – Elements of Functional Analysis.

4. George Bachman and Lawrence Narici – Functional Analysis, Dover Publications, Inc., Mineola, New York.

5. J. B. Conway – A Course in Functional Analysis, GTM, Vol. 96., Springer, 1985.

Course code MAC 020	**Topology I**

Course Outcome

Students are able to

CO1 Define and illustrate the concept of topological spaces and continuous functions

CO2 Provide precise definitions and appropriate examples and counter examples of fundamental concepts in topology.

CO3 Define and illustrate the concept of product topology, metric and quotient topology

CO4 Prove a selection of theorems concerning topological spaces, continuous functions product topologies, and quotient topologies

CO5 Define connectedness and compactness, and prove a selection of related theorems

COURSE CONTENT

Unit I

Set theoretic preliminaries. Topological spaces and continuous maps - topological spaces, basis for a topology, the order topology, the product topology on X x X, the subspace topology.

Unit II

Closed sets and limit points, continuous functions, the product topology, the metric topology, the quotient topology.

Unit III

Connectedness - connected spaces, connected sets on the real line, path connectedness.

Unit IV

Compactness - compact spaces, compact sets on the line, limit point compactness, local compactness.

Books for Reference:

1. J. R. Munkres – A First Course in Topology, Prentice Hall India, 2000, 2nd Ed.,

2. G. F. Simmons – Introduction to Topology and Modern Analysis, McGraw-Hill, Kogakusha, 1968.

3. S. Willard – General Topology, Addison Wesley, New York, 1968.

4. J. Dugundji – Topology, Allyn and Bacon, Boston, 1966.

5. J. L. Kelley – General Topology, Van Nostrand and Reinhold Co., New York, 1955.

Course code MAC 210	**Commutative Algebra**

Course Outcome

Students are able to

CO1 Know the basic definition of commutative rings, local rings, prime and maximal Ideals over commutative rings

CO2 Explain basic concepts of The prime spectrum of a ring, the nil radical and Jacobson radical

CO3 Study the operation on ideals and extension and contraction

CO4 Be Familiar with the notions of Noetherian and Artinian modules

CO5 Discuss and understand the Free modules Finitely generated modules, Simple modules, Exact sequences of modules

CO6 Know how to localize rings and modules, and familiar with important applications of localization

CO7 Know basic theory of Noetherian rings and study the Hilbert basis theorem .

COURSE CONTENT

Unit I

Rings and ideals - Rings and ring homomorphisms, Ideals, Quotient rings, zero-divisors, nilpotent elements, units, prime ideals and maximal ideals.

Unit II

The prime spectrum of a ring, the nil radical and Jacobson radical, operation on ideals, extension and contraction.

Unit III

Modules - Modules and modules homomorphisms, submodules and quotient modules, Direct sums, Free modules Finitely generated modules, Nakayama Lemma, Simple modules, Exact sequences of modules.

Unit IV

Modules with chain conditions - Artinian and Noetherian modules, modules of finite length, Artnian rings, Noetherian rings, Hilbert basis theorem.

Books for Reference:

1. M. F. Atiyah and I. G. Macdonald – Introduction to Commutative Algebra, Addison-Wesley.

2. C. Musili – Introduction to Rings and Modules, Narosa Publishing House.

3. Miles Reid – Under-graduate Commutative Algebra, Cambridge University Press.

4. N. S. Gopalakrishnan, Commutative Algebra, Oxonian Press.

Course code MAC 220	**Theory of Numbers**

Course Outcome

Students are able to

CO1 Define and interpret the concepts of divisibility, congruence, greatest common

divisor, prime, and prime-factorization

CO2 Apply the Law of Quadratic Reciprocity and other methods to classify numbers as primitive roots, quadratic residues, and quadratic non-residues

CO3 Produce rigorous arguments (proofs) centered on the material of number theory, most notably in the use of Mathematical Induction and/or the Well Ordering Principal in the proof of theorems

CO4 Know the diophantine equations, irrational numbers, continued fractions

COURSE CONTENT

Unit I

Prime numbers, The Fundamental theorem of Arithmetic, The series of Reciprocals of primes, The Euclidean Algorithm. Fermat and Mersenne numbers. Farey series, Farey dissection of the continuum, Irrational numbers-Irrationality of m^{th} root of N, e and π.

Unit II

Arithmetical Functions – The Mobius function, The Euler' function and Sigma function, The Dirichlet product of Arithmetical functions, Multiplicative functions. Averages of Arithmetical functions – Euler summation formula, Some elementary asymptotic formulas, The average orders of d(n), $\sigma(n)$, $\varphi(n)$, $\mu(n)$. An application to the distribution of lattice points visible from the origin.

Unit III

Approximation Irrational numbers, Hurwitz's Theorem, Representation of a number by two or four squares, Definition g(k) and G(k), Proof of $g(4)<50$, Perfect numbers. The series of Fibonacci and Lucas.

Unit IV

Continued fractions - Finite continued fractions, Convergent of a continued fraction, Continued fractions with positive quotients. Simple continued fractions, The representation of an irreducible rational fraction by a simple continued fraction. The continued fraction algorithm and Euclid's algorithm. The difference between the fraction and its convergents, Infinite simple continued fractions, the representation of an irrational number by an infinite continued fraction, Equivalent numbers and periodic continued fractions, some special quadratic surds.

Books for Reference:

1. G. H. Hardy and E. M. Wright – An Introduction to Theory of Numbers, Oxford University Press, 1979, 5th Ed.,

2. I. Niven, H. S. Zuckerman and H. L. Montgomery – An Introduction to the Theory of Numbers, New York, John Wiley and Sons, Inc., 2004, 5th Ed.,

3. Bruce C. Berndt – Ramanujan's Note Books Volume-1 to 5, Springer.

4. G. E. Andrews – Number Theory, Dover Books, 1995.

5. T. M. Apostol – Introduction to Analytic Number Theory, Narosa Publishing House, New Delhi.

OPEN ELECTIVE (For others)

Coursecode MCC/BCC/BTC/BOC/ZOC/CSC 580	**Basic Mathematics**

Course Outcome

Students are able to

CO1 Write an argument using logical notation and determine if the argument is or is not valid

CO2 Identify sets as well defined collections, represents sets in roster and set builder form, conversion from set builder form to roster form and vice versa.

CO3 Understand the meaning of equal and equivalent sets and differentiate between equal and equivalent sets.

CO4 Identify the subsets of the given sets, find the complement of a subset of a given Set, within a given universe. Represent venn diagram using sets.

CO5 Use the simple method to solve small linear programming models by hands, given a basic feasible point

CO6 Solve a two dimensional linear programming problem graphically

CO7 Understand the definitions of graphs, path, connectedness, cut vertex, bridge, blocks of a graph.

CO8 Study the properties of trees and matrix of a graph

COURSE CONTENT

Unit I

Mathematical Logic: Connection – Normal Forms – Theory of Inferences –Predicate Calculus.

Unit II

Set Theory: Operations on Sets – Basic Set Identities – Relations and Orderings, Functions.

Unit III

Introduction: formulation of LP problems, Graphical solution of LP problems. Introduction to Simplex, revised simplex methods and Dual simplex, Game theory.

Unit IV

Graph Theory: Basic Concepts of Graph Theory- Paths – Connectedness – Matrix Representation of Graphs – Trees – List structures and Graphs

Books for Reference:

1. C. L. Liu – Elements of Discrete Mathematics, McGraw-Hill, 1986.

2. Kenneth H. Rosen – Discrete Mathematics and its Applications, McGraw-Hill, 2002.

3. F. Harary – Graph Theory, Addition Wesley Reading Mass, 1969.

4. N. Deo – Graph Theory With Applications to Engineering and Computer Science, Prentice Hall of India, 1987.

5. K. R. Parthasarathy – Basic Graph Theory, Tata McGraw-Hill, New Delhi, 1994.

6. G. Chartand and L. Lesniak – Graphs and Diagraphs, wadsworth and Brooks, 2nd Ed.,

7. Clark and D. A. Holton – A First Look at Graph Theory, Allied publishers.

8. D. B. West – Introduction to Graph Theory, Pearson Education Inc.,2001, 2nd Ed.,

9. J. A. Bondy and U. S. R. Murthy – Graph Theory with applications, Elsevier, 1976.

10. S. D Sharma- Operations Research.

Fourth Semester

Course code MAD 010	**Measure and Integration**

Course Outcome

Students are able to

CO1 Understand the fundamental concepts of Mathematical Analysis and the classical theorems in Advanced Real Analysis

CO2 Be familiar with measurable sets and functions

CO3 Discuss the Integration a measurable function

CO4 Discuss theorems on monotonic functions, functions of bounded variation, differentiation of an integral, absolute continuity

CO5 Understand the fundamentals of measure theory and be acquainted with the proofs of the fundamental theorems underlying the theory of integration.

CO6 Learn about measure theory of Signed measures, product measures

COURSE CONTENT

Unit I

Lebesgue measure - outer measure, measurable sets and Lebesgue measure, a nonmeasurable set, measurable functions.

Unit II

The Lebesgue integral – the Lebesgue Integral of a bounded function over as set of finite measure, the integral of a non-negative function, the general Lebesgue integral.

Unit III

Differentiation and integration - Differentiation of monotonic functions, functions of bounded variation, differentiation of an integral, absolute continuity.

Unit IV

Measure and integration - Measure spaces, Measurable functions, integration, Signed measures, the Radon - Nikodym theorem, Measure and outer measure, outer measure and measurability, the extension theorem, product measures.

Books for Reference:

1. H. L. Royden – Real Analysis, Prentice Hall, 3rd Ed.,

2. G. de Barra – Measure Theory and Integration, Wiley Eastern Limited.

3. Inder K. Rana – An Introduction to Measure and Integration, Narosa, 1997.

Course code MAD 020	**Topology II**

Course Outcome

Students are able to

CO1 Define and illustrate the concepts of the countability and separation axioms.

CO2 Appreciate the beauty of deep mathematical results like Uryzohn's lemma and Tietze's extension theorem and understand the dynamics of the proof techniques.

CO3 Discuss Tychonoff's theorem, locally compact spaces, Compactness of metric spaces

CO4 Study Stone-Weierstrass theorems

CO5 Describe different examples distinguishing general, geometric, and algebraic topology.

CO6 Construct of the fundamental group of a topological space and applications to covering spaces and homotopy theory.

COURSE CONTENT

Unit I

Countability and Separation axioms - the countability axioms, the separation axioms, normality of a compact Hausdorff space.

Unit II

Urysohn's lemma, Tietze's extension theorem, Urysohn's metrization theorem, Partitions of unity.

Unit III

Tychonoff's theorem on the product of compact spaces. Local finiteness, Paracompactness, Normality of a paracompact space.

Unit IV

The Fundamental group and the Fundamental group of a circle, The Fundamental group of the punctured plane, Essential and Inessential Maps, The Fundamental Theorem of Algebra.

Books for Reference:

1. James R. Munkres - A First Course in Topology , Prentice Hall India, 2000, 2nd Ed.,

2. G. F. Simmons – Introduction to Topology and Modern Analysis, McGraw-Hill, Kogakusha, 1968.

3. S. Willard – General Topology, Addison Wesley, New York, 1968.

4. J. Dugundji – Topology, Allyn and Bacon, Boston, 1966.

5. J. L. Kelley – General Topology, Van Nostrand and Reinhold Co., New York, 1955.

Course code MAD 230	**Differential Geometry**

Course Outcome

Students are able to

CO1 Define and analyze the basic concepts of space curves and plane curves

CO2 Introduce the fundamentals of differential geometry primarily by focusing on the theory of curves and surfaces in three space.

CO3 Compute quantities of geometric interest such as curvature, as well as develop a facility to compute in various specialized systems

CO4 Understand the global properties of curves such as the four vertex theorem.

CO5 Know the theory of surfaces introduces the fundamental quadratic forms of a surface, intrinsic and extrinsic geometry of surfaces, and the Gauss theorem.

CO6 Introduce the method of the moving frame and over determined systems of differential equations as they arise in surface theory.

COURSE CONTENT

Unit I

Plane curves and Space curves – Frenet-Serret Formulae. Global properties of curves – Simple closed curves, The isoperimetric inequality, The Four Vertex theorem. Surfaces in three dimensions – Smooth surfaces, Tangents, Normals and Orientability, Quadric surfaces.

Unit II

The First Fundamental form – The lengths of curves on surfaces, Isometries of surfaces, Conformal mappings of surfaces, Surface area, Equiareal Maps and a theorem of Archimedes.

Unit III

Curvature of surfaces – The Second Fundamental form, The Curvature of curves on a surface, Normal and Principal Curvatures.

Unit IV

Gaussian Curvature and The Gauss' Map – The Gaussian and The mean Curvatures, The Pseudo sphere, Flat surfaces, Surfaces of Constant Mean Curvature, Gaussian Curvature of Compact surfaces, The Gauss' Map.

Books for Reference:

1. A. Pressley – Elementary Differential Geometry, Under-graduate Mathematics Series, Springer.

2. T. J. Willmore – An Introduction to Differential Geometry, Oxford University Press.

3. D. Somasundaram – Differential Geometry: A First Course, Narosa, 2005.

Course code MAD 220	**Theory of Partitions**

Course Outcome

Students are able to

CO1 Know the definitions of partitions

CO2 Apply the q-binomial theorem and Ramanujan ${}_1\psi_1$ - summation formula

CO3 Know the congruence of partition

CO4 Apply the q-series

COURSE CONTENT

Unit I

Partitions - partitions of numbers, the generating function of p(n), other generating functions, two theorems of Euler, Jacobi's triple product identity and its applications.

Unit II

${}_1\psi_1$ - summation formula and its applications, combinatorial proofs of Euler's identity, Euler's pentagonal number theorem, Franklin's combinatorial proof.

Unit III

Congruence properties of partition function, the Rogers - Ramanujan Identities.

Unit IV

Elementary series - product identities, Euler's, Gauss', Heine's, Jacobi's identities. Restricted Partitions – Gaussian, Frobinius partitions.

Books for Reference:

1. G. H. Hardy and E. M. Wright – An Introduction to Theory of Numbers, Oxford University Press, 1979, 5th Ed.,

2. I. Niven, H. S. Zuckerman and H. L. Montgomery – An Introduction to the Theory of Numbers, New York, John Wiley and Sons, Inc., 2004, 5th Ed.,

3. Bruce C. Berndt – Ramanujan's Note Books Volumes-1 to 5.

4. G. E. Andrews – The Theory of Partitions, Addison Wesley, 1976.

5. A. K. Agarwal, Padmavathamma, M. V. Subbarao – Partition Theory, Atma Ram & Sons, Chandigarh, 2005.

JSS COLLEGE OF ARTS, COMMERCE & SCIENCE

(An Autonomous College of University of Mysore)

Re-accredited by NAAC with 'A' grade

OOTY ROAD, MYSORE-570 025, KARNATAKA

ESTD-1964

SYLLABUS

2017-2020

M.VOC. FOOD PROCESSING & ENGINEERING

Plant Manager

Scheme of Instruction For M. Voc. (Food Processing & Engineering)								
General Education Component								
(L-Lecture; T-Tutorial; P-Practical/Practice) (1 Credit = 15 Hrs)								
Semesters	**Paper No.**	**Title**	**L:T:P**	**Theory Hours**	**Tutorial Hours**	**Practical Hours**	**Total Hours**	**Total Credits**
Sem I	MFA 510	Food Chemistry	2:0:1	30	0	15	45	3
	MFA 520	Food and Nutrition	2:0:1	30	0	15	45	3
								06
SemII	MFB 510	Food Microbiology	2:0:1	30	0	15	45	3
	MFB 520	Biostatistics	2:0:1	30	0	15	45	3
								06
SemIII	MFC 510	Information Communication Technology	2:0:1	30	0	15	45	3
	MFC 520	EDP	2:0:1	30	0	15	45	3
								06
SemIV	MFD 510	Food Marketing	2:0:1	30	0	15	45	3
	MFD 520	Food Standards, Regulatory Affairs and IPR Issues	2:0:1	30	0	15	45	3
								06

General Component MFA 510 Semester - I

Sl. No.	Food Chemistry	Hrs
1.	Introduction to food chemistry, its role in processing and food formulations,	1
2.	Moisture in foods: Role and type of water in foods, Functional properties of water, role of water in food spoilage, Water activity and sorption isotherm, Molecular mobility and food stability.	2
3.	Dispersed systems of foods: Physicochemical aspects of food dispersion system: a) Sol b) gel c) foam d) emulsions.	1
4.	Carbohydrates: Functional characteristics of different carbohydrates. Maillard reaction, caramelization, methods to control non enzymatic reactions. Starch and Dietary fibres, Functional properties of polysaccharides, natural vegetable gums, carbohydrate composition of various natural foods.	5
5.	Proteins in foods: Protein content and composition in various foods- cereal grains, legumes and oilseed proteins, proteins of meat, milk, egg and fish. Functional properties of proteins in foods – water and oil binding, foaming, gelation, emulsification. Effect of processing on functional properties of proteins-heat processing alkali treatments, chilling, freezing, dehydration and radiations. Unconventional sources of proteins- SCP fish protein concentrates, leaf proteins	5
6.	Lipids in foods: Role and use of lipids /fat, occurrence, fat group classification, Physicochemical aspects of fatty acids in natural foods, hydrolysis, reversion,. Chemical aspects of lipolysis, autooxidation, antioxidants, Technology of fat and oil processing: Refining, Hydrogenations, Inter etherification, Safety use of oils and fats in food formulation.	5
7.	Vitamins and minerals, Dietary sources, requirements, Allowances, Enrichment, Restorations, Fortifications, Losses of vitamins and minerals, Optimization and retention of vitamins and minerals	2
8.	Enzymes in food industry, Carbohydrases (Amylases, cellulases, pectinases,) Proteases, Lipases and oxidases in food processing.	2
8.	Chemistry of food flavour: definitions of flavour, Flavourmatics / flavouring compounds, Sensory assessment of flavour, Technology for flavour retention.	2

9.	Food additives: Buffer systems/ salts / Acids, Chelating agents and sequestrants, Antioxidants, Antimicrobial agents, Non-nutritive and low calorie sweetners, Stabilizer and thickeners,	2
10.	Food colours, natural and synthetic, Regulatory aspects –Natural and synthetic permitted food colours.	1
11.	Food toxicants – anti nutritional factors and their occurrence, effects and methods of elimination or inactivation- protease inhibitors, lectins, lathyrogens, phytates and flatulence factors.	2
12.	Food Contaminants, Pesticidal residues – permitted limits. Toxicology and public health.	2

Sl. No.	**Practical**	**Hrs**
1.	Determination of moisture content of foods using different methods	1
2.	Determination of crude proteins by microkjeldahl method	2
3.	Determination of crude fat by soxlet method	2
4.	Determination of acid value, saponification value and iodine number of fat/ oil	2
5.	Determination of minerals and acid insoluble ash and estimation of Calcium and phosperus	3
6.	Assay of amylases, papain and lipases	2
7.	Detection of common food adulterants	2
8.	Determination of food colors	1

MODEL QUESTION PAPER

CODE NO: **Semester - I**

Food Chemistry

TIME: 3 hrs **Max marks: 70**

Instructions: Draw neat and labeled diagram wherever necessary.

PART-A

I. Write short notes for the following(any 5): **(5x2=10)**

1. ----------
2. ----------
3. ----------
4. ----------
5. ----------
6. ----------

PART-B

II. Answer any 4 of the following: **(4x5=20)**

1. ----------
2. ----------
3. ----------
4. ----------
5. ----------

PART –C

III.Answer any 4 of the following: **(4x10=40) IV.**

1. ----------
2. ----------
3. ----------
4. ----------
5. ----------

I SEMESTER PRACTICAL EXAMINATION

INFORMATION AND COMMUNICATION TECHNOLOGY

PRACTICAL

SCHEME OF EXAMINATION

DURATION: 3 Hours Maximum Marks: 70

Practical proper: 60

Record marks: 10

NOTE :- Candidates are required to submit the records duly signed by the teacher-in charge and certified by the Head of the Department

1. Determination of moisture content of foods using different methods
2. Determination of crude proteins by microkjeldahl method
3. Determination of crude fat by soxlet method
4. Determination of acid value, saponification value and iodine number of fat/ oil
5. Determination of minerals and acid insoluble ash and estimation of Calcium and phosperus
6. Assay of amylases, papain and lipases
7. Detection of common food adulterants
8. Determination of food colors

Plant Manager

General Component Semester - I

MFA 520

Sl. no.	Food and Nutrition	Hrs
1.	Introduction to Food: Definition, classification and constituents of food : Carbohydrates, Fats , Proteins ,Fat soluble vitamins-A, D, E and K , Water soluble vitamins – Thiamin, Riboflavin, Niacin, Pyridoxine, Folate, Vitamin B12 and Vitamin C, Minerals – Calcium, Iron, Zinc, Iodine and Flourine.	3
2.	Food Design: Nutritive values of cereals, pulses, oil seeds, fruits, vegetables, fish, meat and eggs.	2
3.	Functions of food, Effect of deficiency & overconsumption of dietary sources on health, Basic Food Groups, Recommended dietary Allowance (RDA), Food guide pyramid, Dietary fibers, Functions of water in body. Balanced Diet: Concept of Balanced Diet: Definition, food groups used in planning balanced diets.	5
4.	Traditional and contemporary methods of food processing and quality evaluation of food products	3
5.	Nutrition: Basic terms used in Nutrition, relationship between food, health and nutrition, Bioavailability of nutrients. Basal Metabolic Rate (BMR). Protein quality, Dietary allowances and standards for different age groups: Adult man/woman, Preschool children, Adolescent children, pregnant woman. Geriatric nutrition, Nutrition for athletes	10
6.	Digestion and absorption of carbohydrates, proteins and fats. Factors influencing the sensory acceptability and digestion of foods	1
7.	Food Design: Nutritive values of cereals, pulses, oil seeds, fruits, vegetables, fish, meat and eggs. Nutrient composition of foods and Energy calculations	4
8	Antinutritional factors: Sources and harmful effects of anti vitamins (e.g.: avidin, dicoumarol), Natural toxicants, (e.g.: Lathyrus sativa).Food adultrants- structure and harmfull effects of - Butter yellow, lead chromate and malachite green.	2

Sl. no.	Practical	Hrs

1.	Sensory acceptability of food products: Physical Attributes (Appearance, color, texture, taste and overall acceptansibility). Texture measurement of food products by instrumental methods. Preparation of food labelling. Formulation for foods for target groups (weaning, pre-school children, geriatric, therapeutic foods etc.). Processing of spices for traditional products. Storage and shelf determination.	15

MODEL QUESTION PAPER

CODE NO: **Semester - I**

Food and Nutrition

TIME: 3 hrs **Max marks: 70**

Instructions: Draw neat and labeled diagram wherever necessary.

PART-A

V. Write short notes for the following(any 5): **(5x2=10)**

7. ----------
8. ----------
9. ----------
10. ----------
11. ----------
12. ----------

PART-B

VI.Answer any 4 of the following: **(4x5=20)**

6. ----------
7. ----------
8. ----------
9. ----------
10. ----------

PART –C

VII.Answer any 4 of the following: **(4x10=40)**

VIII.

6. ----------
7. ----------
8. ----------
9. ----------
10. ----------

I SEMESTER PRACTICAL EXAMINATION

Food and Nutrition

PRACTICAL

SCHEME OF EXAMINATION

DURATION: 3 Hours

Maximum Marks: 70

Practical proper: 60

Record marks: 10

NOTE :- Candidates are required to submit the records duly signed by the teacher-in charge and certified by the Head of the Department

1. Sensory acceptability of food products: Physical Attributes (Appearance, color, texture, taste and overall acceptansibility).
2. Texture measurement of food products by instrumental methods.
3. Preparation of food labelling.
4. Formulation for foods for target groups (weaning, pre-school children, geriatric, therapeutic foods etc.).
5. Processing of spices for traditional products.
6. Storage and shelf determination.

General Component MFB 510Semester - II

Sl. no.	Food Microbiology	Hrs
1.	Microbiology: Introduction, historical developments in food microbiology; prokaryotes and eukaryotes; Microscope; classification & morphology of microbes; Techniques of pure culture; Bacteriology of air & water; classification of microorganisms-a brief account; sources of microorganisms in foods; microbial growth, growth curve; Thermal inactivation of microbes; Concept, determination & importance of TDT, F, Z & D values; Factors affecting heat resistance; Pasteurization and sterilization. factors affecting growth-intrinsic and extrinsic factors controlling growth of microorganisms. Microbiology of various food stuffs.-Cereals, legumes, oilseeds, fruits & vegetables, Milk and their processed products	8
2.	Disinfection & disinfectants; Energy metabolism of aerobic & anaerobic microbes	4
3.	Effect of food preservatives, heating process, irradiation, low temperature storage, chemical preservatives and high-pressure processing on the microbiology of foods; control of water activity and microbial growth	
4.	Foods microbiology and public health: food poisoning, types of food poisonings, important featuresetc; bacterial agents of food borne illness, food poisoning by *Clostridium, Salmonella, E. coli, Bacillus, Staphylococcus* etc.; non-bacterial agents of food borne illness: poisonous algae, and fungi-a brief account**.**	5
5.	Food spoilage and microbes of milk, fruits, vegetables and various plant products, spoilage of canned foods; methods of isolation and detection of microorganisms or their products in food; conventional methods; rapid methods,retention of microbes, (newer techniques)-immunological methods; fluorescent, anti body, radioimmunoassay, principles of ELISA, PCR (Polymerase chain reactions**)**	8
6.	Indicators microorganisms; microbiological criteria of foods and their significance; the HACCP system and food safety used in controlling microbiological hazards, applications of hurdle	4
	technology for controlling microbial growth.	

7.	Microbiology of Fermented foods:, Cereals, Vinegar, Oriental foods, Alcoholic beverages. Food poisoning and microbial toxins, standards for different foods. Food borne intoxicants and myco toxins	4
8.	Microbiology of milk & milk products like cheese, butter, ice cream, and milk powder etc	4
9.	Microbiology of fruits & vegetable and products like jam, jelly, sauce, juice; etc	4
10.	Microbiology of cereal & cereal products like bread, biscuits, confectionary etc	4

Sl. no.	**Practical**	**Hrs**
1.	Equipments used in microbiology laboratory, study of microscope, observation of microbial slides, preparation and sterilization of media, methods of sterilization, staining techniques, effects of environmental factors on growth of microorganisms, **Assignment**-microbiological analysis of market samples- milk & milk products, fresh & processed fruits and vegetables, Cereal & bakery products	45

MODEL QUESTION PAPER

CODE NO: **Semester - II**

Food Microbiology

TIME: 3 hrs **Max marks: 70**

Instructions: Draw neat and labeled diagram wherever necessary.

PART-A

IX.Write short notes for the following(any 5): **(5x2=10)**

13. ----------
14. ----------
15. ----------
16. ----------
17. ----------
18. ----------

PART-B

X. Answer any 4 of the following: **(4x5=20)**

11. ----------
12. ----------
13. ----------
14. ----------
15. ----------

PART –C

XI.Answer any 4 of the following: **(4x10=40) XII.**

11. ----------
12. ----------
13. ----------
14. ----------
15. ----------

II SEMESTER PRACTICAL EXAMINATION

Food Microbiology

PRACTICAL

SCHEME OF EXAMINATION

DURATION: 3 Hours

Maximum Marks: 70

Practical proper: 60

Record marks: 10

NOTE :- Candidates are required to submit the records duly signed by the teacher-in charge and certified by the Head of the Department

1. Equipments used in microbiology laboratory, study of microscope, observation of microbial slides, preparation and sterilization of media, methods of sterilization, staining techniques, effects of environmental factors on growth of microorganisms,
2. Assignment-microbiological analysis of market samples- milk & milk products, fresh & processed fruits and vegetables, Cereal & bakery products

General Component Semester - IIMFB 520

Sl. no.	Biostatistics	Hrs
1.	Statistical concepts: Data structure, sampling methods, collection, classification and tabulation of data, graphical and diagrammatic representation, histogram, frequency polygon, frequency curve, bar graph, pie chart etc.	4
2.	Measure of Central Frequency: Mean, median, mode.	2
3.	Measure of dispersion of data: Range, semi-interquartile range, mean deviation, standard deviation, standard error, coefficient of variation, confidence limits.	5
4.	Types of distribution of data: Normal, Binomial, Poisson.	7
5.	Z-test, t-test, ANOVA, multiple comparisons, LSD and DMRT, Chi-square test.	4

6.	Regression estimate, correlation coefficient.	4
7.	Experimental designs, data transformation.	4

Sl. no.	**Practical**	**Hrs**
1.	Analytical Problems / calculations	15

MODEL QUESTION PAPER

CODE NO: Semester - II

Biostatistcs

TIME: 3 hrs **Max marks: 70**

Instructions: Draw neat and labeled diagram wherever necessary.

PART-A

XIII.Write short notes for the following(any 5): **(5x2=10)**

19. ----------
20. ----------
21. ----------
22. ----------
23. ----------
24. ----------

PART-B

XIV.Answer any 4 of the following: **(4x5=20)**

16. ----------
17. ----------
18. ----------
19. ----------
20. ----------

PART –C

XV.Answer any 4 of the following: **(4x10=40)**

XVI.

16. ----------
17. ----------
18. ----------
19. ----------
20. ----------

II SEMESTER PRACTICAL EXAMINATION

Biostatistics

PRACTICAL

SCHEME OF EXAMINATION

DURATION: 3 Hours

Maximum Marks: 70

Practical proper: 60

Record marks: 10

NOTE :- Candidates are required to submit the records duly signed by the teacher-in charge and certified by the Head of the Department

1.Analytical Problems / calculations

General Component Semester – IIIMFC 510

Sl. no.	Information Communication Technology	Hrs
1	The humanitarian supply chain – Definition, system of organizations, people, technology, activities, information and resources involved in moving a product or service from supplier to customer	5
2	Technology framework – Front-end services, Middleware services and Infrastructure services: Supporting the food assistance supply chain; Mapping technologies; Web portals	5
3	Mobile technologies - Combining hand-held and wireless communications technologies	5
4	Beneficiary identification - Challenges in food assistance to ensure that assistance goes to the right beneficiaries	5
5	ICT in emergencies – Requirement inputs of Food assistance interventions during emergencies	5
6	Linking the humanitarian supply chain - Ways in which WFP uses technology and technological techniques to fulfill its role as the provider of food assistance in development and emergencies	5

Sl. no.	Practical	Hrs
1.	Identification of software related to Food Processing and Engineering	3
2.	Practicing the use of software	6
3.	Requirement development for Food Processing Software	6

MODEL QUESTION PAPER

CODE NO: Semester – III

Information Communication Technology

TIME: 3 hrs **Max marks: 70**

Instructions: Draw neat and labeled diagram wherever necessary.

PART-A

XVII.Write short notes for the following(any 5): **(5x2=10)**

25. ----------
26. ----------
27. ----------
28. ----------
29. ----------
30. ----------

PART-B

XVIII.Answer any 4 of the following: **(4x5=20)**

21. ----------
22. ----------
23. ----------
24. ----------
25. ----------

PART –C

XIX.Answer any 4 of the following: **(4x10=40)**

XX.

21. ----------
22. ----------
23. ----------
24. ----------
25. ----------

II SEMESTER PRACTICAL EXAMINATION

Information Communication Technology

PRACTICAL

SCHEME OF EXAMINATION

DURATION: 3 Hours

Maximum Marks: 70

Practical proper: 60

Record marks: 10

NOTE :- Candidates are required to submit the records duly signed by the teacher-in charge and certified by the Head of the Department

I. Identification of software related to Food Processing and Engineering.
II. Practicing the use of software.
III. Requirement development for Food Processing Software

General Component Semester - III MFC 520

Sl. no.	EDP	Hrs
1	Need for EDP, Entrepreneurship and enterprise – Concept, definition and characteristics with special reference to Food and allied areas of the Indian scenario.	2
2	Entrepreneurial development – objectives, evaluation and the existing experience, soft skill for entrepreneurship	2
3	Functions and classification of Entrepreneur and supporting institution and schemes by the National and International agencies Factors influencing entrepreneurship groups	3
4	Gender equality in Entrepreneurship, Women Entrepreneurship, selection of enterprising men and women. The short comings for women entrepreneurship and remedial majors	3
5	Identifying products, services and enterprise establishmentSWAT Analysis	1
6	Institution working for promotion of entrepreneurship in the country such as NSIC, NIMSME, NIESBUD, KVIC/KVIB etc. And also National Financial Institutions such as banks, corporations and Agro industry projects	5
7	Identification of potential areas of food processing and regions for SMES, appraisal implementation, monitoring and evaluation, Globalization and the emerging business / entrepreneurial environment, business plan format for tiny and small enterprises, planning small scale units	5
8	Training the identified entrepreneurs, Investment analysis, Risk analysis and probable approach for successful entrepreneurship, cost benefit analysis, assessing financial viability of the project, market survey tools and market management	3
9	Network establishment for food chain, corporate and social responsibility	2
10	Communication skills, listing and noting down, project preparation and presentation skills, field dairy maintenance, upgradation of skills and knowledge on the contemporary food processing technology, public private partners	4

Sl. no.	Practical	Hrs
1	Different methods to identify potential entrepreneurs – men and women from both rural and urban areas	2
2	Selection of enterprise best suited for men and women, identification of business opportunities and financial processing sector	1
3	Selection and identification of enterprise based on local/regional – financial support, resources	3
4	Training on communication skills for development of enterprise by the entrepreneur	2
5	Market survey and identification of potential food processing entrepreneurships	3
6	Preparation of project reports, business plan and feasibility report	2
7	Presentation of the project proposed and documentation	2
1	Visit to Industries / Research Institutions	4
2	Project	8
3	Internship	12

MODEL QUESTION PAPER

CODE NO: Semester – III

EDP

TIME: 3 hrs **Max marks: 70**

Instructions: Draw neat and labeled diagram wherever necessary.

PART-A

XXI.Write short notes for the following(any 5): **(5x2=10)**

31. ----------
32. ----------
33. ----------
34. ----------
35. ----------
36. ----------

PART-B

XXII.Answer any 4 of the following: **(4x5=20)**

26. ----------
27. ----------
28. ----------
29. ----------
30.----------

PART –C

XXIII.Answer any 4 of the following: **(4x10=40)**

XXIV.

26. ----------
27. ----------
28. ----------
29. ----------
30. ----------

III SEMESTER PRACTICAL EXAMINATION

EDP

PRACTICAL

SCHEME OF EXAMINATION

DURATION: 3 Hours

Maximum Marks: 70

Practical proper: 60

Record marks: 10

NOTE :- Candidates are required to submit the records duly signed by the teacher-in charge and certified by the Head of the Department

I. Different methods to identify potential entrepreneurs – men and women from both rural and urban areas
II. Selection of enterprise best suited for men and women, identification of business opportunities and financial processing sector
III. Selection and identification of enterprise based on local/regional – financial support, resources
IV. Training on communication skills for development of enterprise by the entrepreneur
V. Market survey and identification of potential food processing entrepreneurships
VI. Preparation of project reports, business plan and feasibility report
VII. Presentation of the project proposed and documentation
VIII. Visit to Industries / Research Institutions
IX. Project
X. Internship

General Component Semester – IV MFD 510

Sl. No.	Food Marketing	Hrs
1.	Food Marketing: Definition, meaning, characteristics of rural and urban marketing	3
2.	Opportunities and challenges marketing food products by small scale entrepreneurs	2
3.	Rural marketing segmentation, rural consumer behavior, changing trends in rural consumer selection and decision, marketing process and influential factors, marketing needs for export products.	5
4.	Urban marketing segmentation, urban consumer behavior, changing trends in urban consumer selection and decision, marketing process and influential factors	5
5.	Product design, innovativeness presentation, services, prices, method of pricing, network for sourcing raw materials and distribution of products in both rural and urban area.	4
6.	Designing advertisement, campaign, sales promotion, choice of media, techniques, personal selling and publicity	4
7.	Online Marketing: Target population, product packing, distribution through courier and other mode of transportation.	3
8.	Food packaging, labelling for consumer acceptability	2
9.	Relevant of marketing information system, market research in accessing consumer behavior	2

Sl. No.	Practical	Hrs
1.	Regulatory aspects and food hygiene and safety for packing and marketing of food products. Costing of food products.	15
	Visit to marketing federation, cooperatives APMCs and other marketing organization and institution for familiarization of marketing strategy, handling and transportation of fresh package products, perishable goods and self stable and transport table. Financial management, securing financial support, advancing the products for marketing, bulk and retail sales, recalling the products recovery of advances.	

MODEL QUESTION PAPER

CODE NO: Semester – IV

Food Marketing

TIME: 3 hrs **Max marks: 70**

Instructions: Draw neat and labeled diagram wherever necessary.

PART-A

XXV.Write short notes for the following(any 5): **(5x2=10)**

37. ----------
38. ----------
39. ----------
40. ----------
41. ----------
42. ----------

PART-B

XXVI.Answer any 4 of the following: **(4x5=20)**

31. ----------
32. ----------
33. ----------
34. ----------
35. ----------

PART –C

XXVII. Answer any 4 of the following: **(4x10=40)**

31. ----------
32. ----------
33. ----------
34. ----------
35. ----------

IV SEMESTER PRACTICAL EXAMINATION

PRACTICAL

Food Marketing

SCHEME OF EXAMINATION

DURATION: 3 Hours

Maximum Marks: 70

Practical proper: 60

Record marks: 10

NOTE :- Candidates are required to submit the records duly signed by the teacher-in charge and certified by the Head of the Department

1.Regulatory aspects and food hygiene and safety for packing and marketing of food products. Costing of food products

2.Visit to marketing federation, cooperatives APMCs and other marketing organization and institution for familiarization ofmarketing strategy, handling and transportation of fresh package products, perishable goods and self stable and transport table.

3.Financial management, securing financial support, advancing the products for marketing, bulk and retail sales, recalling the products recovery of advances.

Plant Manager

General Component Semester – IV MFD 520

Sl. No.	Food Standards, Regulatory Affairs and IPR Issues	Hrs
1.	Introduction to concepts of food quality, food safety, food quality assurance and food quality management; objectives, importance and functions of quality control, Current challenges to food safety	3
2.	Principles of food quality assurance, total quality management (TQM) –good manufacturing/management practices, good hygienic practices, good lab practices, general awareness and role of management practices in quality control	3
3.	Microbial quality control: determination of microorganisms in foods by cultural, microscopic, physical, chemical methods. Statistical quality control in food industry Food adulteration, nature of adulterants, methods of evaluation of food adulterants and toxic constituents	3
4.	Food safety management, applications of HACCP in food safety, concept of food trace ability for food safety, Food safety and Standards Act 2006: salient provision and prospects	3
5.	Role of national and international regulatory agencies, Bureau of Indian Standards (BIS), AGMARK, Food Safety and Standards Authority of India (FSSAI)	3
6.	Introduction to WTO agreements: SPS and TBT agreements, Codex Alimentarious Commission ,, International organization for standards (ISO) and its standards for food quality and safety (ISO 9000 series, ISO 22000, ISO 15161,ISO 14000)	5
7.	Food safety in USA, USFDA, Legislation in Europe: Directives of the official journal of the EU, council regulations, food legislation in UK. Regulating methods for food analysis, case studies. Enforcers of Food Laws Approval Process for Food Additives ,Nutritional Labeling	5
8.	Concept of property, rights, duties and their correlation; History and evaluation of IPR; Copyrights and related rights. Distinction among Various forms of IPR. Patent rights/protection and procedure; Infringement or violation; Remedies against infringement; Indian Patent Act 1970 and TRIPS; Geographical indication and Industrial design	5
Sl. No.	**Practical**	**Hrs**
1.	Study of food regulations in various countries ; study of nutritional labeling of packaged food items by visiting food market, Visit the websites of FSSAI, BIS, AGMARK, ISO, Codex Alimentarius Commission , USFDA Study of patent law in India and the procedure for grant of patent in India	15

MODEL QUESTION PAPER

CODE NO: Semester – IV

Food Standards, Regulatory Affairs and IPR Issues

TIME: 3 hrs **Max marks: 70**

Instructions: Draw neat and labeled diagram wherever necessary.

PART-A

XXVIII. Write short notes for the following(any 5): (5x2=10)

43. ----------
44. ----------
45. ----------
46. ----------
47. ----------
48. ----------

PART-B

XXIX.Answer any 4 of the following: (4x5=20)

36. ----------
37. ----------
38. ----------
39. ----------
40. ----------

PART –C

XXX.Answer any 4 of the following: (4x10=40)

36. ----------
37. ----------
38. ----------
39. ----------
40. ----------

IV SEMESTER PRACTICAL EXAMINATION

PRACTICAL

Food Standards, Regulatory Affairs and IPR Issues

SCHEME OF EXAMINATION

DURATION: 3 Hours

Maximum Marks: 70

Practical proper: 60

Record marks: 10

NOTE :- Candidates are required to submit the records duly signed by the teacher-in charge and certified by the Head of the Department

1. Study of food regulations in various countries ;

2.study of nutritional labeling of packaged food items by visiting food market, Visit the websites of FSSAI, BIS, AGMARK, ISO, Codex Alimentarius Commission , USFDA

3.Study of patent law in India and the procedure for grant of patent in India

Plant Manager

M.Voc (Food Processing and Engineering) Syllabus		
1st -M.Voc **NSQF Level: 8 – Semester I & II** **Sub Sector: Fruits & Vegetables** **Job Role: Head of Production**		
UNIT I		
Post Harvest Management of Fruits		
S.No	**THEORY**	**Hrs**
1.	General Introduction of fruits-citrus, tropical and subtropical, pome, stone, soft, and berry fruits, melons and watermelons	1
2.	Importance and scope of post harvest management of fruits, Morphology, structure and composition of fruits	2
3.	Maturity Indices and standards for standards for selected fruits, methods of maturity determination	2
4.	Post-harvest physiological and biochemical changes in fruits; ripening of climacteric and non-climacteric fruits	2
5.	Harvesting and handling of important fruits. Harvesting tools; field heat removal/precooling of fruits. Sorting and grading at farm and cluster level; factors affecting post harvest losses	2
6.	Nature of post harvest deterioration; physiological change- physical damage; chemical injury-pathological decay; identification of diseases and disorders in fruit-nutritional disorders, respiratory disorders, temperature disorders and miscellaneous disorders. Classification of diseases and diseases organisms, types of diseases and agents of diseases in fruits.	4
7.	Pre-cooling of fruits and cold storage, zero energy cool chamber	3
8.	Shelf life enhancement- permitted chemicals for ripening, wax coating	3
9.	Storage practices: Refrigerated storage, modified atmospheric storage-novel MAP gases and their role, novel MAP applications, Applying high oxygen MAP; MAP of minimally processed fruits; controlled atmosphere storage/ultra low oxygen storage of fruits, recent advances in CAP and MAP	9
	TOTAL	**28**
S.No	**PRACTICALS**	**Hrs**
1.	Familiarization of various fruits available in India and categorization of fruits used for pulping	3
2.	Studies on morphological features of some of the fruits	3
3.	Studies on maturity indices; Studies on harvesting of fruits	3
4.	Studies on permitted chemicals for ripening and enhancing the shelf life of fruits	3
5.	Studies on regulations of ripening of banana and mango	3
6.	Studies on physiological disorders like chilling injury of certain fruits	3
7.	Studies on pre cooling and storage of fruits and vegetables	3
8.	Demonstration on wax coating on apples, citrus and Mango	3
9.	Studies on various storage systems and structures;	3
10.	Studies on pre packaging of whole and cut vegetables	3
11.	MAP of minimally processed fruits & vegetables	3
12.	Visit to commercial packaging houses for mango, banana, pomegranate, grapes	3
13.	Visit to Controlled Atmospheric packaging centres	4
14.	Visit to commercial storage structures for onion and potato	4
15.	Visit to multi chamber cold storages for fruits and vegetables	4
16.	Visit to Fruit Orchards -Observations on Pruning, orchard Hygiene, Irrigation, Manuring, Insect Pests, Pathological Spoilages, Pre-harvest spray schedules to	4

	control pathological spoilages and insect infestation	
17.	Visit to Fruit Orchards - Studies on Causes for pre and post harvest losses. Spoilage factors, post harvest field operations including methods to reduce the post harvest losses	4
	TOTAL	**56**
UNIT II		
Technology for processing of Fruit Pulp		
S.No	**THEORY**	**Hrs**
1.	Process of receiving, ripening, checking raw material quality, sorting, washing, cutting/slicing, deseeding/destining, pulping, precooking/pasteurization, sterilizing, aseptic packaging or canning, retort pouching, sampling for quality analysis and storing	2
2.	Machineries and tools used for the fruit pulping process such as fruit washer, peeler, slicer, fruit pulper, steam jacketed kettles, packaging machines etc	2
3.	Quality assessment of packaging materials	2
4.	Enzymes in quality and processing of tropical and sub tropical fruits	3
5.	Non thermal processing methods-ultra violet light, high pressure processing, ultrasound, ozone application, irradiation, pulsed electric field	7
6.	Introduction, canning machineries, various steps involved in canning of fruit pulp, syrup preparation, pretreatment for canning operation	7
7.	Canning of various fruits, process flow diagram for canning, filling, exhausting, sealing and processing operations	5
	TOTAL	**28**
S.No	**PRACTICALS**	**Hrs**
1.	Canning of mango pulp	5
2.	Canning of tomato pulp	5
3.	Preservation of tomato pulp by chemical preservation method	5
4.	Preservation of banana pulp by freezing method	5
5.	Canning of mango slices in syrup	5
6.	Canning of pineapple slices in syrup	5
7.	Canning of banana slices in syrup	5
8.	Visit to fruit processing units and collection of data on wastes and by products	5
9.	Visit to Aseptic packing units for fruit pulps & concentrates	8
10.	Visit to the pilot plants of CFTRI & DFRL Mysore	8
	TOTAL	**56**
UNIT III		
Food Quality and Food Microbiology		
S.No	**THEORY**	**Hrs**
1.	Introduction – definition, historical development and significance of food microbiology; Microscope; Classification & morphology of microbes; Techniques of pure culture; Bacteriology of air & water; Anti-microbial agents – physical & chemical – mechanism & action	3
2.	Sources of Contamination: Air, Water, Soil, Sewage, Post processing Contamination. Intrinsic &extrinsic factors influencing the growth of Microorganisms in foods	3
3.	Disinfection & disinfectants; Energy metabolism of aerobic & anaerobic microbes; Thermal inactivation of microbes; Concept, determination & importance of TDT, F, Z & D values; Factors affecting heat resistance; Pasteurization and sterilization	4
4.	Microbiology of Fruits and vegetables and their products like jam, jelly, sauce, juice/pulp	3
5.	Food Quality aspects of Fruits & vegetables; Introduction, Quality principles, Quality enhancement model. Application of quality enhancement model	3
6.	Food Waste Treatment : Liquid waste, Solid waste vessel containers & wrapping	3

	waste, Hazardous waste .Quality and Safety of Frozen Foods: Fruits, Vegetable	
7.	Measuring and Controlling Devices: Role of transducers measurements in food processing; Humidity, Turbidity and Color, Food & Process temperature controller and indicators. Statistical Quality Control for food Industry : Food Quality System, Fundamentals, Process control implementing quality control program, six sigma, RSM	4
8.	Food additives – preservatives, antioxidants, sequestrates, surface active agents, stabilizers and thickeners, bleaching and maturing agents, starch modifies, buffers, acids, alkalis, food colors, artificial sweeteners, nutritional additives, flavoring agents.	5
	TOTAL	**28**
	PRACTICALS	3
1.	Determination of firmness of fruits	3
2.	Determination of moisture content	3
3.	Titratable acidity estimation	3
4.	Estimation of SO2 in food sample	3
5.	Estimation of sodium benzoate in food sample	3
6.	Estimation of polyphenol and polyphenol oxidase	3
7.	Estimation of Reducing sugar, Non-reducing and total sugars	3
8.	Determination of organic acid content	3
9.	Ascorbic acid estimation	3
10.	Determination of pH in food products	3
11.	Determination of total Ash	3
12.	Determination of total soluble solids	3
13.	Estimation of ash content	3
14.	Estimation of crude fibre	3
15.	Estimation of pectin	3
16.	Flow process chart of food plant Waste utilization processes, various treatment for waste disposal analysis of cleaners & sanitizers, CIP Cleaning	11
	TOTAL	**56**
UNIT IV		
Food Safety, Hygiene and Sanitation for Processing of Fruit Pulp		
S.No	**THEORY**	**Hrs**
1.	Food safety, hygiene and sanitation for processing of fruit pulp: food safety standards and regulations for fruit pulp, definition of hygiene, hygiene practices and its importance at every stage of fruit pulp processing at industrial level; personal hygiene requirements; physical, chemical and biological hazards and methods for prevention of various hazards; CIP and COP methods and procedures, GHP, GMP and HACCP; waste management-pre and post production.	14
2.	Microbiological aspect of Food; types of food microbes, causes of food spoilage, types of food spoilage/deterioration, criteria to check the food spoilage, need for food preservation, different types of food preservation methods, method of assessing the quality of products based on physical parameters	14
	TOTAL	**28**
S.No	**PRACTICALS**	**Hrs**
1.	Clean and maintenance of work area using appropriate sanitizers, ensure the work area safe and hygienic for fruit processing, disposal of waste material as per SOPs and industrial requirement	8
2.	Check the working and performance of machineries and tools for fruit pulp process, clean the machineries and tools used with recommended sanitizer, to place the necessary tools required for the process, to attend minor repair, faults of all machineries if required.	8
3.	Dissembling and assembling of machineries used in fruit pulp industry (Fruit mill, crusher etc)	8
4.	Demonstration of CIP and COP methods of cleaning the machines with approved	8

	sanitizers	
5.	Visit to industry to learn about GHP, GMP, HACCP	12
6.	Visit to industry to learn about waste management pre and post production	12
	TOTAL	**56**
S.No	**UNIT V**	**Hrs**
Plant Design, Plant Economics and Plant Management		
1.	Food Industry management- location of plant land and building requirements, plant capacity, plant and machinery requirement, building and plant layout, utilities, byproducts, waste, energy and safety audit, manpower requirements	5
2.	Introduction to economics: Meaning, scope, and contribution to business decisions. Analysis of Demand: Law of demand, Utility function, Rate of commodity substitution, Maximization of utility, Demand functions, Indifference curve analysis, Substitution and income effects. Market demand and demand elasticities: concept of market demand, price and income elasticities of demand, importance of elasticity. Demand forecasting: causes and techniques of demand forecasting	6
3.	Analysis of supply and market equilibrium: Law of supply, price elasticity of supply, equilibrium of demand and supply. Theory of the Farm: Production function, returns to scale, Optimizing behavior, Input demands, Cost functions, Profit maximization, economics & diseconomies of scale, break even analysis. Market structures perfect competition: Profit maximization and equilibrium of firm and industry, Short run and long run supply curves; Price and output determination, practical applications	6
4.	Plant maintenance program; Role of maintenance staff and plant operators, Preventive maintenance; Guidelines for good maintenance & safety precautions; Lubrication & lubricants; Work place improvement through '5S'. Hygiene and sanitation requirement in food processing and fermentation industries; CIP methods, sanitizing & disinfestation, pest control in food processing; storage and service areas	6
5.	Supply chain management for fruits	5
	TOTAL	**28**
PRACTICALS		
1.	Visit to industry to learn the management system	16
2.	Visit to Fruit & Vegetable Processing Industries. Preparation of a Business Plan for setting up fruit & vegetable processing unit	40
	TOTAL	**56**

VI	**Hands on Training in Fruit Pulp Processing Industry and submission of report**	120
	TOTAL	**540**

Model Curriculum

Plant Manager

SECTOR: FOOD PROCESSING

SUB-SECTOR: FRUIT & VEGETABLE, FOOD GRAIN MILLING (INCLUDING OILSEEDS), DAIRY PRODUCTS, MEAT & POULTRY, FISH & SEAFOOD, BREAD & BAKERY, ALCOHOLIC BEVERAGES, AERATED WATER/ SOFT DRINKS, SOYA FOOD, PACKAGED FOOD

OCCUPATION: PROCESSING REF ID: FIC/Q9004, V1.0

NSQF LEVEL: 9


Skill India
FICSI
N·S·D·C
National Skill Development Corporation
Certificate
CURRICULUM COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS
is hereby issued by the
FOOD INDUSTRY CAPACITY AND SKILL INITIATIVE (FICSI)
for the
MODEL CURRICULUM
Complying to National Occupational Standards of Job Role/ Qualification Pack: 'Plant Manager'
QP No. 'FIC/Q9004, Version 1.0, NSQF Level 9'
Date of Issuance: March 30, 2016
Valid up to*: March 29, 2019
* Valid up to the next review date of the Qualification Pack
Authorised Signatory
(Food Industry Capacity And Skill Initiative)

TABLE OF CONTENTS

Plant Manager

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of a "Plant Manager", in the "Food Processing" Sector/Industry and aims at building the following key competencies amongst the learner

Program Name	**Plant Manager**		
Qualification Pack Name & Reference ID. ID	FIC/Q9004, v1.0		
Version No.	1.0	**Version Update Date**	30/03/2016
Pre-requisites to Training	Preferably Class 12 and 6-7 years' experience in a food processing unit		
Training Outcomes	**After completing this programme, participants will be able to:** Daily management of food processing unit Coordination of food processing unit operations including production planning, managing human resources, supply chain, production operation, maintenance, quality assurance, storage and distribution of finished products.		

This course encompasses 3 out of 3 National Occupational Standards (NOS) of "Plant Manager" Qualification Pack issued by "Food Industry Capacity and Skill Initiative".

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1	**Introduction to the training program** **Theory Duration** (hh:mm) 00:30 **Practical Duration** (hh:mm) 00:00 **Corresponding NOS Code** Bridge Module	Introduce each other and build rapport with fellow participants and the trainer.	White board/Chart papers, marker
2	**Overview of the "Plant Manager" Role** **Theory Duration** (hh:mm) 01:00 **Practical Duration** (hh:mm) 00:00 **Corresponding NOS Code**	Understanding the roles and responsibilities of plant manager Awareness of the nature and availability of job opportunities	Laptop/computer white board, marker, projector, chart papers
3	**Introduction to the Food Processing Industry** **Theory Duration** (hh:mm) 01:30 **Practical Duration** (hh:mm) 00:00 **Corresponding NOS Code**	Define food processing List the various sub sectors of food processing industry	Laptop, white/black board, marker, chart papers, projector ,Trainer's guide, Student manual
4	**Introduction to food processing process** **Theory Duration** (hh:mm) 02:00 **Practical Duration** (hh:mm)	List the common machineries used in food processing Explain the process of testing food for accepted quality standards Demonstrate the test for checking the quality of food Describe the procedure for processing various food	Laptop, white board, marker, chart papers, projector, trainer's guide and student handbook

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	04:00 **Corresponding NOS Code**	Identify different equipment used in food industry	
5	**Organizational standards and norms** **Theory Duration** (hh:mm) 04:00 **Practical Duration** (hh:mm) 02:00 **Corresponding NOS Code**	State the roles and responsibilities of a plant manager State how to conduct yourself at the workplace State the personal hygiene and sanitation guidelines State the food safety hygiene standards to follow in a work environment	Laptop, white board, marker, chart papers, projector, trainer's guide and student handbook, protective gloves, head caps, aprons, safety goggles, safety boots, mouth masks, sanitizer, safety manual
6	**Lead operations of a food processing unit** **Theory Duration** (hh:mm) 15:00 **Practical Duration** (hh:mm) 11:40 **Corresponding NOS Code** FIC/N9017	• Develop operational plans for the operation of food processing unit that is consistent with the objectives and goals of organisation, and to produce quantity and quality products • Develop operational plan that is flexible and complements supply chain, inventory, human resource, production, maintenance, quality and logistics management of production unit • Develop operational plan to improve output in all areas of functions with the objective to reduce overall cost, and to produce quantity and quality products • Develop operational plan considering national and international regulatory requirements, health and safety, food safety and hygiene requirements on process and product(s), and to maintain safe and environmental compliant workplace • Develop objectives and set demanding but achievable targets for operation function managers, and assign clear responsibilities with expected targets/performance • Provide direction and professional expertise to all function managers to achieve organisation goals • Monitor and control the operational plan to achieve its overall objectives	Laptop, white board, marker, chart papers, projector, trainer's guide and student handbook

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		• Evaluate the implemented operational plan periodically, analyze performance data, identify areas for improvement and recommend changes • Monitor performance of managers and employees to ensure that departmental and individual objectives are achieved within scheduled timelines and budget • Design new work processes, procedures, systems, structures and roles for any changes implemented in the organisation to achieve organizational goal and regulatory requirements • Review and ensure implemented changes are effective and meet the requirements of the organization • Maintain professionalism, tact, diplomacy, sensitivity, diversity and equality, and lead food processing unit to achieve organisation objectives and goals • Ensure that work arrangements, resources and business processes respond to different needs, abilities and values • Develop and implement new business strategies for improving processes and procedures to improve performance • Develop a leadership style and apply them appropriately for managers to follow the lead willingly to achieve organisation targets and goals • Communicate clearly the organisation vision, values and goals to employees, make managers understand and commit their expertise to achieve organisation goals • Lead managers of all operation functions, link operational plans and drive managers towards achieving organisation vision, objectives and goals • Lead managers through difficulties, challenges and conflicts • Conduct meetings with managers regularly and effectively, encourage them to share their views, provide guidance and support to overcome process issues and lead to achieve organisation goal	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		• Encourage managers to take lead in their own areas of expertise, take own decisions in their area of function, and provide recognitions when they are successful • Lead the managers and organisation successfully through difficulties and challenges • Design processes with achievable targets and realistic timeline, proper resource allocation, with defined process responsibilities to manage food processing operation based on organizational goals • Develop processes that are effective and sustainable, implement and ensure it is followed, review its effectiveness and make necessary changes if required • Develop process measures that are affordable, and provide enough information and required training for managers and employees to manage the process • Review and understand resource requirements for process and allocate necessary resources to all functional areas • Develop systems to link all function processes, and encourage function heads and employees to interact across the organisation to form a complete system • Establish effective methods to review the quality of work and product, and improve the process • Focus attention on issues that are critical to achieve results, provide solutions and guidance to overcome the issues that affect the process • Identify issues and trends and recognize their impact upon current and future work, work out solutions and implementation plan to overcome and utilize latest trends to achieve long term goals of the organisation • Develop policies and procedures for any change in organisation goal, organisation structure PC31. set responsibilities for managers, set and prioritize objectives for change, clearly communicate change and make the managers understand their responsibilities and commitment	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		• Implement change, identify and deal with obstacles to change, and support managers and employees through the change process • Brief managers on their responsibilities and make them understand their role, objectives for their area and the overall organisation, and expected performance • Monitor progress and performance quality of the managers on regular basis against the level of expected performance and provide prompt and constructive feedback PC35. support managers in identifying and dealing with problems and unforeseen events • Identify gaps and performance issues, discuss the causes and recommend solutions to improve performance of mangers and their team • Monitor performance, analyze employee strength and weakness, and make changes in their tasks/responsibilities • Review performance and update work plans in their area, monitor and conduct review meetings on regular basis, recognize successful completion of work or work activities by function manager(s) and their teams • Motivate managers to complete expected target and any additional work allocated and provide additional support and resources to complete work	
7	**Ensure proper production and operation management** **Theory Duration** (hh:mm) 08:00 **Practical Duration** (hh:mm) 12:00 **Corresponding NOS Code** FIC/N9018	Update self with an understanding of the goals of the organisation and forecast/requirements of the sales and marketing manager, with the knowledge of production method and process, plant capacity, resource availability, plan products and quantity to be produced Monitor and regulate supply chain management which includes sourcing and procurement, conversion of raw materials to finished products, all logistics activities, coordination and collaboration with suppliers,	Laptop, white board, marker, chart papers, projector, trainer's guide and student handbook ,

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		intermediaries, third party service providers, and customers, to integrate supply and demand management within and across companies Monitor and regulate inventory process to meet the production requirement of the organisation, review current procurement procedures, analyze benefits and risks that may impact the procurement of supplies, implement plans and methods to improve and provide solutions to resolve any immediate problems Evaluate current storage methods and identify ways of improving the storage of supplies to provide better fit with supply chain strategy During production process, coordinate production activities with procurement, maintenance, and quality control function to obtain optimum production and efficient utilization of human resources, machines and equipment Make adjustments/revise/reschedule production schedules and priorities in case of breakdown down of equipment/issues with physical or human resource/ urgent orders/unforeseen issues or any operational problems Direct production activities and establish production priorities to produce quantity and quality products within the operation budget Review and analyze human resource, production, quality control, maintenance, and operational reports to identify reason for nonconformance/ non-compliance to organisation and regulatory standards for product and process, develop and implement operating methods and procedures to eliminate problems and improve product and process quality Monitor storage and distribution of products to and from the plant/processing unit warehouse, ensure storage and distribution norms and procedures like palletizing, stacking height, labeling, fefo etc are followed	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		Establish systems to collect and assess information on performance of all functions, analyze data and evaluate performance of departments and organisation, through knowledge and understanding identify reasons for problems and low performance Establish and implement methods and procedures for improvement, ensure implemented methods deliver expected result, and identify opportunities to improve organization performance Read financial responsibilities, compile available financial information, evaluate the cost, benefits and risks of the current budget, and estimate financial requirements for operation of food processing unit Consult with department managers the objectives and associated plans, discuss and identify priorities and develop a realistic master budget for food processing operation, communicate the final proposed budget with all managers Submit the proposed master budget with clear proposals to the management for approval, assist them to evaluate the budget, negotiate with clarity and strong reasoning and get the budget approved Evaluate, analyze and allocate budget to departments of food processing operation, allocate budget to each department managers with expectations and targets, provide required ongoing support and resources Establish systems to monitor and evaluate performance against delegated budgets and the master budget and put contingency plans in place Identify reason for significant variances between budget and actual expenditure, discuss with managers, provide solutions and ensure immediate corrective action is taken In case of unforeseen situation/emergency/shortage,	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		identify any additional financial needs, prepare provisional budget, negotiate and get it approved by the management, delegate provisional budget to respective managers, monitor and control expenditure Encourage managers to identify ways of reducing expenditure, analyze and pursue potential ideas, implement those in all areas of function Review the financial performance of managers regularly, and identify improvement opportunities and ensure it is implemented, provide information to the management on the financial performance of the operation management Determine human resource requirement including contingencies to achieve organisation goal, organize interview, hiring and training of new employees through human resources manager Ensure that all employees receive appropriate training on job duties, corporate policies and applicable regulations Oversee and direct the activities of subordinate managers, provide coaching and mentoring, and conduct evaluations of all Discuss with managers of operation function and identify resource requirement for their area, analyze, estimate and approve resources, monitor effective use of those resources Ensure compliance of all employees with organization policy, procedures and applicable regulations Conduct meetings to address grievances, to resolve or effect settlements within the scope of authority, and refer unresolved grievances for management-union negotiations Take personnel actions, such as promotions, transfers, discharges or disciplinary measures, within the scope of authority Update self with knowledge of quality management system, legal and regulatory requirements, environmental issues related to the	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		organisation, process and products produced Ensure system, plan and resources are in place to assure food products produced in the organisation meet the organisation standards, national and international regulations Implement procedure, standards and specifications to meet quality goals of the organisation, co-ordinate departments and provide support to implement food safety system like HACCP in the organisation Evaluate records of quality of product and process to assess the effectiveness of quality system followed in the organisation, review and revise the quality system through quality assurance manager and implement changes Organize training for employees to update on latest developments/systems/ tools and techniques in quality management system and evaluate their competency to fulfill organisation goals Encourage employees of all functions to take personal responsibility for achieving quality standards of product and process and address or report/address any non-conformance Monitor process and product quality against target and plan, identify and assess risks of shortfalls in the quality of processes and products/services and take immediate corrective action to address risks Direct and coordinate implementation of quality system such as ISO, HACCP, etc. in the organisation though quality manager Ensure managers responsible for organizational processes understand the requirements of quality system, establish their roles in implementation of quality system in their functional areas, enhance their confidence and commitment to quality by providing continuous support Encourage and support department heads and employees for quality	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		audit process to obtain accreditation, certifications to a standard or a mark of quality, monitor quality audit process, review results and take immediate corrective action through concerned managers Identify the environmental impact related to the resources, process and products produced in the organisation such as air/water/noise pollution, effluent treatment, waste disposal etc, identify risks to the environment, consult with experts and identify opportunities to improve environmental performance Set and implement policies and procedures through mangers, monitor to ensure its efficiency and effectiveness and make changes as required to meet the regulatory requirements	
8	**Manage new projects and ensure compliance to regulatory requirements** **Theory Duration** (hh:mm) 07:00 **Practical Duration** (hh:mm) 09:00 **Corresponding NOS Code** FIC/N9019	Implement new project/business plans of the organisation for introducing new products or for improving processes, procedures and performance Map or perform comparative study of the project with the current project/product to understand the ways proposed project fits with the overall vision, objectives and plans of the organization Read the key objectives and scope of the proposed project, prepare resource requirement for implementation of new project, negotiate with clarity and strong reasoning and get approval from superiors/management Consult with experts and managers and prepare realistic and thorough plan to implement the project successfully, prepare project report considering all possibilities Submit the project report to the superiors/management, discuss plan, consider suggestions and recommendations and make necessary changes where necessary, take approval of final plan brief project team managers on the project plan and their roles and responsibilities, start implementation of project and provide ongoing	Laptop, white board, marker, chart papers, projector, trainer's guide and student handbook, logbooks, internal audit register, food safety manual, quality policy etc.

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		support, encouragement and information for successful completion Monitor, control and review project plan during each stage of implementation Provide sufficient resources to deal with contingencies and to manage any potential risks Inform the management/superiors of the developments in the project on regular basis, discuss progress and problems, take approval for any changes in project plan Complete project within agreed level of resources, meeting all legal and regulatory requirements, share the success with the project team members, recognize and reward their contribution Update self with understanding of national and international food safety regulations and standards related to the food processing units, process and products produced in the organisation Ensure effective policies and procedures are in place in the organization to meet to legal and regulatory requirements Ensure regulatory standards set by the organisation for products are stringent in context of the national and international legal requirements Ensure managers of all functional area have a clear understanding of the policies and procedures on food regulatory standards Organize training for all employees on policies and procedures on food regulatory standards and the importance of following regulations Monitor and ensure relevant legal and regulatory requirements pertaining to food proces sing units and products produced in the organisation are followed and met Identify reasons for non-compliance, review and revise the policies and procedures in consultation with quality and regulatory affairs manager to correct and overcome failures, provide support to all managers to implement corrective actions for the organisation and	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		products to comply with regulatory standards Update self with understanding of health and safety requirements, and food safety, hygiene and sanitation requirements for the organisation and products produced Ensure that the organisation has written policy and procedures on health and safety, food safety, hygiene and sanitation, and those are clearly communicated to all employees of the organisation, and are put into practice and followed Implement a system for identifying hazards and assessing risk in food processing and products and set procedures to control and prevent them Implement system for GMP, HACCP, FIFO/FEFO, product recall, etc., organize training to the employees on health and safety, food safety, hygiene and sanitation for effective implementation of the systems, allocate required resources for implementation, and ensure those are followed by all employees Ensure systems are in place for effective monitoring, measuring and reporting on the performance of health and safety system Evaluate the existing systems and procedures, consult with mangers and experts and identify methods to reduce risks/improve control measure Ensure health and safety policies are practiced across the organisation, effectively monitored, reviewed and revised at regular intervals to meet the changes in national and international regulations	
9	**Professional and Core Skills** **Theory Duration** (hh:mm) 03:00 **Practical Duration** (hh:mm) 05:00	Undertake a self-assessment test Identify personal strengths and weaknesses Plan and schedule the work order and manage time effectively to complete the tasks assigned Prevent potential problems from occurring	Laptop, white/black board, marker, chart papers, projector ,Trainer's guide, Student manual

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Corresponding NOS Code	Resolve issues and problems using acquired knowledge and realize the importance of decision making Identify potential problems and make sound and timely decision Improve your reading skills State the importance of listening	
10	**IT Skills** **Theory Duration** (hh:mm) 05:00 **Practical Duration** (hh:mm) 07:00 **Corresponding NOS Code**	Identify parts of the computer Use the computer keyboard effectively to type Use computer applications effectively to record day-to-day activities Use the word processor effectively Use the spreadsheet application effectively Use the computer to document day-to-day activities	Laptop, white/black board, marker, chart papers, projector, Trainer's guide, Student manual
11	**Field Visits** **Theory Duration** (hh:mm) 04:00 **Practical Duration** (hh:mm) 30:00 **Corresponding NOS Code**	Observe the factory location, layout and safety aspects of food processing Observe the storage facilities for raw materials and finished products Observe the various machineries used in process Observe the various machineries used in process Observe the cleaning methods and processes followed to maintain the process machineries and tools Observe the raw materials used and their storage procedures Observe the packaging and storage processes of raw material and finished product Observe the post-production cleaning and maintenance process followed in the industry	All the tools and equipment listed above must be available at the site of field visit
12	**Revision** **Theory Duration** (hh:mm) 02:00 **Practical Duration** (hh:mm) 02:00 **Corresponding NOS Code**	Revised the knowledge gained so far	All the tools and equipment listed above must be available at the time of revision
13	**Evaluation**	Assess the knowledge and skills acquired by the participants	All the tools and equipment listed above

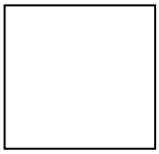
Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Theory Duration (hh:mm) 08:00 **Practical Duration** (hh:mm) 20:00 **Corresponding NOS Code**		must be available for evaluation
14	**On-the-job Training** **Theory Duration** (hh:mm) 30:00 **Practical Duration** (hh:mm) 65:00 **Corresponding NOS Code**	Apply the skills and knowledge acquired in the training program in the field	All the tools and equipment listed above must be available on the site at the time of OJT
	Total Duration 240:00 **Theory Duration 88:00** **Practical Duration 152:00**	**Unique Equipment Required**: Laptop, white board, marker, chart papers, projector, trainer's guide and student handbook, protective gloves, head caps, aprons, safety goggles, safety boots, mouth masks, sanitizer, safety manual	

Grand Total Course Duration: **240Hours, 0 Minutes**

*(This syllabus/ curriculum has been approved by **SSC: Food Industry Capacity and Skill Initiative)***

Trainer Prerequisites for Job role: "Plant Manager" mapped to Qualification Pack: "FIC/Q9004, v1.0"

Sr. No.	Area	Details
1	**Description**	To deliver accredited training service, mapping to the curriculum detailed above, in accordance with the Qualification Pack "FIC/Q9004", Version 1.0
2	**Personal Attributes**	An aptitude for conducting training, and pre/ post work to ensure competent, employable candidates at the end of the training, and pre/post work to ensure competent, employable candidates at the end of the training. Strong communication skills, ability to work as part of a team; a passion for quality and for developing others; well-organized and focused, eager to learn and keep oneself updated with the latest in the mentioned fields.
3	**Minimum Educational Qualifications**	M.Sc/M.Tech/ME in Food Technology or Food Engineering with 7-8 years of hands on experience in a food industry B.Sc (home Sc) /B.Tech/BE in Food Technology or Food Engineering with 9-10 years of hands on experience in a food industry
4a	**Domain Certification**	Certified for Job Role: "Plant Manager" mapped to QP: "FIC/Q9004, v1.0". Minimum accepted score is 80%
4b	**Platform Certification**	Recommended that the Trainer is certified for the Job Role: "Trainer", mapped to the Qualification Pack: "SSC/Q1402". Minimum accepted SCORE IS 80 % as per FICSI guidelines.
5	**Experience**	M.Sc/M.Tech/ME in Food Technology or Food Engineering with 7-8 years of hands on experience in a food industry B.Sc (home Sc) /B.Tech/BE in Food Technology or Food Engineering with 9-10 years of hands on experience in a food industry

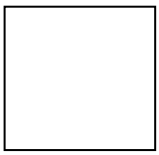


Annexure: Assessment Criteria

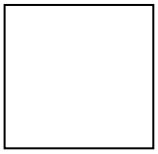
Assessment Criteria	
Job Role	Plant Manager
Qualification Pack	FIC/Q9004, v1.0
Sector Skill Council	Food Processing

Sr. No.	Guidelines for Assessment
1	Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2	The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3	Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training centre(as per assessment criteria below)
4	Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training canter based on this criteria
5	To pass the Qualification Pack, every trainee should score a minimum of 70% (overall) in every QP
6	The marks are allocated PC wise; however, every NOS will carry a weight age in the total marks allocated to the specific QP

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
1. FIC/N9017: Lead Operations of a food processing unit	PC1. Develop operational plans for the operation of food processing unit that is consistent with the objectives and goals of organisation, and to produce quantity and quality products	100	3	1	2
	PC2. Develop operational plan that is flexible and complements supply chain, inventory, human resource, production, maintenance, quality and logistics management of production unit		2.5	1	1.5
	PC3. Develop operational plan to improve output in all areas of functions with the objective to reduce overall cost, and to produce quantity and quality products		2.5	0.5	2
	PC4. Develop operational plan considering national and international regulatory requirements, health and safety, food safety and hygiene requirements on process and product(s), and to maintain safe and environmental compliant workplace		2.5	1	1.5



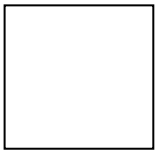
Assessable Outcome	Assessment Criteria	Total Mark (600)	Marks Allocation Out Of	Theory	Skills Practical
	PC5. Develop objectives and set demanding but achievable targets for operation function managers, and assign clear responsibilities with expected targets/performance		3	1	2
	PC6. Provide direction and professional expertise to all function managers to achieve organisation goal		2.5	1	1.5
	PC7. Monitor and control the operational plan to achieve its overall objectives		2.5	0.5	2
	PC8. Evaluate the implemented operational plan periodically, analyze performance data, identify areas for improvement and recommend changes		2.5	1	1.5
	PC9. Monitor performance of managers and employees to ensure that departmental and individual objectives are achieved within scheduled timelines and budget		3	1	2
	PC10. Design new work processes, procedures, systems, structures and roles for any changes implemented in the organisation to achieve organizational goal and regulatory requirements		2.5	1	1.5
	PC11. Review and ensure implemented changes are effective and meets the requirements of the organisation		2.5	1	1.5
	PC12. Maintain professionalism, tact, diplomacy, sensitivity, diversity and equality, and lead food processing unit to achieve organisation objectives and goals		2.5	1	1.5
	PC13. Ensure that work arrangements, resources and business processes respond to different needs, abilities and values		2.5	0.5	2
	PC14. Develop and implement new business strategies for improving processes and procedures to improve performance		2.5	1	1.5
	PC15. Develop a leadership style and apply them appropriately for managers to follow the lead willingly to achieve organisation targets and goals		2.5	1	1.5
	PC16. Communicate clearly the organisation vision, values and goals to employees, make managers understand and commit their expertise to achieve organisation goals		2.5	0.5	2



Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC17. Lead managers of all operation functions, link operational plans and drive managers towards achieving organisation vision, objectives and goals		3	1	2
	PC18. Lead managers through difficulties, challenges and conflicts		2.5	1	1.5
	PC19. Conduct meetings with managers regularly and effectively, encourage them to share their views, provide guidance and support to overcome process issues and lead to achieve organisation goal		2.5	0.5	2
	PC20. Encourage managers to take lead in their own areas of expertise, take own decisions in their area of function, and provide recognitions when they are successful		2.5	1	1.5
	PC21. Lead the managers and organisation successfully through difficulties and challenges		3	1	2
	PC22. Design processes with achievable targets and realistic timeline, proper resource allocation, with defined process responsibilities to manage food processing operation based on organizational goals		2.5	1	1.5
	PC23. Develop processes that are effective and sustainable, implement and ensure it is followed, review its effectiveness and make necessary changes if required		2.5	1	1.5
	PC24. Develop process measures that are affordable, and provide enough information and required training for managers and employees to manage the process		2.5	0.5	2
	PC25. Review and understand resource requirements for process and allocate necessary resources to all functional areas		2.5	1	1.5
	PC26. Develop systems to link all function processes, and encourage function heads and employees to interact across the organisation to form a complete system		2.5	0.5	2
	PC27. Establish effective methods to review the quality of work and product, and improve the process		2.5	0.5	2

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC28. Focus attention on issues that are critical to achieve results, provide solutions and guidance to overcome the issues that affect the process		2.5	1	1.5
	PC29. Identify issues and trends and recognize their impact upon current and future work, work out solutions and implementation plan to overcome and utilize latest trends to achieve long term goals of the organisation		3	1	2
	PC30. Develop policies and procedures for any change in organisation goal, organisation structure		2.5	1	1.5
	PC31. Set responsibilities for managers, set and prioritize objectives for change, clearly communicate change and make the managers understand their responsibilities and commitment		2.5	1	1.5
	PC32. Implement change, identify and deal with obstacles to change, and support managers and employees through the change process		2.5	1	1.5
	PC33. Brief managers on their responsibilities and make them understand their role, objectives for their area and the overall organisation, and expected performance		2	1	1
	PC34. Monitor progress and performance quality of the managers on regular basis against the level of expected performance and provide prompt and constructive feedback		3	1	2
	PC35. Support managers in identifying and dealing with problems and unforeseen events		2.5	1	1.5
	PC36. Identify gaps and performance issues, discuss the causes and recommend solutions to improve performance of mangers and their team		3	1	2
	PC37. Monitor performance, analyze employee strength and weakness, and make changes in their tasks/responsibilities		2.5	1	1.5
	PC38. Review performance and update work plans in their area, monitor and conduct review meetings on regular basis, recognize successful completion of work or work activities by function manager(s) and their teams		2.5	1	1.5

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC39. Motivate managers to complete expected target and any additional work allocated and provide additional support and resources to complete work		2	1	1
			100	**35**	**65**
2. FIC/N9018: Ensure proper production and proper management	PC1. Update self with an understanding of the goals of the organisation and forecast/requirements of the sales & marketing manager, with the knowledge on production method and process, plant capacity, resource availability, plan products and quantity to be produced	**100**	2	1	1
	PC2. Monitor and regulate supply chain management which include sourcing and procurement, conversion of raw materials to finished products, all logistics activities, coordination and collaboration with suppliers, intermediaries, third-party service providers, and customers, to integrates supply and demand management within and across companies		3	0.5	2.5
	PC3. Monitor and regulate inventory process to meet the production requirement of the organisation, review current procurement procedures, analyze benefits and risks that may impact the procurement of supplies, implement plans and methods to improve, provide solutions to resolve any immediate problems		3	1	2
	PC4. Evaluate current storage methods, identifying ways of improving the storage of supplies to provide better fit with supply chain strategy		3	1	2
	PC5. During production process, coordinate production activities with procurement, maintenance, and quality control function to obtain optimum production and efficient utilization of human resources, machines and equipment		1.5	0.5	1
	PC6. Make adjustments/revise/reschedule production schedules and priorities in case of breakdown down of equipment/issues with physical or human resource/ urgent		1.5	0.5	1



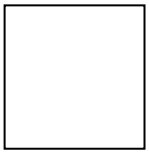
Assessable Outcome	Assessment Criteria	Total Mark (600)	Marks Allocation Out Of	Theory	Skills Practical
	orders/unforeseen issues or any operational problems				
	PC7. Direct production activities and establish production priorities to produce quantity and quality products within the operation budget		3	1	2
	PC8. Review and analyze human resource, production, quality control, maintenance, and operational reports to identify reason for non-conformance/ noncompliance to organisation and regulatory standards for product and process, develop and implement operating methods and procedures to eliminate problems and improve product and process quality		3	1	2
	PC9. Monitor storage and distribution of products to and from the plant/processing unit warehouse, ensure storage and distribution norms and procedures like palletizing, stacking height, labeling, FEFO etc are followed		3	0.5	2.5
	PC10. Establish systems to collect and assess information on performance of all functions, analyze data and evaluate performance of departments and organisation, through knowledge and understanding identify reasons for problems and low performance		1.5	1	0.5
	PC11. Establish and implement methods and procedures for improvement, ensure implemented methods deliver expected result, and identify opportunities to improve organization performance		1.5	1	0.5
	PC12. Read financial responsibilities, compile available financial information, evaluate the cost, benefits and risks of the current budget, and estimate financial requirements for operation of food processing unit		3	1.5	1.5
	PC13. Consult with department managers the objectives and associated plans, discuss and identify priorities and develop a realistic master budget for food processing operation, communicate the final proposed budget with all managers		3	1	2

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC14. Submit the proposed master budget with clear proposals to the management for approval, assist them to evaluate the budget, negotiate with clarity and strong reasoning and get the budget approved		2.5	1	1.5
	PC15. Evaluate, analyze and allocate budget to departments of food processing operation, allocate budget to each department managers with expectations and targets, provide required ongoing support and resources		3	1	2
	PC16. Establish systems to monitor and evaluate performance against delegated budgets and the master budget and put contingency plans in place		2.5	1	1.5
	PC17. Identify reason for significant variances between budget and actual expenditure, discuss with managers, provide solutions and ensure immediate corrective action is taken		2.5	1	1.5
	PC18. In case of unforeseen situation/emergency/shortage, identify any additional financial needs, prepare provisional budget, negotiate and get it approved by the management, delegate provisional budget to respective managers, monitor and control expenditure		3	1	2
	PC19. Encourage managers to identify ways of reducing expenditure, analyze and pursue potential ideas, implement those in all areas of function		2.5	1	1.5
	PC20. Review the financial performance of managers regularly, and identify improvement opportunities and ensure it is implemented, provide information to the management on the financial performance of the operation management		2.5	1	1.5
	PC21. Determine human resource requirement including contingencies to achieve organisation goal, organize interview, hiring and training of new employees through human resources manager		3	1	2
	PC22 Ensure that all employees receives appropriate training on job duties,		2.5	1	1.5

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	corporate policies and applicable regulations				
	PC23 Oversee and direct the activities of subordinate managers, provide coaching and mentoring, and conduct evaluations of all		2.5	1	1.5
	PC24 Discuss with managers of operation function and identify resource requirement for their area, analyze, estimate and approve resources, monitor effective use of those resources		3	1	2
	PC25 Ensure compliance of all employees with organization policy, procedures and applicable regulations		2.5	1	1.5
	PC26 Conduct meetings to address grievances, to resolve or effect settlements within the scope of authority, and refer unresolved grievances for management-union negotiations		2.5	0.5	2
	PC27 Take personnel actions, such as promotions, transfers, discharges or disciplinary measures, within the scope of authority		3	1	2
	PC28 Update self with knolwdge of quality management system, legal and regulatory requirements, environmental issues related to the organisation, process and products produced		2.5	0.5	2
	PC29 Ensure system, plan and resources are in place to assure food products produced in the organisation meet the organisation standards, national and international regulations		3	1	2
	PC30 Implement procedure, standards and specifications to meet quality goals of the organisation, coordinate departments and provide support to implement food safety system like HACCP in the organisation		3	1	2
	PC31 Evaluate records on quality of product and process to assess the effectiveness of quality system followed in the organisation, review and revise the quality system through quality assurance manager and implement changes		2.5	1	1.5
	PC32 Organize training for employees to update on latest		2.5	0.5	2

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	developments/systems/ tools and techniques in quality management system and evaluate their competency to fulfill organisation goals				
	PC33 Encourage employees of all functions to take personal responsibility for achieving quality standards of product and process and to address or report/address any non-conformance		2.5	1	1.5
	PC34 Monitor process and product quality against target and plan, identify and assess risks of shortfalls in the quality of processes and products/services and take immediate corrective action to address risks		3	1	2
	PC35 Direct and coordinate implementation of quality system like ISO, HACCP etc in the organisation though quality manager		3	1	2
	PC36 Ensure managers responsible for organizational processes understand the requirements of quality system, establish their roles in implementation of quality system in their functional areas, enhance their confidence and commitment to quality by providing continuous support		3	1	2
	PC37 Encourage and support department heads and employees for quality audit process to obtaining accreditation, certifications to a standard or a mark of quality, monitor quality audit process, review results and take immediate corrective action through concerned managers		2.5	1	1.5
	PC38 Identify the environmental impact related to the resources, process and products produced in the organisation like air/water/noise pollution, effluent treatment, waste disposal etc, identify risks to the environment, consult with experts and identify opportunities to improve environmental performance		1.5	0.5	1
	PC39 Set and implement policies and procedures through mangers, monitor to ensure its efficiency and effectiveness and make changes as required to meet the regulatory requirements		1.5	0.5	1
			100	**35**	**65**

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
3. FIC/N9019: Manage new projects and implement health and safety system in food processing unit	PC1. Implement new project/business plans of the organisation for introducing new products or for improving processes, procedures and performance	100	3	1	2
	PC2. Map or perform comparative study of theprojectwiththecurrent project/product to understand the ways proposed project fits with the overall vision, objectives and plans of the organisation		4	1	3
	PC3. Read the key objectives and scope of the proposed project, prepare resource requirement for implementation of new project, negotiate with clarity and strong reasoning and get approved from superiors/management		5	2	3
	PC4. Consult with experts and managers and prepare realistic and thorough plan to implement the project successfully, prepare project report considering all possibilities		4	1.5	2.5
	PC5. Submit the project repot to the superiors/management, discuss plan, consider suggestions and recommendations and make necessary changes where necessary, take approval of final plan		4	1.5	2.5
	PC6. Brief project team managers on the project plan and their roles responsibilities, start implementation of project and provide ongoing support, encouragement and information for successful completion		5	2	3
	PC7. Monitor, control and review project plan during each stage of implementation		4	1.5	2.5
	PC8. Provide sufficient resources to deal with contingencies and to manage any potential risks		4	1.5	2.5
	PC9. Inform the management/superiors of the developments in the project on regular basis, discuss progress and problems, take approval for any changes in project plan		4	1.5	2.5
	PC10. Complete project within agreed level of resources meeting all legal and regulatory requirements, share the success with the project team		4	1.5	2.5



Assessable Outcome	Assessment Criteria	Total Mark (600)	Marks Allocation Out Of	Theory	Skills Practical
	members, recognize and reward their contribution				
	PC11. Read national and international food safety regulations and standards related to the food processing units, process and products produced in the organisation		3	1.5	2.5
	PC12. Ensure effective policies and procedures are in place in the organization to meet to legal and regulatory requirements		5	2	3
	PC13. Ensure regulatory standards set by the organisation for products are stringent than the national and international legal requirements		4	1.5	2.5
	PC14. Ensure managers of all functional area have a clear understanding of the policies and procedures on food regulatory standards		4	1.5	2.5
	PC15. Organize training for all employees on policies and procedures on food regulatory standards and the importance of following regulations		4	1	3
	PC16. Monitor and ensure relevant legal and regulatory requirements pertaining to food processing units and products produced in the organisation are followed and met		5	2	3
	PC17. Identify reasons for noncompliance, review and revise the policies and procedures in consultation with quality and regulatory affairs manager to correct and overcome failures, provide support to all managers to implement corrective actions for the organisation and products to comply with regulatory standards		5	2	3
	PC18. Read the health and safety requirements, and food safety, hygiene and sanitation requirements for the organization and products produced		3	1	2
	PC19. Ensure that the organisation has written policy and procedures on health and safety, food safety, hygiene and sanitation, and those are clearly communicated to all employees of the organisation, and are put into practice and being followed		4	1	3

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC20. Implement system for identifying hazards and assessing risk in food processing and products, set procedures to control and prevent them		4	1	3
	PC21. implement system for GMP, HACCP, FIFO/FEFO, product recall etc, organize training to the employees on health and safety, food safety, hygiene and sanitation for effective implementation of the systems, allocate required resources for implementation, and ensure those are followed by all employees		5	2	3
	PC22.Ensure systems are in place for effective monitoring, measuring and reporting on the performance of health and safety system		4	1	3
	PC23. Evaluate the existing systems and procedures, consult with mangers and experts and identify method to reduce risks/improve control measure		4	1	3
	PC24. Ensure health and safety policies are practiced across the organisation, effectively monitored, reviewed and revised at regular intervals to meet the changes in national and international regulations		4	1	3
	Total		**100**	**35**	**65**
	Grand Total	**300**	**300**	**200**	**100**
	Percentage Weightage		**100**	**60%**	**40%**
	Minimum Pass% to qualify (aggregate):			**70%**	

JSS MAHAVIDYAPEETHA

JSS College of Arts, Commerce & Science (Autonomous)

Ooty Road, Mysuru-25

PG Department of Physics

(Autonomous under University of Mysore, Re-accredited by NAAC with 'A' Grade
Recognised by UGC as "College with Potential for Excellence")

M.Sc. Physics

Course Structure and Syllabus

Under

Choice Based Credit Scheme (CBCS)

&

Continuous Assessment Grading Pattern (CAGP)

2018-19

JSS MAHAVIDYAPEETHA

JSS College of Arts, Commerce & Science (Autonomous),*Ooty Road, Mysuru-25*

PG Department of Physics

Details of Courses offered and associated credits

Paper Code	Paper	HC/SC/EL/OE	Credits			
			L	T	P	Total
I Semester						
PHA 120	Classical Mechanics	HC 1	3	-	-	03
PHA 130	Mathematical Methods of Physics 1	HC 2	3	-	-	03
PHA 140	Mathematical Methods of Physics 2	HC 3	3	-	-	03
PHA 150	Classical Electrodynamics & Plasma Physics	HC 4	3	-	-	03
PHA 160	Computer Lab CL-A	HC 5	-	-	2	02
PHA 220	Electronics Lab	SC 1	-	-	4	04
18						
II Semester						
PHB 070	Continuum Mechanics and Relativity	HC 6	3	-	-	03
PHB 080	Thermal Physics	HC 7	3	-	-	03
PHB 090	Quantum Mechanics 1	HC 8	3	-	-	03
PHB 100	Spectroscopy and Fourier Optics	HC 9	3	-	-	03
PHB 110	Computer Lab CL-B	HC 10	-	-	2	02
PHB 210	Optics Lab	SC 2	-	-	4	04
18						
III Semester						
PHC 050	Quantum Mechanics 2	HC 11	3	-	-	03
PHC 060	Condensed Matter Physics	HC 12	3	-	-	03
PHC 070	Nuclear and Particle Physics	HC 13	3	-	-	03
PHC 080/090	Condensed Matter Physics Lab / Nuclear and Particle Physics Lab	HC 14	-	-	4	04
Students are permitted to choose any one of the following (special paper) and corresponding practical coupled to the special paper						
PHC 240	Solid State Physics 1	SC 3	3	-	-	03
PHC 250	Solid State Physics Lab 1	SC 4	-	-	2	02
PHC 260	Nuclear Physics 1	SC 3	3	-	-	03
PHC 270	Nuclear Physics Lab 1	SC 4	-	-	2	02
PHY 306	Theoretical Physics 1	SC 3	3	-	-	03
PHY 315	Theoretical Physics Lab 1	SC 4	-	-	2	02
Students from other departments can register for any one of the following						
PHY-321/322	Modern Physics/Energy Science	OE	3	1	-	04
22						

IV Semester						
PHD 090/080	Nuclear and Particle Physics Lab/ Condensed Matter Physics Lab	HC 15	-	-	4	04
A student has to register for one particular discipline in confirmation with the corresponding SC (special paper) opted in III semester						
PHD 250	Solid State Physics 2	SC 5	3	-	-	03
PHD 260	Solid State Physics 3	SC 6	3	-	-	03
PHD 240	Solid State Physics Lab 2	SC 7	-	-	2	02
PHD 300	Nuclear Physics 2	SC 5	3	-	-	03
PHD 310	Nuclear Physics 3	SC 6	3	-	-	03
PHD 320	Nuclear Physics Lab 2	SC 7	-	-	2	02
PHY-405	Theoretical Physics 2	SC 5	3	-	-	03
PHY-406	Theoretical Physics 3	SC 6	3	-	-	03
PHY-425	Theoretical Physics Lab 2	SC 7	-	-	2	02
Students are permitted to choose any one of the following (Elective papers 1)						
PHD 270	Accelerator Physics	SC 8	2	-	-	02
PHY-408	Liquid Crystals		2	-	-	02
PHY-409	Atmospheric Physics		2	-	-	02
PHY-410	Numerical Methods		2	-	-	02
Students are permitted to choose any one of the following (Elective papers 2)						
PHY-411	Nuclear Spectroscopy Methods	SC 9	3	1	-	04
PHY-412	Modern Optics					
PHD 280	Electronics					
PHY-414	Minor Project		04			
18						

Semester	HC	SC	OE	Total
I Semester	14	4		18
II Semester	14	4		18
III Semester	13	5	04	22
IV Semester	04	14		18
Total	45	27	04	76

HC: *Hard Core;* **SC:** *Soft Core;* **OE:** *Open Elective;* **EL:** *Elective;* **EC:** *Extra Credit;*

Scheme of Assessment

1. *First Theory and Practical Internal Assessment tests (for C1) will be conducted after 8th week of the semester comprising 50% of the syllabus.*
2. *Second Theory and Practical Internal Assessment tests (for C2) will be conducted in the 16th week of the semester comprising remaining 50% of the syllabus.*
3. *The Theory C1 and C2 Internal Assessment tests evaluation will be an aggregate of written test, assignments, seminar by the corresponding Course teacher/teachers.*
4. *Practical Internal Assessment tests C1 and C2 will be assessed based on the performance of the student in the given Lab experiment, Record writing and viva by the corresponding Course teacher/teachers.*
5. *A student will be eligible for C3 semester end examination, if he/she has scored a minimum of 30% which is the sum total of C1test and C2 test.*
6. *C3 semester end examination for theory Courses (papers) will be conducted in 18th week of the Semester. Three sets of question papers will be set by both internal and external Examiners, who were chosen from the panel of examiners approved by the Board of Studies for each Course. The Board of Examination convened well before the C3 semester end examination will scrutinise and approve the question papers sets and submit the same to Controller of Examination.. From each of the sets, one question paper is randomly chosen by Chief Controller of Examination.*
7. *C3 semester end Laboratory examination for practical Courses will be conducted conveniently before or after C3 semester end examination for theory Courses. The Laboratory examination will be conducted by both internal and external examiners.*
8. *Overall grade will be based on marks scored in C1, C2 and C3 examination.*

The details of the allotment of marks for evaluation of the theory and practical question papers of C1, C2 and C3 examinations were also prepared on the recommendations and approval of Board of Studies. The pattern of evaluation is provided below:

Theory Examination*: C1+C2+C3=100 Marks*

Theory	Unit 1	Unit 2	Unit 3	Problems from the three units	Average Score	Assignment	Seminar	Total Marks
C1	10	10	10	-	10	5	-	15
C2	10	10	10	-	10	-	5	15
C3	18	18	18	16	--	-	-	70

Practical Examination*: C1+C2+C3=100 Marks*

Practical	Experiment	Record	Viva	Total Marks
C1	7	5	3	15
C2	7	5	3	15
C3	50	-	20	70

Programme Outcomes:

PO1. Identify, formulate and analyze complex problems using first principles.
PO2. A research oriented learning to develop analytical problem-solving approaches.
PO3. Awareness of ethical issues and regulatory considerations.
PO4. Understand the basic concepts, fundamental principles and the scientific Theories.
PO5. Acquire skills in handling scientific instruments, planning and performing in laboratory experiments.
PO6. Think creatively in explaining solutions to the problems.
PO7. Realise developments in science subject and interdisciplinary approach.
PO8. Develop scientific outlook towards all aspects of life.
PO9. Effective influence which inspires in new scientific theories and inventions.
PO10. Imbibes ethical, moral and social values in personal and social life and develop Positive attitude that leads to successful life.

PROGRAMME SPECIFIC OUTCOMES:

PSO1. Acquire substantial knowledge in Physics, basic knowledge in Mathematics and computer science
PSO2. Specialisation in Solid State Physics/Nuclear Physics provides special expertise.
PSO4. Provide hands-on research experience in a specific field of Physics, through the supervised project.
PSO5. Familiarise with contemporary research within various fields of Physics.
PSO6. Provides the candidate knowledge with general competence and analytical skills needed in research, education, industry, consultancy and public administration.
PSO7. Develop interdisciplinary approach.
PSO8. Critically assess and evaluate research methods and results.
PSO9. Understands the role of Physics in society and ethical problems.
PSO10. To avail Global research opportunities.

Syllabus for the 4-Semester M.Sc., (Physics)
Choice Based Credit Scheme (CBCS)

PHA 120: Classical Mechanics

Course Outcome:

Students who have completed this course should be able to:

CO1. Deliberate the characteristics of Mechanics of a system of particles
CO2. Specify in depth The Lagrangean method
CO3. Learn in details with examples Central forces
CO4. Write down the details of Hamilton's equations
CO5. Deliberate the characteristics of Canonical transformations
CO6. Write down in details with application, if applicable, Mechanics of rigid bodies
CO7. Learn the characteristics of small oscillations of mechanical system

Mechanics of a system of particles: *Conservation of linear and angular momenta in the absence of (net) external forces and torques using centre of mass. The energy equation and the total potential energy of a system of particles using scalar potential (***Goldstein H).**
The Lagrangean method: *Constraints and their classifications. Generalized coordinates. Virtual displacement, D'Alembert's principle and Lagrangean equations of the second kind. Examples of (1) single particle in Cartesian, spherical polar and cylindrical polar coordinate systems, (2) Atwood's machine, (3) a bead sliding on a rotating wire in a force-free space and (4) Simple pendulum. Derivation of Lagrange equations from Hamilton principle* **(Goldstein H).**
Central forces*: Reduction of two particle equations of motion to the equivalent one-body problem, reduced mass of the system. Conservation theorems (First integrals of the motion). Equations of motion for the orbit, classification of orbits, conditions for closed orbits. The Kepler problem (inverse-square law of force) (***Aruldas G,Goldstein H, Srinivasa Rao K.N***). **[16 hours]**

Hamilton's equations: *Generalised momenta. Hamilton's equations. Examples - simple harmonic oscillator, charged particle moving in an electromagnetic field. Hamiltonian for a free particle in different coordinates. Cyclic coordinates. Physical significance of the Hamiltonian function. Derivation of Hamilton's equations from a variational principle* **(Goldstein H)**.
Canonical transformations: *Definition, Generating functions (Four basic types). Examples of Canonical transformations. The harmonic Oscillator. Infinitesimal contact transformation.Poisson brackets; properties of Poisson brackets, angular momentum and Poisson bracket relations. Equation of motion in the Poisson bracket notation. The Hamilton-Jacobi equation; the example of the harmonic oscillator treated by the Hamilton-Jacobi method* **(Goldstein H). [16 hours]**

Mechanics of rigid bodies: *Degrees of freedom of a free rigid body. Angular momentum and kinetic energy of rigid body. Moment of inertia tensor, principal moments of inertia, products of inertia, the inertia tensor. Euler equations of motion for a rigid body. Torque free motion of a rigid body. Precession of earth's axis of rotation, Euler angles, angular velocity of a rigid body* **(Goldstein H).**
Small oscillations of mechanical system: *Introduction, types of equilibria, Quadratic forms of kinetic and potential energies of a system in equilibrium. General theory of small oscillations, secular equation and eigenvalue equation. Small oscillations in normal coordinates and normal modes, examples of two coupled oscillators. Vibrations of a linear triatomic molecule* **(Goldstein H). [16 hours]**

Total work load **48 hours**

References:

1. *Goldstein H., Poole C. and Safko J., Classical mechanics, 3rd Edn., Pearson Education, New*

Delhi. 2002
2. *Upadhaya J.C., Classical mechanics, Himalaya Publishing House, Mumbai. 2006.*
3. *Srinivasa Rao K.N., Classical mechanics, Universities Press, Hyderabad. 2003.*
4. *Takwale R.G. and Puranik S., Introduction to classical mechanics, Tata McGraw, New Delhi, 1991.*
5. *Landau L.D. and Lifshitz E.M., Classical mechanics, 4th Edn., Pergamon Press, 1985.*
6. *Aruldas G., Classical Mechanics, PHI Learning Private Limited, New Delhi*

PHA 130: Mathematical Methods of Physics 1

Course Outcome:

Upon completion of the course students should,

CO1. Specify the characteristics of Curvilinear coordinates and Tensors
CO2. Write down in depth Tensors
CO3. Learn in details with application, if applicable, Differential equations, Hermite function and Laguerre functions
CO4. Write down the details of Special functions
CO5. Write down in details with application, if applicable, Bessel functions
CO6. Understand the details of Legendre functions
CO7. Learn the details of Spherical harmonics

Curvilinear coordinates and Tensors: *Curvilinear coordinates in the Euclidean 3-space, Orthogonal curvilinear coordinates. Differential vector operators; Grad, divergence, curl and Laplacian in arbitrary curvilinear coordinates. Circular cylindrical coordinates, spherical polar coordinates* **(Arfken &Weber).**

Tensors:*Tensors of rank r as a r-linear form in base vectors. Transformation rules for base vectors and tensor components. Tensor algebra, contraction, Raising and lowering of indices, Associated tensors, quotient rule. Mention of pseudo tensor, dual tensor and non-cartesian tensor. Metric tensor,Covariant and contravariant components of the metric tensor, Christoffel symbols. Tensor derivative operators, Covariant differentiation. The contracted Christoffel symbol* **(Arfken &Weber). [16 hours]**

Differential equations, Hermite function and Laguerre functions: *Differential equations: Partial differential equations, characteristics and boundary conditions, first order differential equations, linear first order differential equations (only briefly, details not expected). Separation of variables - Helmholtz equations in Cartesian, circular cylindrical coordinates Spherical polar coordinates. Regular and irregular singular points of a second order ordinary differential equation. Series solution-Frobenius power series method, Examples of Harmonic oscillator and Bessel's equation. Linear dependence and independence of solutions-Wronskian. Non-homogeneous equations-Green's function, examples* **(Arfken &Weber).**
Hermite functions: *Hermite`s differential equation and its Solution, Hermite polynomials, Generating functions, Recurrence relations, Rodrigues representation, Orthogonality* **(Arfken &Weber).**
Laguerre functions: *Laguerre differential equation and its solution, Laguerrepolynomials, Generating function, Recurrence relations, Rodrigues representation, Orthogonality.Associated Laguerre functions: Definition, Generating function, Recurrence relations and Orthogonalit* **(Arfken &Weber). [16 hours]**

Special functions: *Sturm - Liouville theory - Self adjoint ODE's, Hermitian operators, completeness of eigenfunction, Green's function—eigenfunction expansion (***Arfken &Weber).**

Bessel functions: *Bessel functions of the first kind $J_v(x)$, Bessel differential equation, generating function for $J_v(x)$, Integrals for $J_o(x)$ and $J_v(x)$, recurrence formulae for $J_v(x)$, orthogonal properties of Bessel polynomials***(Arfken &Weber).**

Legendre functions: *Legendre differential equation, Legendre polynomials, generating functions, recurrence formulae, Rodrigues representation, Orthogonality. Associated Legendre polynomials; The differential equation, Orthogonality relation* **(Arfken &Weber).**

Spherical harmonics: *Definition and Orthogonality* **(Arfken &Weber). [16 hours]**

Total work load **48 hours**

References:

1. *Arfken G.B. and Weber H.J., Mathematical methods for physicists, 6th Edn., Academic Press, New York (Prism Books, Bangalore, India), 1995.*
2. *Harris E.G., Introduction to modern theoretical physics, Vol. 1, John Wiley, New York, 1975.*
3. *Srinivasa Rao K.N,, The rotation and Lorentz groups and their representations for physicists, Wiley Eastern, New Delhi, 2003.*
4. *Gupta B.D., Mathematical physics, 4th Edn, 2011.*
5. *Bali N. P., Engineering Mathematics, Laxmi Publications, New Delhi*
6. *Dass H. K., Higher Engineering Mathematics, S. Chand, New Delhi*
7. *Chattopadhay P. K., Mathematical Physics, New Age International.*

PHA 140: Mathematical Methods of Physics 2

Course Outcome:

Upon completion of the course students should be able to

CO1. Understand the classification and characteristics of Linear vector space
CO2. Specify the characteristics of Linear representations of groups
CO3. Deliberate in details with application, if applicable, Rotation group
CO4. Understand the details of Fourier transforms
CO5. Understand in details with examples Integral equations

Linear vector space: *Linear vector space* **-** *Definition. Linear dependence and independence of vectors. Dimension. Basis. Change of basis. Subspace. Isomorphism of vector spaces. Linear operators. Matrix representative of a linear operator in a given basis. Effect of change of basis. Invariant subspace. Eigenvalues and eigenvectors. Characteristic equation. The Schur canonical form. Diagonalization of a normal matrix. Schur's theorm* **(Arfken &Weber). [16 hours]**

Linear representations of groups: *Groups of regular matrices; the general linear groups GL (n, C)and GL (n, R). The special linear groups SL (n, C)and SL(n, R). The unitary groups U (n)and SU(n). The orthogonal groups O(n, C),O (n, R),SO(n, C)and SO(n, R). Homogeneous Lorentz group(***Arfken &Weber).**
Rotation group: *The matrix exponential function-Definition and properties. Rotation matrix in terms of axis and angle. Eigenvalues of a rotation matrix. Euler resolution of a rotation. Definition of a representation. Equivalence. Reducible and irreducible representations. Schur's lemma. Construction of the* $D^{1/2}$ *and* D^{1} *representation of SO (3)by exponentiation. Mention of the* D^{j} *irreps SO (3).*
(Srinivasa Rao K.N). [16 hours]

Fourier transforms and Integral equations: *General properties, completeness, use of Fourier series. Applications of Fourier series* **(Arfken &Weber).**

Integral transforms*; Development of Fourier Integral, Fourier transform - inversion theorem, Fourier transform of derivatives, convolution theorem. Momentum representation (***Arfken &Weber).**

Integral equations*: Definitions, transformation of a differential equation into an integral equation, Integral transforms, generating functions, Abel's equation, Neumann series, separable kernels, Numerical solution, non-homogeneous integral equations* **(Arfken &Weber). [16 hours]**

Total work load **48 hours**

References:

1. *Shankar R., Principles of quantum mechanics, 2nd Edn., Plenum Press, New York, 1984.*

2. *Srinivasa Rao K.N., The rotation and Lorentz groups and their representations for Physicists, Wiley Eastern, New Delhi, 1988.*
3. *Arfken G.B. and Weber H.J., Mathematical methods for Physicists, 5th. Edn., Academic Press, New York, 2001.*
4. *Gupta B.D., Mathematical Physics, 4th Edn. (Page no. 8.48–8.83, 8.16-8.48) 2011*
5. *Bali N. P., Engineering Mathematics, Laxmi Publications, New Delhi*
6. *Dass H. K., Higher Engineering Mathematics, S. Chand Publications, New Delhi*
7. *Charlie Harper, Introduction to Mathematical Physics, PHI Publications, 2008.*

PHA 150: Classical Electrodynamics, Plasma Physics and Optics

Course Outcome:

Students who have completed this course should

CO1. Write down in details with examples Electric multipole moments
CO2. Deliberate the characteristics of Potential formulation
CO3. Specify in details with application, if applicable, Fields of moving charges and radiation
CO4. Learn the characteristics of Radiating systems
CO5. Learn the details of Relativistic electrodynamics
CO6. Deliberate the characteristics of Plasma Physics
CO7. Understand the classification and characteristics of Electromagnetic waves
CO8. Identify the classification and characteristics of Interference
CO9. Identify the details of Diffraction

Electric multipole moments: *The electric dipole and multipole moments of a system of charges. Multipole expansion of the scalar potential of an arbitrary charge distribution* **(Griffiths D.J).**

Potential formulation: *Maxwell equations in terms of electromagnetic potentials. Gauge transformations. The Lorentz, Coulomb and radiation gauges* **(Griffiths D.J).**

Fields of moving charges and radiation: *The retarded potentials. The Lienard-Wiechert potentials. Fields due to an arbitrarily moving point charge; the special case of a charge moving with constant velocity* **(Griffiths D.J).**

Radiating systems: *Radiation from an oscillating dipole. Power radiated by a point charges - Larmor formula. Lienard's generalisation of Larmor formula. Energy loss in bremsstrahlung and linear accelerators. Radiation reaction - Abraham-Lorentz formula* **(Griffiths D.J) [16 hours].**

Relativistic electrodynamics: *Charge and fields as observed in different frames. Covariant formulation of electrodynamics; Electromagnetic field tensor, Transformation of fields, Field due to a point charge in uniform motion. Lagrangian formulation of the motion of charged particle in an electromagnetic field* **(Griffiths D.J).**

Plasma Physics: *Quasineutrality of a plasma, plasma behaviour in magnetic fields, Plasma as a conducting fluid. Magnetohydrodynamics; magnetic confinement, Pinch effect, instabilities, Plasma waves.*
(Laud B. B.). [16 hours]

Electromagnetic waves: *Monochromatic plane waves - velocity, phase and polarization. Propagation of plane electromagnetic waves in (1) conducting media and (2) ionised gases. Reflection and refraction of electromagnetic waves; Fresnel formulae for parallel and perpendicular components. Brewster`s law. Normal and anomalous dispersion; Clausius-Mossotti relation* **(Born M. and Wolf E).**

Interference: *General theory of interference of two monochromatic waves. Two beam and Multiple beam interference with a plane-parallel plate. Fabry-Perot interferometer; etalon construction, resolving power and its application. Interference filters* **(Born M. and Wolf E).**

Diffraction: *Integral theorem of Helmholtz and Kirchhoff. Fresnel-Kirchhoff diffraction formula; conditions for Fraunhofer and Fresnel diffraction. Fraunhofer diffraction due to a circular aperture.*
(Born M. and Wolf E) **[16 hours]**

Total work load **48 hours**

References:

1. *Griffiths D.J., Introduction to Electrodynamics, 5th Edn., Prentice-Hall of India, New Delhi, 2006.*
2. *Jackson J.D., Classical Electrodynamics, 2nd Edn., Wiley-Eastern Ltd, India, 1998.*
3. *Born M. and Wolf E., Principles of Optics, 6th Edn., Pergamon Press, Oxford, 1980.*
4. *Matveev A.N., Optics, Mir Publishers, Moscow, 1988.*
5. *Laud B.B., Electromagnetics, Wiley Eastern Limited, India, 2000.*
6. *Hecht E., Optics, Addison-Wesley, 2002.*
7. *Lipson S.G., Lipson H. & Tannhauser D.S., Optical physics, Cambridge University Press, USA, 1995.*
8. *Ajoy Ghatak, Optics, Tata McGraw – Hill, New Delhi*
9. *Gupta A. B. Modern Optics, Books and Allied (P) Ltd, Kolkata*
10. *Sen S .N., Plasma Physics, Pragathi Prakasan*

PHA 160: Computer Lab CL-A

Course Outcome:

Students who have completed this course should

CO1. *Write down in details with examples LaTeX program*
CO2. *Write down the characteristics of Linux operating system*
CO3. *Learn the characteristics of GNUPLOT*
CO4. *Write down the details of OCTAVE*

- *Linux operating system basics (4 sessions) :*
  Login procedure; creating, deleting directories; copy, delete, renaming files; absolute and relative paths; Permissions—setting, changing; Using text editor.
- *Scientific text processing with LATEX.*
  Typeset text using text effects, special symbols, lists, table, mathematics and including figures in documents.
- *Using the plotting program GNUPLOT (2 sessions) :*
  Plotting commands; To plot data from an experiment and applying least-squares fit to the data points. Including a plot in a LATEX file.
- *Using the mathematics package OCTAVE (2 sessions), To compute functions, matrices, eigenvalues, inverse, roots.*

Total work load: *1 day(s) per week × 4 hours × 16 weeks =* **64 hours**

PHA 220: Electronics Lab

Course Outcome:

Students who have completed this course should

CO1. *Deliberate the characteristics of Regulated power supply*
CO2. *Understand in depth Active filters*
CO3. *Identify the classification and characteristics of Voltage follower*
CO4. *Identify in details with examples Colpitts' oscillator*
CO5. *Write down the characteristics of Colpitts' oscillator*
CO6. *Identify in details with examples Opamp as an integrator and differentiator*

CO7. Write down in details with application, if applicable, Opamp as a summing and log amplifier
CO8. Learn the characteristics of Opamp as an inverting and non-inverting amplifier
CO9. Deliberate in details with application, if applicable, Coder and encoder
CO10. Identify the classification and characteristics of Half adder and full adder
CO11. Write down in details with examples Boolean algebra-Logic gates
CO12. Identify the characteristics of Opamp astable multivibrator

Any ten of the following experiments:

1. *Regulated power supply.*
2. *Active filters : low pass (single pole).*
3. *Active filters : high pass (double pole).*
4. *Voltage follower.*
5. *Colpitts' oscillator.*
6. *Opamp as an integrator and differentiator.*
7. *Opamp as a summing and log amplifier.*
8. *Opamp as an inverting and non-inverting amplifier.*
9. *Coder and encoder.*
10. *Half adder and full adder.*
11. *Boolean algebra-Logic gates.*
12. *Opamp astable multivibrator.*

Total work load: *2 day(s) per week × 4 hours × 16 weeks =* **128 hours**

PHB 070: Continuum Mechanics and Relativity

Course Outcome:

After the completion of the course, student will be familiar with

CO1. Write down the details of Continuum mechanics of solid media
CO2. Understand the characteristics of Fluid mechanics
CO3. Deliberate in details with examples Minkowski space-time
CO4. Specify the classification and characteristics of Relativistic mechanics of a material particle
CO5. Specify the characteristics of Einstein's equations
CO6. Deliberate in details with application, if applicable, The Schwarzschild metric

Continuum mechanics of solid media: *Small deformations of an elastic solid; the strain tensor. The stress tensor. Equations of equilibrium. The symmetry of the stress tensor. The generalised Hooke`s law for a homogeneous elastic medium; the elastic modulus tensor. Navier equations of motion for a homogeneous isotropic medium.* **(Landau L.D. and Lifshitz)**

Fluid mechanics: *Equation of continuity. Flow of a viscous fluid; Navier-Stokes equation and its solution for the case of flow through a cylindrical pipe. The Poiseuille formula* **(Landau L.D. and Lifshitz).**
[16 hours]

Minkowski space-time: *Real coordinates in Minkowski space-time. Definition of 4-tensors. The Minkowski scalar product and the Minkowski metric* η_{ij} *= diag (1 -1 -1 -1). Orthogonality of 4-vectors. Raising and lowering of 4-tensor indices. Time like, null and space like vectors and world-lines. The light-cone at an event* **(Griffiths).**

Relativistic mechanics of a material particle: *The proper-time interval $d\tau$ along the world - line of a material particle. The instantaneous (inertial) rest-frame of a material particle; Components of 4-velocity, 4-acceleration and 4-momentum vector, statement of second law of Newton. Determination of the fourth component F_4 of the 4-force along the world-line of the particle. Motion of a particle under the conservative 3-force field and the energy integral. The rest energy and the relativistic kinetic energy of a particle.*
[16 hours]

Einstein's equations: *The Principle of Equivalence and general covariance. Inertial mass, gravitational mass, Eötvös experiment. Gravitation as space-time curvature. Einstein Gravitational field equations and its Newtonian limits.*

The Schwarzschild metric: *Heuristic derivation of the Schwarzschild line element. Motion of particles and light rays in the Schwarzschild field. Explanation of the (1) perihelion advance of planet Mercury, (2) gravitational red shift and (3) gravitational bending of light. A brief discussion of the Schwarzschild singularity and the Schwarzschild black hole.* **[16 hours]**

Total work load **48 hours**

References:

1. *Landau L.D. and Lifshitz E.M., Fluid Mechanics, Pergamon Press, 1987.*
2. *Landau L.D. and Lifshitz E.M., Theory of Elasticity, Pergamon Press, 1987.*
3. *Synge J.L., Relativity: The Special Theory, North-Holland, 1972.*
4. *Landau L.D. and Lifshitz E.M., The Classical Theory of Fields, 4th Edn., (Sections 1 to 6, 16 to 18, 23 to 25, 26 to 35), Pergamon Press, Oxford, 1985.*
5. *Wald R.M., General relativity, The University of Chicago Press, Chicago, 1984.*
6. *Schutz B.F., A first course in general relativity, Cambridge University Press, Cambridge, 1985.*
7. *Bergman P., Introduction to theory of relativity, Prentice-Hall of India, 1969.*
8. *Rindler R., Relativity: Special, general and cosmological, Oxford University Press, 2006.*
9. *Narlikar J. V., An introduction to Cosmology, Cambridge Publications*
10. *Somnath Datta, Introduction to Special theory of Relativity, Allied Publishers, India, 1998*
11. *Griffiths D. J. Introduction to Electrodynamics, Pearson Publications, 2013.*

PHB 080: Thermal Physics

Course Outcome:

After the completion of the course, Student will be familiar with

- *CO1. Identify the classification and characteristics of Thermodynamics Preliminaries*
- *CO2. Deliberate in depth Entropy*
- *CO3. Specify in depth Phase equilibria*
- *CO4. Deliberate the characteristics of Classical Statistical Mechanics*
- *CO5. Deliberate the classification and characteristics of Quantum Statistical Mechanics*
- *CO6. Understand in depth Applications of Quantum Statistics*

Thermodynamics Preliminaries: *Zeroth law of thermodynamics, vander Walls equation of state second law of thermodynamics* **(Huang K., Laud B.B, Satya Prakash).**

Entropy: *Change in entropy for reversible an irreversible process, entropy and second law of thermodynamics, thermodynamic functions and Maxwell's relations* ***TdS*** *equations, heat capacities equations, third law of thermodynamics. Irreversible thermodynamics; Onsager's reciprocal relation* **(Huang K., Laud B.B, Satya Prakash).**

Phase equilibria; *Equilibrium conditions. Classification of phase transitions; phase diagrams; Clausius-Clapeyron equation, applications. Thermoelectric phenomenon, Peltier effect, Seebeck effect, Thompson effect. Systems far from equilibrium* **(Huang K., Laud B.B, Satya Prakash).[16 hours]**

Classical Statistical Mechanics: *Probability, phase space, division of phase space, ensembles, density distribution in phase space, ergodic hypotheses, Liouville theorem. Statistical equilibrium, postulate of equal a priori probability, general expression for probability, Stirlings formula, the most probable distribution, Maxwell Boltzmann distribution law, law of equipartition of energy. Entropy and probability.*
Microcanonical ensemble, connection between statistical and thermodynamic quantities, Partition function of system of particles, Gibbs paradox, canonical ensemble, perfect monoatmic gas in canonical ensemble, grand canonical ensemble. Vibrational partition function of diatomic molecules (Einstein relations), Rotational partition function of diatomic molecule **(Huang K., Laud B.B, Satya Prakash).**
[16 hours]

Quantum Statistical Mechanics: *The postulates of quantum statistical mechanics. Symmetry of wave functions. The Liouville theorem in quantum statistical mechanics; condition for statistical equilibrium; Ensembles in quantum mechanics; the quantum distribution functions (BE and FD), the Boltzmann limit of Boson and Fermion gases, the derivation of the corresponding distribution functions.*

Applications of Quantum Statistics: *Equation of state of an ideal Fermi gas (derivation not expected), Application of Fermi-Dirac statistics to the theory of free electrons in metals, degeneracy. Application of Bose statistics to the photon gas, derivation of Planck's law, comments on the rest mass of photons. Thermodynamics of Black body radiation. Bose-Einstein condensation* **(Huang, Laud, Satya Prakash).**
[16 hours]

Total work load **48 hours**

References:

1. *Agarwal B.K. and Eisner M., Statistical mechanics, New Age International Publishers, 2000.*
2. *Roy S.K., Thermal physics and statistical mechanics, New Age International Pub., 2000.*
3. *Huang K., Statistical mechanics, Wiley-Eastern, 1975.*
4. *Laud B.B., Fundamentals of statistical mechanics, New Age International Pub.,2000.*
5. *Schroeder D.V., An introduction to thermal physics, Pearson Education New Delhi, 2008.*
6. *Salinas S.R.A., Introduction to statistical physics, Springer, 2004.*
7. *Mark W Zemansky Heat and Thermodynamics, McGraw – Hill*
8. *Gupta A. B and Roy H. B., Thermal Physics Books and Allied (P) Ltd, Kolkata*
9. *Satya Prakash, Statistical Mechanics, Kedarnath Ramnath, 2017.*
10. *Mike Glazer, J.S. Wark, Statistical Mechanics: A Survival Guide, Oxford Publications, 2001.*

PHB 090: Quantum Mechanics 1

Course Outcome:

After the completion of the course Student will be familiar with

- *CO1. Understand in depth The wave function and uncertainty Principle*
- *CO2. Specify in depth Formalism of quantum mechanics*
- *CO3. Understand the details of Schrodinger equation in one dimension*
- *CO4. Deliberate the details of Angular Momentum*
- *CO5. Understand in depth Schrodinger equation in three dimensions*

The wave function and uncertainty Principle: *Wave particle duality, interpretation of the wave function, wave functions for particles having definite momentum, wave packet, Gaussian wave packet. Heisenberg uncertainty principle.*

Time independent Schrodinger equation, conservation of probability, expectation values and operators, the Ehrenfest theorem, Time dependent Schrodinger equation, stationary states. Energy quantisation. Properties of

energy eigenfunction, general solutions of time dependent Schrodinger equation for a time independent potential. Schrodinger equation in momentum space **(Bransden & Joachain). [16 hours]**

Formalism: *Hilbert space. The state of a system, Dirac notation. Dynamical variables and operators – Hermitian operators, adjoint operator, projection operators. Inverse and unitary operators. Expansion in eigenfunctions - eigenvalue and eigenfunction of an operator. Commutator algebra. General Uncertainty relation. Unitary transformation, Representation in discrete basis; Matrix representation of wave functions and operators. Change of representation and Unitary transformations. Matrix representation of eigenvalue problem. Representation in continuous bases. The Schrödinger equation and time evolution of a system.*
The Schrödinger picture and Heisenberg picture.

Schrodinger equation in one dimension: *The free particle, the potential step, potential barrier, infinite square well, finite square well, the linear harmonic oscillator (Algebraic and Analytic method), the periodic potential* **[Bransden and Joachain, Nouredine Zettili]. [16 hours]**

Angular Momentum: *Orbital angular momentum; Orbital angular momentum and spatial rotations, eigenvalues and eigenfunctions of* $\mathbf{L}^2$ *and* L_z**.** *Particle on a sphere and the rigid rotator. General angular momentum. The spectrum of* $\mathbf{J}^2$ *and* J_z**.** *Matrix representation of angular momentum operators, spin angular momentum, spin one-half, total angular momentum. Addition of angular momenta - CG Coefficients***.**

Schrodinger equation in three dimensions: *Separation of the Schrodinger equation in Cartesian coordinates -the free particle. Central potential. Separation of the Schrodinger equation in spherical polar coordinates; the Hydrogenic atom and its solutions* **(Bransden & Joachain). [16 hours]**

Total work load **48 hours**
References:

1. *Nouredine Zettili, Quantum Mechanics, WILEY Publications, U K 2009*
2. *Griffiths D.J., Introduction to quantum mechanics, Prentice-Hall, USA, 1994.*
3. *Bransden & Joachain, 2004, II edition, Pearson Low Price Edition*
4. *Sakurai J.J. and Tuan S.F. (Editor), Modern quantum mechanics, AddisonWesley, India, 1999.*
5. *Shankar R., Principles of quantum mechanics, 2nd Edn., Plenum Press, New York, 1984.*
6. *Schiff L.I., Quantum mechanics, 3rd. Edn., McGraw-Hill, Kogakusha Ltd., New Delhi, 1968.*
7. *Aruldas G., Quantum Mechanics, PHI, New Delhi*
8. *Mathews P. M. and Venkatesan K., Quantum mechanics, Tata - McGraw-Hill, New Delhi*
9. *Verma H. C., Quantum Physics, Surya Publications, Ghaziabad*
10. *Merzbacher E., Quantum Mechanics, III edition, Wiley publication.*

PHB 100: Spectroscopy and Fourier Optics

Course Outcome:

After completing this course, the student will be able to

CO1. Specify the details of Atomic spectroscopy
CO2. Identify in details with application, if applicable, Nuclear magnetic resonance
CO3. Specify in depth Microwave spectroscopy
CO4. Specify in depth Infrared spectroscopy
CO5. Write down in details with application, if applicable, Raman spectroscopy
CO6. Deliberate the characteristics of Fourier optics
CO7. Learn in details with application, if applicable, Propagation of light in an anisotropic medium
CO8. Specify the characteristics of Propagation of light in an anisotropic medium
CO9. Identify the characteristics of Elements of Nonlinear Optics

Atomic spectroscopy:*vector model of atom- orbital magnetic moment , Larmor precession, electron spin, coupling of orbital and spin angular momenta. Spectroscpic terms and their notations, spin-orbit interaction,*

quantum mechanical relativistic correction. Fine structure of hydrogen, Lamb shift. L-S and J-J coupling. Lande interval rule, selection rules.

Zeeman effect, Examples $1\,^{2}_{32}\square D_{-12}\,^{2}\square P$ **2)** $^{2}_{52}\square D_{-32}\,^{2}\square P$ **3)** $^{3}_{\square}\square P_{-}\,^{2}_{\square}\square S$.

Anomalous Zeeman effect, Lande-g factor, Paschen-Back effect – spin-orbit correction. Stark effect – weak field effects and strong field effects. Hyperfine structure of spectral lines. Nuclear spin and hyperfine splitting, intensity ratio and determination of nuclear spin. Breadth of spectral lines, natural breadth. Doppler Effect and external effect **(Rajkumar). [16 hours]**

Nuclear magnetic resonance: *Quantum mechanical expression for the resonance condition. Relaxation Mechanisms; Expression for spin lattice relaxation. Chemical shift; spin-spin interaction, example of ethyl alcohol. Fourier transform technique in NMR. FTNMR spectrometer and experimental procedure. NMR in medicine.*

Microwave spectroscopy: *The classification of molecules. The rotational spectra of rigid diatomic rotator, the spectra of non-rigid diatomic rotator, example of HF. Microwave oven.*

Infrared spectroscopy: *The Born-Oppenheimer approximation. Vibrational energy of diatomic molecule. Anharmonic oscillator. Diatomic vibrating rotator, example of the CO molecule. The vibrations of polyatomic molecules; skeletal and group frequencies. Experimental technique in FTIR.*

Raman spectroscopy: *The quantum theory of Raman effect. Pure rotational Raman spectraof linear molecules and symmetric top molecules. Vibrational Raman spectra. Rotational finestructure. Instrumentation technique in Raman spectroscopy* **(Banwell C.N. and McCash E.M and Aruldas).**
[16 hours]

Fourier optics: *Spatial frequency filter; effect of a thin lens on an incident field distribution. Lens as a Fourier transforming element. Application to phase contrast microscopy.* **(Hecht)**

Propagation of light in an anisotropic medium: *Structure of a plane electromagnetic wave in an anisotropic medium. Dielectric tensor. Fresnel's formulae for the light propagation in crystals. Ellipsoid of wave normals and ray normals. Normal surface and ray surface. Optical classification of crystals. Light propagation in uniaxial and biaxial crystals. Refraction in crystals.* **(Born M. and Wolf E.)**

Elements of Nonlinear Optics*: Second harmonic generation, optical rectification and phase matching; third harmonic generation* **(Lipson, Srivatsava). [16 hours]**

Total work load 48 hours
References:

1. *Tralli N. and Pomilla P.R., Atomic theory, McGraw-Hill, New York, 1999.*
2. *Banwell C.N. and McCash E.M., Fundamentals of Molecular Spectroscopy, 4th Edn., Tata McGraw-Hill, New Delhi, 1995.*
3. *Mahan B.H., University Chemistry, 3rd Edn. (Chapters 3, 10, 11 and 12), Narosa, New Delhi, 1975.*
4. *Hecht E., Optics, Addison-Wesley, 2002.*
5. *Lipson S.G., Lipson H. and Tannhauser D.S., Optical physics, Cambridge University Press, USA, 1995.*
6. *Rajkumar, Atomic and molecular spectra:Laser, Kedarnath Ramanath Publications, Meerut.*
7. *Born M. and Wolf E., Principles of optics, 6th Edn., Pergamon Press, Oxford, 1980*
8. *Srivatsava, P K Optics,* CBS Publisher & Distributors I Ediition, 2011

PHB 110: Computer Lab CL-B

Course Outcome:

After completing this course the student will

CO1. Identify the details of Programming in C
CO2. Learn the details of PERL scripting language
CO3. Write down the classification and characteristics of C programming language and its syntax

CO4. Understand in details with application, if applicable, C techniques for physics problem solving and data analysis

CO5. Write down the classification and characteristics of C techniques for physics problem solving and data analysis

Programming in C

- *Check whether given number is odd or even.*
- *Find the largest and smallest number in the input set.*
- *Compute the Fibonacci sequence.*
- *Check whether the input number is prime or not.*
- *Compute the roots of a quadratic equation.*
- *Generate Pascal's triangle.*
- *To add two m X n matrices.*
- *To find the sum and average of a data stored in a file.*
- *Linear least-squares fitting to data in a file.*
- *To find the trajectory of a projectile shot with an initial velocity at an angle. Also, find the maximum height travelled and distance travelled. Write the trajectory data to a file specified and plot using Gnuplot.*
-

Programming in Perl

- *Searching for a pattern in a string.*
- *Counting the number of characters, words and lines in a given file.*
- *Sorting strings.*
- *Check whether the input number is prime or not.*
- *Compute the roots of a quadratic equation.*
- *Linear least squares fitting to data in a file.*

Total work load : 1 day(s) per week × 4 hours × 16 weeks = **64 hours**

PHB 220: Optics Lab

Course Outcome:

After completing this course the student will

CO1. Learn the details of Brewster law of polarisation

CO2. Learn in details with application, Fresnel laws of reflection

CO3. Learn in details the Babinet compensator

CO4. Deliberate the details of Birefringence of mica by using the quarter-wave plate

CO5. Deliberate in details with application, if applicable, Michelson interferometer

CO6. Deliberate in depth Determination of wavelength by using the Fabry-Perot etalon

CO7. Deliberate in details with application, if applicable, Dispersion of the birefringence of quartz

CO8. Deliberate in depth The Franck-Hertz experiment

Any ten of the following experiments:

1. *Verification of the Brewster law of polarisation.*
2. *Verification of Fresnel laws of reflection from a plane dielectric surface.*
3. *Determination of the inversion temperature of the copper-iron thermocouple.*
4. *Birefringence of mica by using the Babinet compensator.*
5. *Birefringence of mica by using the quarter-wave plate.*
6. *Experiments with the Michelson interferometer.*
7. *Determination of the refractive index of air by Jamin interferometer.*

8. *Determination of the size of lycopodium spores by the method of diffraction haloes.*
9. *Determination of wavelength by using the Fabry-Perot etalon.*
10. *Dispersion of the birefringence of quartz.*
11. *The Franck-Hertz experiment.*
12. *Experiments with the laser.*
13. *Determination of the Stokes vector of a partially polarised light beam*
14. *Determination of the modes of vibration of a fixed-free bar.*

Total work load : 2 day(s) per week × 4 hours × 16 weeks = **128 hours**

PHC 050: Quantum Mechanics 2

Course Outcome:

After completing this course the student will be able to

CO1. Learn in details with application, if applicable, The time-independent perturbation theory
CO2. Learn the characteristics of The Variational Principle
CO3. Understand in details with application, if applicable, WKB Approximation
CO4. Deliberate in details with examples Adiabatic approximation
CO5. Deliberate in details with application, if applicable, Time-dependent perturbation theory
CO6. Learn the details of Scattering
CO7. Deliberate in depth Relativistic quantum mechanics

The time-independent perturbation theory: *Nondegenerate Perturbation Theory; first and second order perturbation, Perturbed Harmonic Oscillator. Degenerate Perturbation Theory; Fine Structure of Hydrogen, The Zeeman Effect.*

The Variational Principle*: Theory, the Ground State of Helium.*

WKB Approximation*: The Classical Region, Tunneling; connection formulae, α-particle decay* **(Griffiths). [16 hours]**

Time-dependent perturbation theory: *Time dependent perturbation theory; general features, constant and periodic perturbations. Two-Level Systems; Emission and Absorption of Radiations, Spontaneous Emission, Fermi golden rule, Rabi Oscillations***.**

Adiabatic approximation - *The Adiabatic Theorem, Berry's Phase. Sudden approximation.*

Scattering: *Introduction, scattering cross section, scattering by a spherically symmetric potential. Partial Wave Analysis, phase shifts. Optical theorem, Lippmann- Schwinger equation. Born Approximation, Rutherford scattering* **(Griffiths D J)**. **[16 hours]**

Relativistic quantum mechanics: *Klein-Gordon equation: free particle, stationary state solutions, continuity equation. The Dirac equation; free-particle, stationary state solutions, continuity equation. Covariant formulation; Covariant form of Dirac equation, Lorentz invariance of the Dirac equation, Plane wave solutions of the Dirac equation -non-relativistic limit. Spin and helicity operators. Normalization of the solutions. Brief discussion of the hydrogen atom according to Dirac theory, Non-relativistic limit of Dirac equation. Negative energy states - Hole theory* **(Sakurai J J). [16 hours]**

Total work load **48 hours**

References:

1. *Bransden and Joachain, II edition, Pearson Low Price Edition*
2. *Sakurai J.J. and Tuan S.F. (Editor), Modern Quantum Mechanics, AddisonWesley, India, 1999.*
3. *Shankar R., Principles of Quantum Mechanics, 2nd Edn., Plenum Press, New York, 1984.*
4. *Schiff L.I., Quantum mechanics, 3rd. Edn., McGraw-Hill, Kogakusha Ltd., New Delhi, 1968.*
5. *Griffiths D.J., Introduction to Quantum mechanics, Prentice-Hall, USA, 1994.*
6. *Sakurai J.J., Advanced quantum mechanics, Addison-Wesley, Harlow, England, 1999.*
7. *Griffiths D., Introduction to Elementary particles, John Wiley and Sons, New York, 1987.*
8. *Gasiorowicz S., Elementary Particle Physics, John-Wiley, New York, 1966.*
9. *Muirhead H., The Physics of Elementary Particles, Pergamon Press, London, 1965.*

PHC 060: Condensed Matter Physics

Course Outcome:

After completing this course, the student will be able to

CO1. Write down the classification and characteristics of X-ray crystallography
CO2. Identify in details with examples Atomic scattering factor
CO3. Specify in details with examples Electron and neutron diffraction
CO4. Identify in details with examples Crystal growth techniques
CO5. Learn the details of Disordered materials
CO6. Understand in details with examples Liquid crystals
CO7. Write down in details with application, if applicable, Crystal lattice dynamics
CO8. Learn in details with application, if applicable, Magnetic properties of solids
CO9. Deliberate in depth Superconductivity
CO10. Understand the details of Semiconductors

X-ray crystallography: *Crystalline state. Reference axes, equation of a plane, Miller indices. External symmetry of crystals; symmetry operations. Two and three dimensional point groups. Lattices; two dimensional lattices, choice of unit cell.* **(Buerger, p12–20, 23–45).**
*Three-dimensional lattices; crystal systems and Bravais lattices.Screw and glide operations. Space groups; Examples of space groups. Diffraction of X rays by crystals; Laue equations. Reciprocal lattice. [*__Sherwood, p272–288__*]. Bragg equation. Equivalence of Laue and Bragg equations. Significance of structure of solid for applications (*__Ladd and Palmer,p55–66, p114-121)__*.*

Atomic scattering factor *(qualitative).*

Electron and neutron diffraction: *Basic principles. Differences between electron, neutron and X-ray diffractions, applications (qualitative).***(Vainshtein, p 336 – 357).**

Crystal growth techniques: *General methods of crystl growth.Czochralski, Kyropoulus, Stockbarger-Bridgman. Zone refining techniques***(Rose et al p 146 – 154). [16 hours]**

Disordered materials: *Amorphous solids. Aperiodic materials.*
Liquid crystals*: Introduction, Classification and their applications. Morphology. The smectic (A-H), nematic and cholesteric phases. Birefringence, texture and X-ray studies***.** *Orientational order and its determination for nematic liquid crystals (***DeGennes P.G. and Prost J, Gray and Goodby)**

Crystal lattice dynamics: *Vibration of an infinite one-dimensional monoatomic lattice, First Brillouin Zone. Group velocity. Finite lattice and boundary conditions. Vibrations of a linear diatomic lattice; optical and acoustical branches, dispersion relations***. (Wahab, p288–305).**

Magnetic properties of solids: *Diamagnetism and its origin. Expression for diamagnetic susceptibility. Paramagnetism; Quantum theory of paramagnetism, Brillouin function. Ferromagnetism; Curie-Weiss law,*

Spontaneous magnetisation and its variation with temperature. Ferromagnetic domains. Antiferromagnetism. Two sub-lattice model. Susceptibility below and above Neel's temperature.
(Dekker, p446–490). [16 hours]

Superconductivity: *Experimental facts. Type I and type II superconductors. Phenomenalogical theory. London equations. Meissner effect. High frequency behaviour. Thermodynamics of superconductors; Entropy and Specific heat. Qualitative ideas of the theory of superconductivity.***(Kittel, p333–364).**

Semiconductors: *Elemental and compound Semiconductors [Streetman, p61–95].Crystal structure and bonding. Expressions for carrier concentrations. Fermi energy, electrical conductivity and energy gap in intrinsic semiconductors. Extrinsic Semiconductors; impurity states and ionization energy of donors. Carrier concentrations and their temperature variation* **(Mckelvey, p256–277).[16 hours]**

Total work load 48 hours

References:

1. *Stout G.H. and Jensen L.H., X-ray structure determination, MacMillan, USA, 1989.*
2. *Ladd M.F.C. and Palmer R.A., Structure determination by X-ray crystallography, Plenum Press, USA, 2003.*
3. *Buerger M.J., Elementary crystallography, Academic Press, London.*
4. *Dekker A.J., Solid state physics, Prentice Hall, 1985.*
5. *Kittel C., Introduction to solid state physics, 7th Edn., John Wiley, New York, 1996.*
6. *Mckelvey J.P., Solid state and semiconductor physics, 2nd Edn., Harper and Row, USA, 1966.*
7. *Streetman B.G., Solid state electronic devices, 2nd Edn., Prentice-Hall of India, New Delhi, 1983.*
8. *DeGennes P.G. and Prost J.,The physics of liquid crystals, 2nd Edn., Clarendon Press, Oxford, 1998.*
9. *Wahab M.A., Solid state physics, Narosa Publishing House, New Delhi, 1999.*
10. *Azaroff L.V., Introduction to solids, McGraw-Hill Inc, USA, 1960.*
11. *Sherwood D., Crystals, X-rays and proteins, Longman, UK, 1976.*
12. *Rose R.M., Shepard L.A. and Wulff J., The structure and properties of materials Vol. 4, Electronic properties, Wiley Eastern, 1965.*
13. *Vainshtein B.K., Modern crystallography, Vol. I, Springer-Verlag, Germany, 1981.*
14. *Pillai S.O., Solid state physics, New Age International Publications, 2002.*

PHC 070: Nuclear and Particle Physics

Course Outcome:

After completing this course the student will be able to

CO1.	*Specify in details with application, if applicable, Properties of the Nucleus*
CO2.	*Learn in details with application, if applicable, Nuclear Models*
CO3.	*Specify the characteristics of Nuclear reactions*
CO4.	*Deliberate in depth Nuclear decay modes*
CO5.	*Understand the classification and characteristics of Interaction of nuclear radiation with matter*
CO6.	*Write down in details with examples Nuclear reactors*
CO7.	*Identify in depth Nuclear forces and elementary particles*
CO8.	*Identify in depth Particle interactions and families*

Properties of the Nucleus: *Nuclear radius; determination by mirror nuclei, Mesic X-rays and electron scattering methods. Nuclear moments; spin, magnetic dipole moment. Relation between J and μ on the basis of single particle model. Determination of nuclear magnetic moment by Molecular beam experiment. Electric quadrupole moment – reduced Electric quadrupole moment* **.**

Nuclear Models: *Liquid drop model; Weissacker's formula and its application to (1) stability of isobars and (2) fission process. Shell model; Infinite square well potential, Magic numbers. Fermi gas model; well depth, level density and nuclear evaporation.*

Nuclear reactions: *Q-values, threshold energy. Reactions induced by proton, deuteron and particles. Photodisintegration* **(Krane & Tayal)**. **[16 hours]**

Nuclear decay modes: *Beta decay; Beta ray spectrum, Pauli neutrino hypothesis, mass of the neutrino from beta ray spectral shape, Fermi theory of beta decay, Kurie plot, ft- values and forbidden transitions. Methods of excitation of nuclei; Nuclear isomerism, Mossbauer effect (qualitative only), Auger effect.*

Interaction of nuclear radiation with matter: *Energy loss due to ionization for proton -like charged particles, Bethe-Bloch formula, Range energy relations. Ionisation and Radiation loss of fast electrons (Bremsstrahlung - qualitative only). Interaction of gamma and X-rays with matter. Detectors; Brief description of NaI (Tl) gamma ray spectrometer. Boron triflouride counter***.**

Nuclear reactors: *Condition for controlled chain reactions, slowing down of neutrons, logarithmic decrement in energy. Homogeneous spherical reactor; critical size, effect of reflectors.*
Breeder reactor (Qualitative discussion) **(Krane & Tayal)**. **[16 hours]**

Nuclear forces and elementary particles: *General features of nuclear force; spin dependence, charge independence, exchange character, saturation other features. Meson theory of nuclear forces; Yukawa's theory. Properties of pi mesons; charge, mass, spin, isospin and parity, decay modes, meson resonances.*

Particle interactions and families: *Conservation laws; classification of fundamental forces and elementary particles. Associated particle production, Gellmann-Nishijima scheme, strange particles. CP violations in Kaon decay. Symmetries; Eight-fold way symmetry, quarks and gluons. Elementary ideas of the Standard model* **(Griffiths D J). [16 hours]**

Total work load **48 hours**

References

1. *Tayal D.C., Nuclear Physics, Himalaya Publishing House, New Delhi, 2012 (Unit 1. Chapter Page 6-14. Page 30- 35, 40-49. Chapter 9. Page 355-369. Chapter 10. Page 401-411.)*
2. *Krane K.S., Introductory nuclear physics, Wiley, New York, 1987. (Unit 1. Chapter 16 page 605-610.)*
3. *Ghoshal S.N., Nuclear physics, S.Chand and Company, Delhi, 1994. (Unit 2: Chapter 5 page 137-155, Chapter 6 page 187-204, 222, 262, Chapter 13, page 647-651, chapter 15, page 717-721.)*
4. *Wong S.S.M., Introductory nuclear physics, Prentice Hall of India, Delhi, 1998.*
5. *Khanna M.P., Introduction to particle physics, Prentice Hall of India, Delhi, 2008.*
6. *Kapoor S.S. and Ramamoorthy V., Nuclear radiation detectors, Wiley Eastern, Bangalore,2007*

PHC 240: Solid State Physics 1

Course Outcome:

After completing this course the student will

- *CO1. Specify in details with application, if applicable, basic concepts of properties of Solid*
- *CO2. Deliberate in details with application, if applicable, Dielectrics; Properties and classification*
- *CO3. Specify the classification and characteristics of Ferroelectrics; Properties and classification*
- *CO4. Specify the characteristics of thermal and vibrational properties of solids*
- *CO5. Learn the characteristics of tight-binding approximation*
- *CO6. Identify the details of trajectories in real and reciprocal space*
- *CO7. Learn the characteristics of electrical and magnetic properties, transport phenomena*

CO8. Write down in depth intrinsic and doped semiconductors
CO9. Identify in details with application, if applicable, superconductivity
CO10. Understand in depth elastic properties of solids

Dielectric properties of solids: *Macroscopic description of static dielectric constant, the static electronic and ionic polarisabilities of molecules, orientation polarization. Local electric field at an atom; Lorentz field, field of dipoles inside cavity. The static dielectric constant of solids; Clausius- Mossotti relation. Complex dielectric constant. Polarization catastrophe. Dielectric losses and Debye relaxation time. Classical theory of electronic polarization and optical absorption.*

Ferroelectricity: *Basic properties and classification of ferroelectric materials. The dipole theory of ferroelectricity, objections against the dipole theory. Ionic displacements and behavior of Barium titanate above the Curie temperature. Theory of spontaneous polarization of Barium titanate. Thermodynamics of ferroelectric transitions. Landau theory of phase transitions, Dielectric constant near the Curie point. Ferroelectric domain* **(Dekker and Kittel). [16 hours]**

Magnetic properties: *Definition of magnetization and susceptibility. Hund`s rule; calculation of L, S and J for 3d and 4f shells. Setting up of Hamiltonian for an atom in an external magnetic field; explanation of diamagnetism, Van Vleck Paramagnetism and quantum theory of paramagnetism* **(Ashcroft & Mermin).** *Interpretation of the Weiss field in terms of exchange integral* **(Dekker p473-474,).** *Calculation of the singlet triplet splitting, spin Hamiltonian and Heisenberg model* **(Ashcroft and Mermin).**

Zero-temperature properties: *Ground state of the Heisenberg ferromagnet. First excitation of one dimensional ferromagnetism at zero-temperature; spin waves, anti-ferromagnetism. Low-temperature behaviour of ferromagnets; Bloch's* $T^{3/2}$ *law* **(Ashcroft and Mermin, Kittel).**

Magnetic resonance: *Phenomenological description, Relaxation mechanisms, Derivation of Casimir Durpe relation. Nuclear Magnetic moments, condition for resonance absorption, setting up of Bloch's equations, solutions for steady state and weak RF field. Expression for power absorption, change of inductance near resonance. Dipolar line width in a rigid lattice* **(Dekker p498-512). [16 hours]**

Band theory of solids: *Statement and proof of Bloch theorem; periodic potentials in solids. Reciprocal lattice, periodic boundary conditions, density of states. Construction of Brillouin zones for a square lattice. Nearly free electron model and solution at the boundary. Energy gap using nearly free electron model. Tightly bound electron approximation, application to SC , BCC and FCC lattices* **(Dekker***).*

Superconductivity: *BCS theory; Cooper pairs, Energy gap, Meissner effect. Flux quantization. Theory for DC and AC bias; Josephson tunnelling, Josephson junction. High* T_c*superconductors* **(Ibach and Luth).**

Elastic constants of crystals: *Elastic strains and stresses. Elastic compliance and stiffness constants, applications to cubic crystals and isotropic solids. Elastic waves and experimental determination of elastic constants* **(Kittel). [16 hours]**

Total work load 48 hours

References:

1. *Dekker A.J., Solid state physics, Prentice Hall, 1985.*
2. *Kittel C., Introduction to solid state physics, 7th Edn., John Wiley, New York, 1996.*
3. *Ashcroft N.W. and Mermin N.D., Solid State Physics, Saunders College Publishing, 1996.*
4. *Ibach H. and Luth H., Solid State Physics Narosa, New Delhi, 1996.*
5. *Pillai S.O., Solid state physics, New Age International Publications, 2002.*
6. *Wahab M.A., Solid state physics, Narosa Publishing House, New Delhi, 1999.*

PHC 260: Nuclear Physics 1

Course Outcome:

After completing this course the student will

CO1. Specify in details with examples Nuclear detectors
CO2. Understand in depth Nuclear pulse techniques
CO3. Learn the details of Shell model
CO4. Understand the classification and characteristics of Collective model
CO5. Identify the classification and characteristics of Nilsson model
CO6. Deliberate in details with application, if applicable, Nilsson model

CO7. Identify the characteristics of Many body self-consistent models
CO8. Identify in depth Timing spectroscopy
CO9. Understand in details with application, if applicable, Gamma ray spectroscopy

Nuclear detectors: *Scintillation processes in inorganic crystals (NaI(Tl)). Semiconductor detector -Diffused junction, Surface barrier and Lithium drifted detectors. Relation between applied voltage and depletion layer thickness in junction detectors, Hyper pure germanium detectors, Cerenkov detectors.*

Nuclear pulse techniques: *Preamplifier circuits; charge sensitive and voltage sensitive preamplifiers. Linear pulse amplifiers; Linearity, stability, pulse shaping, pulse stretching. Operational amplifiers; analog to digital converters. Scalars, Schmidt trigger as a pulse discriminator, Single channel analyser; Integral and differential discriminators. Multichannel Analysers, memory devices and online data processing.* **[16 hours]**

Shell model: *Motion in a mean potential, Square well and simple harmonic oscillator potential well, spin orbit interaction and Magic numbers. Extreme single particle model, Ground state properties of nuclei based on shell model. Nordhiem's Rules.*

Collective model: *Evidences for collective motion. Nuclear rotational motion; Rotational energy spectrum and nuclear wave functions for even-even nuclei. Odd- A nuclei energy spectrum and wave function.*

Nilsson model: *Nilsson diagrams.*
Many body self-consistent models*: Hartree-Fock model.* **(Hans H.S) [16 hours]**
Timing spectroscopy: *Coincidence and anti-coincidence circuits. Delay circuits. Time to amplitude conversion; start-stop and overlap converters.*

Gamma ray spectroscopy: *Life time measurements. Gamma-gamma, beta-gamma angular correlation studies. Angular distribution of gamma rays from oriented nuclei. Polarization of gamma rays.* **[16 hours]**

Total work load **48 hours**

References:

1. *Mermier P. and Sheldon E., Physics of the nuclei and particles, Vol. 1 and 2, Academic Press, New York 1970.*
2. *Segre E., Nuclei and particles, Benjamin Inc, New York, 1977.*
3. *Arya A.P., Fundamentals of nuclear physics, Allyn and Bacon, USA, 1968.*
4. *Blatt J.M. and Weisskopf V.F., Theoretical nuclear physics, Wiley and Sons, New York, 1991.*
5. *Siegbahn K., The alpha, beta and gamma ray spectroscopy: Vol. 1 and 2, North Holland, Amsterdam, 1965.*
6. *Price J.W., Nuclear radiation detectors, McGraw Hill, New York, 1965.*
7. *Kapoor S.S. and Ramamoorthy V., Nuclear radiation detectors, Wiley Eastern, Bangalore, 1993.*
8. *Kowalski E., Nuclear electronics, Springer Verlag, Berlin,1970.*
9. *Leo W.R.,Techniques for nuclear and particle physics experiments, Springer Verlag, 1992.*
10. *Roy R.R. and Nigam B.P., Nuclear physics, New Age International, New Delhi, 1986.*
11. *Hans H.S., Nuclear physics—Experimental and theoretical, New Age International Publishers, 2001.*
12. *Tayal D.C., Nuclear Physics, Himalaya Publishing House, New Delhi, 2012*

PHY-306: Theoretical Physics 1

Course Outcome:

After completing this course the student will
CO1. Tackle a wide range of topics using powerful analytical tools including formal methods in classical and quantum physics

CO2. Clearly communicate information and conclusions in written and verbal formats on ideas in Theoretical Physics
CO3. Evaluate complex problems and formulate solutions, indentifying the role of theory, hypothesis and experiment in the scientific method
CO4. Apply computation to solve the problems in theoretical physics
CO5. Plan, carry out and report theoretical physics based investigation
CO6. Apply classical and quantum theoretical techniques in research

General theory of relativity: *Tensor Calculus and Riemannian geometry: Covariant Differentiation, Parallel Transport, Geodesies, The Curvature Tensor.*

Riemannian geometry: *Riemannian space, The determinant of $g_{\mu\nu}$. Metrical Densities, The Connection of a Riemannian Space: Christoffel Symbols, Geodesies in a Riemannian Space, The Curvature of a Riemannian Space: The Riemann Tensor.* **[16 hours]**

Gravitational field: *The Principle of Equivalence, The Field Equations of General Relativity, Metrics with Spherical Symmetry, The Schwarzschild Solution. Geodesies in the Schwarzschild Space, Advance of the Perihelion of a Planet, The Deflection of Light Rays, Red Shift of SpectralLines, The Schwarzschild Sphere. Gravitational Collapse. Black Holes.* **[16 hours]**

Quantum field theory-1: *Classical and quantum fields: Particles and fields, Discrete and continuous mechanical systems, Classical scalar fields, Maxwell fields Quantum Theory of Radiation: Creation, annihilation, and number operators, Quantized radiation field, Fock states, Emission and absorption of photons by atoms, Rayleigh scattering, Thomson scattering, and the Raman effect.* **[16 hours]**

Total work load **48 hours**

References:

1. *Papapetrov A., Lectures on general relativity, D. Reidel Publishing Company, USA, 1974.*
2. *Dirac P.A.M., The general theory of relativity, John Wiley and Sons, New York, 1975.*
3. *Adler R., Bazin M. and Schiffer M., Introduction to general relativity, McGraw-Hill Kogakusha, Ltd. New Delhi, 1965.*
4. *Hartle J.B., Gravity: An introduction to Einstein's general relativity, Benjamin-Cummings Pub. Co., USA, 2002.*
5. *Sakurai J.J., Advanced quantum mechanics, Addison-Wesley, Harlow, England, First ISE Reprint, 1999.*
6. *Griffiths D., Introduction to elementary particles, John Wiley and Sons, New York, 1987.*
7. *Gasiorowicz S., Elementary particle physics, John-Wiley, New York, 1966.*
8. *Muirhead H., The physics of elementary particles, Pergamon Press, London, 1965.*

Open Elective Papers

Paper to be offered to Non-Physics Postgraduate students

PHY-321: Modern Physics

Course Outcome:

After completing this course the student will

CO1. Apply basic principles and laws of electricity and magnetism
CO2. Solve Problems involving the fundamental principles of physics
CO3. Apply Mathematical techniques for quantitative solutions to problems
CO4. Understand physics using qualitative and quantitative representations in appropriate modes and genres.
CO5. Understand the fundamentals of Condensed Matter, Nuclear and Quantum Physics

Nuclear physics: *A brief overview of nuclear physics. Nuclear reactions, a brief description of nuclear models. Interactions of X-rays and γ-rays with matter, slowing down and absorption of neutrons. Fundamental particles, classification of fundamental particles, fundamental forces, conservation laws in particle physics, a brief outline of the quark model.*
Nuclear power: *Nuclear fission, fission chain reaction, self sustaining reaction, uncontrolled reaction, nuclear bomb. Nuclear reactors, different types of reactors and reactors in India. Nuclear waste management. Nuclear fusion, fusion reactions in the atmosphere. Radiation effects; dosage calculation. Nuclear energy; applications and disadvantages.* **[16 hours]**

Condensed matter physics: *Amorphous and crystalline state of matter. Crystal systems. Liquid crystals. X-ray diffraction; Bragg equation. Structure of NaCl. FTIR; Experiment analysis. NMR; Experiment and analysis. Electrical conductivity of metals and semiconductor. Magnetic materials; para,ferro, ferri and anti-magnetism. Dielectrics—para, ferro, pyro and piezo properties. Symmetry in physics.* **[16 hours]**

Quantum physics: *Qualitative discussion. Molecules, atoms, nucleus, nucleons, quarks and gluons. Particle physics (qualitative). Stern-Gerlach experiment and consequences. Uncertainty relation. Hydrogen atom. Positron annihilation. Laser trapping and cooling. Ion traps. Electromagnetic, strong, weak and Gravitational forces. Big Bang theory, String theory. Large Hadron Collider experiment, consequences. Higgs Boson.*
[16 hours]

Tutorial **[16 hours]**

Total work load **64 hours**

References:

1. *Ghoshal S.N., Atomic and nuclear physics, Vol.2., S. Chand and Company, Delhi, 1994.*
2. *Evans R.D., Atomic nucleus, Tata Mc Grow Hill, New Delhi, 1976.*
3. *Penrose R., Road to Reality, Vintage Books, 2007.*
4. *Ladd M.F.C. and Palmer R.A., Structure determination by X-ray crystallography, Plenum Press, USA, 2003.*
5. *De Gennes P.G. and Prost J., The physics of liquid crystals, 2nd Edn., Clarendon Press, Oxford, 1998.*
6. *Myer R., Kennard E.H. and Lauritsern T., Introduction to modern physics, 5th Edn., McGraw- Hill, New York, 1955.*
7. *Halliday D., Resnick R. and Merryl J., Fundamentals of physics, Extended 3rd Edn., John Wiley, New York, 1988.*

PHY-322: Energy Science

Course Outcome:

After completing this course the student will

CO1. Learn the need for renewable energy in the growing world
CO2. Understand the conservation of renewable energy resources
CO3. Understand the proper utilisation of renewable energy resources
CO4. Understand the physics of renewable energy resources
CO5. Learn the technology behind the biogas and biomass production

Renewable energy resources: *Forms of Energy, Basics of Thermodynamics: Heat capacity, Heat transfer mechanism, entropy, First and second law of thermodynamics Carnot Cycle, Rankin cycle. Fossil fuels, time scale of fossil fuels. Solar energy: Sun as the source of energy and its energy transport to the earth, Extraterrestrial and terrestrial solar radiations, Measurement techniques of solar radiations using Pyranometer and Pyrheliometer.* **[16 hours]**

Materials and solar cell technology : *Single, poly and amorphous silicon, GaAs, CdS, fabrication of single and polycrystalline silicon solar cells, amorphous silicon solar cells, photovoltaic systems and technical problems.*

Wind Energy Origin and classification of winds, Aerodynamics of windmill: Maximum power and Forces on the Blades and thrust on turbines; Wind data collection and field estimation of wind energy, Site selection, Basic components of wind mill, Types of wind mill, Wind energy farm, Hybrid wind energy systems: The present Indian Scenario. **[16 hours]**

Biomass energy and biogas technology: *Nature of Biomass as a fuel, Biomass energy conversion processes, Direct combustion: heat of combustion, combustion with improved Chulha and cyclone furnace; Dry chemical conversion processes: pyrolysis, gasification, types of gasification. Importance of biogas technology, anaerobic decomposition of biodegradable materials, Factors affecting Bio-digestion, Types of biogas plants, Applications of biogas.* **[16 hours]**

Tutorial **[16 hours]**

Total work load **64 hours**

References:

1. *Peter A., Advances in energy systems and technology, Academic Press, USA, 1986.*
2. *Neville C.R., Solar energy conversion: The solar cell, Elsevier North-Holland, 1978.*
3. *Dixon A.E. and Leslie J.D., Solar energy conversion, Pergamon Press, New York, 1979.*
4. *Ravindranath N.H., Biomass, energy and environment, Oxford University Press, 1995.*
5. *Cushion E., Whiteman A. and Dieterle G., World Bank Report, 2009.*

PHC 080: Condensed Matter Physics Lab

Course Outcome:

After completing this course the student will

CO1. Write down the classification and characteristics of Determination of the paramagnetic susceptibility of the given salt by Quincke's method

CO2. Specify in depth Analysis of the powder X-ray photograph of a simple cubic crystal

CO3. Identify the classification and characteristics of Temperature coefficient of resistance of a thermistor

CO4. Understand in details with application, if applicable, Energy gap of a semiconductor

CO5. Learn in details with application, if applicable, Di-electric constant of a Non polar liquid

CO6. Identify in depth Thermionic work function of a metal (Richardson-Dushmann formula)

CO7. Learn the details of Stefan's Constant of Radiation

CO8. Deliberate in details with application, if applicable, Sodium spectrum analysis by using Edser-Butler fringes

Any eight of the following experiments:

1. *Determination of the paramagnetic susceptibility of the given salt by Quincke's method*
2. *Study of mercury spectrum by superimposing it on brass spectrum*
3. *Sodium spectrum analysis by using Edser-Butler fringes*
4. *Temperature coefficient of resistance of a thermistor*
5. *Analysis of the powder X-ray photograph of a simple cubic crystal*
6. *Thermionic work function of a metal (Richardson-Dushmann formula)*
7. *Energy gap of a semiconductor*
8. *Frank Hertz experiment*
9. *Measurement of magneto resistance of semiconductors*
10. *Stefan's Constant of Radiation*

11. *Thermal Conductivity of Poor Conductor*
12. *Di-electric constant of a Non polar liquid*
13. *Dipole moment of an organic Molecule*
14. *High Resistance by Leakage*

Total work load : 2 day(s) per week × 4 hours × 16 weeks = **128 hours**

PHC 090: Nuclear and Particle Physics Lab

Course Outcome:

After completing this course the student will

- *CO1. Deliberate in details with application, if applicable, Theoretical and practical tecniques in Nuclear and Particle Phyics*
- *CO2. Deliberate in details with examples quantitative estimates of phenomena in elementary particles*
- *CO3. Identify in details with examples range of applications of nuclear technology*
- *CO4. Deliberate in depth Scattering experiments and gamma-ray spectroscopy*
- *CO5. Learn the details of Nuclear Electronic circuits*

Any eight of the following experiments:

1. *Half-life of Indium-116 measurement.*
2. *Energy Resolution of a NaI(Tl) scintillation spectrometer.*
3. *Compton scattering—determination of the rest energy of an electron.*
4. *Beta absorption coefficient measurement.*
5. *Dekatron as a counter of signals.*
6. *Gamma-ray absorption coefficient measurement.*
7. *End-point energy of Beta particles by half thickness measurement.*
8. *Common Source amplifier.*
9. *Astable multivibrator using timer IC 555.*
10. *Dead time of the G.M. counter.*

*Total work load : 2 day(s) per week × 4 hours × 16 weeks =***128 hours**

Reference: *1. Varier K. M., Antony Joseph and Pradyumman P. P., Advanced experimental techniques in Modern Physics, Pragati Prakashan, 2011*

PHC 250: Solid State Physics Lab 1

Course Outcome:

After completing this course the student will

- *CO1. Understand in details with examples Verification of Langmuir-Child's law.*
- *CO2. Deliberate in details with examples Cell parameter(s) from an X-ray powder diffractogram*
- *CO3. Identify in details with examples Birefringence of quartz using spectrometer*
- *CO4. Learn the classification and characteristics of Fermi energy of copper*
- *CO5. Write down the characteristics of BH Curve in a ferromagnetic Material*
- *CO6. Identify in depth Paramagnetic susceptibility by Gouy balance method*
- *CO7. Learn the details of Dielectric constant and its temperature variation*

*For those who have opted for **Solid State Physics Specialisation***

Any five of the following experiments:

1. *Optical rotatory dispersion of a uniaxial crystal.*
2. *Birefringence of quartz using spectrometer.*
3. *Paramagnetic susceptibility by Gouy balance method.*
4. *Fermi energy of copper.*
5. *Cell parameter(s) from an X-ray powder diffractogram.*
6. *Verification of Langmuir-Child's law.*
7. *Thermoluminescence.*
8. *Curie temperature of a ferroelectric material.*
9. *Dielectric constant and its temperature variation.*
10. *Determination of the polarisabilities of the molecules of an uniaxial crystal using spectrometer.*
11. *Photoelasticity in crystalline solids.*
12. *Thermal expansion coefficient in solids.*
13. *Determination of Stefan's constant using Photo Cell*
14. *Calibration of Si Diode*
15. *Measurement of Electrical and Thermal Conductivity of Copper*
16. *Verification of Curie-Weiss law*
17. *BH Curve in a ferromagnetic Material*

Total work load : 1 day(s) per week × 4 hours × 16 weeks = **64 hours**

PHC 270: Nuclear Physics Lab 1

Course Outcome:

After completing this course the student will

CO1. Understand the details of Cockroft-Walton voltage multiplier

CO2. Deliberate in details with examples Coincidence circuit

CO3. Deliberate the details of Linear amplifier

CO4. Identify in details with application, if applicable, Transistorised binary circuit

CO5. Learn the classification and characteristics of Randomocity of radioactive decay

CO6. Identify the classification and characteristics of Measurement of endpoint energy of beta rays

CO7. Specify in depth linearity of the NaI(Tl) gamma ray spectrometer

*For those who have opted for **Nuclear Physics Specialisation***

Any five of the following experiments:

1. *Cockroft-Walton voltage multiplier.*
2. *Coincidence circuit.*
3. *Linear amplifier.*
4. *Transistorised binary circuit.*
5. *Pulse shaping circuits.*
6. *Linear Gate.*
7. *Randomocity of radioactive decay.*
8. *Nomogram method : Measurement of endpoint energy of beta rays.*
9. *Study of linearity of the NaI(Tl) gamma ray spectrometer.*
10. *Determination of the energy of an unknown gamma ray source.*

Total work load : 1 day(s) per week × 4 hours × 16 weeks = **64 hours**

PHY-315: Theoretical Physics Lab 1

Course Outcome:

After completing this course the student will

CO1. Tackle a wide range of topics using powerful analytical tools including formal methods in classical and quantum physics
CO2. Clearly communicate information and conclusions in written and verbal formats on ideas in Theoretical Physics
CO3. Evaluate complex problems and formulate solutions, indentifying the role of theory, hypothesis and experiment in the scientific method
CO4. Apply computation to solve the problems in theoretical physics
CO5. Plan, carry out and report theoretical physics based investigation
CO6. Apply classical and quantum theoretical techniques in research

For those who have opted for ***Theoretical Physics Specialisation***
Any five of the following experiments:

1. *Calculation of Christoffel symbols.*
2. *Geodesics and curvature calculations.*
3. *Exterior Schwarzschild metric calculations.*
4. *Robertson-Walker metric calculations.*
5. *Lagrangian and Hamiltonian, Euler Lagrange equations for Schroedinger field.*
6. *Lagrangian for Maxwell's field and The field equations.*
7. *Symmetries of the Lagrangian and Constants of motion.*
8. *Operator algebra-BCH formula.*
9. *Relativistic kinematics-1: Relations between center of momentum and laboratory frames.*
10. *Relativistic kinematics-2: Non-relativistic limit of relativistic kinematics.*

Total work load : 1 day(s) per week × 4 hours × 16 weeks = **64 hours**

PHD 250: Solid State Physics 2

Course Outcome:

After completing this course the student will

CO1. Learn the details of X-ray diffraction by crystals
CO2. Identify the details of Experimental techniques
CO3. Deliberate in depth Structure analysis
CO4. Learn the classification and characteristics of Particle Size study of Fibre structure
CO5. Specify in depth Imperfections in solids
CO6. Learn the characteristics of Diffusion in metals
CO7. Understand the characteristics of Dislocations
CO8. Understand the details of fabrication of Nanomaterials
CO9. Write down in details with application, if applicable, Luminescence

X-ray diffraction by crystals: *The reciprocal lattice. Ewald sphere and construction. Scattering by an electron and atom; Atomic scattering factor. Anomalous scattering. Fourier analysis and inversion of Fourier series; Physical significance. Geometrical structure factor of the unit cell. Absent reflections and space groups.* **(Sherwood, P290 – 358).**

Experimental techniques: *Brief introduction to Laue, Powder and single crystal methods. Use of Synchrotron radiation for structure studies. Weissenberg and precession methods. Cell parameter and space group determination. Molecular weight determination.* **(Stout and Jensen,p 90–211).[16hours]**

Structure analysis: *Low angle scattering. Reduction of intensities to structure amplitudes. Various corrections. Absolute scale factor and temperature factor from statistical methods. Statistical method for finding the presence of center of symmetry Fourier analysis of electron density. Patterson synthesis. Harker sections and lines. Heavy atom methods. Direct methods for phase determination. The inequality relations. Difference Patterson synthesis and error Fourier synthesis. Figure of merit. Cyclic Fourier refinement, Difference Fourier synthesis. Refinement of structures: The least squares method. Accuracy of the parameters. Bond lengths and angles.* **(Sherwood, Ladd and Palmer)**

SAXS; *Particle Size study of Fibre structure* **[16 hours]**

Imperfections in solids: *Different types of imperfections. Schottky and Frenkel defects; expression for energy for the formation of Frenkel and Schottky defects. Diffusion in metals; Kirkendall effect. Ionic conductivity in pure and doped halides. Photoconductivity* **(Kittel).**

Dislocations*: Buerger's Vector. Expression for strain in edge and screw dislocations* **(Wahab and Kittel).**

Synthesis and Device fabrication of Nanomaterials: *Nanomaterials***.** *Bottom-Up approach; Sol-gel synthesis, hydrothermal growth, thin-film growth, physical vapor depositon, chemical vapor depostion. Top-Down Approach; Ball milling, Microfabrification, Lithography, Ion-beam lithography* **(Ramachandra rao and Shubra singh, p129-142).**

Luminescence: *Excitation and Emission. Franck-Condon principle. Decay mechanisms;Temperature dependent and independent decays. Thermoluminescence and glow curve. Gudden-Pohl effect* **(Dekker).** **[16 hours]**

Total work load **48 hours**

References:

1. *Stout G.H. and Jensen L.H., X-ray structure determination, MacMillan, USA, 1989.*
2. *Ladd M.F.C. and Palmer R.A., Structure determination by X-ray crystallography, Plenum Press, USA, 2003.*
3. *Sherwood D., Crystals, X-rays and proteins, Longman, London, 1976.*
4. *Wahab M.A., Solid state physics, Narosa Publishing House, New Delhi, 1999.*
5. *Azaroff L.V., Introduction to solids, McGraw-Hill Inc, USA, 1960.*
6. *Weertman J. and Weertmann J.R., Elementary dislocation theory, McMillan, USA, 1964.*
7. *Pillai S.O., Solid state physics, New Age International Publications, 2002.*

PHD 260: Solid State Physics 3

Course Outcome:

After completing this course the student will

- *CO1. Write down in details with application, if applicable, Free electron theory of metals*
- *CO2. Identify the characteristics of Electrical conductivity*
- *CO3. Deliberate in details with examples Hall effect*
- *CO4. Write down the classification and characteristics of Elemental and Compound Semiconductors*
- *CO5. Deliberate in details with application, if applicable, Carrier concentrations*
- *CO6. Specify the details of Magneto-resistance phenomenon*
- *CO7. Learn the details of Cyclotron resonance*
- *CO8. Specify the classification and characteristics of High field transport in semiconductors*
- *CO9. Identify the characteristics of Superlattice Phenomenon*
- *CO10. Identify the classification and characteristics of Transition capacitance*

CO11. Deliberate the characteristics of barrier potential, barrier thickness

Free electron theory of metals: *Boltzmann transport equation, Sommerfeld's theory of electrical conductivity, mean free path in metals, dependence of resistivity on temperature and impurities. Matthiessens rule. Electron-phonon collisions. Electrical conductivity of metals at high frequencies. Plasma frequency. Transparency of alkali metals to UV radiation. Anomalous skin effect. Plasmons. Field enhanced emission, Schottky effect. Hall effect and magnetoresistance in metals. Cyclotron frequency* **(Kittel & Pillai).** *Thermal conductivity of insulators; Umklapp processes* **(Dekker, p275-292)**. **[16 hours]**

Impurity semiconductors: *A brief discussion on Elemental and Compound Semiconductors and their properties. Carrier concentrations; effect of temperature and impurity density. Electrical neutrality condition. Fermi energy; Variation with temperature and impurity density, when the Boltzmann approximation is valid,. Effect of impurity density at very low temperatures. Mobility of current carriers; effect of temperature and impurity. Electrical conductivity; effect of temperature, impurity density and the energy band gap.*

Hall effect in semiconductors*; Expression for Hall co-efficient,*
Magneto-resistance phenomenon *(qualitative)* **(M A Wahab).**
Cyclotron resonance*;Cyclotron resonance in Si and Ge semiconductors. Effective mass tensor. Variation of cyclotron resonance frequency with orientation of the crystal in the magnetic field* **(Mckelvey, p270–300).**
[16 hours]

Excess carriers in semiconductors: *Generation and recombination rates. Continuity equations; Einstein equations, Expression for the diffusion length of electrons and holes* **(Mckelvey, p320–335).**
High field transport in semiconductors; electron temperature. Gunn effect, Expression for drift velocity. Superlattice Phenomenon **(Roy, p29–39).**

Semiconductor devices: *The pn junction; space charge region, effect of the applied field on barrier potential, barrier thickness and contact field. Transition capacitance. Current density for excess carriers. Characteristics and applications of phototransistors, JFET, SCR and UJT***(Mckelvey, p390–441).**
[16 hours]

Total work load **48 hours**

References:

1. *Dekker A.J., Solid state physics, Prentice Hall, 1985.*
2. *Mckelvey J.P., Solid state and semiconductor physics, 2nd Edn., Harper and Row, USA, 1966.*
3. *Roy D.K., Physics of semiconductor devices, University Press, Hyderabad, 1992.*
4. *Schur M., Physics of semiconductor devices, Prentice-Hall of India, New Delhi, 1999.*
5. *Wilson J. and Hawkes J.F.B., Optoelectronics—An introduction, 2nd Edn., Prentice-Hall of India, New Delhi, 1996.*
6. *Streetman B.G., Solid state electronic devices, 2nd Edn., Prentice-Hall of India, New Delhi, 1983.*
7. *Omar M.A., Elementary solid state physics, Addison Wesley, New Delhi, 2000.*
8. *Wahab M.A., Solid state physics, Narosa Publishing House, New Delhi, 1999.*
9. *Pillai S. O. Solid State Physics, ew Age International Publications, New Delhi.*

PHD 300: Nuclear Physics 2

Course Outcome:

After completing this course the student will

- *CO1. Write down the details of Nuclear fission*
- *CO2. Write down in details with application, if applicable, Neutron transport equation using elementary diffusion theory*
- *CO3. Specify the details of Fermi age theory*
- *CO4. Specify in depth homogeneous reactor*
- *CO5. Identify the characteristics of critical size and critical mass*
- *CO6. Specify the characteristics of Beta decay*

CO7. Understand in details with application, if applicable, Fermi and Gamow-Teller selection rules
CO8. Learn in depth Gamma decay
CO9. Write down the details of Multipole transitions
CO10. Learn the details of beta decay

Nuclear fission: *Nuclear fission, Mass-energy distribution of fission fragments. Statistical model of fission.*

Reactor theory-1: *Neutron and its interaction with matter-collision kinematics, differential elastic scattering cross sections, isotropic scattering, the criticality condition for a reactor. Neutron transport equation using elementary diffusion theory. One group critical equation, critical size on the basis of Fermi age theory.* **[16 hours]**

Reactor theory-2: *Reactors; One group theory, spherical and cylindrical homogeneous reactor. Effective multiplication factor. Reflector reactors: effects of reflector. One group method of a homogeneous reactor with reflector. reflector savings. Infinite multiplication factor, critical size and critical mass.*
Heterogeneous reactor system; calculation of thermal utilization factor. Fast Breeder reactor, Evaluation of Buckling using one group model. **[16 hours]**

Beta decay: *Classification of beta interactions. Matrix elements. Fermi and Gamow-Teller selection rules for allowed beta decay. The non conservation of parity in beta decay. Wu et al experiment. The universal Fermi interaction.*

Gamma decay: *Electromagnetic interactions with nuclei. Multipole transitions. Transition probabilities in nuclear matter. Weisskopf's estimates. Structure effects. Selection rules. Internal conversion Photo disintegration of deuteron and radiative capture of neutron by proton.* **[16 hours]**

Total work load **48 hours**

References:

1. *Glasstone S. and Edlund M.C., Elements of nuclear reactor theory, D. Van Nostrand Co., USA, 9th Print, 1963.*
2. *Garg S., Ahmed F. and Kothari I.S., Physics of nuclear reactors, Tata McGraw-Hill, New Delhi, 1986.*
3. *Roy R.R. and Nigam B.P., Nuclear physics, New Age International, New Delhi, 1986.*
4. *Hans H.S., Nuclear physics—Experimental and theoretical, New Age International Publishers, 2001.*
5. *Ghoshal S.N., Nuclear physics, Vol. 2., S.Chand and Company, Delhi, 1994. Chapter 15, page 714-730.*

PHD 310: Nuclear Physics 3

Course Outcome:

After completing this course the student will

CO1. Write down the details of Deuteron
CO2. Understand in details with application, if applicable, Deuteron magnetic and Quadrupole moments.
CO3. Understand the details of Nucleon-nucleon scattering processes
CO4. Write down in details with examples Theory of scattering of slow neutrons
CO5. Specify in details with examples Plane wave theory of direct reactions
CO6. Understand the characteristics of Born approximation
CO7. Understand the details of Optical model
CO8. Understand in details with examples Theory of stripping and pickup reactions
CO9. Deliberate in details with examples Heavy ion physics
CO10. Specify in details with examples compound nucleus and quasi molecule formation.

Two particle systems: *Deuteron; Schrodinger equation for a two nucleon system, Theory of the ground state of the deuteron under central and non central forces, Excited states of the deuteron. Rarita-Schwinger relations. Deuteron magnetic and Quadrupole moments.*

Nucleon-nucleon scattering processes: *Theory of s-wave scattering of neutrons by free protons and experimental results. Wigner's formula for n-p scattering. Theory of scattering of slow neutrons by bound protons (Ortho and Para hydrogen) and experimental results. Effective range theory for n-p scattering.*
S wave theory of proton-proton scattering. Mott's modification of Rutherford's formula. Pion-nucleon scattering experimental results, (3/2, 3/2) resonance. **[16 hours]**

Nuclear reactions-1: *Plane wave theory of direct reactions. Born approximation (Plane wave); Butler's theory. Cross section for nuclear scattering and reactions. Shadow scattering, Breit-Wigner resonance formulae.*

Nuclear reactions-2: *Bohr's independence hypothesis. The compound nucleus (CN) reactions, decay rates of CN, Statistical theory of nuclear reactions. Evaporation probability and cross sections for specific reactions.* **[16 hours]**

Optical model: *Giant resonances, Kapur-Pearls' dispersion formula for potential scattering. Direct reactions: Kinematics of stripping and pickup reactions. Theory of stripping and pickup reactions. Inverse reactions.*

Heavy ion physics: *Special features of heavy ion Physics. Remote heavy ion electromagnetic interactions. Coulomb excitations. Close encounters.*
Heavy ion scattering. Grazing interactions. Particle transfer. Direct and head on collisions, compound nucleus and quasi molecule formation. **[16 hours]**

Total work load **48 hours**

References:

1. *Roy R.R. and Nigam B.P., Nuclear physics—Theory and experiment, New Age International Ltd, New Delhi, 1986.*
2. *Hans H.S., Nuclear physics—Experimental and theoretical, New Age International Publishers 2001.*
3. *Sachtler G.R., Nuclear reactions, Addison Wesley, New York, 1983.*
4. *Mermier P. and Sheldon E., Physics of nuclei and particles, Vol. 2 Academic Press, USA, 1971.*
5. *Jackson D.F., Nuclear reactions, Chapman and Hall, London, 1975*
6. *Mermier P. and Sheldon E., Physics of nuclei and particles, Vol. 3 Academic Press, USA, 1971.*

PHY-405: Theoretical Physics 2

Course Outcome:

After completing this course the student will

CO1. Tackle a wide range of topics using powerful analytical tools including formal methods in classical and quantum physics
CO2. Clearly communicate information and conclusions in written and verbal formats on ideas in Theoretical Physics
CO3. Evaluate complex problems and formulate solutions, indentifying the role of theory, hypothesis and experiment in the scientific method
CO4. Apply computation to solve the problems in theoretical physics
CO5. Plan, carry out and report theoretical physics based investigation
CO6. Apply classical and quantum theoretical techniques in research

Relativistic quantum mechanics: *Probability conservation in relativistic quantum mechanics, The Dirac equation, Conserved current, Representation independence, large and small components, approximate Hamiltonian for an electrostatic problem, free particle solutions, Relativistic covariance, Space inversion, Bilinear covariants and their properties, Klein's paradox, Hole theory and charge conjugation.* **[16 hours]**

Quantization of the Dirac field: *Second quantization, positron operators and positron spinors, Electromagnetic and Yukawa couplings. Weak interactions and parity nonconservation: Classification of interactions, parity and hyperon decay, Fermi theory of beta decay, the two-component neutrino. Pion decay and the CPT theorem.* **[16 hours]**

Covariant perturbation theory: *Natural units and dimensions, S-matrix expansion in the Interaction representation. Unitarity, First order processes: Matrix element for electron scattering. Cross section for Mott scattering. Helicity change and spin projection operator. Pair annihilation, pair creation, hyperon decay. S - matrix for two photon annihilation, electron propagator, Matrix element for Compton scattering, Feynman rules. Cross section for two photon annihilation.* **[16 hours]**

Total work load **48hours**

References:

1. *Sakurai J.J., Advanced quantum mechanics, Addison-Wesley, Harlow, England, First ISE Reprint, 1999.*
2. *Griffiths D., Introduction to elementary particles, John Wiley and Sons, New York, 1987.*
3. *Gasiorowicz S., Elementary particle physics, John-Wiley, New York, 1966.*
4. *Muirhead H., The physics of elementary particles, Pergamon Press, London, 1965.*

PHY-406: Theoretical Physics 3

Course Outcome:

After completing this course the student will

CO1. Tackle a wide range of topics using powerful analytical tools including formal methods in classical and quantum physics
CO2. Clearly communicate information and conclusions in written and verbal formats on ideas in Theoretical Physics
CO3. Evaluate complex problems and formulate solutions, indentifying the role of theory, hypothesis and experiment in the scientific method
CO4. Apply computation to solve the problems in theoretical physics
CO5. Plan, carry out and report theoretical physics based investigation
CO6. Apply classical and quantum theoretical techniques in research

Angular momentum theory and applications: *Angular momentum: Transformations under rotations. Coupling of three and four angular momenta. Racah coefficients, Wigner 9j symbols, applications. Wigner-Eckart theorem. Projection theorem. j-j and L-S coupling. Angular momentum in nuclear reactions, Spherical tensors. Evaluation of matrix elements between coupled angular momentum states. Vector spherical harmonics. Gradient theorem (without proof). Multipole radiation.* **[16 hours]**

Spin density matrix: *Spin and helicity in a relativistic process. Effect of Lorentz and discrete transformations on helicity states. Wick and Wigner rotations, pure rotation, pure boost, parity, time reversal and charge conjugation. The spin density matrix (ρ), general properties, multipole parameters, combined systems, Diagonalization of ρ. Oriented and non-oriented systems, Polarized and aligned systems, Spherical tensor basis and SU(N) basis.* **[16 hours]**

Relativistic density matrix: *Helicity multipole parameters and their transformation laws. Helicity amplitudes for elastic reactions and their symmetry properties. Polarization in scattering of spin ½ particles, Final state density matrix. Observables of a reaction, reactions involving polarized beam and polarized targets.*
[16 hours]

Total work load **48 hours**

References:

1. *Sakurai J.J. and Tuan S.F. (Editor), Modern quantum mechanics, AddisonWesley, India, 1999.*
2. *Leader E., Spin in particle physics, Cambridge University Press, London, 2001.*
3. *Rose M.E., Elementary theory of angular momentum, John Wiley and Sons, USA, 1957.*
4. *Blum K., Density matrix theory and applications, Plenum Press, New York, 1981.*

Elective Papers 1

PHD 270: Accelerator Physics

Course Outcome:

After completing this course the student will

CO1. Specify in details with application, if applicable, ion Source
CO2. Deliberate the details of Alternating gradient machines
CO3. Understand the working of Betatron
CO4. Learn the details of Ion sources
CO5. Write down the characteristics of Townsend theory
CO6. Understand the details of Paschen's law for gas breakdown

CO7. Understand the classification and characteristics of Ion optics and focussing
CO8. Specify in details with application, if applicable, Cockroft-Walton generator
CO9. Write down the classification and characteristics of Cyclotron
CO10. Learn the characteristics of Microtron

Ion sources*: Brief introduction to ion sources for positive and negative ions. Ion production. Semi classical treatment of ionization, Townsend theory-comparison of theory and experiment for ion production. Examples of ion sources-properties of ion sources. Insulation at high voltages-Spark voltage. Paschen's law for gas breakdown.*
Ion optics and focussing: *Focussing properties of linear fields. Electrostatic and magnetic lenses.*
[16 hours]
Particle accelerators: *Introduction, development of accelerators. Direct-voltage accelerators: Cockroft-Walton generator, Van de Graff generator, Tandem accelerators, Pelletron. Resonance accelerators: Cyclotron - fixed and variable energy, principles and longitudinal dynamics of the uniform field cyclotron. Linear accelerators.* **[16 hours]**

Electron accelerators: *Betatron; Beam focusing and Betatron Oscillation. Microtron. Synchronous accelerators; Principle of phase stability, Mathematical theory for Principle of phase stability. Electron synchrotron. Proton synchrotron.*
Alternating gradient machines; Alternating gradient principle, AG proton synchrotron. **[16 hours]**

Total work load **48 hours**

References:

1. *Townsend P.D., Kelly J.C. and Hartley N.E.W., Ion implantation, sputtering and their applications, Academic Press, London, 1976.*
2. *Humphrey S. Jr., Principles of charged particle acceleration, John Wiley, 1986.*
3. *Arya A.P., Fundamentals of nuclear physics, Allyn and Bacon, USA, 1968.*
4. *Ghoshal S.N., Atomic and nuclear physics, Vol. 2, S.Chand and Company, Delhi, 1994.*
5. *Varier K.M., Joseph A. and Pradyumnan P.P., Advanced experimental techniques in modern physics, Pragathi Prakashan, Meerut, 2006.*

PHY-408: Liquid Crystals

Course Outcome:

After completing this course the student will
CO1. Be familiars with the fundamentals of anisotropic fluids.
CO2. Understand the principles of Long and short range order in nematics.
CO3. Learn static distortion in nematics, defects and textures in nematics
CO4. Know about Dynamical properties of liquid crystals and nematics.
CO5. Study Optical properties of Cholesterics.

Anisotropic fluids: *Main Types and properties: Introduction. The building blocks. Small organic molecules. Long helical rods. Associated structures. Nematics and Cholesterics. Nematics proper. Static pretransitional effects above* T^{i}_{N-1}*. The cholesterics. A distorted form of the nematic phase. Smectic. Smectic A. Smectic B. Smectic C. Other mesomorphic phases. Exotic smectics; long range order in a system of long rods. Lyotropic systems. Remarkable features of liquid crystals. Applications of liquid crystals.*
[De Gennes and Prost] **[16 hours]**

Long and short range order in nematics: *Definition of an order parameter. Microscopic approach. Order parameter from optical method, from diamagnetic anisotropy. Mean field theory with S2 interaction (Maier-Saupe).*

Static distortion in nematics: *Long range distortions, distortion free energy. Magnetic field effects—Molecular diamagnetism, Magnetic coherence length.*

Defects and textures in nematics: *Observations. Black filaments. Schlieren structures. Types of defects (qualitative discussion only).*

Smectics: *Continuum description of smectics A and C, Mean field description of S_A-N transition.*
[De Gennes and Prost] **[16 hours]**

Dynamical properties of nematics: *Experiments measuring the Leslie coefficients-Laminar flow under a strong orienting field, Attenuation of ultrasonic shear waves, Laminar flow in the absence of external fields. Convective instabilities under electric fieldsb - Basic electrical parameters, Experimental observations at low frequencies, The Helfrich interpretation. Extension to higher frequencies (qualitative).*

Cholesterics: *Optical properties of an ideal helix—The planar texture, Bragg reflection, Transmission properties at arbitrary wavelengths (normal incidence), The Mauguin limit, Rotatory Power. Agents influencing the pitch—Physicochemical factors, External fields (qualitative). Textures in cholesterics.*
[De Gennes and Prost] **[16 hours]**

Total work load **48 hours**

References:

1. *De Gennes P.G. and Prost J., The physics of liquid crystals, 2nd Edn., Clarendon Press, Oxford, 1998.*
2. *Chandrashekhar S., Liquid crystals, Cambridge University Press, 1977.*
3. *Gray G.W., Molecular structure and the properties of liquid crystals, Academic Press, 1962.*
4. *Maier G., Sackmann E. and Grabmanier I.G., Applications of liquid crystals, Springer Verlag, 1975.*
5. *Gray G.W. and Goodby J.W., Smectic liquid crystals (Textures and structures), Leanard Hill, London, 1984.*

PHY-409: Atmospheric Physics

Course Outcome:

After completing this course the student will

CO1. Understand the composition of atmosphere and its different layers.
CO2. Get on the thermodynamics of the atmosphere.
CO3. Learn on terrestrial radiations and its effects on atmosphere.
CO4. Understand on aerosols, clouds and atmospheric radioactivity.
CO5. Understand working of atmospheric electricity.

Atmospheric composition: *Energy in the atmosphere, heating of the atmosphere, motions in the atmosphere. Variations in atmospheric composition, Structure on the basis of composition. Thermal structure of the atmosphere.*

Thermodynamics: *Entropy of dry air, vertical motion of saturated air, tephigram, potential energy of an air column.*

Dynamics: *Escape of hydrogen, photodissociation of oxygen, photo chemical processes. Equations of motion, the geostrophic approximation, cyclostrophic motion.* **[16 hours]**

Terrestrial and extra terrestrial radiation: *General features of direct, diffuse and global radiation-attenuation of direct solar radiation-Rayleigh and Mie scattering. Angstrom turbidity formula for all aerosols. Direct transmittance due to continuum attenuation, diffuse spectral irradiance due to Rayleigh and aerosol scattering.*

Aerosols: *Production and properties of aerosols. Aerosol optical depth, Beer's law - Sun Photometer. Optical filters.*

Clouds: *Microphysics of clouds, Macro characterization of clouds. Radiative transfer in clouds and aerosols.* **[16 hours]**

Atmospheric radioactivity: *Background Radiation, Radioactivity in Atmosphere, Radon, Properties of radon, Origin of radon, Radon entry into the atmosphere: Diffusion, Advection and Convection. Health Effects: Dose.*

Atmospheric electricity: *The generation of an ion, The mobility of ions, Ion size, recombination of ions. Ions in an electric field, Ionizing agencies, radioactivity. The conductivity of the atmosphere and its origin, Measurement of conductivity of the atmosphere near the ground. Relationship between ions and conductivity. The current voltage characteristics in a gas under conditions of volume ionization.*

[16 hours]

Total work load **48 hours**

References:

1. *Salby M.L., Fundamentals of atmospheric physics, Academic Press, USA, 2006.*
2. *Houghton J., The physics of the atmosphere, Cambridge University Press, 2002.*
3. *Siddhartha K., Atmosphere, weather and climate, Kisalaya Publications, 2000.*
4. *Lutgens F.K. and Tarbuk E.K., The atmosphere: An introduction to meteorology, Prentice Hall USA, 1986.*
5. *Holton, J.R., Dynamic meteorology, 3rd edition, Academic Press, USA, 1992.*
6. *Keshvamurthy R.N. and Shankar Rao M., The physics of monsoons, Allied Publishers, 1992.*
7. *Iqbal M., An introduction to solar radiation, Academic Press, USA, 1983.*
8. *Wilkening M., Radon in the environment, Elsevier Science Publishers, The Netherlands, 1990.*
9. *Israel H., Atmospheric electricity-Vol II, Israel Program for Scientific Translations, Jerusalem. 1973.*

PHY-410: Numerical Methods

Course Outcome:

After completing this course the student will

CO1. Understand Computer arithmetic in solving the problems.
CO2. Learn Iterative methods like Bisection method, Newton-Raphson method, Secant method.
CO3. Solve Linear algebraic equations by numerical techniques like the Gauss elimination method.
CO4. Learn numerical Interpolations, Least-squares approximation of functions.
CO5. Learn different techniques of Numerical integration
CO6. Solve Numerical solution of differential equations

Computer arithmetic: *Integers; Floating point representation of numbers; Arithmetic operations with normalisation; Errors in representation; Commonly used number types and their limits like max. and min. integer, float, double precision, long, etc.*

Iterative methods: *Bisection method, Newton-Raphson method, Secant method, the method of successive approximations. Solution of a polynomial equation.* **[16 hours]**

Linear algebraic equations: *The Gauss elimination method, LU decomposition method, Gauss-Jordon method, An introduction to the solution of simultaneous non-linear equations.*

Interpolations: *Introduction, Newton interpolation formulae, extrapolation, Lagrange interpolation. spline interpolation.*

Least-squares approximation of functions: *Introduction, linear regression, algorithm for linear regression. Polynomial regression, fitting exponential and trigonometric functions.* **[16 hours]**

Numerical integration. *Trapezoidal method, Simpson rule. Errors in integration formulae (Romberg method). Algorithms for integration of a tabulated function. Algorithms for integrating a known function. Gaussian quadrature formulae.*

Numerical solution of differential equations: *Euler method, Runge - Kutta methods, Runge - Kutta 4th order formulae, predictor - corrector method. comparison of predictor-corrector and Runge- Kutta methods.* **[16 hours]**

Total work load **48 hours**

References:

1. *Atkinson K.E., An introduction to numerical analysis, John Wiley and Sons, USA, 1988.*
2. *Press W.H., Flannery B.P., Teukolsky S.A. and Vetterling W.T., Numerical recipes in C, Cambridge University Press, UK, 1989.*
3. *Krishnamurthy E.V. and Sen S.K, Numerical algorithms, Affiliated East West Press Pvt. Ltd., India, 1993.*
4. *Rajaraman V., Computer oriented numerical methods, Prentice Hall of India Pvt. Ltd., India,m 2001.*

Elective Papers 2

PHY-411: Nuclear Spectroscopy Methods

Course Outcome:

After completing this course the student will

CO1. Understand Ion implantation and backscattering spectroscopy
CO2. Study Compton scattering
CO3. Know about Positron annihilation spectroscopy
CO4. Understand Experimental methods of positron annihilation spectroscopy

Ion implantation and backscattering spectroscopy: *Ion implantation, Implantation technique, Ion beam diffusion, Thermal annealing and sputtering, Analysis techniques. Backscattering, Energy loss and straggling. Kinematics factor, differential scattering cross sections, depth scale, backscattering yield, instrumentation. Application to elemental and compound targets. Axial and planar half angles. Estimates of minimum yield. Lattice location of impurities, alignment procedures. Ion induced X-rays. Application of ion implantation.* **[16 hours]**

Compton scattering: *Compton scattering from free electrons. Effects of external potential. Klein-Nishina cross sections for polarized and unpolarized radiation. Compton profiles, momentum distributions and impulse Compton profiles. Calculation of Compton profiles for electron models. Relativistic profile corrections: experimentation. Discussion of methodology including sources, detectors and geometry. Data accumulation, analysis and multiple scattering corrections. Discussion of experimental results for some simple metals, ionic and covalent crystals.* **[16 hours]**

Positron annihilation spectroscopy: *The positron and its discovery, Positronium, its characteristics, formation. Spur model and Ore gap model of positronium formation. Quenching and enhancement. Theory of 2-gamma and 3-gamma annihilations. Positron and positronium states in solids: trapping of positrons. Two state trapping model.*

Experimental methods of positron annihilation spectroscopy: *Positron lifetime techniques (PLT), Angular Correlation of Annihilation Radiation (ACAR), Doppler broadening (DB) and Coincidence DB. Methods of data analysis: PLT and ACAR. Experimental results of some metals and defected materials. Interpretation of the experimental results. PAS in the study of polymers. Multiparameter techniques.*
A brief mention of slow positron beams. **[16 hours]**

Tutorial **[16 hours]**

Total work load **64 hours**

References:

1. *Townsend P.D., Kelly J.C. and Hartley N.E.W., Ion implantation, sputtering and their applications, Academic Press, London, 1976.*
2. *ChuW.K., Mayer J.W. and Nicholate Mar A.O., Backscattering spectroscopy, Academic Press, New York, 1978.*
3. *Mayer J.W. and Rimini B. (Eds.), Ion beam handbook for material analysis, Academic Press, 1977.*
4. *Williams B. (Ed.), Compton scattering, McGraw-Hill, New York, 1977.*
5. *Hautojarvi P. (Ed.), Positrons in solids, Springer Verlag, New York, 1979.*
6. *Fava R.A. (Ed.), Methods of experimental physics, Academic Press, New York, 1980.*
7. *Schradev D.M. and Jean Y.C., Positron and positronium chemistry, Elsevier Science Publication, Amsterdam, 1988.*
8. *Jayaram B., Mass spectrometry–Theory and applications, Plenum Press, New York, 1966.*

PHY-412: Modern Optics

Course Outcome:

After completing this course the student will

CO1. Understand the phenomenon of polarization of light using quantum mechanics
CO2. Familiar with Non linear Optics
CO3. Understand Pancharatnam phase in*Quantum features of radiation field.*
CO4. Learn the concept of Radiation Field Quantization.
CO5. Understand Squeezed states of light.

Polarization of light: *Pure states and mixed states. Density operator, properties and equation of motion. Polarization of light, states of polarized light, Jones matrices, Jones formalism, Stokes parameters, Poincar´e sphere, Mueller matrices and Mueller formalism, Mueller matrices and their characterization, Few illustrative examples; comparison of Jones and Mueller formalisms. Pancharatnam phase, dynamical phase, cyclic evolution of polarization state on Poincar´e sphere; Applications of the concept of Pancharatnam phase.*
[16 hours]

Quantum features of radiation field: *Planck's law of radiation and Einstein coefficients, Thermal equilibrium, Semi-classical theory of two level atoms, quantum theory of B coefficient, Optical resonance, damping, Theory of chaotic light, coherence, temporal, spatial, mutual coherence, line broadening, natural and Doppler width, collision broadening.* **[16 hours]**

Quantized radiation field: *Quantization of radiation field, States of radiation field; Fock states and phase eigenstates; Interaction of radiation with matter, theory of spontaneous emission; Coherent states and their properties, BCH formula, P, Q and Wigner distribution functions, Squeezed states of light and their properties; applications. Correlation functions, Brown-Twiss correlations.* **[16 hours]**

Tutorial **[16 hours]**

Total work load **64 hours**

References:

1. *Loudon R., The quantum theory of light, Clarendon Press, Oxford, 1973.*
2. *Mandel L. and Wolf E., Optical coherence and quantum optics, Cambridge University Press, 1995.*
3. *Louisell W.H., Quantum statistical properties of radiation, John Wiley and Sons, New York, 1973.*
4. *Blum K., Density matrix theory and applications, Plenum Press, New York, 1981.*
5. *Pancharatnam S., Collected works, Oxford University Press, 1975.*

PHD 280: Electronics

Course Outcome:

After completing this course the student will

CO1. *Understand in details with examples BJT AC Analysis*
CO2. *Deliberate the classification and characteristics of BJT transistor modeling*
CO3. *Specify in details with application, if applicable, Feedback and Oscillator Circuit*
CO4. *Identify in details with application, if applicable, FET amplifiers*
CO5. *Deliberate the characteristics of Operational amplifiers*
CO6. *Understand the characteristics of inverting amplifier, non inverting amplifier*
CO7. *Identify in depth oscillator*
CO8. *Identify the details of multivibrators*
CO9. *Learn the classification and characteristics of Boolean Laws and Theorems*
CO10. *Specify in details with application, if applicable, Flip-Flop*
CO11. *Learn in details with application, if applicable, Combinational logic circuits*
CO12. *Specify the details of Counters*
CO13. *Write down in details with examples Registers*

BJT AC Analysis: *Amplification in AC domain. BJT transistor modeling, common emitter voltage divider bias configuration. Emitter follower configuration. Darlington connection. Hybrid equivalent model, Approximate Hybrid equivalent circuit ; Voltage divider configuration, Complete hybrid equivalent model.*
Feedback and Oscillator Circuit: *Feedback concept, Feedback connections types, Practical feedback circuits. Feedback amplifier; Phase and frequency considerations. Oscillator operation, Phase - shift Oscillator, Wien-bridge Oscillator, Crystal Oscillator—BJT version.*
FET amplifiers: *JFET small signal model, Biasing of FET, Common drain, common gate configurations, FET amplifier and its frequency response. MOSFET – types and E – MOSFET Voltage divider configurations* **(Boylestad and Nashelsky) [16 hours]**

Operational amplifiers: *Concepts of differential amplifier, Ideal op-amp, op-amp parameters, ideal voltage transfer curve, open loop and closed op-amp configurations, inverting amplifier, non inverting amplifier, limitations of open loop op-amp configurations.*
Operational amplifier applications: *Summing, scaling and averaging amplifiers, voltage to current converter with grounded load, current to voltage converter, integrator, differentiator,. V to I and I to V converters, Log and antilog amplifiers, Wave form generators, phase shift oscillator, Wein bridge oscillator. Non-linear circuit applications: Crossing detectors, 555 timer as a mono-stable and astable multivibrators, Active Filters—First and second order Low pass and High pass filters, Butterworth filters* **(Gaekwad R.A) [16 hours]**
Digital electronics: *Boolean Laws and Theorems, addition and subtraction based on 1's and 2's complements, Families of gates, RS and JK flip-flops, The Master-Slave JK Flip-Flop, D and T flipflops. Karnaugh maps for 3 and 4 variables, Decoders-BCD decoders, Encoders.*
Combinational logic circuits: *Shift registers-series, series in-series out and parallel in parallel out. Half and full adders, Registers, Counters - Binary Ripple Counters, Synchronous Binary counters, Counters based on Shift Registers, Synchronous counters, Synchronous Mod-6 Counter using clocked JK Flip-Flops. Synchronous Mod-6 Counter using clocked D, T, or SR Flip-Flops. Memory cells, memory registers*
[16 hours]

Tutorial [16 hours]

Total work load 64 hours

References:

1. *Boylestad R.L. and Nashelsky L., Electronic devices and circuit theory, 4th Edn., Pearson Education, 2006.*
2. *Bell D.A., Operational amplifiers and linear circuits, 2nd Edn., Pearson Education, 2004.*

3. *Gayakwad R.A., Operational amplifiers and linear integrated circuits, Prentice-Hall of India, New Delhi, 1993.*
4. *Malvino A.P. and Leach D.P., Digital principles and applications, 4th Edn., Tata McGraw Hill, 1988.*
5. *Arivazhagan S. and Salivahananan S., Digital circuits and design, Vikash Publishing House Pvt. Ltd.New Delhi, 2001.*
6. *Op-amps and linear integrated circuits, ramakanth A Gaekwad, 3rd edition,Pearson education Asia, 2002*
7. *Linear ICs and applications Uday A Bakshi & Atul P Godse, Technical Publications*
8. *Linear integrated Circuits, Roy & Choudary*
9. *Digital fundamentals, Thomos L Floyd*

PHY-414: Minor Project

Course Outcome:

After completing this course the student will have

CO1. *Hands on experience to various experimental Techniques*
CO2. *Research exposure to Physics experiments.*
CO3. *Knowledge on construction of electronic circuits for various application.*
CO4. *Data analysis techniques and plotting of experimental results.*

(Total work load 64 hours)

PHD 090: Nuclear and Particle Physics Lab

Course Outcome:

After completing this course the student will

CO1. Deliberate in details with application, if applicable, Theoretical and practical tecniques in Nuclear and Particle Phyics
CO2. Deliberate in details with examples quantitative estimates of phenomena in elementary particles
CO3. Identify in details with examples range of applications of nuclear technology
CO4. Deliberate in depth Scattering experiments and gamma-ray spectroscopy
CO5. Learn the details of Nuclear Electronic circuits

For those who have completed ***Condensed Matter Physics Lab PHY311***

Any eight of the following experiments:

1. *Half-life of Indium-116 measurement.*
2. *Energy Resolution of a NaI(TI) scintillation spectrometer.*
3. *Compton scattering determination of the rest energy of an electron.*
4. *Beta absorption coefficient measurement.*
5. *Dekatron as a counter of signals.*
6. *Gamma-ray absorption coefficient measurement.*
7. *End-point energy of beta particles by half thickness measurement.*
8. *Common source amplifier.*
9. *Astable multivibrator using timer IC 555.*
10. *Dead time of the G.M. counter.*

Total work load : 2 day(s) per week × 4 hours × 16 weeks = **128 hours**

PHD 080: Condensed Matter Physics Lab

Course Outcome:

After completing this course the student will

CO1. Write down the classification and characteristics of Determination of the paramagnetic susceptibility of the given salt by Quincke's method
CO2. Specify in depth Analysis of the powder X-ray photograph of a simple cubiccrystal
CO3. Identify the classification and characteristics of Temperature coefficient of resistance of a thermistor
CO4. Understand in details with application, if applicable, Energy gap of semiconductor
CO5. Learn in details with application, if applicable, Di-electric constant of a Non polar liquid
CO6. Identify in depth Thermionic work function of a metal (Richardson-Dushmann formula)
CO7. Learn the details of Stefan's Constant of Radiation
CO8. Deliberate in details with application, if applicable, Sodium spectrum analysis by using Edser-Butler fringes

*For those who have completed **Nuclear Physics Lab PHY 312***
Any eight of the following experiments :

1. *Determination of the paramagnetic susceptibility of the given salt by Quincke's method.*
2. *Study of mercury spectrum by superimposing it on brass spectrum.*
3. *Sodium spectrum analysis by using Edser-Butler fringes.*
4. *Temperature coefficient of resistance of a thermistor.*
5. *Analysis of the powder X-ray photograph of a simple cubic crystal.*
6. *Thermionic work function of a metal (Richardson-Dushmann formula).*
7. *Energy gap of semiconductor.*
8. *Determination of Stefan's constant.*
9. *Frank Hertz experiment*
10. *Magnetic hysteresis.*
11. *Measurement of magneto resistance of semiconductors.*

Total work load : 2 day(s) per week × 4 hours × 16 weeks = **128 hours**

PHD 240: Solid State Physics Lab 2

Course Outcome:

After completing this course the student will

CO1. Identify in depth Hall effect in semiconductors
CO2. Specify in details with examples Determination of the energy gap of semiconductors by four-probe method
CO3. Learn the characteristics of Determination of material constant of an intrinsic semiconductor
CO4. Understand the classification and characteristics of Photovoltaic cell
CO5. Write down in depth Photoconductive cell
CO6. Learn the characteristics of Depletion capacitance of a junction diode
CO7. Understand the classification and characteristics of Determination of Curie temperature of a magnetic material

*For those who opted for **Solid State Physics Specialisation***
Any five of the following experiments:

1. *Photovoltaic cell.*
2. *Photoconductive cell.*
3. *Hall effect in semiconductors.*
4. *Determination of the energy gap of semiconductors by four-probe method.*
5. *Temperature variation of the junction voltage of a p-n diode.*
6. *Temperature variation of the reverse saturation current in a p-n diode.*
7. *Depletion capacitance of a junction diode.*
8. *Determination of material constant of an intrinsic semiconductor.*
9. *Schottky effect.*
10. *Ionic conductivity of an alkali halide crystal.*
11. *Dielectric constant and its temperature variation.*
12. *Ultrasonic velocity and elastic constants of a solid.*
13. *Determination of Curie temperature of a magnetic material*
14. *Magnetic field variation along with axis of the solenoid*
15. *Magnetic Hysteresis*
16. *Thermal Diffusivity of Brass*
17. *Temperature co-efficient of resistance of copper*

Total work load: 1 day(s) per week × 4 hours × 16 weeks = **64 hours**

PHD 250: Nuclear Physics Lab 2

Course Outcome:

After completing this course the student will

CO1. Learn the characteristics of Schmitt trigger
CO2. Write down in details with application, if applicable, Feather analysis: End-point energy of beta rays measurement
CO3. Write down in depth Fermi-Kurie plot,Determination of the end-point energy of beta rays using a plastic scintillation detector.
CO4. Understand in details with application, if applicable, Beta ray absorption studies – relation between /and end point energy.
CO5. Learn the details of Variable delay line the variation of energy resolution as a function of gamma ray energies.
CO6. Identify the characteristics of Absorption coefficient of Al using Sr-90 and Y-90 beta sources.

*For those who opted for **Nuclear Physics Lab Specialisation***

Any five of the following experiments:

1. *Schmitt trigger.*
2. *Variable delay line.*
3. *Pulse recorder.*
4. *Display devices.*
5. *Feather analysis: End-point energy of beta rays measurement.*
6. *Z dependence of external Bremsstrahlung radiation.*
7. *Fermi-Kurie plot : Determination of the end-point energy of beta rays using a plastic scintillation detector.*
8. *Determination of the resolving time of a coincidence circuit.*
9. *Determination of source strength by gamma-gamma coincidence.*
10. *Determination of source strength by beta-gamma coincidence.*
11. *Multichannel analyser : Study of the variation of energy resolution as a function of gamma ray energies.*
12. *Verification of Mosley's law*

13. *Beta ray absorption studies – relation between* $\frac{❑}{❑}$ *and end point energy.*
14. *Absorption coefficient of Al using Sr-90 and Y-90 beta sources.*

Total work load : 1 day(s) per week × 4 hours × 16 weeks = **64 hours**

PHY-425: Theoretical Physics Lab 2

Course Outcome:

After completing this course the student will

- *CO1. Tackle a wide range of topics using powerful analytical tools including formal methods in classical and quantum physics*
- *CO2. Clearly communicate information and conclusions in written and verbal formats on ideas in Theoretical Physics*
- *CO3. Evaluate complex problems and formulate solutions, indentifying the role of theory, hypothesis and experiment in the scientific method*
- *CO4. Apply computation to solve the problems in theoretical physics*
- *CO5. Plan, carry out and report theoretical physics based investigation*
- *CO6. Apply classical and quantum theoretical techniques in research*

For those who opted ***Theoretical Physics Lab Specialisation***

Any five of the following experiments:

1. *Density matrix description of polarization of light.*
2. *Double scattering of spin-1/2 particles on spin-zero targets.*
3. *Second order QED processes (Compton scattering).*
4. *Evolution of matrix elements between coupled angular momentum states.*
5. *Dirac matrix representations.*
6. *Algebra of Dirac matrices.*
7. *Electron-proton scattering, Rosenbluth formula.*
8. *Relativistic kinematics-3: Study of decay and production processes.*
9. *Feynman diagrams and calculations.*
10. *Energy matrix calculation.*

Total work load : 1 day(s) per week × 4 hours × 16 weeks = **64 hours**

JSS MAHAVIDHYAPEETHA

JSS COLLEGE OF ARTS COMMERCE & SCIENCE

(Autonomous) Ooty road, Mysore – 25

II and IV Semester Examination May / June 2018

M.Sc PHYSICS Question Paper Pattern

Time: 3 Hours **Answer all the questions** **Max. Marks: 70**

SECTION A

1. (a)
(b)
(c) **18 Marks**

OR

2. (a)
(b)
(c) **18 Marks**

SECTION B

3. (a)
(b)
(c) **18 Marks**

OR

4. (a)
(b)
(c) **18 Marks**

SECTION C

5. (a)
(b)
(c) **18 Marks**

OR

6. (a)
(b)
(c) **18 Marks**

SECTION D - (Problems only)

7. **5 Marks**

OR **5 Marks**

8.

9. **6 Marks**

OR

10. **6 Marks**

11. **5 Marks**

OR

12. **5 Marks**

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE,
(Autonomous)

B.N.ROAD, MYSURU 25

MASTER OF SOCIAL WORK

MSW

SYLLABUS

CREDIT BASED, CHOICE BASED CONTINUOUS ASSESSMENT PATTERNED EDUCATION SYSTEM

(Regulations, Scheme of Examination and Course Content)

2017-18

P.G. DEPARTMENT OF SOCIAL WORK

DISTRIBUTION OF COURSE CONTENT AND CREDITS

MSW- I Semester

Compulsory additional papers for non BSW students

Sl. No.	Code No.	Paper Title	L	T	P	Credits
1	NSW-1	Social Science Perspectives for Social Work Practice	-	-	-	-
2	NSW-2	Term Project	-	-	-	-

1. A bridge course will be conducted for a period of 5 days covering the required course input. There are no credits allotted to this course and no written examination too. However, attendance of 75% is compulsory.

2. Paper code: NSW2 : **Term project**:

The term project is a team-exercise consisting 3 to 5 students. The team is expected to select a theme relevant to current social issues in consultation with the supervisor and make an exhaustive survey of literature on the chosen theme including empirical studies made on the same.

Further, the group shall also collect the experiences or opinions of people on the issues and make a detailed presentation. Flexibility is accorded in planning and executing the term project. Creative and analytical approaches are to be carried out under the direct supervision of a faculty supervisor.

The report of the term project has to be submitted before the end of theory examination of the first semester. The term project is offered only for the non-BSW students. However, students with BSW background are also encouraged to opt for the term project, as an innovative approach in social work, if they desire so.

DISTRIBUTION OF CREDITS

Sl. No.	Course Type	Credits
1	HARD CORE (HC)	52
2	SOFT CORE (SC)	20
3	OPEN ELECTIVE (OE)	04
	TOTAL	76

Semester- wise Distribution of Course Content and Credits

I Semester

Sl. No.	Course Code	Course Title	L:T:P	Credits

1.	SWA 010	Social Work - History and Ideologies	2:1:0	3
2.	SWA 020	Work with Individuals and Families	2:1:0	3
3.	SWA030	Work with Groups	2:1:0	3
4.	SWA040	Work with Communities	2:1:0	3
5.	SWA050	Human Growth and Development	2:1:0	3
6.	SWA060	Social Work Practicum – I	0:1:2	3
		Total		**18**

II Semester

Sl. No.	**Course Code**	**Course Title**	**L:T:P**	**Credits**
1.	SWB010	Social Work Research and Statistics	2:1:0	3

2.	SWB020	Management of Developmental and Welfare Services	2:1:0	3
3.	SWB030	Social Work Practicum – II (Social Work Camp and Summer Placement)	0:0:3	3
4.	SWB040	Social Work Practicum - III	0:1:2	3
5.	SWB220/ SWB240	Communication and Counselling / Gandhian Approach To Welfare & Development	3:1:0	4
6.	SWB210/ SWB230	I)Personal and Professional Growth OR II)Population and Environment	2:1:0	3
			Total	**19**

III Semester

Sl. No.	**Course Code**	**Course Title**	**L:T:P**	**Credits**
1.	SWC010	Human Resource Management	2:1:0	3

2.	SWC020	Social Work Practicum – IV	0:1:2	3
3.	SWC030 SWC040	Employee Relations and Legislation / Social Work With Rural & Tribal Communities	2:1:0	3
4.	SWC220 SWC250	Preventive and Social Medicine and Medical Social Work / Rehabilitation & After Care Services	2:1:0	3
5.	SWC230/ SWC240	I)Social Policy, Planning and Development OR II)Legal System in India	2:1:0	3
6.	SWC510	Gerentological Social Work	4:0:0	4
	SWC610	Society and Social Work		
			Total	**19**

IV Semester

Sl. No.	Course Code	Course Title	L:T:P	Credits
1	SWD060	Organizational Behavior and Organizational Development	2:1:0	3

2	SWD020	Mental Health and Psychiatric Social Work	2:1:0	3
3	SWD050	Major Project	0:2:4	6
4	SWD030	Social Work Practicum – V	0:1:2	3
5	SWD040	Social Work Practicum – VI (Block Placement)	0:0:2	2
6	SWD210/ SWD220	Human Resource Development and Employee Wellness/Case Studies	3:1:0	4
			Total	**21**

Note: In a Semester for only one Soft Core Course, there can be two choices.

Programme Outcomes of Master of Social Work

PO1: Develop the capacity to project self as a professional.

PO2: Equipped to work in various fields of Social Work

PO3: Equipped with the knowledge of Social dynamism with the experience of

working in different settings in their field work practice.

PO4: Develop the skills and capacities to work in a multidisciplinary team.

PO5: Imbibed with the core values and principles of Social Work and develop the ability to apply the same.

PO6: Develop the capacity to undertake Research.

Programme Specific Outcomes:

PSO1: Equip to work in the Community Development Programmes.

PSO2: Develop the capacity to work in the field of Human Resource as Labour Welfare Officers, HR Executives and liaison officers.

PSO3: Develop the skill to work as medical and psychiatric social workers.

PSO4: Equip with the skill to work in family and Child Welfare Centres.

PSO5: Develop the capacity to work in correctional settings.

Name of the Programme:

The Programme shall be called **' Master of Social Work' (MSW)**.

Duration of the Course:

The Programme of study **for MSW Degree** shall extend over a period of four semesters spreading over two academic years.

Regulations:

ELIGIBILITY FOR ADMISSION TO MSW COURSE

Candidates who have passed BSW/ BA / B.Sc. / B.Com. / BBM/ B.C.A / LLB of the University y of Mysore or any other university recognized as equivalent there to are eligible for admission to MSW course. Candidates will be selected for admission as per the general guidelines issued from the University of Mysore from time to time. The Department/University shall conduct entrance examination for admission to the course.

The examination is of two hour duration and the question paper comprises of 100 objective t ype questions - 20% questions from general knowledge and current social issues, 60% from science & social sciences, and another 20% questions will be from reasoning and numerical ability. Merit will be assessed on the basis of performance in the entrance examination and performance in the undergraduate examination on equal weightage.

Odd semester (I Semester)

Course code: NSW -1

Course Title: SOCIAL SCIENCE PERSPECTIVES FOR SOCIAL WORK PRACTICE

INTRODUCTION

This course provides the learners basic understanding of relevant concepts from social sciences to help the learners to study and understand social phenomenon. Further, it helps the learner develop skills for social analysis and understand developmental processes.

Course Outcome

CO1	Understand the concepts to examine social phenomenon.
CO2	Develop skills to analyse Indian society and change.
CO3	Understand change and conflict.
CO4	Understand the system for economic order.
CO5	Develop skills for social analysis.
CO6	Understand the development and its impact.

Course Content

UINIT I

Sociology and its relationship to other disciplines: Meaning, scope and significance - Its relationship with other social sciences such as History, Economics, Politics, Psychology, Anthropology and Social work.

Society and Culture: Society as a system of relationship - Social Structure: Meaning, status and roles - Culture: Meaning and contents-Tradition, customs, values, norms, folklore and mores.

Indian Society: Composition of Indian Society: the concept of unity amidst diversity
- Social classification in India: Tribal, rural and urban divisions - Social stratification in India: Meaning, caste, class divisions.
Socialization: Meaning, process of socialisation - The development of self - Agencies of socialisation.

UINIT II

Social Groups, Social Institutions and Social Control - Meaning and types: Primary and Secondary groups, in-groups and out-groups, reference groups - Types of social institutions: Marriage, Family, Religion, State and Law.
Meaning and Functions: Social Control exercised through the social institutions
Social Change: Meaning, characteristics and factors inducing change with reference to India.

Social Movements in India: Meaning, factors essential for a Movement - Dominant social movements in India - Social reform movement and contributions of social reforms - Peasant movement - Trade Union movement - Social movements and social change in India.

UINIT III

Development - A Human Right Perspective: Social Ideals of Indian Constitution - Fundamental Rights - Human Rights.

Socio-economic order and comparative economic system: Capitalism, Socialism and Mixed

economy, their features, merits and demerits - Marxian political economy.

Social Analysis: Significance of social analysis: A brief analysis of socioeconomic, political and cultural systems - Inter-linkages in the Indian context.

UINIT IV

Under-development and its causes and Contemporary Development Dynamics: A historical overview with reference to developing countries of Asia, Africa and Latin America - North-south relations, world trades, Multinational corporations and their influences on Third World economics - Trends and counter trends (Paradoxes) in the global, political, economic, military, ecological and socio-cultural spheres.

Theories of Economic Development, Globalisation and its impact on Developing Countries: Stages of growth theory - Structural internationalist theory
Privatization, liberalization and structural adjustment programmes - Role of international financial institutions.

REFERENCES

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Descrochers, John. 1 77 — Methods of Social Analysis, Bangalore: Centre for Social Action.

10. Deshpande, Narain. Srinivasan — Society Economy of Polity in India, Mumbai: University of Mumbai.

1978

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12. Elsenhans, Hartmut. 1991 Development and Under Development: The History, Economics and Politics of North South Relations, New Delhi: Sage Publications.

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16. Kapadia, K. M. 1966 Marriage and Family in India, London: Oxford University Press.

17. Kingsley, David. 1969 Human Society, New York.

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21. Nana Poku Lloyd Pettiford (Ed.) 1998 Rebuilds up the Third World, London: Macmillan Press Limited.

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Economic Order, New Delhi: Deep and Deep Publications.

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Paper code: NSW 2

TERM PROJECT

The term project is a team-exercise consisting 3 to 5 students. The team is expected to select a theme relevant to current social issues in consultation with the supervisor and make an exhaustive survey of literature on the chosen theme including empirical studies made on the same.

Further, the group shall also collect the experiences or opinions of people on the issues and make a detailed presentation.

Flexibility is accorded in planning and executing the term project. Creative and analytical approaches are to be carried out under the direct supervision of a faculty

supervisor.

The report of the term project has to be submitted before the end of theory examination of that semester to the Department of Social Work, University of Mysore, Mysore through the supervisor and Chairman/Principal of the college.

The term project is offered only for the non-BSW students. However, students with BSW background are also encouraged to opt for the term project, as an innovative approach in social work, is they desire so.

Evaluation of the term project will be done along with the viva-voce examination by the viva-voce committee, constituted for the assessment of social work practicum or similar committee may be constituted, if required.

Odd semester
Course code: SWA010
Course Title: SOCIAL WORK - HISTORY AND IDEOLOGIES

INTRODUCTION
This course aims at introducing the learners to a critical inquiry into the history and ideologies of social change and professional social work.

Course Outcome

CO1 Learn the details of Indian History of Social work Profession

CO2 Understand in depth Values and principles of Social work

CO3 Identify in depth Indian Ideologies for social change in Ancient Period

CO4 Deliberate the details of Contemporary Ideologies for Social change

CO5 Learn the details of Western Ideologies for Social Change and History of Social Work

Course Content:

UNIT I

Indian History of Social Work Profession: Introduction - Beginning of social work education - Welfare versus developmental orientation in social work - Professionalization of social work values, education, knowledge and professional associations - Goals, values, functions/roles and process of social work - Interface between professional and voluntary social work, social work ethics.

UNIT II

Indian History of Ideologies for Social Change -Ancient period: Vedic, Vedantic and non-Vedic Ideologies, Spirituality - Medieval period: Zoroastrianism and Islam in India - Mysticism of Bhakti and Sufi movements and Sikhism.

Modern period: Christianity in India - Hindu reform movements - Dalit movements - Gandhian ideology and Sarvodaya movement – Nationalism - Ideology of the Indian Constitution - Ideology of voluntary organisations and voluntary action.

UNIT III

Contemporary Ideologies for Social Change: Neoliberalism and Globalisation - Post modernism - Multiculturalism - Ideology of action groups and social movements - Ideology of non-governmental organisations.
Role of state in providing social welfare services.

UNIT IV

Western History of Ideologies for Social Change: Organized and scientific charity - Beginning of social work education - Clinical social work - Ecological social work - Attributes of a profession.

Western History of Social Work Profession - Medieval period: Judeo-Christian-ideologies - Secular humanism and Protestantism - Modem period: Rationalism and Welfarism - Liberalism and democracy - Utilitarianism and Social Darwinism - Socialism and human rights - Emerging ideologies of professional social work.

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Journals/ Magazines

Economic and Political Weekly, The Indian Journal of Social Work, Lokayan Bulletin and Vikalp.

Odd semester
Course code: SWA 020
Course Title: WORK WITH INDIVIDUALS AND FAMILIES

INTRODUCTION

This course aims to develop simple to complex skills of working with individuals and families in various crises, preventive, facilitative and developmental.

Course Outcome:

CO1	Learn in details with application of social case wok as method of Social Work
CO2	Learn in detail the Values and principles of Social Case work
CO3	Learn the details of theories and process of Casework
CO4	Specify in depth application of Social Case work in different settings

Course Content

UNIT I

Social casework: Definitions, scope, historical development - Influence of psychoanalysis on casework - Introduction of casework as a method of social work - Concepts of adjustment and maladjustment - Philosophical assumptions and casework values.

Principles of casework: Individualization, acceptance, non-judgmental attitude, participation, relationship, effective communication of feeling, client self-determination, and confidentiality.

Components of social casework: The person, the problem, the place and the process.
Process in casework: Study, assessment, intervention, evaluation, follow-up, and termination.

UNIT II

Types of problems faced by Individuals and families; individual differences and needs - Family assessment in casework practice.

Theories and approaches: Psycho-social approach, Functional approach, Problem-solving approach, Crisis Theory, Family intervention, Behavioural modification, Transactional analysis and Holistic approach.

UNIT III

Tools for Help: Case work tools: Interview, home visit, observation, listening, communication skills, rapport building.
Records: Nature, purpose and principles of recording.

Techniques of casework: Supportive, resource enhancement and counseling.
Self as a professional: Professional self - Conflicts and dilemmas in working with individuals and families.

UNIT IV

Application of Method: Primary and secondary settings - Application of methods in family, women, and child welfare settings, marriage counselling centres, schools settings, medical and psychiatric settings, correctional institutions, and industry.

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19. Sena F. Fine and Paul H. Glass. 1996 — The First Helping Interview Engaging the Client and building Trust, Sage Publication.

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Odd semester
Course code: SWA 030
Couse Title: WORK WITH GROUPS

INTRODUCTION

This course aims at developing the understanding of Group Work as a method, developing skills for intervention, and gaining knowledge of the scope of this method in various settings.

Course Outcome:

CO1	Identify in detail the concept of group and group work
CO2	Learn the process of Group Work
CO3	Understand in depth Group dynamics and skills in group work
CO4	Learn in depth application of Group work in different settings

Course Content

UNIT I

Introduction and history of Group Work: Understanding of groups - Characteristics and significance of group - Definition of Social Group Work - Characteristics of Social Group Work - Purpose of Social Group Work; Historical evolution of group work with special emphasis on the Indian Context.

Type of Groups: Types and approaches based on objectives and purpose - Type of

membership - Time duration - Social group work in different settings and analysis of group processes.

Values and Principles in group work and Characteristics of Group formation: Values in social group work- Principles in group work - Assumptions underlying social group work - Factors of group formation - Formulation of goals - Identification of problems for work.

Pre-group and Initial Phase: Planning model - Characteristics of pre group phase - Group structures - Facilitation skills and role of worker in pre-group and initial phase.

UNIT II

Group Processes and Group Dynamics: Importance of group processes - Typical patterns - Processes in different type of groups - Worker's skills in identifying and understanding processes - Bond, sub-groups, role.
Leadership - Isolation - Decision making - Conflict – Communication - Relationships.

UNIT III

Middle Phase and Use of Program: Characteristics of middle phase - Group structures - Group dynamics - Facilitation skills - Role of group workers - - Comparison across phases - Concept and principles - Program planning - Skills in program planning

Facilitation: Knowledge of skills and techniques for effective work with groups/problem solving.
Recordings in Group work: Importance of recording in social group work - Principles of recording - Recording structure - Types of recording.

UNIT IV

Evaluation in Groups and Termination Phase : Importance of evaluation - Types of evaluation - Methods of evaluation - Need for termination - Types of termination - Characteristics of termination phase - Worker's skills.

Application of Group Work: Application in health settings, school settings, family welfare settings, industrial settings, women and child welfare settings.

REFERENCES

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Odd semester
Course code:SWA040
Course Title: WORK WITH COMMUNITIES

INTRODUCTION

Community organization / development, as a method of social work practice, is seen as a means to facilitate communities towards self-directed change. It takes as its basis the inequalities in society manifested through processes of marginalization, discrimination or disempowerment of groups, which have resulted in the loss of control over resources, be they tangible or intangible. The strategies of Community Organisation practice being addressed as part of the course cover a range spanning different ideologies, from those being people-initiated, and those that are initiated by the elite. Community organization is seen as a means as well as an end, where collective processes are to sustain the community's capacity to bring about change.

Course Outcome

CO1	Learn in details with examples concept of Community and Community organization Practice
CO2	Deliberate in details with examples Understanding Human Rights in Community
CO3	Learn in depth models and strategies of Community Organization
CO4	Understand the skills of Community organizer
CO5	Understand in depth Micro and macro policies of community Organizaion

Course Content

UNIT I

Community: Concept, characteristics, types and functions.
Understanding of community organisation practice: Definition of community organisation, values and principles of Community Organisations, ethics of community organisation practice.

Community Organisation Practice: Community work within social work, Understanding Human Rights in community organisation practice.
Historical development of community organisation practice.

Power: Concept of power - The range of perspectives - Dimensions of power relevant to community organization.

Empowerment: Concept of Empowerment - Barriers to, process and cycle of empowerment.
Gender and Empowerment: Gender sensitive community organization practice

UNIT II

Models and Strategies of Community Organization - Locality Development Model - Social Planning Model - Social Action Model - Select methods of public interest mobilization, litigation, protests and demonstrations, Dealing with authorities, Public Relations, Planning, Monitoring and Evaluation - Roles in different models attributes and attitude.

UNIT III

Community Organization as a Method: Relevance of community organisation as a method across different spheres of social work intervention and relook at own attitudes.

Skills of Community Organization Practitioner: Problem analysis, resource mobilization, conflict resolution, organizing meetings, writing and documentation, networking, training.

UNIT IV

Strategy and Roles: Unionization as a strategy - Advocacy in community organization.

Current debates in Community Organisation Practice: Emerging issues - Impact of macro policies.

REFERENCES

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21. Shivappa R. 2009 — STREAMS IN THE RIVER- A Journey Into Inclusive Concerns, Dhatri Pustaka, Bangalore

22. Sussman, M. B. 1959 — Community Structure and Analysis, New York: Thomas Y. Crowell Co.

Course Title: HUMAN GROWTH AND DEVELOPMENT

INTRODUCTION

The course aims to introduce the learners to the development of the individual across the life span, in a system and an ecological perspective. It also provides an understanding of human development and behaviour, in contextual influences, including individuals in disadvantaged or special contexts. The theoretical inputs are to enhance the understanding of people's growth, health, and development at various stages as bio-psycho-socio-spiritual being over the life span.

Course Outcome

CO1 Learn in detail Human life span and principles of growth and development

CO2 Understand the details of Developmental stages of Human Life span

CO3 Understand the theories of Human Development and learning

CO4 Understand the theories of Basic Human Needs, motivation, Personality and intelligence

Course Content

UNIT I

Life Span: Beginning of life - Human reproductive system; Fertilization and Foetal development - Delivery and pre-natal and post-natal care and their importance in development.

Principles of growth and development - Methods of studying human behaviour, - Role of heredity and environment - Social customs traditions, values in parenting and child rearing practices, deprivation and development during stages of life span. Understanding of the Indian concept of life span stages.

UNIT II

Developmental periods: Infancy, babyhood, childhood, puberty, adolescence -. Growth, hazards, lifestyle effects

Adulthood - Growth, personal and social adjustment, health, sexuality, vocational and marital adjustment.

Aging - Characteristics, hobbies, adjustment, physical and mental health, death, dying and bereavement.

Special focus is on psychosocial development, moral development, and personality development vis-a-vis the influence of the contexts of development., (The contexts here refers to gender, family, significant others, neighbourhood: peers, school, community, work place and other larger contexts like the society and culture. Emphasis is placed on the Indian context of development, variations from the normal patterns of development and views on the stages)

UNIT III

Theories of Human Development: A critical look at the theories of human

development - Freud's psychosexual theory, Erikson's psychosocial theory, learning theories.

UNIT IV

Basic human needs: Physical, psychological and intellectual needs, stress - Coping and social support.
Motivation, frustration and conflicts - Emotions and emotional behaviour.
Personality: Definition, nature, types and assessment of personality.
Intelligence: Concept, levels of intelligence, influence of heredity and environment, assessment of intelligence.
Relevance of Psychology to social work practice across the stages of development, period specific needs, tasks and challenges.

REFERENCES

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Counselling, Indian Journal of Social Work, 54 (1),85-92.

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Odd semester Course Code: SWA060

Title: SOCIAL WORK PRACTICUM - I

Course out Come

CO1 Understand the structure and functioning of NGOS

CO2 Understand the details of intervention skills to work in NGOS

Orientation provides information regarding.

i. the importance and place of the practicum in the educational programme.
ii. the purpose, functions and ethics in professional practice.

In the first four weeks, the learners may make a local directory to include emergency numbers of Hospitals/ PHCs/ Police/ Panchayath Office and Network Agencies along with references to other developmental and welfare services in the location.

Visits - provide an exposure to and understanding of the services provided in responses to people's needs. (Agencies in health setting, education, community, institutional services, criminal justice system, civic administration, rehabi1itation etc.)

Structured experience laboratory - is a classroom activity, which provides opportunities through the games/activities, to form the involvement of self in various practice skills. These laboratory experiences are designed in small groups to encourage participation, sharing of the experience and aid in examining learning and applications of skil1s. These sessions have a specific objective of experiencing self, and applying /using self in practice. (Relationship skills, Communication skills etc., will be focused)

Concurrent practice learning of two-days a week - on going learning of practice is an opportunity to develop intervention skills in reality situations. This entails learning social work practice for two, or two and a half days or its equivalent, each week of the semester.
The learners may be placed in agencies or in communities to initiate and participate in direct service delivery. Practice learning is a vital component of the educational opportunity to be provided to the learner. The teaching-learning process must be designed to help the learner to move on the mastering strategies, skills and techniques to practice social work.

Even semester (II Semester)

Course Code: SWB010
Course Title: SOCIAL WORK RESEARCH AND STATISTICS

INTRODUCTION

This course is to equip learners to utilize, and conduct research as service managers to improve services, evaluate, and develop new services and intervention methods:

strategies and techniques and also, be an effective consumer of other researches.

Course out come

CO1 Understand the meaning, objectives and scope of Social Work Research

CO2 Understand in detail the Process of Social Work Research

CO3 Learn in depth Data Analysis and Interpretation

CO4 Learn the Application of Statistics in Social Wok Research

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Course Content

UNIT I

Science - Meaning and assumptions, scientific approach in comparison to the native or common sense approach.

Scientific attitude; Scientific method; application of scientific method for the study of social phenomena.

Research: Definition and objectives, Social Work Research: Meaning, objectives, functions and limitations; Scope of social work research in India; Agencies sponsoring and conducting social work research, ethics in research.

Problem identification: Criteria for the selection of research problem; Problem formulation.
Concepts, constructs, variables, conceptual and operational definitions. Hypothesis: Meaning, importance, uses and requirements.

UNIT II

Design of research: Definition and importance; types of research design; exploratory,

descriptive, experimental, evaluative design, participatory research and action research.

Source and Types of Data: Primary and secondary, objective and subjective, qualitative and quantitative.

Sampling: Sample and population: Rationale and Characteristics of sampling; methods of sampling, general considerations in the determination of sample size.

Methods of collection of primary data:
Observation: Structured and unstructured; participant and non-participant. Questionnaire, interview schedule and interview guide. Pilot study and Pre-testing.

Scales: Need for scales, some prominent scaling procedures.
Case study: Meaning, uses, steps.

Secondary data: Official data, personal documents, problem in the use of secondary data

UNIT III

Processing of data: Content, editing, coding data classification, manual and mechanical tabulation of data; frequency distribution, diagrammatic and graphic presentation - use of computers.

Issues related to Social Work Research: Interpretation of data, research reporting: contents of research report: foot-note, references, bibliography, preparation of abstract; the art of making book review.

UNIT IV

Statistics: Definition, functions and importance
Measures of Central Tendency; Measures of Dispersion.
Chi-square, Correlation Coefficient, 't' distribution; Analysis of Variance and 'F' distribution.
SPSS package.

REFERENCES

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Course Code: SWB 020

Course Title: MANAGEMENT OF DEVELOPMENTAL AND WELFARE SERVICES

INTRODUCTION

The course aims to develop management competencies to function in organizations, participate as a team member and understand the role of a social work programmes manager.

Course Outcome:

CO1 Deliberate in depth need for social welfare organization

CO2 Learn the procedure of establishment of Human Service Organizations

CO3 Understand the process of Management

CO4 Learn in detail the concepts of Programme Development and Public Relations

Course Content

UNIT I

Social Services: Need for welfare and developmental organisations, Factors determining social welfare programmes, Development and Welfare organizations' response to societal needs; role of state, voluntary and corporate sector.

Management services: Types of settings, organizational characteristics like origin, nature, size, structure, and design, organizational climate and impact of socio-political environment - Management process: Vision, Planning, Organizing, Directing, Staffing, Coordination, Reporting, Budgeting.

Establishment: Registration, different types of legislations, legal status, constitution, rules and procedure, goals - Financial resources: Organizational Budget, Sources of finance, Fund Raising, Records, Audit.

UNIT II

Physical: All activities related to acquiring, hiring and maintaining importable structure and infrastructure, maintenance of premises and daily upkeep.

Enhancing the involvement and the potential of people in organization's executive boards, committees; professionals and other staff-relationship, communication, team work, and facilitating team building, supervision, and participation in training.

UNIT III

Programme Development: Programme management: long term, short term, and Documentation.

Project proposals based on felt-needs, nature of resources, eligibility criteria, records, evaluation and research.

Impact analysis - Qualitative and quantitative.

UNIT IV

Public Relations: Public relations need and its promotion by all in the organisation. Representing the organization, networking, public, corporate and voluntary sector,

resource building, accountability, transparency, use of media for publicity.

Change and its Management: Understand and manage change, innovation in a rapidly changing social environment: for policy programmes and structure.

Organizational understanding: Conflict, conflict resolution, creating positive climate.

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Code : SWB030

Title: SOCIAL WORK PRACTICUM - II:

Course Outcome:

CO1 Identify in details with application, analysis of rural dynamics and observe the functioning of local self government

CO2 Learn the Direct Practice with client system and ongoing management operations

SOCIAL WORK CAMP:

Rural/ Tribal camps with a duration of 7 - 10 days - provide opportunities to experience rural life, analyze rural dynamics, and observe the functioning of local

self government and voluntary organisations. This experience aids peer participation in planning for activities for own group and those for local people. It also helps develop skills to carry out, evaluate, and report the experience.

SUMMER PLACEMENT:

Summer Placement - provides an opportunity to experience day-to-day work in a setting. The learner gets involved with direct practice with the client system and with the ongoing management operations of the setting. The time frame recommended for this experience is about three weeks, after the first year of the post-graduate programme. The learner may use the same setting for data collection of research project, if such an arrangement is part of the plan.

Code: SWB040

Title : SOCIAL WORK PRACTICUM – III

Course Outcome

CO1 Understand the practice of Social Casework and Group Work

CO2 Learn the details of Intervention skills in reality situations

Concurrent practice learning of two-days a week - on going learning of practice is an opportunity to develop intervention skills in reality situations. This entails learning social work practice for two, or two and a half days or its equivalent, each week of the semester. The learners may be placed in agencies or in communities to initiate and participate in direct service delivery. Practice learning is a vital component of the educational opportunity to be provided to the learner. The teaching-learning process must be designed to help the learner to move on the mastering strategies,

skills and techniques to practice social work.

Even semester
Course Code: SW220

Course title: COMMUNICATION AND COUNSELING

INTRODUCTION

This paper relates the relevance of components of communication and counseling in social work practice.

Course Outcome

CO1	Understand the meaning, importance, purpose and process of communication
CO2	Learn the use of Visual aids in communication
CO3	Understand the counselling situations and approaches

CO4 Specify the details of Practice of counselling in different settings

Course Content

UNIT I

Communication: Meaning and importance of communication.
Process of communication: Key elements in the communication process - Communication, message, audience; channel of communication. Verbal and non-verbal communication.

Basics of Communication.
Education and communication for national development.

Interpersonal communication: Interviewing - Objectives, principles of interviewing; listening, qualities of effective communicator.
Seminars, conferences, lectures, group discussion, panel discussion, symposium, workshop, role playing, simulation exercises, written communication, report writing, letter writing, article/essay writing, games, brain storming, street play, field work exposure.

UNIT II
Visual aids in communication: Poster making, use of notice boards, flip charts, charts, flash cards, photographs, pamphlets, slide shows.
Mass Communication: Television, exhibition, newspapers and magazines, advertisements, radio, film, VCD/ DVD, e-mail, internet.
Impact of mass communication on society, family, marriage and child development.
Communication Analysis and Planning: Planning and executing a communication campaign on an issue using various methods of communication.

UNIT III
Counseling: Definition, nature and goals, areas of counseling; Historical background and origins of counseling, ethical nature of counseling, qualities of an effective counselor.

Counseling Situations: Developmental, preventive, facilitative, and crisis.
Counseling and Psychotherapy - Skills in counseling - Establishing the relationship.

Process of Counseling.

Approaches to Counseling: Approaches; Theoretical base, thrust, goals, key concepts, techniques - Approaches like person-centered, rational-emotive, behavioural approaches, gestalt, existential approaches, Egans three stage model, eclectic model.

Indigenous Approach: Indigenous approaches of help and self-help like yoga, reflection. Act of Prayashchit.

UNIT IV

Couple and Family Counseling: Issues in such counseling, its process and stages.
Crisis Counseling

Group Counseling: Counseling for groups - Process, advantages and disadvantages of group counseling.

Practice of counseling in family counseling centres, family courts, counseling bureau - Premarital and marital counseling, vocational counseling centres, mental health centres, child guidance clinics, correctional institutions, deaddiction and rehabilitation centres, educational institutions.

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Course code: SWB240

Paper Title: GANDHIAN APPROACH TO WELFARE AND DEVELOPMENT

INTRODUCTION

The course aims at sensitizing the learner to the Gandhian approach and to utilize some of the skills in practice.

Course Outcome

CO1: Develop an understanding of Gandhi's concept of society and his approach to social transformation.

CO2: Develop knowledge of the specific programmes formulated by Gandhi for rural reconstruction and the development of the weaker sections of society, with the focus on strategies and skills.

CO3: Develop the ability to identify similarities and differences between the Gandhian and professional social work approaches to social change, welfare and development.

Course Content

Unit I

Gandhian thought: Salient features of Gandhian thought; Gandhian values; Concepts and methods; Concept of a healthy society; Sarvodaya.

Unit II

Gandhian Approach: Economic and its organization: Ownership of property; Concept of trusteeship, distribution and economic equality; System of production, problems of mechanization, decentralization of production, rural- urban relationship

Unit III

Social Organisation: Marriage and family, position of women, social stratification, caste and untouchability, education and its role; Basic education.

Unit IV

Constructive programmes: Contents training of constructive workers, skills involved, nature of programmes; Boodan, Gramdan.
Gandhian and Vinbobha's movements with special reference to Bhoodan and Gramdan

Gandhian and Professional Social Work Approach: Similarities and differences between Gandhian and professional approach to social development and welfare

REFERENCES

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Even semester
Course Code: SWB210
Course title: PERSONAL AND PROFESSIONAL GROWTH.

INTRODUCTION

The course aims at enhancing personal and professional effectiveness by developing a continuous awareness and deeper insight into one's being. It encourages value clarification, upholding of professional ethics, and ability to make effective choices for integration. It provides opportunities to understand stress, stressors and methods to handle stress experienced.

Course Outcomes

CO1 Understand self and developing self awareness

CO2 Understand the details of emotions and emotional expressions

CO3 Understand in depth life skills

CO4 Identify in depth Values, attitudes and professional ethics

Course Content:

UNIT I

Self and Self Awareness: Understand self through a cognitive construct/paradigm (two/three models from among those available may be offered as workshops). Suggested approaches are: Rational Emotive Therapy, Gestalt Approach, Transactional Analysis, Reality Therapy, Yoga for Therapy, Meditation Techniques.
Explore self as being, and understand the process of becoming. (through observation)
Practice consciously measures to sustain and experience continuous awareness.
Observation and Reflection: Theory and techniques.
Communication Choices: Communication mode and patterns and effectiveness, Interpersonal communication, nature of choices made.

UNIT II

Emotions and their Expression: Emotions, nature of expression.
Understand own pattern of communication, choices made to express emotions, modes used, examine need for change.

Communication: Informal and knowledge and skills of rapid reading, writing, creative writing, report writing and public speaking.

UNIT III

Creativity and Self: Understand brain functions: Creativity, need and development Life Style: Conscious life style - enhanced life skills: Communication, decision making, empathy, critical thinking, use of time and money, building and sustaining

bonds-relational, colleagial and personal.
Self defeating behaviour - nature and impact. Choices for change.

UNIT IV

Values, Attitude and Professional Ethics: Values and attitudes - their role in life, Value conflict - its impact, value clarification.

Integration: Through Eastern and Western approaches experience the processes of integration. Approaches recommended are: Yoga as a science, meditation (tool for meditation - own choice).

Stress / Burn out - Self help Methods: Stress, Stressors, nature and impact of stress, its expression, and burnout.

Spirituality and Growth.

REFERENCES:

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Course code: SWB230

Course Title: POPULATION AND ENVIRONMENT

INTRODUCTION

The content has two aspects to it. Population dynamics and its relatedness to the environment, natural resources, utilization and their preservation.

Course Outcome

CO1	Understand the classification and characteristics of population and population policy
CO2	Understand the meaning and importance of population education
CO3	Deliberate Inter relatedness of Population and environment
CO4	Learn in details with application environment protection laws and role of social worker

Course Content

UNIT I

Characteristics of population: Population, determinants of growth. global concerns - Characteristics of Indian Population – Distribution by age, sex, literacy and occupation – Fertility trends - Birth and death ratio.

Population Policy, World Action Plan, Population Policy of India- Implementation; Initiatives – Government and NGO.

UNIT II

Family Planning: Objectives, scope, methods, implementation, mechanisms and progress.

Concept and Scope of Population education, family life education, sex education, and family planning education.

Population and Environment: Interrelatedness of human life, living organisms; Environment and natural resource – Environment, lifestyle, degradation. Environment management, maintaining, improving, enhancing – Current issues of Environment.

UNIT III

Natural Resources and Diversity: Utilisation and management – Forest, land, water, air, energy sources - Pollution - Sources, treatment, prevention - Soil, water, air, noise - Waste matter - disposal, recycling, renewal, problems, issues - Programmes for forest, land and water management.

UNIT IV

Environment Protection Laws and Role of Social Worker: Acts related to environmental protection – Forest conservation- Water pollution – Standards and tolerance levels – Unplanned urbanization- Environmental movements in India - Role of NGOs in Environmental issues – Government agencies in environmental protection – Social work initiatives at different levels.

REFERENCES

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semester (III Semester)

Odd Semester

Course code: SWC010

Course Title: **HUMAN RESOURCE MANAGEMENT**

INTRODUCTION

The main objective of this course is to prepare young graduates for management and administrative positions in various industrial, business, governmental/non-governmental organisations and service sector organisations.

Course Outcome

CO1 Learn the concept and philosophy of Human Resource Management

CO2 understand the policies, sources and methods of talent acquisition

CO3 Deliberate in details with examples Compensation Management

CO4 Deliberate the changing scenario of strategic Human Resource Management

Course Content

UNIT I

Human Resource Management: Concept, scope, philosophy and objectives;

Evolution; Approaches, Structure and Functions; Line and staff relations of HRM; HRM Model. Hierarchy, formal and informal structure, Organization chart/reporting structure.

Human Resource Planning: Concept and objectives; Human resource inventory; Human resource planning process; job analysis; job description; job specification; job design; career planning and career paths; job rotation.

UNIT II

Talent Acquisition: Goals; polices, sources and methods. Selection: Concept, process. Talent Acquisition Tests, Theories and issues in psychological testing, Intelligence testing – theoretical background, Aptitude Testing, Personality Assessment, MBTI. Placement, Induction and socializing the new employee. Talent retention: Concept, importance and methods.

UNIT III

Compensation Management: Factors influencing compensation plans and policies; Job evaluation - Fixation of salary, components of salary. Pay for performance – Incentive Schemes, principles and types, Employee Stock Option Plan, compensation survey / review

UNIT IV

Strategic Human Resource Management (SHRM): Business strategy and organizational capability, SHRM: aligning HR with Corporate strategy, Strategic HR planning and Development, Change Management and restructuring and SHRM, Corporate Ethics, Values and SHRM, Competencies of HR professional in a SHRM scenario.

REFERENCES

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Odd semester
Code: SWC020
Title: SOCIAL WORK PRACTICUM - IV

Course Outcomes:

CO1	Understand the structure and functioning of Industry/Hospitals/Human Service Institutions
CO2	Learn in depth Intervention and managerial skills

Workshops: Skills Development - help learners acquire specific skills for situations encountered during practice and acquire skills for intervention. These may be for problems/ concerns, issues or situations like work with alcoholics, HIV/AIDS affected persons, adolescents for life ski11s development, youth for leadership development and couples for marital relationship and enrichment work with elderly. These workshops are to enhance skills/ develop new skills for practice in specific situation, specific problems and issues.

Concurrent practice learning of two-days a week -on going learning of practice is an opportunity to develop intervention skills in reality situations. This entails learning

social work practice for two, or two and a half days or its equivalent, each week of the semester. The learners may be placed in agencies or in communities to initiate and participate in direct service delivery. Practice learning is a vital component of the educational opportunity to be provided to the learner. The teaching-learning process must be designed to help the learner to move on the mastering strategies, skills and techniques to practice social work

Course code SWC030

Course Title: EMPLOYEE RELATIONS AND LEGISLATION

INTRODUCTION

The purpose is to provide an in-depth knowledge about the relationship between employer, employee and the state, to bring out the importance of cordial employee relations for organizational productivity and gain an understanding of the mechanism of inter-personal relations, collective bargaining and productivity improvement functions in the organisation through involvement of all groups.

Course outcome

CO1	Identify in details with application concept, philosophy and principles of employee relations
CO2	Understand in depth process of collective bargaining
CO3	Learn the employee legislations
CO4	Deliberate on functioning of trade unions in India

Course Content

UNIT I

Employee relations, History of industria1ization in India - Issues related to

employees in organized and unorganized sector.

Concept, Definition, Philosophy and Principles of employee relations. Employee relations with special reference to Occupation - Safety - Health and Environment (OSHE) Education.

Analysis of the terms 'industry' and 'industrial dispute', industrial discipline – misconduct, disciplinary proceedings.

Domestic Enquiry: Contents and Process, Principles of Natural Justice, Tribunal; Discharge/Dismissal.

UNIT II

Trade Unions: Trade Unionism in India, emergence, history and growth, Trade Union as an organization – Various Trade Unions in India, Trade Union policies, Role of Trade Unions in India, Employers'' Associations – Objectives, structure and activities. Contemporary issues in employee relations.

UNIT III

Employee Legislations: - The Payment of Bonus Act, 1965, Employees Provident Fund (and Misc. Previsions) Act 1952, Workmen's Compensation Act 1923, Employees State Insurance Act 1948, Payment of Gratuity Act, 1972,Child Labour (Prohibition and Regulation) Act, 1986.
Fundamentals of Labour laws, The Constitution of India: Preamble, Fundamental Rights including writs, Directive Principles of State Policy, The Factories Act 1948, The Contract Labour (Regulation and Abolition) Act 1970,The Minimum Wages Act 1948 and The Payment of Wages Act 1936; The Apprentices Act, 1961,The Maternity Benefit Act 1961.

UNIT IV
The Trade Union Act 1926, The Industrial Employment (Standing Orders) Act 1946, The Industrial Dispute Act 1947, The Employment Exchanges (Compulsory Notification of Vacancies) Act 1958. Introduction to Right to Information Act, Intellectual Property Rights, Patent Law, Copyrights, Trademark Law.

Collective Bargaining: Definitions, characteristics, critical issues in collective bargaining, theories of collective bargaining, Hick's Analysis of Wages setting under collective bargaining, conflict-choice model of negotiation, Behavioral Theory of Labor Negotiation, Collective Bargaining in India, Collective bargaining in practice, levels of bargaining, coverage and duration of agreements, administration of agreements, negotiating a contract, the negotiation process, effective negotiation, negotiation and collective bargaining, post negotiation – Administration of the agreement.

Employee relations in knowledge based industry - Concepts of self-managed teams (SMT) - Changing employee/ employer and trade union relationship.

Current rules of Taxation of Salaries.

Labor Welfare Officer - Duties and functions; Social Work in Industry.

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House.

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22. Srivastava S C, 2009 — Industrial Relations and Labour Law. New Delhi, Vikas Publishing House Pvt Ltd.

Odd semester

Course code : SWC040

Course Title : SOCIAL WORK WITH TRIBAL AND RURAL COMMUNITIES.

INTRODUCTION

This course aims at introducing the learner the programmes of tribal and rural development, and the importance of social work practice with tribal and rural communities.

Course Outcome

CO1: Develop an understanding of tribal and rural communities.
CO2: Understand the characteristics and problems of tribal and rural communities. c.
CO3: Acquire knowledge about the contribution of Governmental and Non-governmental organisations to tribal and rural development.
CO4: Develop an understanding of the functions of Panchayath Raj Institutions with particular reference to Karnataka.
CO5: Gain knowledge about the application of social work in tribal and rural development programmes.

Course Content

UNIT I

Tribe in relation to caste and nation - Nature and Characteristics of Primitive Cultures- Tribes in India and their ecological distribution.
Emerging Trends in Tribal Social Institutions - Family and Kinship Systems, Jati Structure, Economic Structure, Political organisations.

Characteristics of Tribal Society - Economic, Social, Political and Cultural Problems of Tribal Life.

UNIT II

Government Programmes since Independence and their Impact on Tribal Societies - Programmes of Voluntary Agencies and their Impact on Tribal Societies.

Analysis and Assessment of Tribal Community Problems - Special Problems of the Tribals in a particular area.

Social Work Practice in Tribal Development: Community organisation as a method of intervention, Participatory Rural Appraisal (PRA), Logical Framework Approach/Analysis (LFA), techniques of intervention and its scope in tribal community development.

UNIT III

Rural Society and Poverty - Historical perspective - Dynamics in the village society – Caste/class relationships - Control and Power, Conflict and Integration. Poverty in the rural context - Its nature and manifestations. Analysis of Basic Problems - Issues faced by the rural poor such as indebtedness, Bonded labour, Low wages, Unemployment, Underemployment, and other forms of exploitations.

UNIT IV

Current Rural Development Programmes in India: Council for the Advancement of People's Action and Rural Technology (CAPART) and other Rural Development Statutory Bodies.

Panchayath Raj System in Karnataka and its role in rural and tribal development.

Role of social worker in tribal and rural development progrmmes. **REFERENCES:**

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Narayan, B. K. and Kalappa, A. (Eds.) 1987 — India, Bombay: Himalaya Publishing House.

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20. Sodhi, J. S. 1990 — Poverty Alleviation of Rural Development, New Delhi: Criterion Publications.

21. Swaminathan, M. S. 1982 — Science and Integrated Rural. Development, New Delhi: Concept Publishing company.

Odd semester

Course code: SWC 220

Course Title: PREVENTIVE AND SOCIAL MEDICINE AND MEDICAL SOCIAL WORK

INTRODUCTION

This course introduces the basic health issues and the application of social work in health setting both in hospital and community.

Course Outcome:

CO1 Learn in depth concept of health and health care

CO2 Understand the classification and characteristics of communicable and non communicable diseases

CO3 Learn in details with application Medical Social Work and Rehabilitation of Patients

CO4 Understand the Policies related to health care and functioning health agencies

COURSE CONTENT

UNIT I

Concept of health : Physical, social, mental and spiritual dimensions of health - Positive health - Determinants of health - Health and development - Indicators of health. Concept of Prevention: Levels of prevention - Hygiene, public health, preventive medicine, community health, social medicine, community medicine.
Health Care of the Community; Concept of health care - Levels and principles of health care.

UNIT II

Communicable and Non-communicable Diseases: Leprosy, Tuberculosis, Sexually Transmitted Diseases (STDs), HIV/AIDS. Cancer, Hypertension, Accidents, Diabetes, Blindness, Neurological problems, Mental illnesses.
Maternal and Child Health Services - Immunization – Integrated Child Development

Services (ICDS) Scheme - School health programmes.

UNIT III

Medical Social Work: Meaning, Definition and Scope - Historical background and nature: Medical Social Work in India and Abroad - Team work and Multidisciplinary approach in health care; Organization and administration of medical social work departments in hospitals.

Patient as a person and Role of Social Worker: Understanding the patient as a person; Illness behaviour and treatment behaviour of the patient - Impact of illness on the patient and family.

Role of social worker with patients and their families - Rehabilitation.

UNIT IV

National Health Policy of India, Directorate General of Health Services, Indian Council of Medical Research (ICMR), Health as a concurrent subject.

Health System in India - at the Centre, at the State level, at the district level, and village level. Health Education and Communication.

Voluntary Health Agencies in India - International health - World Health Organisation (WHO), UNICEF, UNDP, FAO, ILO, World Bank.

Non - governmental and other Agencies - Ford Foundation, CARE, International Red Cross, Indian Red Cross.

REFERENCES:

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Course code: SWC250
Course Title: **REHABILITATION AND AFTER CARE SERVICES**

INTRODUCTION

Rehabilitation of differently abled people is a noble and worthy endeavor, requiring the combined knowledge of the psycho-social theory and practical skills and techniques of social work. The current paper facilitates social work students to work with the specific group of clientele suffering from various types of disabilities and impart application of specific professional social work methods to cater to the needs of this population.

Course Outcome

CO1: Understand the concept of handicap, rehabilitation and the scope for practice.

CO2: Identify the specific client categories requiring the rehabilitation services, problem specificity and rehabilitation service interventions.

CO3: Acquaint with different rehabilitation settings, different therapeutic approaches to rehabilitation process.

CO4: Acquire the social work skills adapted to facilitate the process of rehabilitation, the rights and legal provisions provided for differently abled people and assimilate the knowledge of social work practice to disability specific client service.

Course Content

UNIT I

Rehabilitation: Definition and scope for social work interventions; definition of Impairment, Disability, Handicap; causes of Handicap - heredity, acquired, Major illnesses - physical, neurological and psychiatric Stress, vulnerability, coping and competence to deal with handicaps; Need for comprehensive rehabilitation – psycho-social rehabilitation

UNIT II

History, philosophy and principles of psycho-social rehabilitation; specific problem areas – physical handicap - vision, hearing, orthopedic, speech and language difficulties, mental retardation and others; neurological, psychiatric problems,

disasters, alcohol and drug usage, terminal illnesses and any other.
Intervention in rehabilitation: Assessment, planning, intervention, evaluation, tools for assessment, follow-up services.

UNTI III

Rehabilitation Settings: Hospital based, day-care, night-care, quarter-way home, half- way-home, group home, hostels, long-stay homes, vocational guidance centre, sheltered workshop, occupational therapy centre, community based rehabilitation centre, home care, inclusive education and others

Approaches: Therapeutic community, behavior modifications, transactional analysis and eclectic approach

UNIT IV

Practice of Social work methods in the process of rehabilitation: Case work, group work, community organisation, research, administration and social action.
Legal provisions for differently abled people – The Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act 1995, Rehabilitation Council of India: Formation, scope and functions, governmental policies and programmes, initiatives from the non- governmental sectors.

International trends and national initiatives in the rehabilitation scenario.

REFERENCES

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Course code: SWC230
Course Title: SOCIAL POLICY, PLANNING AND DEVELOPMENT

INTRODUCTION

The course introduces the learner as to how policy is a link between Constitutional Principles, Development Plans, Legislative and Executive Actions. The analysis of these processes is to enable utilization of the knowledge to improve social work practice.

Further, it provides a critical and analytical framework to understand key concepts, development processes and current issues, pertaining to different parts of the world, with specific reference to India. This course is expected to provide the social work students with a context for micro-level interventions.

Course Outcome

CO1	Understand in detail concept and purpose of social policies and values underlying social policy
CO2	Learn in detail sectoral policies in India
CO3	Learn the social planning process
CO4	Learn in detail the concept of social development and Indicators of development

Course Content

UNIT I

Social Policy and Constitution: Concept of social policy, sectoral policies and social services - Relationship between social policy and social development--Values underlying social policy and planning based on the Constitutional provisions (i.e. the Directive Principles of State Policy and Fundamental Rights) and the Human Rights - Different models of social policy and their applicability to the Indian situation.

UNIT II

Sectoral Social Policies in India: Evolution of social policy in India in a historical perspective-Different sectoral policies and their implementation, e.g. Policies concerning education, health, social welfare, women, children, welfare of backward classes, social security, housing, youth, population and family welfare, environment and ecology, urban and rural development, tribal development and poverty alleviation.

UNIT III

Social Planning: Concept of social planning - Scope of social planning - the popular restricted view as planning for social services and the wider view as inclusive of all sectoral planning to achieve the goals of social development - Indian planning in a historical perspective - The Constitutional position of planning in India. Niti Ayog - Coordination between Centre and State, need for decentralization - Panchayath Raj - people participation.

UNIT IV

Social Development: Concept of social development - Current debates of development - Approaches to development - Development indicators.

Social Development in India: The historical and social context of development in India - Demographic transitions - Rural development: Agrarian and land reforms; Green Revolution - Industrialization and urban development - Labour relations-Gender issues - Environmental issues (land, water, forest) - Education - Health.

REFERENCES

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Theory: An Introduction, Buckingham: Open University Press.

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Course code: SWC240
Course Title: LEGAL SYSTEM IN INDIA

INTRODUCTION

The course is to help learners understand the legal system and procedures in India. It supports understanding the processes in public interest litigation and develops skills for the same.

Course Outcome

CO1	Learn in depth concept of social justice and understanding of Rights
CO2	Understand the divisions of law and chapters under IPC and CRPC
CO3	Understand the details of structure and functions of District Court, High Court and Supreme Court
CO4	Deliberate on legal aid, Public Interest litigation , Right to Information Act and Correctional Laws

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Course Content

UNIT I

Social Justice: Meaning and Concept; Social legislation: Meaning, definitions and concept. Social justice as an essential basis of social legislations; Social legislations in a welfare state with special reference to India.

Rights: Concept and definitions of Rights; types of Rights; Rights of women and children; Rights of Scheduled Castes and Scheduled Tribes; Rights of accused and offender under Constitution of India, Indian Penal Code and Criminal Procedure Code.

UNIT II

Division of Law: Substantive Law and Procedural Law.

Legislations pertaining to Social Institutions: Marriage, divorce, maintenance of spouse, adoption.
Legislations for prevention of Crime and Deviance: Indian Penal Code (relevant chapters like of Offences against Public Tranquility, of Offences affecting the Public Health, Safety, Convenience, of Decency and Morals, of Offences relating to Religion, of Offences affecting the Human Body, of Offences relating to Marriage, of Cruelty by Husband or Relatives of Husband)Legislations pertaining to women.

UNIT III

Criminal Justice System in India:

Police: Structure, powers and functions and their role in maintaining peace and order in the society.

Prosecution: Meaning, structure, its role in criminal justice, trial participation.

Judiciary: Supreme Court, High Court - Constitution of Supreme Court and High Court: Powers and functions.
Sub-ordinate Courts - District Sessions Court, Magistrate Courts, and other subordinate courts.

UNIT IV

Correction and Correctional Laws: Corrective measures as per Criminal Procedure Code, Probation of Offenders Act, Juvenile Justice (Care and Protection of Children) Act.

Legal Aid: Concept of legal-aid, history of legal-aid, persons needing legal-aid, legal-aid schemes.

Public Interest Litigation: Meaning, Concept, Process and Problems.

Right to Information Act- Provisions and implementation.

Role of Social Worker: Social Work intervention, need, methods.

REFERENCES

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Open Elective

Course Code: SWC510
Course Title: GERONTOLOGICAL SOCIAL WORK

INTRODUCTION

Changing demographic profile in India has led to rise in the number of elderly as never before. Along with the enhanced longevity, a number of issues related to care and management of elderly have come into focus. Social work as a profession concerned with providing professional service to the needy, has recognized the need to address the concerns of the senior citizens. The paper envisages training the learners in professional social work practice with the elderly.

The paper focuses on senior citizens as target client group for social work intervention; the paper deals with the issues, concerns, problems and social work methods in facilitating healthy adaptation of the client group in the current Indian context.

Outcomes

CO1: Get an overview of the perspectives on aging and scope for practice.

CO2: Understand the various challenges related to aging, healthy aging and problems of the elderly in difficult situations.

CO3: Identify agencies working with elderly, the different care settings and issues in working with elderly in different settings and gain an insight into process of working with elderly.

CO4: Train the learners in applying specific social work intervention

CO5: Understanding of National Policy on Older Persons, and the role of International and NGOs in improving the quality of life of the elderly.

Course Content

UNIT I

Gerontology – Definition and scope. Understanding the elderly – demographic, developmental, psychological, socio cultural, economic, and health perspectives. The issues pertaining to elderly- health, occupation, income, retirement planning, family support, gender issues, property Rights and any other

UNIT II

Developmental tasks in elderly: Issues in health care, changes in family structure, coping with aging process, challenges due to changing physiological, economic, safety, status in the family and other issues, Healthy aging, quality of life, coping with demise of the life partner, bereavement, resolving one's own death, and any other.

UNIT III

Care settings for elderly: General hospitals, geriatric wards/ hospitals, home-

based care, homes for the aged, nursing homes, day-care-centers, hobby centers, and facilities for homeless elderly, elder helpline, and senior citizen forum.
Tools for assessment of the problems of elderly, intervention and follow up services and evaluation.

UNIT IV

Social work intervention measures for senior citizens through methods of social work: Case work, group work, community organisation, welfare administration, social work research, social action
Care giver issues - Needs, burden, coping and training; training for caregivers of institutions for the elderly

National Policy on Older Persons, Legal and governmental welfare benefits for senior citizens, Role of HelpAge India and other prominent Organisations working for elderly.
International scenario

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8. Khan M.Z. 1989 — Voluntary Welfare Services for the Aged, Dept. of Social Work, New Delhi, Jamia Milia Islamia.

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12. Vineeta B Pai 2000 — Coping with Retirement, UNESCO CLUB, Naganur, Belgaum

JOURNALS.

1. Indian Journal of Gerontology, C-207, Manu Marg, Tilak Nagar, Jaipur 302 004

2. R & D Journal of Helpage India . C-14, Qutab Institutional Area, New Delhi, 110016.

Open Elective
Paper Code: SWC610
Paper Title: SOCIETY AND SOCIAL WORK

INTRODUCTION

This course aims at introducing the learner to the dynamics of society, nature of human behavior, basic concepts of social work and its interventions. Understanding of these concepts in this course will help the students to understand the Individual

COURSE OUTCOME

CO1	Understand in depth on society and its institutions
CO2	Understand in details on the different concepts of psychology
CO3	Specify the characteristics of mental health and mental disorders
CO4	Deliberate in details on social work interventions, methods and fields of social work

Course content

UNIT I

Society & its Institutions: Meaning and components of society, origin and development, characteristics of Indian society; Social Institutions: concept, forms - Family, Marriage, Kinship, Religion, Education, Media & Culture, Emerging trends.

Social Inequalities & Problems : Concept, causes and consequences, disadvantaged & marginalized groups : SC, ST & OBC, women, children, aged, unorganized labour, physically and mentally challenged, substance abuse, HIV / AIDS, sexual harassment, human trafficking, alienation – causes, consequences, preventive & remedial measures.

UNIT II

Psychology : concept, scope & importance; Basic Human Needs : Physical, psychological, social and intellectual. Motivation, frustration and conflicts – their impact on behaviour; Stress – concept, coping and social support; Group psychology, attitudes, public opinion, mob behavior, leadership.

UNIT III

Mental Health : Concept of mental health and mental illness, common misconceptions about mental illness; types of disorders - Neurosis, Psychosis, Psychosomatic disorders, Psychopathic personalities and perversions, Personality disorders, Delusional disorder, Epilepsy, Suicide, Organic psychotic conditions – signs, symptoms & intervention.

UNIT IV

Social Work Interventions : Social Work: concept, definition, principles, values, ethics, methods and interventions of Social Work ; Different fields of Social Work, Social Service, Social Services, Social Welfare, Social Reform and Social Development; Welfare and developmental services in Indian Society, role of government, NGOs and the corporate sector.

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Broom, Leonard, Charles M. Bonjean, — *Sociology*, Wordsworth publication Co. Belmout.

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Kapadia, K.M. 1966 — *Marriage and Family in India*, London : Oxford University Press.

Shankar Rao. C.N. 2005 — *Introduction to Sociology*, Himalaya Publishing House, New Delhi.

Hurlock, Elizabeth B. 1978 — *Child Growth and Development,* New Delhi, Tata McGraw-Hill Publishing Company Ltd.

Hurlock, Elizabeth B. 1975 — *Developmental Psychology,* New Delhi, Tata McGraw-Hill Publishing Company Ltd.

Nataraj P. — *Introduction to Psychology*, Chetana Book House, Mysore.

Course code SWD060

Course Title: ORGANIZATIONAL BEHAVIOUR AND ORGANIZATIONAL DEVELPOMENT

INTRODUCTION

The course aims to provide an understanding of human behavior at work so that the learner may acquire the skills required to analyze problems and develop a problem-solving approach.

Course Outcome

CO1 Deliberate in depth organizational behaviour and need for training

CO2 Specify the significance of transactional analysis and theories of motivation

CO3 Understand group dynamics and organization development

CO4 Deliberate in depth on organizational change, stress and burnout

Course content

UNIT I

Conceptual Framework: Organization Behavior: Definition, concept, approaches and scope, historical background of Organization Behavior.

Introduction to Enneagram, personality types according to Enneagram. Emotional Intelligence; Attitude, Values, Personality; Job satisfaction, Employee Morale : Meaning, influences and outcomes - Measuring job satisfaction.
Assertiveness Training: Benefits of assertiveness – components of assertive behavior, measuring assertiveness, handling fear, handling anger, handling depression, developing assertive behavior skills, assertiveness on the job, assertiveness in interpersonal relations.

UNIT II

Transactional Analysis (TA), TA and self awareness, Winners and Losers, Structural analysis, Life positions, transactions, games and strokes, Life scripts, TA applications in motivation, Leadership and Teamwork, TA in counseling.

Motivation: Concept and theories, techniques of motivation, role of reinforcement and punishment, motivation and organization reward system, awards, employee empowerment and engagement.

UNIT III

Leadership: Meaning, roles, skills, and styles, leadership theories, types of leadership, powerful persuasion strategies.

Group dynamics: Concept, types of groups, dynamics of group formation, decision making in groups.

Organization Development: Concept, emerging approaches and techniques, Foundations of OD, Organizational Diagnosis, OD interventions – An overview, individual and interpersonal interventions, team/group interventions, comprehensive interventions, organizational transformation, success and failure of OD, Planned Organizational change, feedback and OD.

UNIT IV

Organizational Conflict: Concepts, causes and types, conflict-resolution strategies.

Organizational change: Concept, forces of change and resistance to change, managing organizational change and diversity, facilitating creative and divergent thinking, planned organizational change.

Stress and Burn Out: Concepts, causes, consequences and coping strategies.
Managerial Ethics: Individual ethics, ethical dilemmas in management, Ethical practices of Indian Managers, Corporate ethics.

REFERENCES

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2. Aswathappa K, 2008 — Organisational Behaviour- Text, Cases and Games, Mumbai, Himalaya Publication House.

3. Donald, Hislop, 2007 — Knowledge Management in Organisation- A Critical Introduction, Oxford University Press.

4. Khanka, S S,2008 — Organisational Behaviour, New Delhi, S Chand and Co., Ltd.

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McGraw Hill International Edition.

9. Moorhead Gregory and Griffin Ricky W, 2005 — Organisational Behaviour- Managing People and Organisations, New Delhi, Biztantra Publications.

10. Nelson, Debra L and Quick, James Compbell, 2007 — Organisaional Behaviour- Foundations, Realities and Challenges, New Delhi, Thomson South-Western,.

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12. Robibins, Stephen P, 2007 — Organisational Behaviour, New Delhi, Pearson Education.

13. Ryan, Rosemary K C, 2008 — Leadership Development- A Guide for HR and Training Professionals, New Delhi, Elsevier Publications.

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15. Subba Rao, P, 2004 — Organisational Behaviour, Mumbai, Himalaya Publications House.

Even semester (IV Semester)

Course code: SWD 020
Course Title: **MENTAL HEALTH AND PSYCHIATRIC SOCIAL WORK**

INTRODUCTION

This course is to provide awareness about mental health and mental health problems and also application of social work in mental health settings.

Course Outcome:

CO1	Learn the details of concept of Mental Health, Mental Illness and its classification
CO2	Understand the concept of psychiatric Social Work and Multidisciplinary approach and team work
CO3	Learn about the institutional care of mentally ill and role of social workers
CO4	Understand the psycho social rehabilitation and legislations related to mental Health

Course Content

UNIT I

Concept of mental health and mental illness - Mental health as a part of general health - Misconceptions about mental illnesses. General approaches to the mentally ill - International Classification of Mental Disorders.
Signs, symptoms, etiology, diagnosis, prognosis and management of the following:

- Neuroses
- Psychoses
- Psycho physiologic disorders
- Personality disorders
- Psychiatric disturbances in children and adolescents
- Organic psychotic conditions
- Mental retardation.

UNIT II

Introduction to Psychiatric Social Work: Meaning and Scope - Historical background of psychiatric social work in India and abroad - Reasons for its development as a specialty. Application of social work methods and other related techniques used in the field - Multi-disciplinary approach and team work in mental health care - Problems of hospitalization - Impact of mental illness on the patient, family and community.

Practice of Social Work: Importance of home visit and visit to the place of work - Role of family in the treatment of mentally ill - Preparing the family and community for the return of the affected individual, follow-up.

UNIT III

Care of mentally ill: Day-care centre, night-care centre, half-way-home, sheltered workshop, Occupational therapy units - Role of social worker and

role of voluntary organisations.
Role of voluntary organisations, governmental-agencies and paraprofessionals in the welfare of mentally ill.

Role of social worker in mental health centers, departments of psychiatry in general hospitals, child guidance clinics, community mental health units, correctional institutions, industries, and family welfare centres.

Role of social worker with head injured, paraplegics and epileptics.

Role of social worker in the management of substance abuse – Educational avenues in psychiatric social work - Research avenue in the field of mental health for social workers.

UNIT IV

Organisation of psychiatric social work department - Functions; and collaboration with other departments.

Community mental health and social work, NMHP, Innovations like Satellite clinics, district mental health programme etc.

Rehabilitation and Acts: Occupational therapy - Principles and practice - Psychosocial rehabilitation.

Mental Health Act, 1987.

The Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995.

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of Mental Health.

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6. Dickerson, Martha Ufford. 1981 — Social Work Practice with the Mentally Retarded, New York: Free Press.

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20. Robbins, Arthur J. 1957 — Mental Hospitals in India and Social Work Service, Delhi School of Social Work.

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25. Yelloly, Margaret. 1980 — Social Work Theory and Psychoanalysis, New York: Van Nostrand Reinhold Company.

26. National Mental Health Programme for India

Even semester

Code: **SW D030**

Title: **SOCIAL WORK PRACTICUM - V**

Course Outcome:

CO1 Learn managerial skills

CO2 Ability to initiate and participate in direct service delivery

Concurrent practice learning of two-days a week - on going learning of practice is an opportunity to develop intervention skills in reality situations. This entails learning social work practice for two, or two and a half days or its equivalent, each week of the semester. The learners may be placed in agencies or in communities to initiate and participate in direct service delivery. Practice learning is a vital component of the educational opportunity to be provided to the learner. The teaching-learning process must be designed to help the learner to move on the mastering strategies, skills and techniques to practice social work.

Even semester

Code: **SWD040**

Title: **SOCIAL WORK PRACTICUM – VI**: (BLOCK PLACEMENT)

Course Outcome:

CO1 Understand to Initiate on the job training

CO2 Integrate learning, generate new learning by participating in the

intervention process

Course content:

Block Placement - enables learners to integrate learning and generate newer learning by participating in the intervention process over a period of 6 weeks continuously, in a specific agency. Usually, block field work is provided at the end of the two-year programme. There shall be a professionally qualified worker in the setting willing to plan orientation and provide consultation, when needed.

Code SWD050
Title: **MAJOR PROJECT**

Course Outcome:

CO1 Understand in depth on empirical evidence based project

CO2 Deliberate the project is prepared on the Social Work Research Methodology

Course content:

Students are given broad guidelines for undertaking empirical evidence-based project in the fourth semester. In case of group project work, the group will be formed by the college or the university department by adopting

random method of selection. The project shall comprise of selection of the topic, methodological details, analysis, interpretation and deductions made. The department will prepare a set of guidelines for presenting the report.

Course code: SWD210
Course Title: **HUMAN RESOURCE DEVELOPMENT AND EMPLOYEE WELLNESS**

INTRODUCTION

The purpose of this course is to provide practical exposure and knowledge in behavioural science to develop skills not only to understand and analyse problems but also to develop a problem-solving approach to issues.

Course Outcome
CO1 Understand concept, approaches and dimensions of Human resource

development

CO2 Deliberate in depth on HRD Interventions

CO3 Learn in details with examples concept and importance of talent development

CO4 Deliberate on employee wellness and standardization of systems

Course Content
UNIT I

Human Resource Development (HRD): Concept, origin and needs for HRD; Overview of HRD as a Total system; Approaches to HRD; human capital approach; social psychology approach and poverty alleviation approach; HRD and its dimensions, Competency Mapping.

UNIT II

HRD Interventions: Performance Measurement Systems – Fundamental issues. Feedback sessions. Organizational goal setting process, Key Result Area (KRA) and Key Performance Indicator (KPI),Coaching, Mentoring, career planning, career development, reward system, quality of work life. HRIS: - Computers and computer based Information Systems. Measuring HR : Changing role of HR, HR as a strategic partner, the need for measuring HR. Approaches to measuring HR: - Competitive Benchmarking, HR Accounting, HR Auditing, HR Effectiveness Index, HR Key Indicators, HR MBO (Management by Objectives).

Instructional Technology: Learning and HRD; Building Learning Organization: measuring learning – the intellectual capital, architecting a learning organization, Organizational Learning, models and curriculum; factors and principles of learning; group and individual learning; HRD trends; behavioural sciences; transactional analysis; Concepts of continuous learning, behavior modeling and self-directed learning; evaluating the HRD effort; data gathering; analysis and feedback; HRD experience in Indian organizations; future of HRD - Organization culture and development.

UNIT III

Talent Development: Concept and importance; Training Need Analysis, process of training, designing and evaluating training and development programs. Use of information technology, Types and Methods of Training: Training within industry (TWI), External; on the job and off the job; Training methods; lecture, incident process, role play, structured and unstructured discussion, in-basket exercise, simulation, vestibule, training, management games, case study, programmed instruction, team development, and sensitivity training; review of training programs.

UNIT IV

Employee Wellness: Concept, philosophy, principles and scope; Importance

and relevance of wellness programs, Role of Welfare Officer as per the Factories Act 1948. Relevance - with reference to Accidents, Absenteeism, Alcoholism, Domestic Violence: Preventive and remedial measures.

Employee Counseling. Role of Counselor in Organizations. Corporate Social Responsibility (CSR): CSR as a business strategy.

Environmental management systems ISO 14001, ISO 26000: Social responsibility guidance standard, environmental impact assessment.

REFERENCES

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3. Cowling, Alan and James Philip The Essence of Personnel Management and Industrial Relations, New Delhi, Pentice-Hall of India Pvt., Ltd.

4. Davis, Keith. 1983 Human Behaviour at Work, New Delhi: Tata McGraw-Hill

5. Fisher, Cynthia; Schoenfeldt, Lyle F. and Shaw, James, B. 1997 Human Resource Management, Third Edition, Boston, Houghton Mifflin Company.

6. Jayagopal, R. 1990 Human Resource Development: Conceptual Analysis and Strategies, New Delhi: Sterling Publishers Pvt. Ltd.

7. Moorthy, M. V. 1982 Priciples of Labour Welfare, New Delhi, Oxford & IBH.

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10. Prasad, L. M. 1996 Organisational Behaviour, New Delhi, S.Chand & Co.

11. Rao, T. V. 1990	HRD Missionary, New Delhi. Oxford & IBH.
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15. Singh M. K. and Bhattacharya (Eds.) 1990	Personnel Management, New Delhi : Discovery Publishing House.
16. Vroom, V. H. and Grant, L. 1969	Organisational Behaviour and Human Performance, New York. Wiley.

Code: SWD220
Title: CASE STUDIES

Course Outcome:

CO1 learn the analytical skills to study an individual, an Institution, a community

CO2 Understand in depth Social Work Research Methodology

Course Content:

Every Candidate is expected to take up five cases, study them in depth and present the intervention, if any. Case refers to a unit of study – an individual, an institution, a community or an incident. The candidate has to work under the guidance of faculty member and submit the report on or before the date prescribed.

The university or the college concerned can develop guidelines for undertaking case studies. However, the students are encouraged to start his/her work on case studies from the beginning of the course.

PATTERN OF QUESTION PAPER

(The Question paper comprising of 3 parts: A,B and C as follows)

PART – A

There are 8 questions and a candidate has to answer any 5 questions. Each question carries 5 marks. This part covers all units of the syllabus.

PART – B

There are 5 questions and a candidate has to answer any 3 questions. Each question carries 10 marks. This part covers all units of the syllabus.

PART –C

There is a single compulsory question such as case study (may contain sub questions) covering entire syllabus carrying 15 marks.

ASSESSMENT OF SOCIAL WORK PRACTICUM

A viva-voce examination shall be conducted for each candidate in all semesters. The performance of the candidate shall be assessed by a committee consisting of three members as follows.

1. Chairperson of the Department
2. One Senior Member of the Faculty
3. One External Examiner

Components for Internal Assessment

1. Seminar – 5 marks
2. Assignment – 5 marks
3. Test – 5 marks

*C1 will be conducted before the end of eight week of the semester(15 marks)
*C2 will be conducted before the end of the sixteenth week of the semester (15 marks).
*C3 semester end examinations will be conducted before the end of twentieth week for 70 marks.

J.S.S. College of Arts, Commerce and Science
(Autonomous)
Ooty Road, Mysuru-570 025

DEPARTMENT OF ZOOLOGY (PG)

Programme outcome, Programme specific outcome, Course outcome and curriculum for Postgraduate Zoology
(2018-2019 & onwards)

Program Outcome

1. Imbibe the knowledge with facts and figures related Zoology.
2. Understand the basic concepts, fundamental principles, and the scientific theories related to various scientific phenomena and their relevancies in the day-to-day life.
3. Identify, formulate, research literature, and analyze complex problems reaching substantiated conclusions using first principles of mathematical, biological, physical and chemical sciences.
4. Will be able to think creatively to propose novel ideas in explaining facts and figures or providing new solution to the problems.
5. Develop scientific outlook not only with respect to Zoology but also in all aspects related to life.
6. Realize that interdisciplinary knowledge in other faculties can have greatly and effectively influence which inspires in evolving new scientific theories and inventions.
7. Imbibe ethical, moral and social values in personal and social life leading to highly cultured and civilized personality.
8. Develop various communication skills such as reading, listening, speaking, etc.
9. Realize that acquiring knowledge is a continuous process and in combination with untiring efforts and positive attitude and other necessary qualities leads towards a successful life.

Programme Specific outcome:

At the completion of M.Sc. in Zoology the students are able to:

1. Understand the classification and taxonomic aspects of the animal world (chordates and non-chordates). The students will be able to identify the taxonomic group of a given animal based on the external characteristics.
2. Understand the basic concepts of Animal physiology. The students will be able to identify and understand the important life processes which are essential for continuation of life on earth.
3. Understand the nature and structure of biomolecules and basic concepts of Biological chemistry.
4. Understand the concepts of Genetics, Cell Biology and Molecular Biology.
5. Understand the basic principles and concepts of environmental science, ecology and nature conservation.
6. Understand the importance of knowledge of wild life and animal behaviour for conservation and balancing the nature.
7. Understand the tools and techniques employed in Biological research and experiments.
8. Understand the process of evolution.
9. Understand the concept and applications of sericulture, apiculture, animal husbandry, Lac culture etc.

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE
OOTY ROAD, MYSURU
PG DEPARTMENT OF ZOOLOGY
Syllabus Adopted from the academic year 2018-19

Semester	HC / SC	Paper title	CREDITS			Total Credits
			L	T	P	
I	HC - 1.1	Biosystematics & Non Chordata	2	0	2	**4**
	HC - 1.2	Biological Chemistry	2	0	2	**4**
	HC - 1.3	Cytogenetics	2	0	2	**4**
	SC - 1.4	Tools and techniques in Biology	3	1	0	**4**
	SC - 1.5	Chronobiology	3	1	0	**4**
	SC - 1.6	Histology and Histopathology	3	0	1	**4**
	Any two of the Soft core paper may be opted					**20**
II	HC - 2.1	Chordata	2	0	2	**4**
	HC - 2.2	Animal Physiology	2	0	2	**4**
	HC - 2.3	Entomology	2	0	2	**4**
	SC - 2.4	Developmental Biology	3	0	1	**4**
	SC - 2.5	Immunology	3	1	0	**4**
	SC - 2.6	Evolutionary Biology	3	1	0	**4**
	Any two of the Soft core paper may be opted					**20**
III	HC - 3.1	Molecular Biology & Biotechnology	2	0	2	**4**
	HC - 3.2	Reproductive Biology	2	0	2	**4**
	HC - 3.3	Ecology and Wildlife**	2	0	2	**4**
	SC - 3.4	Ethology *	3	1	0	**4**
	SC - 3.5	Pollution and Toxicology *	3	1	0	**4**
	OE - 3.6	Concepts of Zoology	3	1	0	**4**
	Any one of the Soft core paper may be opted** * Field visits are included in this paper**					**20**
IV	HC - 4.1	Advanced Genetics and Computational Biology	2	0	2	4
	HC - 4.2	Applied Zoology*	2	0	2	4
	HC - 4.3	Project	0	2	6	**8**
	*** Field visits are included in this paper**					**16**

Total credits

Hard Core - 52 Credits

Soft Core - 20 Credits

Open Elective - 04 Credits

Total credits required to complete M.Sc Course - 76 Credits

M.Sc, I SEMESTER
HC 1.1 Non Chordata

32hrs

Course Outcome:
After completing the course student will be able to

1. Understand the classification of major and minor invertebrate phyla
2. Give some examples and basic characteristics of some examples of each phylum
3. Understand the evolutionary pathway and its significance
4. Adaptive characters of animals coming under different invertebrate phyla

UNIT I Basic concepts of animal taxonomy: 8 hrs

A. Introduction and history of taxonomy
B. Species concept
C. Zoological classification - theories of classification - taxonomic ranks – hierarchy
D. Zoological nomenclature: Binomial nomenclature, trinomial nomenclature-ICZN
E. taxonomical keys: key to the species
F. Linnaean taxonomy and classical taxonomy - level of taxonomy.

Unit II : Classification, Locomotion and Nutrition: 8 hrs

A. General Characteristics of Non chordata.
B. Locomotion: Muscle filaments and myonemes,
Flagella and cilia. Amoeboid movement.
C. Nutrition in Protozoa: Filter feeding in polychaetes, Filter feeding and digestion in Deuterostomia and molluscs.
D. Respiration:
Structure and function of respiratory organs- Skin, gills, book lungs and Trachea. Respiratory pigments

Unit III: 8 hrs

A. Excretion and osmoregulation:
Osmoregulation in fresh water and marine Invertebrates
Structure and function of excretory organs- Coelom, Coelomoducts, Nephridia, Maliphigian tubules and Coxal glands
B. Nervous system:
Primitive nervous system: Coelenterata and Echinodermata
Advanced nervous system: Annelida, Arthropoda(Crustacea and insecta) and Mollusca (Cephalopod)
C. Sense organs and their importance

Unit IV: 8 hrs

A. Invertebrate paleontology and larval forms:
Free living and parasitic Larval forms
B. Fossil: types and importance of fossil study, overview of Geological Time Scale

NON CHORDATA –PRACTICALS 4x16=64 Hrs

1. PROTOZOA; 4x12=48 hrs

Slides : 1) *Trypanosoma cruzi* 2) Plasmodium – signet ring stage 3) Ceratium 4)*Leishmania donovani* 5) Vorticella 6) Noctiluca 7) Radiolaria 8*) Entamoeba histolytica* 9) Foraminifera 10) Opalina

2. PORIFERA;

a) Slides: 1)Sponge spicules 2)Sponge gemmules

b) Specimen: 1) Grantia 2) Euspongia 3) Clypeaster

3. CNIDARIA:

a) Slides: 1) Obelia polyp and Medusa 2) Pennaria 3) Aurelia-tentaculocyst

b) Specimens: 1) Physalia 2) Gorgonia 3) Spongodus 4) Zoanthus 5) Favia 6) Pennatula 7)Sea anemone 8) *Corallium rubrum*

4. HELMINTHES:

a) Slides: 1) *Fasciola hepatica* 2) *Ancylostoma*

b) Specimens: 1) Planaria 2) Male and female *Ascaris lumbricodes* 3) *Taenia solium* 4)

5. ANNELIDA:

a) Slides: 1) Leech 2) Earthworm setae

b) Specimens: 1)Neries 2) *Chloea flava* 3) *Pheretima postuma* 4) Terebella 5) Eurythoe

6. ARTHROPODA:

a) Slides: 1) Daphnia 2) Sacculina 3) T.S of Peripatus

b) Specimens: 1) Balanus 2) Lepas 3) Palinurus 4) Scolopendra 5) Rhinocerous beetle 6)Spider 7) Gongylus 8) Belostoma 9) Limulus 10) Squilla 11) Eupagarus 12) Julus

7. MOLLUSCA :

Specimens: 1) Aplysia 2) Glochidium 3) Loligo 4) Chiton 5) Cypreae 6) Octopus 7)Sanguinolaria 8) Chicoreus 9) Ficus 10) Lambis 11) Mytillus 12) Doris 13) Onchidium 14) Oliva 15) Murex 16) Turritella 17) Cardium

8. ECHINODERMATA:

Specimens: 1) Sea Urchin 2) Linckia 3) Echinodiscus 4) Holothuria 5) Antedon

9. MINOR PHYLA: —1) Lingula

10. LARVAL FORMS:

Slides: 1) Cercaria 2) Trochophore 3) Megalopa larva 4) Nauplius 5) Zoea 6) Mysis

7) Phyllosoma 8) Protozoea 9) Bipinnaria 10) Veliger 11) Tornaria

12) Glochidium 13) Pluteus

11. Field Study: Visit to different areas around the college campus, to observe and study Non chordates in their natural habitat. **4x2=8 hrs**

II. Study of Nervous system, Respiratory system, Reproductive system and Excretory system in invertebrates by employing computer animation/charts: **4x2=8 hrs**

REFERENCES :

1. Barnes, R.D.1974. Invertebrate Zoology, III edition. W.B Saunders Co., Philadelphia
2. Barrington, E.J.W, 1976. Invertebrate Structure and Function. Thomas Nelson and Sons Ltd.,London.
3. Hyman L,H. 1940. The invertebrates. Vol. 1. Protozoa through Ctenophora, McGraw hill Co.,N.Y.
4. Hyman. L H. 1959. The Invertebrates smaller coelomate groups, Vol. V. McGraw Hill Co.,
5. Hyman. L. H. 1951. The Invertebrates. Vol. 2. McGraw Hill Co., N.Y.
6. Hyman. L H. 1968. The invertebrates Vol. 8. McGraw Hill Co., N.Y and London.
7. Simpson, G C. Principles of Taxonomy.

M.Sc, I SEMESTER
HC -1.2 BIOLOGICAL CHEMISTRY

32 hrs

Course Outcome:

After completing the course student will be able to

1. Identify the five classes of polymeric biomolecules and their monomeric building blocks.
2. Explain the specificity of enzymes (biochemical catalysts), and the chemistry involved in enzyme action.
3. Understand types, Structure, biochemical properties and functions of vitamins.
4. Explain how the metabolism of organic compounds leads ultimately to the generation of large quantities of ATP.

UNIT I Chemical Bonds and Carbohydrates: 8 Hrs

A. Structure of an atom, orbitals, chemical bonds - covalent, co-ordinate, ionic and hydrogen; Vander-Waal's force; hydrophobic interactions; Normality and Molarity of solutions.

B. Carbohydrates – Chemistry and biological properties

UNIT II Proteins and Lipids: 8 Hrs

A. Proteins- Chemistry and biological properties, Christian Anfinsen's experiment, Biological values of proteins

B. Lipids: Chemistry, triglycerides; prostaglandins and steroids –biosynthesis, Chemical importance of lipids.

UNIT III Enzymes: 8 Hrs

A. Enzymes: Nomenclature – current status; factors influencing velocity of enzyme reaction, enzyme dynamics and enzyme inhibition.
Ribozymes and abzymes; co-enzymes, isozymes, clinical importance.

UNIT IV Nucleic acids & Vitamins: 8 Hrs

A. Nucleic acids: Chemistry, alternative models of DNA,

B. Vitamins and trace elements – chemical nature, vitamins as co-enzymes, Deficiency diseases, role of trace elements

Biological Chemistry practicals 4x16=64 Hrs

1. Qualitative analysis for identification of carbohydrates (Starch, Glycogen, Sucrose, Lactose, Maltose, Glucose, Fructose).
2. Qualitative analysis for identification of Proteins (Egg albumin, Casein, Gelatin, Peptone)
3. Precipitation reaction of proteins (Egg albumin, Peptone)
4. The absorbance curves for two dyes and demonstration of Beer-Lambert's law.
5. Estimation of amino acids by Sorenson's formal titration (Arginine, Alanine, Leucine, lysine)
6. Determination of concentration of Glucose and Maltose by calibration curve.
7. Determination of amylase activity.
8. Determination of effect of temperature, pH and incubation period on amylase activity.
9. Test for non-esterified fatty acid.
10. Demonstration of gel electrophoresis.

REFERENCES

1. Barrington, E. J. W (1976) An introduction to general and comparative endocrinology, Oxford University press, London.
2. Conn, E. E., Stumpt, P. K., Bruencing, G. and Dol, R. G. 1995. Outlines of Biochemistry. Pub. John Wiley, Singapore.

3. Eckert, R and Randall, D. 2002, Animal physiology, 2nd Edn, W.H..Freman
4. Guyton. A.G. 1986, Text book of Medical Physiology, 7th Edn., Saunders Publication
5. Harper, H. A. 1993. A review of Physiological Chemistry, Lange Medical Publication, 2nd Edn.
6. Lehninger, A. L., Nelson, D. L. and Cox, M. M., 2nd Edn. 1993. Principles of Biochemistry,CBS Publishers and Distributors, New Delhi.
7. Oser, B. L. (Ed.) 1993. Hawk's Physiological Chemistry. Tata Graw Hill Publishing Co. Ltd.New Delhi.

M.Sc., I SEMESTER
HC – 1.3 CYTOGENETICS

32 Hrs

Course Outcome:

After completing the course student will be able to

1. Described the fundamental molecular principles of genetics
2. Understood the structure and function of DNA & RNA
3. Understand about the transmission, distribution, arrangement, and alteration of genetic information and how it functions and is maintained in populations
4. Described the basics of genetic mapping
5. Explain basic structure of animal cell and its organelles
6. Describe the functions and organization of cell organelles

Unit I: Introduction to the Cell & Cell Organelles **8 hrs**

A. The origin and evolution of the cell, From molecules to first cell, from Prokaryotes to eukaryotes, from single cell to multicellular organisms.
B. Membrane Structure and Function,
C. Structural organization and functions of intracellular organelles- The nucleus, Mitochondria, Lysosomes, Peroxisomes, Golgi apparatus, and endoplasmic reticulum.

Unit II: Cell Cycle and Cell signalling **8 Hrs**

A. Phases of cell cycle.
B. Biochemical studies with oocytes, eggs and early embryos.
C. Regulation of cell cycle: Molecular mechanisms regulating mitotic events.
   Regulation of cell cycle progression.
   Check points in cell cycle regulation.
   Cell cycle control in polytene cells.
D. Molecular basis of signal transduction
E. Cellular aging and death: (a)Causes of aging
   (b)Cellular changes due to aging
   (c)Theories of aging
   (d) Apoptosis
   (e) Longivity genes

UNIT III Gene mutations **8 Hrs**

A. Types of mutations (Spontaneous, Induced, Base substitutions and frameshifts - Transitions, Transversions, gain in function, loss in function, Neutral mutations),
B. Molecular mechanism of mutations (Base analogs, alkylating agents); Detection of mutations: Dominant lethal test, Sex-linked recessive lethal test, II-III translocations, Ames test, P-mediated mutagenesis

UNIT IV Chrmosomal mutations **8 Hrs**

A. Structure and organization of eukaryotic chromosomes
B. Structural and numerical variations of chromosomes, Chromosomal rearrangements and their cytogenetic consequences with examples from plants, Drosophila and Man,

Practical applications of chromosome rearrangements - Balancers and attached X-chromosome in Drosophila. Cytogenetic effects of ionizing and nonionizing radiations

CYTOGENETICS PRACTICALS **4X16 =64 Hrs**

1) Life cycle of *Drosophila melanogaster* 1x4=04hrs
2) Preparation of culture media. Culture of Drosophila - Methods of maintenance. 1x4=04hrs
3) Study of morphology of *Drosophila melanogaster* 1x4=04hrs
4) Mounting of Sex comb of *Drosophila melanogaster* 1x4=04hrs
5) Mounting of Wing of *Drosophila melanogaster* 1x4=04hrs
6) Study of mutants of *D. melanogaster* 1x4=04hrs
7) Preparation of genital plate of *D. melanogaster* 2x4=08hrs
8) Chi square Analysis of F1, F2 and Test cross progeny in *Drosophila melanogaster* to understand pattern of inheritance of different characters and to demonstrate. 3x4=12hrs
   a) Law of segregation
   b) Law of Independent assortment
   c) Sex-linked inheritance
9) Temporary squash preparation of Mitotic chromosomes from root tip meristem of *Allium cepa* 2x4=08hrs
10) Temporary squash preparation of Meiotic chromosomes from testis of *Poicelocerus pictus* 2x4=08hrs
11) Study of Barr body using buccal smear of volunteers 1x4=04hrs

REFERENCES:

1. Alberts, B., A. Jhonson, J. Lewis, M. Raff, K. Roberts and P. Walter 2008. Molecular Biology of the cell. V Ed. Garland Science, New York.
2. Brachet, J. 1985. Molecular Cytology, Academic Press, N. Y.
3. Furukawa, R., and M. Fechheimer. 1997. The structure, function and assembly of actin filament bundles. Int. Rev. Cytol. 175: 29-90.
4. Lewin B. (1997) Gene VI Oxford University Press, Oxford
5. Lodish, H., A. Berk, C.A Kaiser, M.P. Scott, A Bretscher, H. Ploegh, P. Matsudaira. 2008. Sixth Edition, Molecular Cell Biology. W. H. Freeman and Co., N. Y.
6. Pollard, T. D. and W. C. Earnshaw. 2002. Cell Biology. Saunders
7. Russel P.J (1998) Genetics. The Benjamin Cummings Publishing Co Inc.
8. Snustad D.P and M.J.Simons. (1997) Principles of Genetics. John Wiley and Sons Inc. N.Y.
9. Strickberger M.W. (1977) Genetics. MacMillan Collier Co. Pvt Ltd
10. Watson J.D, Hopkins, N.H, Roberts J.A, Steitz and A.M.Weiner. (1987) Molecular biology of gene. The Benjamin Cummings Publishing Co Inc.
11. Wolfe, A. 1995. Chromatin: Structure and function. Academic Press, N. Y.

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M.Sc., I SEMESTER
SC – 1.4 TOOLS AND TECHNIQUES OF BIOLOGY

48 hrs

Course Outcome:
After completing the course student will be able to

1. Describe the methodology involved in biotechniques.
2. Describe the applications of bioinstruments
3. Demonstrate knowledge and practical skills of using instruments in biology and medical field.
4. Perform techniques involved in molecular biology and diagnosis of diseases
5. Update current knowledge regarding biomedical engineering involving new methods and the instrumentation.

UNIT I: MICROSCOPY: 12hrs

Basic principles of microscopy, Types of microscopes and their biological applications Bright-field microscope, numerical aperture, limit of resolution, types of objectives, ocular & stage micrometers, Electron Microscope, SEM, Confocal microscope.
Dark-field microscope
Phase-contrast microscope
Differential interference contrast microscope
Fluorescence microscope
Photomicrography and image processing

UNIT II: SEPARATION TECHNIQUES: 12hrs

Centrifugation - Basic principles, Types of rotors, Clinical, high speed & ultracentrifuge
Electrophoresis – Agarose and polyacrylamide gel, Two-dimensional, Isoelectrofocussing
Chromatography - Paper and Thin layer chromatography, Column chromatography, Gel filtration, Ion-exchange, Affinity, Introduction to FPLC and HPLC

UNIT III: 12hrs

A. Radio-tracer techniques
Unit of radioactivity and half life, Measurement of radioactivity (β and γ emission), Applications of radioisotopes, Safety measures
B. Techniques in immunodetection: Immunoblotting and immunofluorescence
C. Immunological techniques: Immunodiffusion and Imunoelectrophoresis

UNIT IV: 12hrs

A. Cell culture techniques: Design and functioning of tissue culture laboratory; Culture media, essential components and preparation; Cell viability testing
B. Cytological techniques: Mitotic & Meiotic chromosome preparations from insects and vertebrates Chromosome banding techniques (G-, C-, Q-, R- banding etc.)
C. Molecular cytological techniques: In situ hybridization (radiolabelled & non-radiolabelled methods), FISH, and Restriction banding
D. Molecular biology techniques: Southern hybridization and Northern hybridization DNA sequencing Polymerase chain reaction (PCR)

TUTORIALS 2x16 = 32 Hrs

REFERENCES

1. Alberts et al: Molecular Biology of the Cell, Garland, 2002
2. Karp: Cell and Molecular Biology, John Wiley & Sons, 2002
3. Lodish et al: Molecular Cell Biology, Freeman, 2000
4. Pollard & Earnshaw: Cell Biology, Saunders, 2002
5. Ruthman: Methods in Cell Research, Bell & Sons, 1970.

6. Boyer: Modern Experimental Biochemistry and Molecular biology (2nd Ed.), Benjamin/Cumin, 1993
7. Freifelder: Physical Biochemistry (2nd Ed.), Freeman, 1982
8. Holme and Peck: Analytical Biochemistry (3rd Ed.), Tata McGraw Hill, 1998
9. Plumer: An Introduction to Practical Biochemistry (3rd Ed.), Tata-McGraw Hill, 1990
10. Switzer and Garrity: Experimental Biochemistry 92nd Ed.), Freeman, 1999
11. Wilson and Walker: Practical Biochemistry (3rd Ed.), Cambridge Univ. Press, 2000

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M.Sc., I SEMESTER
SC – 1.5 CHRONOBIOLOGY

48 hrs

Course Outcome:

After completing the course student will be able to

1. Understand the concept of Chronobiology
2. Identify the way by which circadian rhythms affect life from the genome to the complex behaviour of the individual
3. Acknowledge the role of Chronobiology and chronodisruption on several physiopathological events
4. Acknowledge the input of the synchronizers on homeostasis
5. Characterize the biological relevance of several chronotypes
6. Acknowledge the relevance of circadian rhythms on therapeutic interventions
7. Acknowledge the importance of scientific research on Chronobiology
8. To interpret study designs and scientific parameters related to Chronobiology.

UNIT I: Introduction: **4 hrs**

History, Biological rhythms, Biological clocks, Significance of biological timekeeping

UNIT II: Biological rhythms: **10 hrs**

A. Types of rhythms- Circadian, Circatidal,Circalunar, Circannual
B. Methods of measurement
C. Properties: Entrainment, Re-entrainment, Phase angle difference, Freerun, Phase shift, Phase response curve, Arrhythmia.

UNIT III: Factors influencing biological rhythms: **10 hrs**

A. Environmental: Photoperiod -Photoreception and photo-transduction;
   The physiological clock and measurement of day length;
   Role of photic and non-photic cues in seasonality,Other zeitgebers
   Reversal of roles of principal and supplementary cues.
B. Evolution of photoperiodism: comparative studies; Circannual rhythms and seasonality.

UNIT III: Circadian pacemaker system: **8 hrs**

A. Suprachiasmatic nuclei, B. Pineal gland, C. Optic lobes.

UNIT IV: Molecular basis of circadian rhythms **8 hrs**

A. Clock genes, B. Drosophila, C. Mouse

UNIT V: Applied Chronobiology: **8 hrs**

A. Human circadian rhythms: Melatonin: Input or output signal of the clock system, Clock function (dysfunction); Human health and diseases
B. Applications of circadian rhythm principles: Jet-lag/shift work, Depression and

sleep disorders, Chronopharmacology and Chronotherapy

TUTORIALS **2X16=32 Hrs**

References

1. Binkley, S. (1990): The clockwork sparrow: time, clocks, and calendars in biological organisms, Prentice-Hall, New Jersey.
2. Chandrashekaran, M. K. (1985): Biological rhythms, Madras Science Foundation, Chennai.
3. Jay. C. Dunlap, Jennifer. J. Loros, Patricia J. DeCoursey (ed). 2004: Chronobiology Biological Timekeeping, Sinauer Associates, Inc. Publishers, Sunderland, MA, USA
4. Nelson, R. J. (2000) An Introduction to Behavioural Endocrinology, 2nd edition, Sunderland Publishers, Massachusetts.
5. Saunders D.S., C.G.H. Steel, X., afopoulou (ed.)R.D. Lewis. (3rd Ed) 2002: Insect Clocks, Barens and Noble Inc. New York, USA
6. Shapiro, C. M. and Heslegrave, R. J. (1996): Making the shift work, Joli Joco Publications, Inc. Toronto.
7. Vinod Kumar (ed 2002) : Biological Rhythms Narosa Publishing House, Delhi/ Springer-Verlag, Germany

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M.Sc., I SEMESTER
SC – 1.6 HISTOLOGY AND HISTOPATHOLOGY

48 Hrs

Course Outcome:

After completing the course student will be able to

1. Understand the applications of dyes and its classification.
2. Know the functional morphology of various mammalian organs.
3. Imbibe the knowledge on histochemical techniques.
4. Describe the etiology and pathology of liver cirrhosis and atheroscleorsis.
5. Explain histopathology of breast and prostate tumours.

UNIT – I Basics of Histology **8Hrs**

A. Objectives and applications
B. Tissue fixation : Objectives, methods, chemical fixatives-types and chemistry of fixation; Physical methods-:freezing and microwave fixation; choice of fixatives, fixation artifacts.
C. Dyes. –Natural and Synthetic, Classification

UNIT-II Functional Morphology (mammalian) **8 Hrs**

A. Histological organization of GI tract- stomach and intestine,
B. Histological organization of lungs & kidney
C. Histological organization of spleen & thymus,
D. Bone and bone marrow.

Unit-III Histochemistry **8 Hrs**

A. Principles and methods of application
B. Classical histochemical Techniques: for localization of glycoproteins (PAS), nucleic acids (Feulgen) and steroid dehydrogenase activity.

Unit-IV Immunohistochemistry **8 Hrs**

A. Principles, method of application
B. Imunohistochemistry techniques for localization of proteins in endocrine cells (Pituitary cell types or islet of Langherhans)

C. Immunofluorescence: In situ hybridization of nucleic acids

UNIT-V Histopathology **8 Hrs**

A. Morphological alterations in cells due to disease,
B. Types of degeneration: clouding, hyaline, hydrophic and fatty degeneration.
C. Etiology, pathogenesis and histopathology of Liver cirrhosis and atheroscelerosis
D. Neuropathology of alcoholism and methanol poisioning.

Unit-VI Histopathology of tumors **8 Hrs**

A. Malignant and non-malignant
B. Types of carcinoma
C. histopathology of breast and prostate tumors

PRACTICALS **2x8= 16 Hrs**

I. Histology:

1. Microtomy and staining: Hematoxylin-eosin - Demonstration 2x2=4 hrs
2. Histology: 2x2=4 hrs

Observations of permanent slides of mammalian organs – stomach, intestine, spleen, liver, kidney, lungs, testis, epididymis, vas deferens, ventral prostate, seminal vesicle, ovary, uterus and Fallopian tube.

II. Histometry: **2x3=6hrs**

Histometrical measurements and statistical analysis of some tissues.

III. Histopathology: **2x1=2hrs**

Study of histopathological changes (permanent slides) – gastric ulcers, cirrhosis of liver, breast tumors, cystic follicles of ovary, pancreas in diabetics, cryptorchid testis and leukemia.

REFERENCES:

1. Boyd,W. 1976:A text book of Pathology. Structure and function in disease, 4th edition. Lea and Fibiger, Philadephia.
2. Pearse, A.G.E. (1980): Histochemistry, theoretical and Applied ,J & A, Churchill Ltd., London.
3. Rogers, A.W.(1983): Cells and Tissues, An introduction to Histology and Cell Biology, Academic Press, NY.
4. Telford, I.R. and Bridgman,C.F.(1990). Introduction to Functional Histology, Harper and Row, NY.

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M.Sc., II SEMESTER
HC – 2.1 CHORDATA

32 Hrs

Course Outcome:

After completing the course student will be able to

1. Understand the classification of chordates
2. Give some examples and basic characteristics of some examples of protochordates
3. Give some examples and basic characteristics of some examples of vertebrates
4. Understand the evolutionary pathway and its significance
5. Analyse adaptive characters of animals coming under different vertebrate classes

UNIT I General characters and outline classification of Chordata **8hrs**

A. General and Comparative study: Comparision of three Protochordates, Subphyla in terms of General comparision, Habits and habitats,

B. Alimentary canals and associated glands, Pharynx, Food and feeding and excretory system in Protochordates.
C. Adaptive radiation in vertebrates – fishes, amphibians, reptiles, aves and mammals

UNIT II **8hrs**

A. **Integument and its Derivatives**: Epidermal Integument or Skin Functions, Structure & its Derivatives (Glands, Scales and scutes, digital cornifications, horns, feathers, hairs), Integument in different classes of Chordates.
B. **Nervous system**- Development of Brain, spinal cord, Peripheral nerves and sense organs

UNIT III **8hrs**

A. **Respiratory System**: Introduction Respiratory organs: Gills (Internal or true gills, External or Larval gills). Lungs and Ducts, Accessory Respiratory organs and Swim Bladders.
B. **Circulatory system:** Evolution of heart and aortic arches

UNIT IV **8hrs**

A. **Digestive System:** Introduction Embryonic Digestive Tract
Alimentary Canal: Divisions, Digestive Glands
B. **Urinogenital System:** Vertebrate kidneys and ducts, Gonads and their ducts

CHORDATA PRACTICALS **4x16=64 Hrs**

1. **Protochordates**: Specimens:1)Amphioxus , Herdmania
Slides- Salpa (sexual), Doliolum

2. **Fishes** : 1) *Rhinobatus* 2) *Hippocampus* 3) Goldfish (aquarium fish) 4) *Clarius*
5) *Anabas* 6) Coffer fish 7) *Acipenser* 8) *Periopthalmus* 9) *Triacanthus*
10) *Notopterus* 11) *Exocoetus* 12) *Diodon hysterix* 13) *Echenenis neucrates*

3. **Amphibians** : 1) Ichthyophis 2) Axolotl Larva 3) *Rana tigrina* 4) *Amblystoma*

4. **Reptiles** : 1) *Calotes* 2) *Mabuya* 3) Chameleon 4) *Phrynosoma* 5) *Chelone mydas*
5) Varanus 6)*Naja naja* 7) Krait 8) Hydrophis 9)Viper

5. **Birds** : 1) Blue jay 2) Indian koel -male and female 3) Kite

6. **Mammals** : 1) Guinea pig 2)Domestic cat 3) Loris 4) *Megaloderma lyra* (bat)
5) Pangolin

7. **Integuments of vertebrates**: Scales of fish, Hoofs, nails, horns, claws,
plastron and carapace of tortoise, snout of saw fish

8. **Osteology :**
1) **Skull and lower jaw**:- a) Crocodile b) Bird c) Carnivore mammal (dog)
d) Herbivore mammal (horse)
2) **Types of vertebrae**:- a) Procoelous b) Ophisthocoelous c) Amphicoelous
d) Amphiplatian e) Heterocoelous f) Axis and atlas vertebrae.

II. Study of following systems in rat by employing computer animation/charts:
a) Circulatory system b) Nervous system c) Reproductive system
d) Digestive system e) Sense organs f) Urinary system

REFERENCES :

1. Alexander, R. M. 1975. The Chordata. Canbridge University Press, London.
2. Barrington, E.J.W. 1965. The Biology of Hemichordata and Protochordata, Oliver and Boyd, Edinbourgh.
3. Colbert, E. H, 1969. Evolution of the vertebrates, John Wiley and Sons, Inc., N.Y.
4. Kent, C. G. 1954. Comparative anatomy of vertebrates
5. Kingsley, J.S. 1962. Outlines of Comparative anatomy of vertebrates. Central book depot Allahabad.

M.SC., II SEMESTER
HC – 2.2 ANIMAL PHYSIOLOGY

32 Hrs

Course Outcome:

After completing the course student will be able to

1. Understand the mechanism of transport of molecules, stepwise release of energy , aerobic and anaerobic respiration
2. Describe the physiology of digestive and respiratory system of human beings.
3. Understand the blood composition, types, groups and circulatory system.
4. Describe the physiology of excretory system and nervous system of human beings.
5. Know the physiology of sense organs, muscles and reproductive system.

UNIT I: Membrane Transport, Bioenergetics & Circulation — 8 Hrs

A. Membrane Transport:

Molecular mechanisms of passive and active transport.

B. Bioenergetics:

a) Energy – Concept, laws of thermodynamics
b) Redox potential
c) Stepwise release of energy through cytochromes, production of ATP, uncoupling of oxidative phosphorylation,inhibitors.
d) Anaerobic and aerobic breakdown of glucose, alternate pathway – HMP shunt and glucoronic acid pathway.
e) Citric acid cycle as common metabolic pathway.

C. Circulation:

a) Major types of body fluids and their composition.
b) Neurogenic and myogenic hearts.
c) Mammalian heart – cardiac cycle, ECG.

UNIT II: Physiology of excitation & Excretion — 8 Hrs

A. Muscle Physiology:

a) Molecular organization of sarcomere.
b) Mechanism of contraction with emphasis on sliding filament and Davies models, regeneration of storage phosphate.
c) Physiological adaptations of muscles for jumping, swimming and flight.

B. Neurophysiology:

a) Axonal and synaptic transmission of nerve impulses.
b) Synaptic integrity, synaptic plasticity.
c) Molecular mechanism of sensory transduction and neural output in receptor cells.

C. Excretion:

a) Comparative physiology of excretion in animals- Nitrogenous wastes and waste elimination.
b) Mammalian kidney- Structure and physiology of urine formation.

Unit III: Basic Concepts of Endocrinology **8 hrs**

A. Chemical messengers:
Autocrine, Paracrine and endocrine secretions,
Types of hormones, an overview of human endocrine system

B. Hormone synthesis: Peptide and steroid hormones.
Role of Hormones in homeostasis- Glucose and Water balance

C. Hypothalamus and pituitary gland:
Structure, function and control of hypothalamic hormones.
Pituitary hormones and their physiological actions
chemical structure and. Feedback regulation. Pathophysiology.
Hyppothalamo - hypophysial portal system

D. Pineal gland–Structure and function**.**

Unit IV: **8 hrs**

A. Thyroid gland: Structure, function and biosynthesis of thyroid hormone

B. Parathyroid : Structure and PTH – Calcitonin – Role of hormones in calcium and phosphate metabolism.

C. Adrenal gland hormones
Adrenal cortex hormones: Corticoids: role played in Stress management – Aldosterone and the rennin- angiotensin system
Adrenal medullary hormones: Catecholamines as emergency hormones

D. Gastrointestinal hormones: Secretion, control and function

E. Pancreatic Hormones: Insulin and glucagons, their role in the regulation of Carbohydrate, protein and lipid metabolisms.

ANIMAL PHYSIOLOGY PRACTICALS **4x16=64 Hrs**

1. Estimation of Proteins by Lowry *et al* method. (in tissue sample from slaughter house)
2. Determination of serum cholesterol. (Clinical sample)
3. Determination of glucose content by Anthrone method. ((in tissue sample from slaughter house)
4. Estimation of liver and skeletal muscle glycogen. (in tissue sample from slaughter house)
5. Determination of serum/ blood urea by DAMO method. (Clinical sample)
6. Estimation of creatinine in the urine sample.
7. Total count of RBC and WBC.
8. Differential count of WBC
9. Response of RBC's to Hypertonic, hypotonic and isotonic solutions
10. Observation of permanent slides of T.S of endocrine glands
    a. Pituitary gland b. Thyroid gland c. Adrenal gland d. Pancreas
11. Identification of chemical structures of steroid hormones

REFERENCES:

1. Adler N. T (1981) Neurcendocrinology of Reproduction, Physiology and Behaviour.Austin, C. R and R. V. Short (eds) (1972) Reproduction in mammals. (1) Germ cells andFertilization (2) Embryonic and Foetal development (3) Hormones in Reproduction (4) Reproduction pattern (5) Artificial control of reproduction, Cambridge University press,London.
2. Barrington, E. J. W (1976) An introduction to general and comparative endocrinology,Oxford University press, London
3. Raghavendra Puri (2003) Mammalian endocrinology Vol. I & II, Dominant Publishers and Distributors, New Delhi.
4. Eckert, R and Randall, D. 2002, Animal physiology, 2nd Edn, W.H..Freman

5. Guyton. A.G. 1986, Text book of Medical Physiology, 7th Edn., Saunders Publication

M.Sc., II SEMESTER
HC – 2.3 ENTOMOLOGY

32hrs

Course Outcome:
After completing the course student will be able to

1. Understand insects encountered in agricultural fields.
2. Envisage an insight on economically important pests of various foods, fiber and household
3. Understand various insect pest management methods and its significance
4. Learn to apply various agricultural equipment and understand the effect of chemicals and its dosages in agricultural pest management
5. Learn to apply the pest control methods wisely to minimise ecological backlash
6. Discuss the evolutionary significance of insect plant interaction and insect animal interaction.

Unit I: General Entomology **10 hrs**

A. Classification of class Insecta up to orders with suitable examples; Integument appendages.

B. Insect Endocrinology

I. Insect Hormones and their regulation**:** Chemistry and functions of hormones, Hormones in metamorphosis, Ecdysis and Diapause

II. Semiochemicals:**:** Allelochemicals and Pheromones (Primer & releaser)

Unit II: Agricultural Entomology **10hrs**

A. Role of insects in plant pollination

B. Insects pests: Classification and categories of pests, origin and emergence of pests, pest out breaks and pest resurgence
Structure, life history, significance, nature of damage and control methods of major pests of sugarcane, Paddy and Coconut.

C. Structure, life history, significance, nature of damage and control measures of stored grain pests: (a) *Sitophilus* (b) *Trogoderma* (c) *Rhizopertha* (d) *Tribolium* (e) *Bruchus* (f) *Sitotruga* (g) *Ephestia*

Unit III: General and household insect pests **06hrs**

A. Structure, life history, significance, nature of damage and control measures of following general pests: (a) grasshoppers & locusts (c) termites (d) aphids (e) hairy caterpillars

B. Household pests: Cockroaches, Ants, Wasps, Silverfish, furniture beetle, and their control

Unit IV: Medical Entomology **06hrs**

A. Insect vectors: Role of insect as vectors of human diseases (Malaria, filariasis, Kala azar and their control)
Mosquitoes as pests and their control.
Housefly: A human health hazard and its control

B. Arboviral diseases: Dengue, chicken gunya, swine flu.

PRACTICALS: **4x16=64 Hrs**

1. Collection and preservation of dead insects for systematic studies & field report 4x4=16 hrs
2. Identification of different insects upto orders- House fly, Cockroach :
Mosquitoes, stored grain beetles, destructive insects, important crop and household pests
4x4=16 hrs

4. Fixing and preservation of dead insects by Plastination technique. 4x4=16 hrs
5. Field studies of insects to understand their habit: Ants, Butterflies, termite, wasps, Moths. 4x2=08 hrs
6. Study of insect mouth parts: Mosquito, Cockroach, House fly, Butterfly 4x2=08 hrs

REFERENCES:

1. Awasti V.B. 2009 Introduction to general entomology 3rd Ed. Scientific publication (India), Jodhpur
2. Awasti V.B.2007, Agricultural Insect Pests and their control. Scientific publishers (India) Jodhpur
3. Trigunayat M.M. 2009, A Mannual of practical entomology, scientific publishers, Jodhpur, India.
4. Dhaliwal G.S. Ramsingh and B.S. Chillar 2006, Essentials of Agricultural entomology. Kalyani Publishers, New Delhi.
5. L . K Jha. Applied Agricultural Entomology. New central book agency. Culcutta

M.Sc., II- SEMESTER
SC – 2.4 DEVELOPMENTAL BIOLOGY

48 Hrs

Course Outcome:

After completing the course student will be able to

1. Understand the molecular concepts of developmental biology during fertilization.
2. Know about Noble prize concepts during frog development viz., Nucleocytoplasmic interactions.
3. Explain on axis development in drosophila.
4. Describe endocrine and molecular control in metamorphosis of insects and amphibians.
5. Explain the various stages of chick embryonic development.

Unit I:

A) Introduction : Descriptive V/s. Experimental Embryology **8hrs**

B) Fertilization : a) An overview of structure and differentiation of egg and sperm
b) General sequence and molecular events during fertilization

Unit II: Early development - I **8 hrs**

a) Nucleocytoplasmic interactions in early development: An overview of Nuclear transplantation experiments in Amphibians and mammals
b) Creations of multicellularity: Cleavage-Regulatory mechanism
c) Gastrulation: Morphogenetic movements and regulatory mechanisms in amphibian and mammalian embryo.

Unit III: Early development - II **8hrs**

a) Morphogenetic determinants and their role in development:
Yellow cytoplasm in Ascidians, Polar body in Mollusca, Pole plasm in *Drosophila*

b) Laying down the embryonic body plan :
Determination of embryonic axes in *Drosophila* – Anterior-posterior (maternal effect genes) & Dorsoventral; Amphibians (cell-cell interaction) & Mammals (Hox Genes)

c) Cell lineage studies and cell death genes in *Caenorhabditis elegans*.

Unit IV: Morphogenesis –I **8 hrs**

a) Early embryogenesis in Drosophila : Regional specification by. Segmentation genes: Gap genes, Pair rule genes, Segment polarity genes, and Homeotic genes.
b) Cellular differentiation and morphogenesis:
i. Neuronal v/s epidermal fate specification in *Drosophila*.

ii. Vulval induction in Caenorhabditis elegans.

Unit V: Morphogenesis-II **8 hrs**

a) Role of Cell Adhesion molecules in morphongenesis : Cadherins and Fibronectins
b) Genetics of imaginal discs and transdetermination
c) Limb development-an over view :
i. Proximo-distal axis specification in developing limb.
ii. Cell death and formation of digits.

Unit VI: Post embryonic development **8 hrs**

a) Metamorphosis : Endocrine and molecular control of metamorphosis in insects and amphibians b) Types of growth c) Regeneration : Types, Blastema formation,Sources of cells for regeneration d) Abnormal development as seen in Teratogenesis.

PRACTICALS **16X2=32Hrs**

1. Study of internal changes during early development of frog & chick (permanent slides) 3X2=06hrs
2. Development of chick-Embryo mounting-permanent preparation 2X2=04hrs
3. Study of early developmental stages of *Drosophila* (Live Observation of embryo) and dechorionation and observation of embryos 2X2=04hrs
4. Study of Imaginal discs – the precursors of adult structures in *Drosophila* 3X2=06hrs
5. Demonstration of window technique to observe chick embryo development 2X2=04hrs
6. Effect of thyroid hormone on development in frog 2X2=04hrs
7. Study of various developmental stages in frog up to tadpole stage 2X2=04hrs

REFERENCES:

1. Balinsky, B.I., 1965. An introduction to embryology, W.B.Saunders company.
2. Gilbert, S. F. 2006, Developmental Biology, 8th Ed.Sinauer Associates Inc.,
3. Kalthoff, 2000, Analysis of Biological Development, 2nd Ed., McGraw-Hill Science, New Delhi, INDIA. Massachusetts, USA.
4. Vasudeva Rao, 1994. Developmental Biology: A modern synthesis, Oxford & IBH, New Delhi.
5. Wolpert, Beddington, Brockes, Jessell, Lawrence,Meyerowitz, (3rd Ed., 2006)Principles of Development, , Oxford University Press, New Delhi, INDIA.
6. Wolpert, L, Beddington, R Jessell, T. Lawrence P, Meyerowitz, E, Smith J., 2001, Principles of Deveopment Oxford University Press Oxford.
7. Ann Kiessling and Scott C. Anderson, Human Embryonic Stem Cells: An Introduction to the Science and Therapeutic Potential, 2003. Jones and Bartlett Publishers, Boston MA, USA

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M.Sc., II SEMESTER
SC – 2.5 IMMUNOLOGY

48hrs

Course Outcome:

After completing the course student will be able to

1. Outline the key components of the innate and adaptive immune responses.
2. Describe about cell types and organs which are involved in an immune response¬
3. Describe the Infectious diseases, hypersensitivity, autoimmune disorders,¬ immunodeficiency diseases

Unit I: Introduction to immunity **8hrs**

A. History; types of immunity – Innate and acquired immunity.
B. Cells and Organs of immune system: Cells: Lymphocytes (T & B cells), monocytes, macrophage; eosinophills, basophills, neutrophils and mast cells.
C. Primary and secondary lymphoid organs: Bone marrow, Thymus, Spleen, Lymph nodes

Unit II: Antigens and Immunoglobulins **8hrs**

A. Antigens: factors influencing immunogenicity, adjuvant, epitope, hapten
B. Immunoglobulins: Basic structure of the immunoglobulin;
Types and functions of immunoglobulins.
C. Monoclonal antibodies:Antigen-antibody reactions

Unit III: Immune response **8hrs**

A. Humoral and cell mediated immune responses
B. Primary and secondary immune modulation; Cytokines; role of complement system in immune response (Classical pathway, Alternate pathway);
C. Immune response against bacterial (tuberculosis), parasitic (malaria) and viral (HIV) infections;

Unit IV Immunotechniques **8hrs**

A. Agglutination; Precipitation;
B. Immunofluorescence; RIA, ELISA, Immuno-electrophoresis and Western blotting.

Unit V Major histocompatibility complex and Hypersensitivity **8hrs**

A. Transplantation and graft rejection,
B. Genetic organization of H2 and HLA complexes, HLA typing;
C. Immediate and delayed hypersensitivity.

Unit VI Vaccines and Vaccination **8hrs**

A. Types of Vaccines and their significance
B. Vaccine delivery systems.
C. Congenital and acquired immunodeficiencies

TUTORIALS **2X16=32 Hrs**

References:

1. Austyn, J.M. and Kathym, J. Wood. 1993. Principles of cellular and molecular Immunology. Oxford University Press. Oxford.
2. Benjamin, Elisunshine, Geoffrey Leskowitz.1996. Immunology: A short course. 3rd Edition. New York.
3. Kubey, J.M. 1990. Essential Immunology. 6th Edition. Blackwell Scientific Publication, New York.
4. Rao, C.V. 2002. An introduction to Immunology. Narona Publishing House, New Delhi.
5. Rotti, I. 1994. Essential Immunology. Blackwell, London.
6. Stibes, D.P. and Terr, A.I. 1991. Basic and Clinical Immunology. 7th Edition. Appleton and Large. California.

M.Sc., II SEMESTER
SC – 2.6 EVOLUTIONARY BIOLOGY

48 Hrs

Course Outcome:
After completing the course student will be able to

1. Understand that many of the organisms that inhabit the Earth today are different from those that inhabited it in the past
2. Understand that the propositions underlying Darwin's theory of evolution.
3. Explain adaptation, providing examples from several different fields of biology
4. Explain how the molecular record provides evidence for evolution
5. Understand the Human origin and evolution.

UNIT I Emergence of concept of evolution: 8 Hrs

A. Pre Darwinian concepts, Darwinism and its impact in the development of synthetic theory.
B. Neodarwinism: Birth of population genetics, Components of population genetics, Mendelian population, gene pool, allele frequencies and genotype frequencies,

UNIT II Speciation: **8 Hrs**

A. Concept of species,
B. Types of species
C. Models of speciation,
D. Patterns and mechanisms of reproductive isolation,
E. Hybridization, polyploidy and speciation.

UNIT III Molecular evolution 8 Hrs

A. Phyletic gradualism and punctuated equilibrium.
B. Micro and macroevolution.
C. Molecular evolution: Selectionists theory of evolution, Neutral theory of evolution and Molecular clock and emergence of non-darwinism,

UNIT IV Phylogeny 8 Hrs

A. Phylogenetic trees : Construction with nucleic acid and amino acid sequences,
B. Types of trees and Techniques employed in construction of phylogenetic trees,
C. Molecular phylogenetics of Homo sapiens.

UNIT V Population genetics and Evolution 8 Hrs

A. Gene pool, gene frequency, Hardy-Weinberg Law.
B. Destabilizing forces of evolutionary equilibrium (Mutation, Migration, Selection, Meiotic drive and genetic drift).
C. Founder effect, Isolating mechanisms and speciation.
D. Micro Macro and Mega evolution, Co-evolution.

UNIT VI Genome and Evolution **8 Hrs**

A. Genes and gene clusters
B. Origin of new genes by gene duplication (Ohno's concept)
C. Selfish DNA
D. Karyotypic evolution (Drosophila).

TUTORIALS 2X16=32Hrs

REFERENCES:

1. Dobzhansky Th, (1951) Genetics and origin of species, 3rd Edn. Chapman and Hall, London.
2. Dobzhansky Th, Ayala F.J, Stebbins G.L and J.M. Valentine, (1976) Evolution, Surjeet Publication, New Delhi.
3. Futuyama D.J (1986) Evolutionary Biology, Sinuauer Associates Inc. USA
4. Hartl D.L (2000) A primer of population genetics, Sinuauer Associates Inc. USA
5. Jha A.P (1992) Genes and Evolution - John Wiley Publicaion, New Delhi

6. King M (1993) Species evolution - The role of chromosomal change. The Cambridge University Press, Cambridge

M.Sc., III SEMESTER
HC – 3.1 MOLECULAR BIOLOGY AND BIOTECHNOLOGY

32 hrs

Course Outcome:
After completing the course student will be able to

1. Know nucleic acids, DNA replication and its mechanism.
2. Understand transcription and its modifications.
3. Explain genetic code, enzymes, factor and the process of translation.
4. Analyse gene regulation, lytic and lysogenic cycles in prokaryotes.
5. Understand gene regulation in eukaryotes.
6. Explain molecular mechanism of DNA damage repair.

Part A: Molecular Biology

Unit I Introduction to nucleic acids **8hrs**

A. DNA Replication: i) Enzyme components of replication unit ii) Mechanism with emphasis on Dna A in initiation, Co-ordinated synthesis, End replication in eukaryotes iii) Fidelity.
B. Transcription: i) Transcription apparatus and process (RNA polymerase, cisregulatory elements, terminators, transcription factors). ii) Post transcriptional modifications of mRNA in eukaryotes (G-cap, Poly tail, Splicing).
C. Translation: i) Genetic code (major features, usage of different codons). ii) Enzymes, factors and the process (Aminoacyl t-RNA synthatase, Peptidyl transferase, IFs, EFs, RFs and Ribosome)

Unit II Gene regulation **8hrs**

A. Gene regulation in Prokaryotes: (i) Regulation at transcription initiation: Eg. lac operon (+ve and -ve control) (ii) Regulation beyond transcription initiation: trp attenuator (iii) Regulation in Lambda Phage - Lytic and lysogenic cycle induction.
B. Gene regulation in Eukaryotes: (a) Transcriptional activators (b) Transcriptional repression: (i) direct repression, indirect repression (ii) Gene silencing by modification of histones and DNA (c) RNA interference
C. Molecular basis of homologous recombination: Models and protein machinery
D. Molecular mechanisms of DNA damage repair**.**

Part B: Biotechnology

Unit III: **8 hrs**

A. **Genetic engineering:**
Definition, objectives and outline of recombinant DNA technology procedure.
Enzymes**:** Restriction Enzymes; DNA ligase, Klenow enzyme,
T4 DNA polymerase, Polynucleotide kinase, Alkaline phosphatase.
Cloning vectors: Plasmids, Phages, Cosmids, Phagemids, Artificial chromosomes (YAC, BAC, HAC),

B. **Cloning:**
Construction of Genomic and cDNA libraries.
Indetification of Recombinants: Genetic selection, Use of chromogenic substrates, Insertional inactivation.
Analysis of recombinant DNA clones: Characterization of clones, Restriction mapping, Southern hybridization.
Polymerase chain reaction and DNA sequencing-Maxam and Gilbert's method, Sanger's method, Automated DNA sequencing

Unit IV: **8 hrs**

C. **Applications of Biotechnology:**
Production of medicinally important products – vaccines, Gene therapy, AIDS therapy, Biofertilizers, biopesticides, medicine and human health

D. **Animal Biotechnology**
Animal cell and Tissue culture: Principles of cell culture, cell and tissue types, cell lines, transformation.
Cell and tissue culture media: Natural and defined, role and components of serum in culture.
Applications of tissue culture: Tissue culture in biomedical research karyological studies, amniocentesis, mutagenesis, Cytotoxicity assays.

PRACTICALS **4x16=64 Hrs**

1. Extraction of DNA by rapid method.
2. Extraction of DNA by standard method.
3. Estimation of DNA concentration by Diphenylamine method.
4. Localization of DNA in prefixed paramecium slides by Feulgen staining
5. Localization of nucleic acids in prefixed paramecium slides by Toluidine blue staining
6. Estimation of RNA concentration by Orcinol method
7. PCR amplification of DNA and gel electrophoresis.
8. Restriction digestion and gel electrophoresis.
9. Isolation of plasmid DNA from bacteria.
10. Molecular biology problems

REFERENCES

1. Griffiths A J F, H. J. Muller, D. T. Suzuki, R. C. Lewontin and W. M. Gelbart 2000. An introduction to genetic analysis. W. H. Greeman. New York.
2. Lewin, B 2003 Genes VIII. Oxford University Press. Oxford
3. Dale, Jeremy W and Schantz, Malcom V. 2002. From Gene to Genomes. John Wiley and Sons Ltd,NY,USA
4. Das, H.K. 2007. Text book of Biotechnology.Wiley India Pvt. Ltd. New Delhi
5. Freshney, Ian, R. 2006. Culture of Animal Cell (5th edn).Wiley- Liss publications
6. Pandian, T.T. and Kandavel, D.2008. Text Book of Biotechnology. I.K International Publishing House, New Delhi. 47
7. Primrose, S.B., Twyman, R.M., and Old, R.W. 2001. Principle of Gene Manipulation (6th edn). Blackwell Science Ltd, London
8. Singh .B.D. 2006. Biotechnology. Kalyani Publishers, New Delhi
9. Sobti, R. C. and Pachauri, Suparna S. 2009. Essentials of Biotechnology. Ane Books Pvt. Ltd. New Delhi

M.Sc., III SEMESTER
HC – 3.2 REPRODUCTIVE BIOLOGY

32 hrs

Course Outcome:
After completing the course student will be able to

1. Understand structure and function of reproductive organs
2. Explain the structure of reproductive cells
3. Describe the role of internal cues in reproduction
4. Describe the role of external factors in reproduction
5. Analyse the role of endocrine glands and their secretions in reproduction
6. Identify the factors affecting fertility
7. Know different types of assisted reproductive technologies.

UNIT I: Male reproduction: **8 hrs**

A. Functional morphology of male reproductive system
B. Kinetics of spermatogenesis – wave and cycle
C. Hormonal control of mammalian testis and spermatogenesis
D. Ultrastructure of spermatozoa
E. Abnormalities of sperm
F. Brief description of histomorphology and hormonal control of male accessory organs viz., epididymis, vas deferens, seminal vesicles, ventral prostate, bulbourethral gland and preputial gland
G. Sperm maturation – morphological and biochemical events, influence of accessory organ secretions
H. Biochemistry of semen and capacitation

UNIT – II Female reproduction : **8 hrs**

A. Origin and migration of primordial germ cells; genetic and hormonal control of differentiation of gonads and gonadal ducts in mammals.
B. Female Reproductive System-Functional morphology of mammalian ovary, Fallopian tube and uterus.
C. Ovarian steroid hormones and their actions

UNIT III: Reproductive cycles in Mammals: **8 hrs**

A. Comparison of estrous and menstrual cycles
B. Menstrual cycle : Different phases, changes in the ovary and uterus and hormonal control
C. Implantation – Process, Types and hormonal control
D. Pregnancy – length of gestation, hormonal control
E. Parturition – Process of birth and influence of hormones
F. Lactation – Hormonal control of mammary gland, development and lactogenesis

UNIT – IV: Fertility and reproductive management **8 hrs**

A. Fertility control – Need, principles of different male and female temporary and permanent contraceptive methods.
B. Assisted Reproduction: Causes of infertility, Artificial insemination, different methods of assisted reproduction (*In-vitro* Fertilization, Gamete Intra Fallopian tube Transfer, Zygote Intra Fallopian tube Transfer).

PRACTICALS **16X4=64 hrs**

1. Demonstration of surgical technique by video clipping
2. Counting of spermatozoa in semen sample collected from volunteers
3. Staining of spermatozoa for abnormalities in semen samples collected from volunteers /clinical samples
4. Study of different contraceptive devices
5. Observation of permanent Histology slides
   a. Comparative morphology of ovary
   b. Comparative morphology of testis
   c. Comparative study of male accessory organs
   d. Comparative study of female accessory organs
6. Observation of permanent slides of T.S of endocrine glands
   a. Pituitary gland b. Thyroid gland c. Adrenal gland d. Pancreas

REFERENCES

1. Adler N. T (1981) Neurcendocrinology of Reproduction, Physiology and Behaviour.
2. Austin, C. R and R. V. Short (eds) (1972) Reproduction in mammals. (1) Germ cells andFertilization (2) Embryonic and Foetal development (3) Hormones in Reproduction (4) Reproduction pattern (5) Artificial control of reproduction, Cambridge University press,London.
3. Barrington, E. J. W (1976) An introduction to general and comparative endocrinology,Oxford University press, London
4. Raghavendra Puri (2003) Mammalian endocrinology Vol. I & II, Dominant Publishers and Distributors, New Delhi.
5. Muneeth Kainth (2005) Chordate Embryology, Dominant Publishers and Distributors, New Delhi.
6. Moudgal, N. R. Yoshinaga K Rao, A. J. and P. R. Adiga (1991) Perspectives in primate reproductive biology. Wiley Eastern Ltd., New Delhi, Bangalore
7. Paul Wassar man and Jimmy D. Neill (2005) Knogbil and neill's physiology of reproductive volume 1st and 2nd and 3rd edition
8. Jones, R. E (1991) Human Reproductive Biology press N.Y
9. Knobil, E and Neil J. D (1994) The physiology of reproduction, Vol. I & II. Raven press, New York.

M.Sc., III SEMESTER
HC – 3.3 ECOLOGY AND WILDLIFE

32 hrs

Course Outcome:

After completing the course student will be able to

1. Demonstrate and Understand ecological relationships between organisms and their environment.
2. Present an overview of diversity of life forms in an ecosystem.
3. Explain and identify the role of the organism in energy transfers
4. Describe the Habitat ecology and Resource ecology
5. Understand the types of environmental Pollution and their management
6. Scope, Values and Conservation strategies of wildlife.

Part-A Ecology

UNIT - I **8 hrs**

A. Ecosystem: Historical account, Scope, Basic concepts and Approaches to the study of Environmental Biology. Components of Environment - An overview of abiotic factors and Biotic factors. Concepts of habitat and Ecological niche. Ecotone and Edge effect. Food chains, Food-webs and their structure in Ecological Pyramids in aquatic, terrestrial and parasitic Environments.

B. Population Ecology: Introduction. An overview of important population attributes – Density, Natality, Growth rates, Growth forms and concept of carrying capacity, Patterns in human population growth and its explosion -Remedial measures. Mortality - life tables and survivorship curve, sex ratio, age distribution, dispersal and dispersion, aggregation and Allee's principle, population fluctuation and cyclic oscillations and Population interactions.

UNIT - II **8 hrs**

A. Community Ecology Concept of community - community structure and attributes, concept of climax Species diversity in community and it's measurement- Alpha diversity- Simpson's diversity index, Shannon index, Fisher's alpha, rarefaction. Beta diversity- Sorensen's similarity index, Whittaker's index, Evenness, Gamma diversity. Drivers of species diversity loss and conservation.

B. Bioecology of Freshwater Zooplankton: Definition, Types and adaptations of Zooplankton. Brief study of organizations, life cycles and Ecological importance of Rotifers, Cladocerans, Copepods-Calanoids, Harpacticoids and Cyclopoids, and Ostracods. Mass culturing of Zooplankton.

C. Microbial Ecology: Ecological role, beneficial and pathogenic Microorganisms. Indicator Microorganisms. Role of microorganisms in biodegrading and bioremediation of organic and metal pollution.

Part B Wildlife Biology

UNIT – III **8hrs**

A. Scope and values of wildlife (Ecological, Aesthetic, Scientific, Recreational, Medicinal)

B. Causes of wildlife depletion: Degradation and destruction of natural habitats, Exploitation for commercial purposes, Deforestation, Agricultural expansion, Urbanization and Industrialization, forest fires and hunting.

C. Wildlife corridors, Human-wildlife conflicts

D. Wildlife awareness and education, Wildlife and tribal welfare

UNIT – IV

A. Conservation strategies: Red data book, protected area network, Role of NGOs in conservation.

B. Wildlife act and legislation: Wildlife Protection Act 1972; Biological Diversity Act 2002.

C. Wildlife conservation projects in India (with special reference to Project Tiger, Project Hungul and Gir Project)

D. In-situ conservation: Bioreserves, National parks, Wildlife sanctuaries and Safari's in India

E. Management of Bioreserves, National parks, Wildlife sanctuaries and Safari.

F. Ex-situ conservation: Zoo garden, Management of Zoos, Captive breeding, Artificial insemination, Cryopreservation (techniques and applications) Germplasm banks,

PRACTICALS: **4X16=64 Hrs**

1. Qualitative and Quantitative study of freshwater planktons.
2. Determination of species diversity by Shannon-Weiner Index
3. Determination of species diversity by Simpson's index
4. Field visit to Sewage pond, Natural lake (and if possible river): Collection of water samples and study of physico-chemical parameters such as colour, pH, temperature, conductivity, total solids and turbidity
5. Estimation of Dissolved Oxygen in three natural (sewage, pond and Tap) water samples.
6. Estimation of free Carbon di-Oxide in three natural (sewage, pond and Tap) water samples.
7. To study the relationship between Dissolved Oxygen and free Carbon di-Oxide, if any, in three natural (sewage, pond and Tap) water samples.
8. Determination of BOD in three natural (sewage, pond and Tap) water samples
9. Determination of COD in three natural (sewage, pond and Tap) water samples
10. To study the relationship between BOD and COD, if any, in three natural (sewage, pond and Tap) water samples
11. Collection, observation of planktons (Phytoplankton and Zooplankton) from polluted and non-polluted water bodies.
12. Estimations of bacterial abundance in different water samples – using DEMT.
13. Visit to RMNH, Mysore, to study models of freshwater, marine, estuarine and terrestrial habitats.
14. Survey of Animal Population - to visit different habitats/areas in and around Mysore and collect data on some population attributes, application of Bio-statistical tests to the collected data and its interpretation.
15. Visit to nearby Zoological garden, wildlife sanctuaries, Animal rehabilitation centres.

REFERENCES

1. Begon, Harper and Townsend, 1995. Ecology: Individuals, populations and community. II edition. Blackwell Series, U.S.A.
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4. Emmel, T.C. 1976. Population Biology, Harper and Row publishers, N.Y.
5. Kormondy, E.J. 1978. Concepts of Ecology, Prentice Hall of India Pvt. Ltd., New Delhi.
6. Odum E.P. 1971. Fundamentals of Ecology. III Edition. W.B.Saunder's Co., Philadelphia.
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11. NBA. 2004. The Biological Diversity Act (2002) and Biological Diversity rules (2004). National Biodiversity Authority, India.
12. Saharia, V.B. 1982. Wildlife in India. Natraj Publishers. Dehara Dun.

M.Sc., III SEMESTER
SC 3.4 ETHOLOGY

48 Hrs

Course Outcome:
After completing the course student will be able to

1. Evaluate the learning and instinct behavior.
2. Explain the mechanisms in instinct and behaviour
3. Explain how animals learn
4. Compare learning and instinct behaviour.
5. Analyse any problem about animal behaviour
6. Explain the importance of evolution for animal behaviour.
7. Explain evolution and behaviour.
8. Explain natural selection and behaviour.
9. Explain the relationship between predators and prey
10. Explain social behaviour.

UNIT - I **8 Hrs**

A. Descriptive versus experimental approaches

B. Reflexes and complex behaviour- Latency, after discharge, summation, warm up, fatigue inhibition and feedback control

C. Instinctive Behaviour - Fixed action pattern, Types of sign stimuli and releasers as triggers, Genetic basis of instinctive behaviour.

UNIT- II **8 Hrs**

A. Development and behaviour- Causes of behavioral changes during development, development of bird song.

B. Learning- Classical conditioning experiment, latent and insight learning. Social learning, learning sets and play.

C. Importance of early experience – Critical period- Filial imprinting, Sexual imprinting in birds, Imprinting like process in mammals.

UNIT- III Foraging and anti-predator behaviour **8 Hrs**

i. Anti predator behaviour – avoiding detection through colour and Markings (Mullarian mimicry)

ii. Warning coloration
iii. Batesian mimicry

UNIT-IV Biological communication **8 Hrs**

i. Forms of signals,
ii. Visual communication with suitable examples,
iii. Auditory Communication
iv. Tactile and Chemical communication

UNIT -V Sexual Behaviour **8 Hrs**

i. Hormones and sexual behaviour – Selected examples of courtship and mating behaviour.
ii. Pheromones in Insects and Mammals
iii. Lee Boot, Whitten, Bruce, Collidge and Castro-Vandenberg effect/s
iv. Selected examples of courtship and mating behaviour

UNIT-VI Social Behaviour **8 Hrs**

i. Introduction
ii. Advantages of grouping
iii. Social organization in insects with special reference to ants and honeybees
iv. Social organization in sub human primates
v. Altruism, Kin selection and Genetic control of behaviour

TUTORIALS – On the basis of the proposed chapters. **2x16 = 32 Hrs.**

REFERENCES

1) Goodenough J.E., Mc Guire B. and Wallace R. A. (1993) Perspectives on Animal Behaviour. John Wiley and sons, New York.
2) Tinbergen (2006) Social ehaviour in Animals. J.V. Publishing House Jodhpur India.
3) Vandenbergh. J.E.(Ed) (1983). Pheromones and Reproduction in mammals. Academic Press. NewYork.
4) Agrawal, K.C. 2000. Biodiversity. Agrobios. India.

M.Sc., III SEMESTER
SC – 3.5 POLLUTION AND TOXICOLOGY

48hrs

Course Outcome:

After completing the course student will be able to

1. broader understanding of how science and the scientific method work to address environmental problems.
2. Earth's major systems (ecosystems and biogeochemical cycles), how they function and how they are affected by human activity (population growth, air, water and soil pollution, ozone depletion, global warming, and solid waste disposal).
3. the interaction of human society (urban sprawl, energy use/generation, resource consumption and economics) with the Earth's systems.

Part A - Pollution **24 hrs**

Unit I: **8 hrs**

A. Concept of Biosphere: Its components, hydrosphere, atmosphere, and lithosphere, Origin of life in the biosphere.

B. Water pollution: Definition, sources Types and classification of pollutants. Effects of Water Pollution, River Pollution, Oxygen sag curves and Eutrophication Drinking water: Collection, purification and distribution. Wastewater treatment: Primary, secondary and tertiary treatment.

Unit II: **8 hrs**

A. Atmospheric pollution: Primary and secondary air pollutants. Biological effects of Nox, SOx, SPM, Hydrocarbons, Acid rain, Global warming, Photochemical smog and Ozone hole.
B. Solid waste and Biomedical waste: Sources, collection, transport, treatment and Disposal methods.. Noise Pollution: Sources, Biological effects, Control measures and OSHA standards.

UnitIII: **8hrs**

A. Radiation & Thermal pollution: Sources, types, effects, Atmospheric fallout and abatement.
B. Environmental Impact Assessment: Basic elements, Methods Guideline for industrial EIA, Aquaculture related EIA, Transport related EIA and Water related EIA. Case studies: Konkan Railway, Silent valley, Bhopal Tragedy and Love canal tragedy, Mangalore Bojpe tragedy

Part B – Toxicology **24 hrs**

Unit IV: **8hrs**

A. General Principles of Toxicology: Introduction, Definition of toxicology Importance of Dose and Dose-response, factors influencing toxicity, Bioassay-toxicity evaluation studies using fish as model.
B. Toxic compounds: Heavy metals-Lead and mercury, Hydrocarbons- Aromatic and Aliphatic, and cyanides, and toxic gases - Bhopal tragedy.

Unit V: **8hrs**

A. Biotransformation: Bioactivation, Biodetoxification of organo phosphates and organo chorines in the bodies of animals.
B. Natural toxins, Venoms and poisons: Properties and their effects, Major Sites and mechanism of action, Toxins in lower and higher organisms, Toxin and Venom therapy.

Unit VI: **8hrs**

A. Smoking aids: Active and Passive smoking, Consumption of tobacco, Mariguana(Ganja), their effects and Prevention measures.
B. Cosmetics: Types of cosmetics, Chemical Characteristics, Applications, Exposure and risk assessment, Cosmetic safety regulations.
C. Risk assessment: Exposure assessment, Dose-Dosage, Risk characterization, Risk analysis and communications, Occupational health and illness.

TUTORIALS – On the basis of the proposed chapters **2x16 = 32 Hrs**

REFERENCES:

1. Nandini, .N. Sunitha N. and T. Sucharita 2010. Environmental Studies, Sapna Book House Bangalore
2. Frant C.L.V. 1991, Basic Toxicology II (Eds.), Hemisphere publishing corporation, Washington, London
3. Sambasiva Rao K.R.S. 1999. Pesticide impact on fish metabolism. (Eds.) Discovery Publishing House, New Delhi.
4. Bio-pesticides in Insect Pest Management 1999. S. Ignacimuthu and Alok Sen, Phoenix Publishing House Pvt., Ltd., New Delhi.
5. APHA, AWWA and WEF. 1992: Standard Methods for Examination of Water and Wastewater, XVIII Ed, American Public Health Association. NY, USA
6. Nebel, B.T. and Wrigly R.T. 1998. Environmental Science, VI Ed. Prentice Hall New Jersey, USA

7. Hosetti, B.B. 2001. A Text Book of Applied Aquatic Biology, Daya Publishing House, Delhi.
8. Hassall, K.A. 1990. The Biochemistry and uses Pesticides structure, metabolism and Mode of action and uses in crop protection, John Wiley & Sons. Inc.
9. Pandey, K. and J.P. Shukla, 1990. Elements of Toxicology. Radha publ. New Delhi.

M.Sc., III Semester:
OPEN ELECTIVE-(For Science discipline students).
CONCEPTS OF ZOOLOGY.

48 Hrs

Course Outcome:
After completing the course student will be able to

1. Broader understanding of Zoology and its concepts
2. Understand the concepts and basics of animals taxonomy
3. Understand the basics of histology
4. Describe the structure and basic functions of organ systems
5. Explain ecological concepts and effects of environmental pollution
6. Explain the mechanism of inheritance.

1. Introduction: **8 Hrs**

a) Branches of animal science: Taxonomy, Animal Physiology, Genetics, Developmental Biology, Evolution, Ethology, Ecology, Applied Zoology, Entomology, Histology, c) Indian Wildlife- Status, Causes of wildlife depletion, Wildlife corridors, Conservation strategies- *In situ* and *Ex situ* d) e) Animals and human welfare.

2. Animal Taxonomy: **4 Hrs**

a) Carl Linnaeus – Taxonomic hierarchy: Kingdom, Division, Phylum, Class, Order, Family and Binomial nomenclature

3. Animal cells and Tissues : **8 Hrs**

a) Brief description of animal cell (light and ultra structure) b) Functions of cell organelles c) Structure and functional diversity in animal cell d) Cell division: Types and significance e) Structure and functions of basic tissues.

5. Structure and functions of organ systems: **16 Hrs**

a) Human alimentary canal and outlines of digestion and absorption
b) Respiration: Human respiration – exchange of gases.
c) Circulation : Structure of human heart, Blood vessels and capillaries, composition of blood, blood coagulation.
d) Excretion : Mammalian kidney and urine formation.
e) Locomotion in vertebrates – Swimming, walking running, flying
f) Nervous system and their functions, A brief account of human endocrine system
g) Reproduction : Asexual and sexual reproduction, significance of sexual reproduction, outlines of human reproduction and fertility control

6. Ecology and Environmental Biology: **8 Hrs**

a) Abiotic and Biotic factors b) Environmental Pollution – brief account of Air, Water and Noise pollution.

7. Heredity: **4 Hrs**

a) Continuity of life – Mendel's laws b) Structure of chromosomes c) DNA and RNA

TUTORIALS **2x16=32 Hrs**

REFERENCES :

1. Barnes, R. D. 1974. Invertebrate Zoology, III edition, W. B. Saunders Co., Philadelphia.
2. Barrington, E. J. W. 1976. Invertebrate structure and function. Thomas Nelson and Sons
3. Ltd., London

4. Hyman L. H. 1940. The invertebrates Vol.1 Protozoa through Ctenophora, McGraw hill
5. co., N. Y.
6. Hyman. L. H. 1968. The Invertebrates Vol.8 McGraw Hill Co., N. Y and London.
7. Parker, T. J. Haswell, W. A. 1961. Text book of Zoology, Vol.I, Macmillon Co., London.
8. Russel – Hunter, W.D 1969. A. biology of higher invertebrates, Mac millon Co., Ltd.,
9. London.
10. Barrington, E. J. W. 1965. The Biology of Hemichordata and Protochordata – Oliver and Boyd, Edinbourgh.
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13. Romer, A. S. 1966. Vertebrate Paleontolgy, 3rd Ed., Univ. of Chicago Press, Chicago.
14. Romer A. S., 1960. Vertebrate body, 3rd Ed., W. B. Saunders Co., Philadelphia.
15. Young. J. Z., 1950. Life of vertebrates The Oxford University Press, London
16. Young J Z 1957 Life of mammals, Oxford University Press, London.

M.Sc., IV SEMESTER
HC – 4.1 ADVANCED GENETICS AND COMPUTATIONAL BIOLOGY

32 hrs

Course Outcome:
After completing the course student will be able to

1. Understand the genomic organization of prokaryotes and eukaryotes.
2. Know the applications of various model organisms in genomic research.
3. Able to analyse the pedigree, psychosomatic disorders, prenatal diagnosis and genetic counselling.
4. Recognise few heritable diseases in man.
5. Understand the basic concepts of genomics
6. Understand the basic concepts of proteomics
7. Understand the nucleic acid and proteinr databases and tools**.**

Part A-Advanced Genetics

Unit I: Genome organization: 3 hrs

Prokaryotes, Eukaryotic nuclear genomes - C-value paradox, Eukaryotic organelle genomes Split Genes Mobile genetic elements in Prokaryotes (bacteria) and Eukaryotes (Drosophila, maize and humans), Genome Projects of model organisms (*C. elegans*, *Drosophila* and Mouse).

Unit II: Cancer Genetics: 5 hrs

Cancer incidence and mortality, types of cancer, causes of cancer, properties of cancer cells, Genetic basis of Carcinogenesis- Oncogenes: proto-oncogenes, oncogenes, retroviral oncogenes in human cancer. Tumor suppressor genes: Functions of tumor suppressor gene products. Cancer as a multistep process. Animal models of cancer research: Transgenic mouse and Drosophila models.

Unit III: Human genetics: 5 hrs

History of human genetics, pattern of inheritance, pedigree analysis. Human genome: Organization, distribution of genes, gene families. Genetic basis of syndromes and disorders: Cystic fibrosis, Neurofibromatosis, Schizophrenia, Anxiety disorder, Congenital heart diseases, Dyslexia.

Unit IV: Quantitative genetics: 3hrs

Introduction, types of quantitative trait, Nature of quantitative traits and their inheritance-Polygenic inheritance (Multifactorial hypothesis) – analysis of continuous variation; Variations associated with polygenic traits.

Part B-Computational Biology

Unit VII: Introduction and Scope of the Computational Biology 4 hrs

Genomics: Definition and types of genomics Structural genomics: whole genome shotgun sequencing, gene annotation, gene families and clusters. Orthologs and paralogs. Functional genomics: Transcriptome, Microarray technology.

Unit VIII: Proteomics: 4 hrs

Definition, Protein structure determination, protein domains, protein folding, Computer aided protein structure analysis, Protein-protein interactions, Protein microarrays.

Unit IX: Nucleic acid sequence and Protein analysis: 4 hrs

Alignment, similarity searches including remote similarity searches, secondary structure element, motifs, Single nucleotide polymorphism (SNP), Two dimensional polyacrylamide gel electrophoresis, Mass Spectrometry.

Unit X: Genomics and proteomics databases and tools: 4 hrs

Nucleic acid sequence databases and tools: Genbank, UCSC, ENSEMBL, EMBL, DDBJ, BLAST vs FASTA, file formats-FASTA, GCG, Genscan and ClustalW. Protein sequence databases and tools: Uni- prot, PDB, PIR, BLAST, PSI- BLAST (steps involved in use and interpretation of results).

PRACTICALS:

1. Study of mitotic chromosomes of *Drosophila* species- *Drosophila melanogaster*, *Drosophila nasuta*.
2. Preparation of metaphase chromosomes from bone marrow cells of mouse.
3. Karyotypic studies of normal human chromosomes and syndromes.
4. Creation of pedigrees and study of patterns of inheritance.
5. Studies on phenotypes of different diseases and syndromes.
6. Study of Quantitative characters: Sternopleurals, Acrosticals – mean, standard deviation.
7. Data mining for sequence analysis.
8. Web– based tools for sequence searches and homology screening-BLAST, FASTA
9. Nucleic acid sequence databases: GenBank retrieval, GeneScan.
10. Proteomics data bases: Uni-Prot, PROSITE, PDB, PIR, ProtParam.
11. Annotations: ORF finder, Use of ARTEMIS or any other suitable software

REFERENCES:

1. The Human Genome 2001, Nature Vol. 409.
2. The Drosophila Genome. 2000, Science Vol. 267.
3. The Caenorhabditis elegans genome 1998. Science Vol. 282.
4. Introduction to Genetic Analysis. Griffiths, Anthony J.F.; Miller, Jeffrey H.; Suzuki, David T.; Lewontin, Richard C.; Gelbart, William M. New York: W.H. Freeman & Co.; 1999
5. Fundamental Neuroscience. Larry R. Squire, Darwin Berg, Floyd Bloom, and Sascha du Lac. Third Edition, Academic Press; 3 edition (2008)
6. Principles of Neural Science. Eric R. Kandel, James H. Schwartz, and Thomas M. Jessell. McGraw-Hill Medical; 4 edition(2000)
7. Neurogenetics: Scientific and Clinical Advances (Neurological Disease and Therapy) David R. Lynch, Informa HealthCare; 1 edition (2005)
8. The Molecular and Genetic Basis of Neurologic and Psychiatric Disease. Roger N Rosenberg, Salvatore DiMauro, Henry L Paulson, and Louis Pt (2007) Lippincott Williams & Wilkins; Fourth edition

9. Bioinformatics for Dummies, Claverie J. M., Notredame C., (2nd Ed., 2007), Wiley Publishing, Inc., New York, USA
10. Brown T. A. 2007, Genomes 3. Garland Science Publishing, New York.
11. A.Malcolm Campbell and Laurie J.Heyer. Discovering Genomimcs, Proteomics and Bioinformatics. 2004. Low Price edition. Pearson Education, Inc.

M.Sc., IV SEMESTER
HC – 4.2 APPLIED ZOOLOGY

32 hrs

Course Outcome:

After completing the course student will be able to

1. Explain plant insect interaction, origin of pest and its control.
2. Understand vectors and its communicable diseases.
3. Explain races of silkworm their disease and its control.
4. Know about the importance of insects in forensic science and medicine.
5. Know about aquaculture and its practices in India.

UNIT I: Aquaculture **8hrs**

Aquaculture in India: an overview – nutritional value and food security - Site selection and preparation of culture ponds - Fish culture: carps, marine fishes and ornamental fishes. Prawn culture: Freshwater prawns and marine shrimps. Fattening of crabs. Crayfish and Lobster - Molluscs: mussels, clams, chanks and oysters including pearl oyster. Live feeds: micro algae, micro-invertebrates (*Artemia* nauplii, Rotifers, Cladocerans, Copepods, Ostracodes) and worms as live baits – Water quality management and maintenance of sanitation - Plant and animal nutrients - Balanced diet (iso-nitrous and iso-caloric) - Artificial feed formulation – Low cost feed formulation - Aquatic weeds.

UNIT II: Sericulture **8hrs**

Salient features of Saturnidae and Bombycidae. Mulberry and non mulberry silkworms, classification based on voltinism, moulting and geographic origin.

Morphology and life cycle of *Bombyx mori*. Structure and functions of Silk glands.

Silkworm rearing technology: Building, equipments, disinfection, environmental factors, Seed cocoons, preservation, grainage activity, LSPs, egg production, incubation, artificial hatching.

Pests and diseases: Protozoan, Fungal, Viral and Bacterial diseases and their control measures. Silkworm pests and Predators

UNIT III: Apiculture **8hrs**

Scope and its importance, Classification and morphology of honey bees, species and races of honey bees, tribal life and bee hunting. sex seperation, comb building, orientation of comb, communication, collection of propolis and water.

Honey and its chemical composition, medicinal importance.

Eonomic importance of honey, wax, bee pollination, pollen and Venom.

UNIT IV: Vermiculture **8hrs**

A. Introduction to vermiculture. Definition, meaning, history, economic importance, their value in maintenance of soil structure. Useful species : Local species and Exotic species of earthworms. Role of four R's.

B. Taxonomy Anatomy, Physiology and Reproduction of Lumbricidae and Eudrilidae.

C. Earthworm Farming (Vermiculture) for home gardens, larger scale, Extraction (harvest), vermicomposting harvest and processing.

D. Nutritional Composition of Vermicompost for plants, comparison with other fertilizers

E. Enemies of Earthworms, Sickness

PRACTICALS: **16X4=64 hrs**

1. Study of morphometric characters of Indian major carps.
2. Diversity of fishes.
3. Collection of phytoplankton and zooplankton from natural resources and their identification.
4. Study of morphology of honey bee and cast system.
5. Mounting of mouth parts, stinging apparatus of honey bee.
6. Study of digestive system of honeybee.
7. Study of structure and types of honey comb.
8. Study of bee plants.
9. Study of morphology of lifecycle of *Bombyx mori*
10. Study of digestive and silk gland of *Bombyx mori*
11. Study of Non mulberry silkworms and their food plants.
12. Field trip- Collection of native earthworms & their identification
13. Study of systematic position& External characters of locally available earthworm species.
14. Mounting of setae and identification of earthworm species.
15. Study of equipments used in Vermiculture.

REFERENCES

1. Ashok Kumar (2009) Textbook of Animal Diseases
2. Edwards, C.A. and J.R. Lofty (1977) "Biology of Earthworms" Chapman and Hall Ltd., London.
3. G.S. Shukla, V.B. Upadhyay (2006) Economic Zoology.
4. Kevin, A and K.E.Lee (1989) " Earthworm for Gardeners and Fisherman" (CSIRO, Australia, Division of Soils)
5. Lee, K.E. (1985) "Earthworms: Their ecology and Relationship with Soils and Land Use" Academic Press, Sydney.
6. Pradip. V Jabde, (2005) Text Book of Applied Zoology.
7. R. L. Kotpal (2000) Modern Textbook of Zoology. Rastogi Publications
8. Satchel, J.E. (1983) "Earthworm Ecology" Chapman Hall, London.
9. Wallwork, J.A. (1983) "Earthworm Biology" Edward Arnold (Publishers) Ltd. London.

M.Sc., IV SEMESTER
HC – 4.3 Project

Course Outcome:

After completing the course student will be able to

1. understand the concepts of Project Management for planning to execution of projects
2. find importance of reference work Using tools of information such as periodical , journals, online resources
3. break work down the tasks of project and determine handover procedures
4. Interpret, analyse and presentation of the results obtained and compare with similar works and draw conclusion.

M.Sc., Examination
(Scheme CBCS)
M.Sc., ZOOLOGY
HARD CORE- Model question paper

Time: 3 hrs **Max Marks: 70**

Instructions: ***1. Answer all questions***
2. Illustrate your answer wherever necessary

I. Write short notes on the following: **[8×2=16]**

1.
2.
3.
4.
5.
6.
7.
8.

II. Write elaborate notes on any FIVE of the following: **[5×6=30]**

9.
10.
11.
12.
13.
14.
15.
16.

Q3. Answer the following: **[2×12=24]**

17. (i)
Or
(ii)

18. (i)
Or
(ii)

M.Sc Examination
(Scheme CBCS)
M.Sc., ZOOLOGY
Softcore - Model question paper

Time: 3 hrs **Max Marks: 70**

Instructions: ***1. Answer all questions***
2. Illustrate your answer wherever necessary

I. Write short notes on the following: **[8×2=16]**

1.
2.
3.
4.
5.
6.
7.
8.

II. Write elaborate notes on any FIVE of the following: **[5×6=30]**

9.
10.
11.
12.
13.
14.
15.
16.

Q3. Answer the following: **[2×12=24]**

17. (i)
Or
(ii)

18. (i)
Or
(ii)

M.Sc Examination
(Scheme CBCS)
M.Sc., ZOOLOGY
Open Elective-Model question paper

Time: 3 hrs **Max Marks: 70**

Instructions: ***1. Answer all questions***
2. Illustrate your answer wherever necessary

I. Write short notes on the following: **[8×2=16]**

1.
2.
3.
4.
5.
6.
7.
8.

II. Write elaborate notes on any FIVE of the following: **[5×6=30]**

9.
10.
11.
12.
13.
14.
15.
16.

Q3. Answer the following: **[2×12=24]**

17. (i)
Or
(ii)

18. (i)
Or
(ii)

JSS Mahavidyapeetha

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE

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Ooty Road, Mysuru – 570 025, Karnataka

Postgraduate Department of Biochemistry

SYLLABUS FOR M.Sc DEGREE PROGRAMME IN BIOCHEMISTRY

under

Choice Based Credit System (CBCS) and
Continuous Assessment Grading Pattern (CAGP)

(with effect from 2018–19)

Credit Matrix, Course of Study and Scheme of Examination for M.Sc. Degree Programme in Biochemistry

(With effect from 2018-19)

Programme Code: BIC

Course Type	Credits to be earned				Total Credits
	I Semester	II Semester	III Semester	IV Semester	
Hard Core Course	12	12	12	16	**52**
Soft Core Course	04	04	04	–	**12**
Elective Course	04	04	–	–	**08**
Open Elective Course*	–	–	04	–	**04**
Semester Total	**20**	**20**	**20**	**16**	**76**

*An Open Elective course offered by PG Dept. of Biochemistry to the students of other Depts.

Course Code	Course Type	Course Title	Credit Pattern (L:T:P)	Credits
Semester – I				
BCA040	HC	Analytical Biochemistry–I	3:1:0	4
BCA050	HC	Chemistry and Metabolism of Proteins and Nucleic Acids	3:1:0	4
BCA060	HC	Experiments in Biochemical Techniques and Enzymology** and Seminar	0:0:4	4
BCA230	SC	Enzymology	3:1:0	4
BCA250	**Choose any ONE from the following**		3:1:0	4
	SC	(i) Chemical Principles and Biochemical Reactions (ii) Plant Biochemistry (iii) Microbial Biochemistry		
Semester Total Credits				**20**

Course Code	Course Type	Course Title	Credit Pattern (L:T:P)	Credits
Semester – II				
BCB040	HC	Analytical Biochemistry–II	3:1:0	4
BCB050	HC	Chemistry and Metabolism of Carbohydrates and Lipids	3:1:0	4
BCB060	HC	Experiments in Immunology and Biochemical Estimations** and Seminar	0:0:4	4
BCB250	SC	Immunology and Microbiology	3:1:0	4
BCB260	**Choose any ONE from the following**		3:1:0	4
	SC	(i) Human Physiology and Nutrition (ii) Research Methodology and Biostatistics (iii) Clinical Research Methods and Industrial Biochemistry		
Semester Total Credits				**20**

Course Code	Course Type	Course Title	Credit Pattern (L:T:P)	Credits
Semester – III				
BCC070	HC	Cell Biology, Endocrinology and Cell Signaling	3:1:0	4
BCC050	HC	Clinical Biochemistry	3:1:0	4
BCC060	HC	Experiments in Clinical Biochemistry and Molecular Biology** and Research Paper Presentation	0:0:4	4
BCC220	**Choose any ONE from the following**		4:0:0	4
	SC	(i) Genomics, Proteomics and Bioinformatics (ii) Biotechnology (iii) Pharmaceutical Biochemistry		
BCC630	OE	Nutrition and Health	4:0:0	4
		Semester Total Credits		**20**

Course Code	Course Type	Course Title	Credit Pattern (L:T:P)	Credits
Semester – IV				
BCD010	HC	Molecular Biology and Gene Regulation	3:1:0	4
BCD070	HC	Genetics and Genetic Engineering	3:1:0	4
BCD060	HC	Project Work OR Dissertation***	0:4:4	8*
		Semester Total Credits		**16**
		Total CREDITS to be earned for M.Sc. BIOCHEMISTRY		**76**

* Grade Point will be calculated with respect to the allotted credits

HC	Hard Core Course
SC	Soft Core Course
E	Elective Course
OE	Open Elective Course
C1	Component 1 of Internal Assessment (IA)
C2	Component 2 of Internal Assessment (IA)
C3	Component 3 (Semester-end Exam)
L	Lecture (1 Credit=1 hr)
T	Tutorial (1 Credit=2 hrs)
P	Practical (1 Credit=2 hrs)

** Weekly Four hrs of practical for Two days

*** Project work OR Dissertation should be in-house only and may be allotted to the students in the 2nd/3rd semester

Note: Two Practical examinations of four hrs duration each for C3 (component 3) of Hardcore Course with Practical Component Only.

SCHEME OF ASSESSMENT

Course Code	Course Type	Course Title	Exam Hrs	Max. Marks			
				IA		Exam C3	Total
				C1*	C2*		
Semester - I							
BCA040	HC	Analytical Biochemistry–I	3	15	15	70	100
BCA050	HC	Chemistry and Metabolism of Proteins and Nucleic Acids	3	15	15	70	100
BCA060	HC	Experiments in Biochemical Techniques and Enzymology and Seminar	–	15	15	70	100
BCA230	SC	Enzymology	3	15	15	70	100
BCA250	**Choose any ONE from the following**		3	15	15	70	100
	E	(i) Chemical Principles and Biochemical Reactions (ii) Plant Biochemistry (iii) Microbial Biochemistry					
Semester Total Marks							**500**

Course Code	Course Type	Course Title	Exam Hrs	Max. Marks			
				IA		Exam C3	Total
				C1*	C2*		
Semester - II							
BCB040	HC	Analytical Biochemistry–II	3	15	15	70	100
BCB050	HC	Chemistry and Metabolism of Carbohydrates and Lipids	3	15	15	70	100
BCB060	HC	Experiments in Immunology and Biochemical Estimations and Seminar	–	15	15	70	100
BCB250	SC	Immunology and Microbiology	3	15	15	70	100
BCB260	**Choose any ONE from the following**		3	15	15	70	100
	SC	(i) Human Physiology and Nutrition (ii) Research Methodology and Biostatistics (iii) Clinical Research Methods and Industrial Biochemistry					
Semester Total Marks							**500**

Course Code	Course Type	Course Title	Exam Hrs	Max. Marks			
				IA		Exam C3	Total
				C1*	C2*		
Semester - III							
BCC070	HC	Cell Biology, Endocrinology and Cell Signaling	3	15	15	70	100
BCC050	HC	Clinical Biochemistry	3	15	15	70	100
BCC060	HC	Experiments in Clinical Biochemistry and Molecular Biology and Research Paper Presentation	–	15	15	70	100
BCC220	**Choose any ONE from the following**		3	15	15	70	100
	SC	(i) Genomics, Proteomics and Bioinformatics (ii) Biotechnology (iii) Pharmaceutical Biochemistry					
BCC630	OE	Clinical Research and Drug Development	3	15	15	70	100
						Semester Total Marks	**500**

Course Code	Course Type	Course Title	Exam Hrs	Max. Marks			
				IA		Exam C3	Total
				C1*	C2*		
Semester - IV							
BCD010	HC	Molecular Biology and Gene Regulation	3	15	15	70	100
BCD070	HC	Genetics and Genetic Engineering	3	15	15	70	100
BCD060	HC	Project Work OR Dissertation**	–	15	15	70	100
						Semester Total Marks	**300**

- C1* & C2* Internal test will be conducted for 20 marks of one hour duration and it is reduced to 10 marks + 5 marks for continuous assessment
- Continuous assessment comprise of assignments, group discussions, seminars and tutorials
- ** The Project evaluation is as below

  Component 1 (C1): Periodic Progress Report (15%)
  Component 2 (C2): Periodic Progress Report (15%)
  Component 3 (C3): Final Viva-Voce and Evaluation (70%)
  (The report evaluation is for 40% and the Viva-Voce examination is for 30%)

Program Outcome(s):

PO1: Provides with the necessary knowledge and skills to undertake a career in research, either in industry or in an academic setting
PO2: Provides the breadth and depth of scientific knowledge in Biochemistry and allied areas
PO3: Equips to apply for a PhD or to gain employment in biochemistry and allied areas
PO4: Provides a substantial element of hands-on research experience, with enhanced experimental skills
PO5: Demonstrates detailed knowledge and understanding of the principles and theories of biochemistry
PO6: Helps to understand the principle techniques of biomolecular structural characterization, including spectroscopy

Program Specific Outcome(s): The Specific Outcome of this programme is to train and provide the candidate with knowledge related to

PSO1: Global level research opportunities to pursue PhD programme targeted approach of CSIR-NET examination
PSO2: Enormous job opportunities at all level of chemical, pharmaceutical, food products, life oriented material industries
PSO3: Specific placements in R&D and quality control or analysis division of nutraceutical, pharmaceutical industries and allied division

Course Code	Title of the Course	Credits
BCA040	ANALYTICAL BIOCHEMISTRY–I	4

COURSE OUTCOME(S):

CO1 Specify in depth cell fractionation techniques

CO2 Write down in details with application, if applicable, chromatography and spectroscopy

CO3 Write down in details with application, if applicable, principle and applications of electrophoresis

CO4 Understand the classification and characteristics of centrifugation and microscopy

		No. of Lectures
Unit I:		
1.1	**Cell Fractionation**	
1.1.1	Cell fractionation techniques: Preparation of extracts for biochemical investigations. Physico-chemical properties of solvents, solubility and miscibility, salting–in and salting–out.	**08**
1.1.2	Choice of solvent for solvent extraction, mixed solvents, solid phase extraction. Cell lysis, dialysis, precipitation and ultra filtration.	

Unit II:		
2.1	**Chromatography and Spectroscopy**	
2.1.1	Adsorption *vs.* Partition chromatography. Paper, TLC, Ion exchange, Reverse phase, Gel filtration, Affinity, HPLC, and Gas chromatographic techniques.	**14**
2.1.2	Beer-Lamberts Law, Its verifications and Deviations, Concept of Absorptions, Transmission, Scattering, Phosphorescence, Fluorescence, Luminescence, Diffraction Spectra.	
2.1.3	Principle, instrumentation, working and applications of– UV and Visible Spectroscopy,	
2.1.4	Turbidometry and Nephlometry.	

Unit III:		
3.1	**Electrophoresis**	
3.1.1	Theory of electrophoresis, continuous and discontinuous PAGE, SDS-PAGE.	**12**
3.1.2	Other electrophoretic methods–Isoelectric focusing, 2–dimensional gel electrophoresis, Capillary electrophoresis and PFGE.	
3.1.3	Agarose gel electrophoresis of nucleic acids. Isotachophoresis.	
3.1.4	Separation of proteins, lipoproteins, visualizing separated	

	components–staining, fluorescence, PAS staining, zymogram and reverse zymogram,	

Unit IV:		
4.1	**Centrifugation and Microscopy**	
4.1.1	Analytical and Preparative Ultracentrifuge–Principle, instrumentation and applications.	**14**
4.1.2	Analysis of subcellular fractions, marker enzymes and determination of relative molecular mass–Svedberg's constant, sedimentation velocity and sedimentation equilibrium.	
4.1.3	Theories of Tissue Fixation and Staining Techniques. Principles of Transmission and Scanning Electron Microscopy.	
4.1.4	Principles of Phase Contrast and Fluorescence Microscopy, Confocal Microscopy	

References

[1] Analytical techniques in Biochemistry and Molecular Biology; Katoch, Rajan. Springer (2011)

[2] Basic Methods for the Biochemical Lab; Martin Holtzhauer, Springer, (2007).

[3] Principles and Techniques of Biochemistry and Molecular Biology 7th Edn. Keith Wilson and John Walker, Cambridge University Press, (2010).

[4] Biochemistry LabFax, Ed. J.A.A. Chambers and D. Rickwood,, Blackwell Science, (1993),

[5] Protein Purification Applications, S.L.V. Harris and Angal IRL Press, (1990)

[6] Laboratory Techniques in Biochemistry and Molecular Biology, Work and Work Vol. I & II, North Holland, (1969).

[7] Basic Mathematics for Biochemists; Cornish Bowden, Oxford University Press (1998),.

[8] Biophysical Tools for Biologists *In Vivo* Techniques; John Correia H. Detrich, III Elsevier (2008).

[9] Practical Biochemistry by Keith Wilson and Walker 5th ed. Cambridge.

[10] Biophysical chemistry, Upadhyaya, A., Upadhyaya, K. and Nath, N. Himalayan Publishing House.

[11] Practical biochemistry- Principles and Techniques. Wilson and Walker. J.Cambridge Uni. Press.

[12] Physical Biochemistry-David Freifelder, 2nd Edition.

[13] Principles of Instrumental Analysis. 5th Ed. Douglas A Skoog, James Holler and Timothy A Nieman.

[14] Introduction to Electron Microscopy for Biologists; Terry Allen, Academic Press (2008).

Course Code	Title of the Course	Credits
BCA050	CHEMISTRY AND METABOLISM OF PROTEINS AND NUCLEIC ACIDS	4

COURSE OUTCOME(S):

CO1 Identify the details of amino acids and proteins

CO2 Understand in details with application, if applicable, nitrogen metabolism and degradation

CO3 Write down the classification and characteristics of synthesis of amino acids and proteins

CO4 Write down in details with application, if applicable, metabolism of nucleic acids

		No. of Lectures
Unit I:		
1.1	**Chemistry of Amino acids and Proteins**	
1.1.1	Classification and structure of 20 amino acids, newly discovered amino acids, essential, non–essential, unusual and non-protein	
1.1.2	General properties of aa, acid–base titrations, pKa Peptide bond–stability and formation, chemical synthesis of peptide. Primary structure and determination, GN Ramachandran plots	
1.1.3	Secondary structure and motifs, α helix, β sheet, Leucine zipper, Zinc finger	**10**
1.1.4	Tertiary & Quaternary structure (myoglobin, hemoglobin) Protein-protein interactions (actin, tubulin) Small peptides (glutathione, peptide hormones), Cyclic peptides (Gramicidin)	
1.1.5	Classification of proteins-globular, fibrous, membrane, metallo–proteins, Denaturation (pH, temperature, chaotropic agents), refolding, Role of chaperones in folding	
Unit II:		
2.1	**Nitrogen Metabolism and Degradation of Amino Acids**	
2.1.1	Nitrogen cycle, Nitrogen fixation – symbiotic and non-symbiotic, Nitrogenase complex. Assimilation of ammonia	
2.1.2	Metabolic fate of dietary proteins and amino acids Degradations to glucose and ketone bodies	
2.1.3	Amino acids degraded to Pyruvate, Oxaloacetate	**14**
2.1.4	Amino acids degraded to Acetyl-CoA, Succinyl-CoA Metabolism of branched chain amino acids, urea cycle, regulation of urea cycle	
2.1.5	Genetic defects in metabolism of amino acids (albinism, Phenylketonuria, maple syrup urine disease, homocystinuria alkaptonuria, methyl malonic Acidemia)	

Unit III:		
3.1	**Biosynthesis of Amino Acids and Protein Degradation**	
3.1.1	Biosynthesis of amino acids and regulation of amino acid metabolism	**08**
3.1.2	Biosynthesis and degradation of heme	
3.1.3	Biosynthesis of polyamines, creatine, gramicidine and glutathione	
3.1.4	Biosynthesis and degradation of glycoproteins and proteoglycans	
3.1.5	Protein degradation pathway–Ubiquitin–Proteosome pathway, lysosomal pathway	

Unit IV:		
4.1	**Chemistry and Metabolism of Nucleic Acids**	
4.1.1	Purines, pyrimidines, nucleosides, nucleotides, unusual bases. Structure of DNA – Watson Crick Model, A- and Z- forms.	**16**
4.1.2	Supercoiling of DNA – negative and positive, linking number	
4.1.3	Structure of RNA, tRNA, rRNA, siRNA / miRNA Denaturation and renaturation, Tm (factors affecting Tm) and Cot curves, Isolation and purification of nucleic acids from biological sources.	
4.1.4	Biosynthesis of purines and pyrimidines, Degradation of purines and pyrimidines, Regulation: de novo, salvation, nucleotide analogs, conversion of nucleotides to deoxynucleotides, mechanism of action of methotrexate, 5–flurouridine, azathymidine.	
4.1.5	Gout and Lesch–Nyhan syndrome	
4.1.6	Biosynthesis of NAD, FAD and Co–enzyme A	

References

[1] Lehninger Principles of Biochemistry 4th Ed By David L. Nelson and Michael M. Cox, WH Freeman and Company.

[2] Biochemistry by Lubert Stryer. WH Freeman and Co.

[3] Biochemistry: The Molecular Basis of Life by Trudy McKee and James R McKee. Publisher: McGraw-Hill Higher education.

[4] Biochemistry and Molecular biology By William H. Elliott and Daphne C. Elliott. Oxford University Press.

[5] Biochemistry 3rd Ed. By Donald J. Voet and Judith G. Voet. John Wiley and Sons.

[6] Biochemistry: Biomolecules, Mechanisms of Enzyme Action and Metabolism Vol 1 by D Voet. John Wiley and Sons.

Course Code	Title of the Course	Credits
BCA060	EXPERIMENTS IN BIOCHEMICALTECHNIQUES AND ENZYMOLOGY AND SEMINAR	4

COURSE OUTCOME(S):

CO1 Identify the details of spectrophotometer

CO2 Identify the details of specific activity of enzymes

CO3 Deliberate the characteristics of gel electrophoresis

CO4 Deliberate the characteristics of use of pipettes

Group I:	1. Determination of Normality, Molarity and Molality of solutions 2. Preparation of buffers: Acetate, Phosphate and Tris buffer 3. Colorimetry–Beer's law and its applications 4. Determination of Molar Extinction Coefficient 5. Chromatography–Separation of amino acids by ascending, descending, circular paper chromatography 6. TLC of amino acids 7. Gel filtration, Ion exchange chromatography	
Group II:	8. Estimation of protein by Lowry's method. 9. Estimation of protein by Biuret reagent method. 10. Estimation of amino acids by Ninhydrin method 11. Isolation of casein from milk and its quantification 12. Electrophoresis–Separation of proteins by Native and SDS-PAGE 13. Determination of *pKa* and *pI* of amino acid, formal titration. 14. Separation of nucleic acids by agarose gel electrophoresis	
Group III:	15. Isolation of microbes from air, soil and water 16. Gram's staining 17. Determination of growth curve of bacteria 18. Antibiotic sensitivity tests 19. Determination of specific activity of (i) Acid Phosphatase (ii) Alkaline Phosphatase (iii) Salivary Amylase (iv) Protease (v) Invertase (vi) Aminotransferase	

Group Study	Extraction, Isolation, Purification and enzyme characterization. Determination of specific activity, optimum pH, temperature, time and energy of activation. Determination of *Km* and *Vmax* Enzyme inhibition studies	

References

[1] Analytical techniques in Biochemistry and Molecular Biology; Katoch, Rajan. Springer (2011).

[2] Basic Methods for the Biochemical Lab; Martin Holtzhauer, Springer, (2007).

[3] Principles and Techniques of Biochemistry and Molecular Biology 7th Edn. Keith Wilson and John Walker, Cambridge University Press, (2010).

[4] Biochemistry LabFax, Ed. J.A.A. Chambers and D. Rickwood,, Blackwell Science, (1993),

[5] Protein Purification Applications, S.L.V. Harris and Angal IRL Press, (1990)

[6] Laboratory Techniques in Biochemistry and Molecular Biology, Work and Work Vol. I & II, North Holland, (1969).

[7] Physical Biochemistry, Kansal Edward Van Halde. Prentice Hall.

[8] Modern Experimental Biochemistry R.F.Boyer [Ed.] (1986) Addition Wesley.

[9] Analytical Biochemistry; D.J. Holme and H. Pick Longman (1983).

[10] Principles and techniques of Biochemistry and Molecular Biology; Keith Wilson and John Walker; 6th Edn. (2005) Cambridge University Press.

[11] Biochemical Calculations, Irwin H. Segel (1976) 2nd Ed. John Wiley and Sons.

Course Code	Title of the Course	Credits
BCA230	ENZYMOLOGY	4

COURSE OUTCOME(S):

CO1 Write down in details with examples enzyme kinetics

CO2 Identify in details with examples enzyme catalysed reactions

CO3 Identify the characteristics of cooperativity reactions

CO4 Learn the classification and characteristics of multienzyme complex reactions

		No. of Lectures
Unit I:		**16**
1.1	**Enzyme Kinetics and Inhibition**	
1.1.1	Nature of enzymes, Nomenclature and IUB classification of enzymes, Units of enzyme activity, IU and activity and specific activity. Localization, isolation, purification and characterization of enzymes. Criteria of purity of enzymes. Assay methods–coupled enzyme assays, continuous, end point and kinetic assay.	
1.1.2	Enzyme Kinetics: Rate of a reaction, order and molecularity. Michaelis Menten equation, initial velocity approach, steady state approach. Vmax, Km and their significance. Linear transformation of Michaelis Menten equation–Lineweaver Burk plot, Eadie Hofstee, Haynes–Wolf and Cornish–Bowden.	
1.1.3	Inhibition: Reversible inhibition–Competitive, Non competitive and Uncompetitive, product inhibition, irreversible inhibition–suicide inhibition. Determination of *Ki.* Fast reactions–Stopped flow, temperature jump method with examples of enzymes.	
Unit II:		**08**
2.1	**Enzyme Catalyzed Reactions**	
2.1.1	Bisubstrate enzyme catalysed reactions–Cleland's notation with examples for ordered, ping pong, and random.	
2.1.2	General rate equation. Primary and secondary plots. Mechanisms of enzyme catalysis–Active site structure and its investigation.	
2.1.3	Methods of determining active site structure–isolation of ES/EI complex, affinity labeling, chemical modification studies.	

Unit III:		
3.1	**Enzyme Catalysis and Cooperativity**	
3.1.1	Nature of enzyme catalysis: Transition state theory, proximity and orientation, orbital steering, acid base catalysis, covalent catalysis, metal ion catalysis, nucleophilic and electrophilic catalysis, intramolecular catalyses, entropy effects.	**12**
3.1.2	Effect of temperature and pH on enzyme catalyzed reactions.	
3.1.3	Oligomeric proteins and Cooperativity: Binding of ligands to macromolecules–Scatchard plot, Positive and Negative cooperativity. Oxygen binding to hemoglobin.	
3.1.4	Hill equation, homotropic and heterotropic effectors. Allosteric enzyme–Aspartyl transcarbamylase.	

Unit IV:		
4.1	**Multienzyme Complex and Coenzymes**	
4.1.1	Mechanisms of action of specific enzyme: Chymotrypsin zymogen activation, acid–base catalysis, charge relay net work. Lysozyme, alcohol dehydrogenase, ribonuclease, Carboxypeptidase–A, RNA as enzyme, coenzymic action of NAD+ FAD, TPP, PLP, biotin, CoA, folic acid and lipoic acid.	**12**
4.1.2	Multienzyme complexes: Isoenzymes, eg. LDH. Multifunctional enzyme (DNA polymerase) multi enzyme complex (PDC)	
4.1.3	Metabolic regulation of enzyme activity–Feedback regulation.	

References

[1] Fundamentals of Enzymology; 3rd Edn. Nicholas C. Price and Lewis Stevens, Oxford University Press (2012).
[2] Enzymes; Trevor Palmer, East - West Press Pvt. Ltd., Delhi (2004).
[3] Enzymes: A Practical Introduction to Structure, Mechanism, and Data Analysis; Robert A. Copeland, Wiley-VCH Publishers (2000).
[4] Enzyme Kinetics and Mechanism; Paul F. Cook, W. W. Cleland, Garland Science (2007).
[5] Enzyme Kinetics; Roberts, D.V. (1977), Cambridge University Press.
[6] The Enzymes; Boyer, Academic Press, (1982).
[7] Principles of Enzymology for Food Sciences; Whitaker, Marcel Dekker (1972) Academic Press.
[8] Introduction to Enzyme and Co-enzyme Chemistry. Ed. T. Bugg, (2000), Blackwell Science.

Course Code	Title of the Course	Credits
BCA250	CHEMICAL PRINCIPLES AND BIOCHEMICAL REACTIONS	4

COURSE OUTCOME(S):

CO1 Specify in details with examples chemical principles and bonding

CO2 Write down in depth thermodynamics

CO3 Learn in details with application, if applicable, stereochemistry

CO4 Deliberate in depth secondary metabolites

		No. of Lectures
Unit I:		**16**
1.1	**Chemical Principles and Bonding**	
1.1.1	Chemical principles: Acids and bases, Buffers. Buffering capacity. Ionic strength- Molarity, Normality, Mole concept, Avogadro number, structure and special properties of water.	
1.1.2	Bonding: Covalent bond, ionic bond, Coordinate bond. Coordinate bond formation by transition metals in biological complex structures.	
1.1.3	Crystal field theory, ligand field theory, valence bond theory.	
1.1.4	Bonding of iron in hemoglobin and cytochromes, cobalt in Vit B12, and Mg2+ in chlorophyll. Chelates and complexes.	

Unit II:		**08**
2.1	**Thermodynamics**	
2.1.1	Physiological importance of electrolytes: Osmotic pressure, vapour pressure, vapour pressure osmometer, Donnan membrane equilibrium.	
2.1.2	Introduction to thermodynamics: I, II and III law. Enthalpy, entropy and free energy. Free energy and chemical equilibrium	
2.1.3	Electrodes: Hydrogen electrode, oxygen electrode, oxidation and reduction reactions, redox potential.	

Unit III:		**12**
3.1	**Stereochemistry and Heterocyclic Compounds**	
3.1.1	Importance of Stereochemistry, position and order of groups around carbon. Geometric and optical isomerism, absolute and relative configuration. Symmetry view of	
3.1.2	chirality, relation between chirality and optical activity, representation of chiral structures by Fischer.	
3.1.3	Structure and stereochemistry of glucose–anomers, epimers and sterioisomers, D and L, + and – R and S notations.	
3.1.4	Heterocyclic Compounds: Chemistry, biological	

	occurrence of furan, indole, thiazole, pterine, pteridine, isoalloxazine, pyrrole.	

Unit IV:		
4.1	**Organic Reactions and Secondary Metabolites**	
4.1.1 4.1.2 4.1.3	Mechanism of Organic Reactions: Classification of organic reactions. Reaction intermediates, reaction energetics, rate, order and molecularity of reactions. Mechanisms and stereochemistry of substitution, addition, and elimination. Rearrangements reactions. Mechanisms of ester hydrolysis. Aromaticity and resonance structure. Hydrogenation- homogenous and heterogenous hydrogenation Secondary metabolites: Phytochemicals, terpenes, polyphenols, procyanidins, flavonoids, xanthones, alkaloids and pigments.	**12**

References

[1] Basic principles of organic chemistry- Robers and Caserio
[2] Organic chemistry, Hendrickson, Cram and Hammonal.
[3] Organic chemistry, I. L. Finar, Longman group Ltd.
[4] Organic chemistry, Morrison and Boyd, 4th edition Allyn and Bacon Inc.

Course Code	Title of the Course	Credits
BCA250	PLANT BIOCHEMISTRY	4

COURSE OUTCOME(S):

CO1 Specify in details with examples Photosynthetic pathways and its regulations

CO2 Write down in depth plant growth hormones in the agriculture

CO3 Learn in details with application, if applicable, Medicinal plants

CO4 Deliberate in depth secondary metabolites of plants and its significance

		No. of Lectures
Unit I:		
1.1	**Plant Cell and Photosynthesis**	
1.1.1	Plant cell–Structure and functions of subcellular organelles, plant cell wall, Mechanism of water absorption, Ascent of sap. Transpiration - types, stomatal opening, Mechanism and factors affecting transpiration.	**12**
1.1.2	Photosynthesis–Photosynthetic pigments, Photo synthetic apparatus, Light reactions, cyclic and non cyclic Phosphorylation. Calvin cycle, Hatch–Slack cycle, CAM plants.	
1.1.3	Regulation of photosynthesis, Photorespiration.	

Unit II:		
2.1	**Cycles of elements**	
2.1.1	Nitrogen cycle, Biochemistry of symbiotic and non symbiotic nitrogen fixation, Sulphur cycle, Phosphorus cycle.	**12**
2.1.2	Plant nutrition–Biological functions of micro and macro nutrients in plants and their deficiency symptoms.	

Unit III:		
3.1	**Growth Regulators**	
3.1.1	Plant growth regulators–chemistry, biosynthesis, mode of action, distribution and physiological effects of Auxins, Gibberellins, Cytokinins, ABA and Ethylene.	**16**
3.1.2	Biochemistry of seed dormancy, Seed germination,	
3.1.3	Fruit ripening and Senescence.	

Unit IV:		
4.1	**Medicinal Importance**	**08**
4.1.1	Medicinal value of different parts of plants.	
4.1.2	Basic methods to identify the secondary metabolites. Role of secondary metabolites in Ayurvedha and Siddha treatment.	
4.1.3	Medicinal value of Amla, Stevia, Aswagandha, Turmeric and other Indian medicinal plants.	

References

[1] Plant physiology, Verma, 7th Revised edition, Emkay Publications 2001.

[2] Plant Physiology, S. N. Pandey and B.K. Sinha, Vikas Publishing House Pvt. Ltd, 3rd edition, 1999.

[3] Plant Biochemistry and Molecular Biology, Peter Jhea, Richard C. Leegood,

[4] Introduction to plant physiology, William. G.Hopkins, Norman. P.A. Hunger, 3rd edition

[5] A Handbook of Medicinal Plants –Prajapathi, Purohit,Sharma, Kumar

[6] Medicinal Plants –a compendium of 500 species.

Course Code	Title of the Course	Credits
BCA250	MICROBIAL BIOCHEMISTRY	4

COURSE OUTCOME(S):

CO1	Specify in details with examples staining techniques used for the identification of microbes
CO2	Write down in depth Molecular biology of prokaryotes
CO3	Learn in details with application, if applicable, Operon systems in gene regulation of bacteria
CO4	Deliberate in depth antimicrobial drugs are used for the microbial infections

		No. of Lectures
Unit I:		**10**
1.1	**Pure Culture, Staining Technique and Growth**	
1.1.1	Principles of microbial nutrition: Nutritional requirements, different kinds of media, factors affecting growth.	
1.1.2	Enrichment culture techniques for isolation of chemoautotroph's, chemoheterotroph's and photosynthetic microorganisms. Modes of reproduction,	
1.1.3	Biosynthesis of cell wall components, enumeration, growth curve, generation time, synchronous growth, Chemostat. Adaptation to stationary phase, heat and cold shock, osmolarity and salinity, oxidative stress.	
1.1.4	Gram, Acid fast & flagellar staining. Mechanism of bacterial motility.	

Unit II:		**14**
2.1	**Regulation of Genes in Bacteria**	
2.1.1	Nucleic Acids as Carriers of Genetics Information, Arrangement and Organization of Gene in Prokaryotes:	
2.1.2	Operon Concept, Catabolite Repression, Instability of Bacterial RNA, Inducers and Co repressors E. coli Lac Operon: Negative Regulation and Positive Regulation, E. Coli Arabinose Operon: Regulation by Attenuation, His and Trp Operons: Anti-termination,	
2.1.3	Genetic Transfer: Conjugation, Transformation and Transduction.	

Unit III:		
3.1	**Virology and Biological Nitrogen Fixation**	
3.1.1	Introduction to Virus, Classification, Assay Methods, Properties and Characteristic of Bacterial, Plant and Animal Viruses	**16**
3.1.2	Virus Host Interaction, Acute Virus Infections, Persistent of Virus Infection, Influenza, Herpes, Hepatitis A and B.	
3.1.3	Nitrogen Metabolism: Mechanism and Regulation of Utilization of Ammonia, Nitrate and other Nitrogen Source	
3.1.4	Nitrogen Fixation: Mechanism and Regulation of Nitrogen Fixation, Symbiotic and Asymbiotic Nitrogen Fixation and Biochemistry of Nitrogenase.	

Unit IV:		
4.1	**Antimicrobial Agents**	
4.1.1	The Development of Antimicrobial Agents, Past, Present and Future, Selection of Antimicrobial Agents	**08**
4.1.2	Synthetic Organic Antimicrobials, β-Lactam Antibiotics, Amino glycoside Antibiotics, Antifungal Drugs, Antiviral Drugs	
4.1.3	Resistance to Antimicrobial Drugs	

References

[1] Microbial physiology, 2nd Edn. I.W. Dawes and I.W. Sutherland (1991) Blackwell Scientific.
[2] Microbial physiology, 4th Edn. Albert G. Moat, John W. Foster and Michael P. Spector, Wiley-Liss (2002).
[3] Biology of Microorganisms, Brock Prentice Hall (1996).
[4] Microbiology: Lansing M. Prescot, Hartley and Klein, 5th Edn. McGraw Hill (2002).
[5] General Microbiology, Stainer *et al.,* 4th Edn. McMillan (1975).
[6] Microbiology, Pelczer, Reid and Kreig Tata McGraw Hill (1996).

Course Code	Title of the Course	Credits
BCB040	ANALYTICAL BIOCHEMISTRY–II	4

COURSE OUTCOME(S):

CO1 Identify in details with application, if applicable, flow cytometry

CO2 Specify the characteristics of biosensor technology

CO3 Understand in details with examples spectroscopy

CO4 Write down the details of x-ray crystallography

		No. of Lectures
Unit I:		**08**
1.1	**Flow Cytometry and Model Systems**	
1.1.1	Flow Cytometry: Principle and design of flow cytometer, cell sorting.	
1.1.2	Animal models: Choice of animals, types of studies, mutant organisms, cultured cells, plant as models and tissue culture models.	

Unit II:		**16**
2.1	**Biosensor Technology and Radioactivity**	
2.1.1	Concept and design of biosensors, types and uses of biosensors.	
2.1.2	Principle and applications of biosensors for glucose, triglyceride, uric acid, cholesterol and oxalate.	
2.1.3	Units of radioactivity. Detection and measurement of radioactivity–solid and liquid scintillation counting, scintillation cocktails and sample preparation. Cerenkov counting. Applications of radioisotopes in biology. Radiation hazards.	
2.1.4	Principle and Applications of Autoradiography	

Unit III:		**10**
3.1	**Spectroscopy**	
3.1.1	Principle, instrumentation, working and application of– Spectrofluorimetry, Flame Spectrophotometry, Atomic Absorption Spectrometry.	
3.1.2	IR spectroscopy: Physical basis of IR spectroscopy. Instrumentation, use of IR in structure determination, Fourier Transfer–IR spectroscopy.	
3.1.3	NMR: Principle, effect of atomic, identity on NMR, chemical shift, spin coupling NMR, measurement of NMR spectra, biochemical application of NMR.	
3.1.4	ESR: Principle, measurement of ESR spectra, biochemical application of ESR.	
3.1.5	Principle, instrumentation and applications of ORD and CD	

Unit IV:		
4.1	**Mass spectroscopy, X-ray Crystallography and Nanoparticles**	
4.1.1	Theory and construction of mass spectrometer. Ionization, fragmentation, *m/z*, time of flight, MALDI and ESI.	
4.1.2	Other methods: MS/MS, LC/MS, GC/MS, Peptide mapping, post translation modification analysis, determination of disulfide bridges	
4.1.3	X-ray crystallography–Bragg's law, Unit cell, Isomorphous replacement, Fibre pattern of DNA.	**14**
4.1.4	Introduction to Nanoscience: Importance and fundamental science behind nanotechnology.	
4.1.5	Applications of Nanoparticles: Tools to make nanostructures, Nanoscale lithography, E–beam lithography, molecular synthesis, self assembly. Drug and Gene delivery for human health, Biosensors and sensors, cleaning environment (for heavy metal & Bioremediation).	

References

[1] Analytical techniques in Biochemistry and Molecular Biology; Katoch, Rajan. Springer (2011)

[2] Basic Methods for the Biochemical Lab; Martin Holtzhauer, Springer, (2007).

[3] Principles and Techniques of Biochemistry and Molecular Biology 7th Edn. Keith Wilson and John Walker, Cambridge University Press, (2010).

[4] Biochemistry LabFax, Ed. J.A.A. Chambers and D. Rickwood,, Blackwell Science, (1993),

[5] Protein Purification Applications, S.L.V. Harris and Angal IRL Press, (1990)

[6] Laboratory Techniques in Biochemistry and Molecular Biology, Work and Work Vol. I & II, North Holland, (1969).

[7] Basic Mathematics for Biochemists; Cornish Bowden, Oxford University Press (1998),.

[8] Biophysical Tools for Biologists *In Vivo* Techniques; John Correia H. Detrich, III Elsevier (2008).

[9] Practical Biochemistry by Keith Wilson and Walker 5th ed. Cambridge.

[10] Biophysical chemistry, Upadhyaya, A., Upadhyaya, K. and Nath, N. Himalayan Publishing House.

[11] Practical biochemistry- Principles and Techniques. Wilson and Walker. J.Cambride Uni. Press.

[12] Physical Biochemistry-David Freifelder, 2nd Edition.

[13] Principles of Instrumental Analysis. 5th Ed. Douglas A Skoog, James Holler and Timothy A Nieman.

Course Code	Title of the Course	Credits
BCB050	CHEMISTRY AND METABOLISM OF CARBOHYDRATES AND LIPIDS	4

COURSE OUTCOME(S):

CO1 Understand the classification and characteristics of chemistry of carbohydrates

CO2 Deliberate the classification and characteristics of bioenergetics

CO3 Write down the characteristics of chemistry of lipids

CO4 Learn in depth metabolism of lipids

		No. of Lectures
Unit I:		**10**
1.1	**Chemistry of Carbohydrates**	
1.1.1	Classification, monosaccharides (aldoses & ketoses) Configuration and conformation of monosaccharides (pyranose & furanose, chair & boat).	
1.1.2	Reducing and optical properties of sugars. Stability of glycosidic bond disaccharides, oligosaccharides.	
1.1.3	Structural polysaccharides–cellulose, hemicellulose, pectin, lignin, chitin, chitosan	
1.1.4	Storage polysaccharides: starch, glycogen, inulin Steric factors in polysaccharides folding, blood group polysaccharides and lectins. Glycosaminoglycans, mucopolysaccharides, hyaluronic acid Chondroitin sulfate, keratan sulfate, dermatan sulfate. Bacterial cell wall polysaccharides, proteoglycans (syndecan and agrecan)	

Unit II:		**14**
2.1	**Metabolism of Carbohydrates and Bioenergetics**	
2.1.1	Reactions and energy balance in Glycolysis, Gluconeogenesis, TCA cycle, HMP Shunt pathway, Pasteur and Crabtree effect, Anapleurotic reactions	
2.1.2	Glyoxylate cycle, Glucuronic acid cycle, Glycogen metabolism.	
2.1.3	Photosynthesis reactions for biosynthesis of glucose C3 and C4 cycle in plants	
2.1.4	Mitochondrial ETC–Organization of respiratory chain complexes, P/O ratio, ATP synthesis, Mitchell's hypothesis, uncouplers and inhibitors.	

Unit III:		**12**
3.1	**Chemistry of Lipids**	
3.1.1	Classification & biological significance of lipids, fatty acids and Steroids	
3.1.2	Bile acids and salts, Phospholipids, Oils, waxes, isoprene units, Lipoproteins, Glycolipids, Sphingolipids	

3.1.3	Cerebrosides, Gangliosides, Prostaglandins, Prostacyclins, Thromboxanes, Leukotrienes, cysteinyl leukotrienes	

Unit IV:		**12**
4.1	**Metabolism of Lipids**	
4.1.1	Fate of dietary lipids and Apo-lipoproteins Fatty acid biosynthesis, Desaturation of fatty acids Beta oxidation, breakdown of odd chain fatty acids, energy yields	
4.1.2	Regulation of β–oxidation, ώ–oxidation & α–oxidation Metabolism of phospholipids &Sphingolipids Regulation and Biosynthesis of cholesterol, action of statins	
4.1.3	Fate of acetyl CoA, formation of ketone bodies and ketosis	
4.1.4	Biosynthesis of prostaglandins, Prostacyclins, Thromboxanes, Leukotrienes, Action of aspirin	
4.1.5	Genetic defects in lipid metabolism, Medium chain acyl coenzyme A dehydrogenase deficiency MCAD, Long–chain 3–hydroxyacyl–CoA dehydrogenase (LCHAD) deficiency, Familial hypercholesterolemia	

References

[1] Lehninger Principles of Biochemistry 4th Ed By David L. Nelson and Michael M. Cox, WH Freeman and Company.

[2] Biochemistry by Lubert Stryer. WH Freeman and Co.

[3] Biochemistry: The Molecular Basis of Life by Trudy McKee and James R McKee. Publisher: McGraw-Hill Higher education.

[4] Biochemistry and Molecular biology By William H. Elliott and Daphne C. Elliott. Oxford University Press.

[5] Biochemistry 3rd Ed. By Donald J. Voet and Judith G. Voet. John Wiley and Sons.

[6] Biochemistry: Biomolecules, Mechanisms of Enzyme Action and Metabolism Vol 1 by D Voet. John Wiley and Sons.

Course Code	Title of the Course	Credits
BCB060	**EXPERIMENTS IN IMMUNOLOGY AND BIOCHEMICAL ESTIMATIONS**	4

COURSE OUTCOME(S):

CO1 Understand in details with examples antigen antibody reactions

CO2 Specify in details with application, if applicable, oils and fats estimation

CO3 Understand in depth acid value principle and determination

CO4 Identify in details with examples mitosis and meiosis

Group I:	1. Demonstration of Ag-Ab interaction: Radial immuno-diffusion and ODD. 2. Demonstration of direct agglutination reaction using human blood group antigens. 3. Demonstration of indirect agglutination reaction– latex agglutination. 4. Fluorescence emission of proteins and vitamins 5. UV–Vis spectra of proteins, nucleic acids and other aromatic compounds 6. Extraction of neutral lipids, phospholipids 7. TLC of lipids and estimation of phospholipids	
Group II:	8. Iodine No. of Oils/Fats 9. Saponification Value of Oils/Fats 10. Acid Value/Peroxide Value of Oils/Fats 11. Estimation of α-Keto-acid 12. Estimation of ascorbic acid 13. Estimation of Iron 14. Estimation of Calcium	
Group III:	15. Isolation of Starch from potato and purity determination 16. Colorimetric estimation of reducing sugars (DNS reagent method) 17. Estimation of reducing sugar: Hegedorn and Jensen Method 18. Estimation of Phosphate 19. Mitosis in onion root tips 20. Meiosis in *tradescantia/*grasshopper testis 21. Total and Differential Cell Counting of blood	

Group Study	Preparation of antigen adjuvant mixture, injection and raising antibodies in rat. Purification of antibodies Antibody titer and ELISA	

References

[1] Analytical techniques in Biochemistry and Molecular Biology; Katoch, Rajan. Springer (2011).
[2] Basic Methods for the Biochemical Lab; Martin Holtzhauer, Springer, (2007).
[3] Principles and Techniques of Biochemistry and Molecular Biology 7th Edn. Keith Wilson and John Walker, Cambridge University Press, (2010).
[4] Biochemistry LabFax, Ed. J.A.A. Chambers and D. Rickwood,, Blackwell Science, (1993),
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[11] Biochemical Calculations, Irwin H. Segel (1976) 2nd Ed. John Wiley and Sons.
[12] Methods in Immunology and Immunochemistry; Curtis Williams, Academic Press (1971).
[13] Immuno Assay Hand Book; David Wild, Elsevier (2013).

Course Code	Title of the Course	Credits
BCB250	IMMUNOLOGY AND MICROBIOLOGY	4

COURSE OUTCOME(S):

CO1 Identify in details with examples antigens and antibodies

CO2 Understand the details of cellular basis of immunity

CO4 Identify the classification and characteristics of MHC Complex

CO4 Learn in depth basic concepts of microbiology

		No. of Lectures
Unit I:		**12**
1.1	**Antigens and Antibodies**	
1.1.1	Introduction: Historical development and milestones in immunology. Barriers to infection–skin, mucous membrane, Definitions–Antigenicity, Immunogenicity, primary and secondary lymphoid organs, self and non self discrimination. Innate and acquired immunity.	
1.1.2	Antigens and Antibodies: Haptens and determinants–Epitopes and paratopes. Antigenicity, carbohydrates, proteins, nucleic acids, and cells as antigens. Valency of antigen.	
1.1.3	Classes and subclasses of immunoglobulins, structure of immunoglobulins, hyper variable region, isotypic, allotypic and idiotypic variations.	
Unit II:		**12**
2.1	**Complement and Cellular Basis of Immunity**	
2.1.1	Complement: Structure, components, properties and functions of complement pathways, biological consequences of complement activation.	
2.1.2	Hyper sensitivity reactions (Type I, II, III and IV).	
2.1.3	Cellular basis of immunity: Primary and secondary immune response. Reticuloendothelial system. T, B and accessory cells. Subsets of T (T–helper cells, T–killer cells, T–suppressor cells) and B cells. Development of T and B cells. T and B cell receptors, antigen processing and presentation.	
2.1.4	Cytokines and co–stimulatory molecules–Lymphokines, interleukins structure and function of IL-2, TNFα. T and B interaction. Suppression of immune response, immunoglobulin, diversity of gene rearrangement, factors affecting diversity, class switching and clonal selection theory of Burnet.	

Unit III:		
3.1	**MHC, Transplantation, Tumor Immunology and Vaccines**	
3.1.1	MHC: MHC gene and its polymorphism, role of MHC in immune response.	**16**
3.1.2	Transplantation: Autograft, isograft, allograft and xenograft, Graft rejection, graft *Vs* host reaction, MHC in transplantation.	
3.1.3	Immunochemical techniques: Precipitation, agglutination, complement fixation, immunodiffusion, immunoelectrophoresis, immunofluorescence, RIA, ELISA.	
3.1.4	Tumor immunology: Tumor associated antigens, factors favoring tumor growth, immune surveillance. Tumor necrosis factors α and β Disorders of immunity: Immunological tolerance, auto immune disorders, AIDS, SCID, lupus erythematosus Vaccines: Adjuvants; vaccines and their preparations. Polyclonal and monoclonal antibodies–hybridoma technique.	
Unit IV:		
4.1	**Microbiology**	
4.1.1	Historical aspects - Discovery of microorganisms. Theory of spontaneous generation. Era of Louis Pasteur. Microbes and fermentation. Microbes and diseases-Koch's Postulates.	**08**
4.1.2	General characteristics: Morphology, nomenclature and classification of bacteria, virus, yeasts and fungi.	
4.1.3	Microbial nutrition-Factors influencing growth, growth curve of bacteria. Measurement of growth, continuous culture, synchronous culture and chemostat. Auxotrophs, autotrophs, heterotrophs. Methods of cultivations and preservation of microorganisms.	
4.1.4	Methods of control of microorganisms-Sterilization Techniques: Definitions of physical methods, heat (dry & moist) filtration, radiation; chemical agents-phenols, alcohols, halogens, heavy metals, aldehydes, quaternary ammonium compounds & gases.	

References

[1] Antibodies–A Laboratory Manual; E. D. Harlow, David Lane, 2nd Edn. CSHL Press (2014).
[2] Basic and Clinical Immunology; Stites *et al.,* [Ed] (1982) Lange.
[3] Roitt's Essential Immunology; Ivan, M. Roitt & Peter J Delves (2001) Blackwell Science.
[4] Immunology: Roitt *et al.,* Mosby (2001),
[5] Kuby Immunology; Oven, Punt, Stranford, 7th Edn. W. H. Freeman (2013).
[6] Immune System; M. C. Connel et al., Eds. (1981) Blackwell Science.
[7] Immunology at a Glance: J.H.L. Playfare [ed.] Blackwell Science, (1987).
[8] Immunology; Jan Klein [Ed.], Blackwell Science (1990).
[9] Introduction to Immunology; Kim Bell [Ed.,] 3rd Edn. McMillan (1990).

Course Code	Title of the Course	Credits
BCB260	HUMAN PHYSIOLOGY AND NUTRITION	4

COURSE OUTCOME(S):

CO1 Specify the classification and characteristics of blood and respiratory systems

CO2 Identify in depth digestive and excretory systems

CO3 Learn in details with application, if applicable, concepts of nutrition

CO4 Specify the details of vitamins and minerals

		No. of Lectures
Unit I:		**12**
1.1	**Blood and Respiratory System**	
1.1.1	Blood–Composition, cells. Erythrocytes–structure and function, WBC–types and functions.	
1.1.2	Platelets and their function. Buffer systems; hemostasis–blood volume, blood pressure and its regulation. Blood clotting, Dissolution of clot; anticoagulants. CSF–composition and function.	
1.1.3	Respiratory System–Mechanism of gas exchange, oxygen binding by hemoglobin and factors affecting oxygenation. Acid–base balance and its regulation.	

Unit II:		**12**
2.1	**Hepatobiliary, Digestive and Excretory System**	
2.1.1	Hepatobiliary system–Anatomy of the liver, blood supply; cells–hepatocytes, endothelial cells, Kupffer cells and paranchymal cells.	
2.1.2	Secretory and excretory function; detoxification and formation of bile	
2.1.3	Digestive system–GI tract, digestion and absorption of carbohydrates, proteins and lipids. Mechanism of HCl production in the stomach. Gastrointestinal hormones.	
2.1.4	Excretory System–Ultra structure of the nephron, glomerular filtration, tubular reabsorption and tubular secretion, formation of urine.	

Unit III:		**16**
3.1	**Nutrition, Carbohydrates, Proteins and Fats**	
3.1.1	Nutrition–Concepts of macro and micro nutrients, essential nutrients and their classification. Food groups, proximate analysis of foods, chemical and biological analysis for nutrients.	
3.1.2	Food as source of energy, methods of determining energy value of foods, calorimetry, physiological fuel values and daily requirement of energy, high and low	

	calorie diets. Basal metabolic rate (BMR), factors affecting BMR, specific dynamic action of foods.	
3.1.3	Carbohydrates–dietary sources, dietary fiber essentiality of carbohydrates.	
3.1.4	Proteins–Evaluation of nutritive value of dietary protein PER, BV, essential amino acids, nutritional classification of proteins, supplementary value of proteins, protein calorie malnutrition–Kwashiorkor and Marasmus.	
3.1.4	Fats–Sources, invisible fat, essential fatty acids, PUFA.	

Unit IV:		
4.1	**Vitamins and Minerals**	
4.1.1	Vitamins–Fat soluble and water soluble vitamins, provitamins, antivitamins, dietary sources, structure, daily requirements and functions.	**08**
4.1.2	Deficiency symptoms of B complex members and fat soluble vitamins, hypervitaminosis, vitamin like compounds.	
4.1.3	Minerals–Macro and micronutrients, sources, requirements, functions and deficiency symptoms.	
4.1.4	Water metabolism–distribution in body, function and factors affecting water balance.	
4.1.5	Recommended daily allowances, special nutrition for infants, children, during pregnancy, lactation and old age.	

References

[1] The Cell, Copper, Geoffery, M., Oxford University Press, (2001)
[2] Text Book f Biochemistry with Clinical correlations; Thomas Devlin [Ed.] (1997), Wiley –Liss.
[3] Lehninger- Principles of Biochemistry; DL Nelson and MM Cox [Eds), 6th Edn. Macmillan Publications (2012).
[4] Principles of Human Physiology; 4th Edn. Cindy L. Stanfield Pearson, (2010).
[5] Human Biochemistry, Orten and Neuhans , 10th Edn. Mosbey International, (1983).
[6] Human Physiology: The mechanisms of Body functions. A.J. Vander, et. Al.,(1985) McGraw-Hill.
[7] Molecular Cell Biology, Baltimore et. al. (1995) Scientific American Publication.
[8] Harper's Review of Biochemistry, Murray et. al., (1997) 24th Edn., Lange
[9] Molecular Biology of Cell; Albertis *et. al.* (2002) Garland Science.
[10] Biochemistry Ed. Donald Voet & Judith G. Voet, John Wiley & Sons, Inc. (2010).
[11] Mammalian Biochemistry; White, Handler and Smith, McGraw-Hill, (1986).
[12] Textbook of human Physiology by Guyton, 11th ed.Elesvier.
[13] Introduction to Human Nutrition, 2nd Edn. Michael J. Gibney, Susan A. Lanham-New, Aedin Cassidy, Hester H. Vorster, Wiley-Blackwell (2009).
[14] Nutrition: Everyday Choices, 1st Edition; Mary B. Grosvenor, Lori A. Smolin Wiley (2006).
[15] Bioactive Food as Dietary Interventions for Liver and Gastrointestinal Disease; Watson Elsevier (2012).
[16] Nutrition and Metabolism, 2nd Edn., Lanham S, Mac Donald I and Roche H. The Nutrition Society, London, UK, (2012).
[17] Introduction to Human Nutrition, 2nd Edn., Gibney M, Lanham S, Cassidy A and Vorster H. The Nutrition Society, London, UK, (2012).

Course Code	Title of the Course	Credits
BCB260	RESEARCH METHODOLOGY AND BIOSTATISTICS	4

COURSE OUTCOME(S):

CO1 Specify the classification and characteristics of research methodologies and the experimental designs

CO2 Identify in depth statistical analysis

CO3 Learn in details with application, if applicable, scientific write-up

CO4 Specify the details of Interpretation of data

		No. of Lectures
Unit I:		
1.1	**Research Methodology and Design**	
1.1.1	Research Methodology: Meaning of research, Objectives of research, Motivation in Research, Types of Research, and Research approaches.	
1.1.2	Research methods vs. Research Methodology, Research process–scientific method, Criteria for good research, Defining the research problem.	**12**
1.1.3	Research Design: Meaning and need for research design, features of good design. Preparation of Scientific report, presentation of a review.	

Unit II:		
2.1	**Scientific Writing**	
2.1.1	Mechanical and stylistic aspects of scientific writing-Precision and clarity of language, writing style, writing process, presentation of numerical data and scientific figures.	
2.1.2	Constraints on scientific writing–audience, format and mechanics (grammar, word choice, punctuation, tenses).	**12**
2.1.3	Objectives and design of experiment–experimental unit, identifying variables, replications & controls, power analysis in planning experiments, treatment structure and design structure.	
2.1.4	Graphical analysis of data and presentation of results.	

Unit III:		
3.1	**Statistical Significance Analysis**	
3.1.1	Significance and limitations of statistical calculations, Sampling techniques.	
3.1.2	Probability theory, random variables and distribution functions, Point and interval estimation, linear regression. Statistical evaluation of results–Hypothesis testing, interpretation of statistic for analysis of error.	**16**
3.1.3	Measures of central tendency and dispersion	

Unit IV:		**08**
4.1	**Testing Methods**	
4.1.1	ANOVA, F-test, t-test, z-test, chi-square, correlation coefficient.	

References

[1] Research Methodology: Methods & Techniques By CR Kothari. Publisher: New Age International

[2] From Research to Manuscript: A Guide to Scientific Writing (Paperback) By Michael Jay Katz. Publisher: Springer

[3] The Craft of Scientific Writing (3rd Edition) By Michael Alley. Publisher: Springer-Verlag.

[4] Writing Scientific Research Articles: Strategy and Steps (Hardcover) By Margaret Cargill and Patrick O.Connor. Publisher: WileyBlackewell.

[5] The Mayfield Handbook of Technical and Scientific Writing By Leslie Perelman and Edward Barrett. McGraw-Hill NY

[6] Scientific Style and Format: The CBE Manual for Authors, Editors, and Publishers(Hardcover) 6th Ed By Edward J. Huth. Publisher: Cambridge University Press.

[7] The Handbook of Technical Writing, Eighth Edition (Handbook of Technical Writing Practices) (Hardcover) By Gerald J. Alred, Charles T. Brusaw and Walter E. Oliu, St. Martin's Press.

[8] Science and Technical Writing: A Manual of Style (2nd Ed.) By Philip Rubens. Publisher: Routledge, London.

[9] The Elements of Technical Writing (Elements of Series) (Paperback) By Gary Blake and Robert W. Bly. Publisher: Longman.

[10] Technical Writing: Principles, strategies and readings (7th Edition) By Diana C. Reep. Publisher: Longman.

[11] Biostatistics By PN Arora and PK Malhan, Himalaya Publishing House.

[12] Experimental Design and Data Analysis for Biologists By Gerry P. Quinn and Michael J. Keough. Publisher: Cambridge University Press.

[13] Principles of Biostatistics (with CD-ROM) (Hardcover) By Marcello Pagano and Kimberlee Gauvreau. Publishers: Duxbury Press

[14] Biostatistics: Experimental Design and Statistical Inference (Hardcover) By James F. Zolman. Oxford University Press.

[15] Intuitive Biostatistics By Harvey Motulsky. Publisher: Oxford University Press

Course Code	Title of the Course	Credits
BCB260	**CLINICAL RESEARCH METHODS AND INDUSTRIAL BIOCHEMISTRY**	**4**

COURSE OUTCOME(S):

CO1 Specify the classification and characteristics of clinical practice and clinical research

CO2 Identify in depth fermentation technology and downstream processing

CO3 Learn in details with application, if applicable, clinical research methods

CO4 Specify the details of steps involved in drug discovery

		No. of Lectures
Unit I:		
1.1	**Introduction to Clinical Research**	
1.1.1	Introduction to Clinical Research, Terminologies and definition in Clinical Research, Origin and History of Clinical Research	
1.1.2	Difference between Clinical Research and Clinical Practice, Types of Clinical Research, Phases of clinical research	**10**
1.1.3	Clinical Trials in India–The National Perspective, Post marketing surveillance	
1.1.4	Pharmaceutical Industry–Global and Indian Perspective Clinical Trial market, Career in Clinical Research	

Unit II:		
2.1	**Clinical Research Methods**	
2.1.1	Design of experiments, factorial experiments, randomization, interaction among factors.	
2.1.2	Types of studies: Cohort studies, double blind, placebo control, cross over and double dummy.	
2.1.3	Introduction to Good Clinical Practices, Clinical Trial Development: Protocol Design and Development, Case Report Form Design and Development, Principals of Data Management, Clinical Trial Management: Maintaining and Managing Essential Documents, Recording and Reporting Non–Serious and Serious Adverse Events.	**14**

Unit III:		
3.1	**Drug Discovery Concepts and Biostatistics**	
3.1.1	Proof of concept, target identification and validation. Identifying the lead compound, optimization of lead compound, mechanism of action, drug target and validation of target.	**12**
3.1.2	Safety pharmacology, pharmaco–kinetics and	

	pharmaco–dynamics, acute and chronic toxicity Development of new drug/molecules and elucidation of their mechanisms of actions, formulations, factors affecting drug efficacy, drug resistance, traditional medicines; biotransformation.	
3.1.3	Statistical concept: Data structure, sampling methods, collection, classification and tabulation of data, graphical and diagrammatic representation, histogram, frequency polygon, frequency curve, bar graph, pie chart.	
3.1.4	Measure of central tendency: Mean, median, mode,mean deviation, standard deviation, standard error Types of distribution of data: Normal, binomial, Poisson,	
3.1.4	Z-test, t-test and ANOVA. Correlation and regression.	
Unit IV:		
4.1	**Bioprocess Methods**	
4.1.1	Basics of chemical engineering, mass transfer, heat generation and removal, fluid dynamics:	
4.1.2	Bernoulli's principle, viscosity, hydraulic conductivity, capillary flow, control and applications of industrial processes, process evaluation and development, over production of metabolites and methods;	**12**
4.1.3	Fermentation–Submerged and solid state fermentation Fermentor design, Industrial use of microbes. Strain improvement, Inocula preparation, Downstream processing–Recovery and purification of intracellular and extra cellular products. Methods to maximize the yield.	

References

[1] Basic Test for Drugs, WHO-GENEVA 1998 edition
[2] Who Expert Committee on Specification for Pharmaceutical Preparation WHO-GENEVA, 2005 edition
[3] Who Expert Committee on Biological Standardization WHO-GENEVA 2003 edition
[4] Clinical Research Fundamental and Practice –Vishal Bansal Parar Medical Publisher, 2010 edition
[5] Introduction to Pharmacopoeia CBS Publishers and Distributors 1991 edition
[6] Essential of Clinical Research –Dr. Ravindra B. Ghooi and Sachin C. Itkar Nirali Prakashan 2010 edition
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[8] A Comprehensive Clinical Research Manual-Samir Malhotra, Nusrat Shafiq, Promila Pandhi Jaypee Brothers Medical Publishers (P) Ltd, 2008 edition
[9] Industrial microbiology, A.H. Patel
[10] Principles of Fermentation technology, Stanburry. P. Whitaker and S.J. Hall, 1995
[11] Biotechnology–U. Sathyanarayana. YLL

Course Code	Title of the Course	Credits
BCC070	CELL BIOLOGY, ENDOCRINOLOGY AND CELL SIGNALING	4

COURSE OUTCOME(S):

CO1 Specify in details with examples cellular organization

CO2 Learn the characteristics of endocrinology

CO3 Learn in depth cell signaling

CO4 Write down the characteristics of membrane biology

		No. of Lectures
Unit I:		**12**
1.1	**Cellular Organization, Division and Cytoskeletons**	
1.1.1	Cell types–organization of prokaryotic and eukaryotic cells.	
1.1.2	Cell division–mitosis and meiosis, cell cycle–phases of cell cycle, cyclins and cdks. Regulation of cell growth and cell cycle.	
1.1.3	Cell motility–molecular motors, microtubules, structure and composition. Microtubular associated proteins–role in intracellular motility.	
1.1.4	Cellular organelles–Nucleus–internal organization, traffic between the nucleus the nucleolus, and cytoplasm. Endoplasmic reticulum–protein sorting and transport, golgi apparatus and lysosomes, morphology and function of mitochondria, chloroplasts and peroxisomes, glyoxysomes.	

Unit II:		**12**
2.1	**Membrane Biology**	
2.1.1	Organization of lipid monolayer, bilayer, Physicochemical properties of biological membranes - compositions, supra molecular organization - Singer and Nicolson's model.	
2.1.2	Membrane asymmetry-lipids proteins and carbohydrates, lateral diffusion, biogenesis of lipids and proteins. Polarized cells, membrane domains- caveolae, rafts, Membrane lipid and protein turnover, intracellular targeting of proteins. Factors influencing fluidity of membrane	
2.1.3	Membrane transport - Laws of diffusion across membranes, simple diffusion, facilitated diffusion and active transport - glucose transporter Na+ K+ ATPase (Structure and mechanism of action), bacterial phosphotransferase system. Endocytosis, receptor mediated endocytosis, exocytosis, ion channels, aquaporin channel, ionophores. Patch clamp technique.	

Unit III:		
3.1	**ENDOCRINOLOGY**	
3.1.1	Endocrine System–Endocrine organs in man. Hierarchy and regulation of hormone release.	
3.1.2	Structure and control of hypothalamus, GRH, somatostatin, TRH, CRH, GnRH. Pituitary-anatomy and structure.	
3.1.3	Hormones of anterior, posterior and median lobes. Pro-opiomelanocortin. Thyroid, parathyroid, adrenals, gonads–Testes and ovaries. Menstrual cycle. Hypothalamus–pituitary target organ axis and regulation by feedback mechanism, Pineal gland, melatonin and circadian rhythm	**12**
3.1.4	Classification of hormones based on solubility and structure, mechanism of action of water soluble and lipid soluble hormones.	
Unit IV:		
4.1	**Cell Signaling**	
4.1.1	Nerve transmission–Central and peripheral nervous systems. Structure of neuron, axon, dendrites, synapse neuromuscular junction. Neurotransmitters- mechanisms of nerve conduction. α and β adrenergic neurons, nicotinic and muscarinic neurons.	
4.1.2	Muscle contraction–Skeletal muscle and smooth muscle contraction, muscle proteins–actin, myosin, tropomyosine, troponins, mechanisms of muscle contraction, role of calcium and calmodulin Biochemistry of vision	**12**
4.1.3	Cellular signaling: Extra cellular signaling–G Protein linked receptors ,Role of cyclic AMP, IP3, DAG, Ca2+ as a second messenger, receptos tyrosine kinases , MAP kinase pathway, NFkB pathway, apoptosis, Cell survival pathway, Jak/Stat pathway, TGF β Signaling. Multiple signaling path ways–Insulin receptor (regulation of blood glucose)	
4.1.4	Steroid hormone receptors, structural organization of receptor protein, hormone binding domain, antigenic domain and DNA binding domain.	

References

[1] The World of the cell by Becker, Kleinsmith and Harden Academic Internet Publishers; 5th edition (2006)

[2] The Cell: A Molecular Approach, Fourth Edition by Geoffrey M. Cooper and Robert E. Hausman.

[3] Cell and Molecular Biology by concepts and experiments by Gerald Karp (2005) John Wiley sons & Inc.

[4] Molecular cell Biology by Harvey Lodish. W. H. Freeman; 6th edition (2007)

[5] The Cell–Biochemistry, physiology and morphology by J. Brachet and A. E. Mirsky, Academic Press (1963)

Course Code	Title of the Course	Credits
BCC050	CLINICAL BIOCHEMISTRY	4

COURSE OUTCOME(S):

CO1 Identify in details with application, if applicable, specimen collection and analysis

CO2 Specify in details with application, if applicable, metabolic disorders

CO3 Write down the characteristics of hormonal disorders

CO4 Write down in details with application, if applicable, hematology

		No. of Lectures
Unit I:		
1.1	**Specimen Collection and Analysis**	
1.1.1	Concepts of accuracy, precision, reproducibility, reliability, and other factors in quality control.	
1.1.2	Normal values. Specimen collection and Processing: Collection of blood–venipuncture, skin puncture, arterial puncture. Anticoagulants. Collection and analysis of normal and abnormal urine–timed urine specimens, preservatives.	**10**
1.1.3	Clinical significance of sugars, proteins, ketone bodies, bilirubin and porphyrins. CSF–collection, composition and analysis. Amniotic fluid–Origin, collection, composition.	

Unit II:		
2.1	**Disorders**	
2.1.1	Disorders of carbohydrate metabolism: Diabetes mellitus, glycohemoglobins, hypoglycemias, galactosemia and ketone bodies.	
2.1.2	Various types of glucose tolerance tests. Glycogen storage diseases.	
2.1.3	Lipid profile, lipidosis and multiple sclerosis. Causes and diagnosis of the disorders of HDL–cholesterol, LDL–cholesterol and triglycerides.	**14**
2.1.4	Cancer: Etiology, diagnosis, treatment and prognosis. Carcinogens, oncogens, mechanism.	
2.1.5	Biochemistry of ageing: Cellular senescence, Role of Telomerase in aging, Alzheimer's disease, Parkinson's disease.	

Unit III:		
3.1	**Enzymes and Hormonal Disorders**	
3.1.1	Evaluation of organ function tests: Clinical assessment of renal, hepatic, pancreatic, gastric, intestinal and thyroid functions. Clinical importance of bilirubin.	**12**
3.1.2	Diagnostic enzymes: Principles of diagnostic enzymology. Clinical significance of aspartate aminotransferase, alanine aminotransferase, creatine	

	kinase, aldolase and lactate dehydrogenase.	
3.1.3	Enzyme tests in determination of myocardial infarction. Enzymes of pancreatic origin and biliary tract.	
3.1.4	Hormonal disorders: Protein hormones (anterior pituitary hormones, posterior pituitary hormones), steroid hormones, adrenocorticosteroids, and reproductive endocrinology. Disorders of thyroid hormones.	

Unit IV:		
4.1	**Hematology**	
4.1.1	Biochemical aspects of hematology: Total cell count, differential count, hematocrit.	**12**
4.1.2	Disorders of erythrocyte metabolism, hemoglobinopathies, thalassemias, thrombosis, porphyrias and anemias. Laboratory tests to measure coagulation and thrombolysis.	
4.1.3	Doping	
4.1.4	Detoxification in the body: Enzymes of detoxification, polymorphism in drug metabolizing enzymes. Mechanism of drug action and channels of its excretion.	
4.1.5	Test for lung function: Chest X-ray, Spirometry. Test for Brain function: EEG, MRI, CT.	

References

[1] Textbook of Medical Biochemistry by MN Chatterjea and Rana Shinde, Jaypee Brothers.

[2] Lehninger Principles of Biochemistry 5th Ed by David L. Nelson and Michael M. Cox, WH Freeman and Company.

[3] Davidson's Principles and Practice of Medicine: A Textbook for Students and Doctors (Hardcover) 15th Ed by LSP Davidson, J MacLeod and CRW Edwards. Publisher: Churchill Livingstone.

[4] Medical Biochemistry (Paperback) by John W. Baynes and Marek Dominiczak. Publisher: Mosby.

[5] Clinical Biochemistry: An Illustrated Colour Text (Paperback) 3rd Ed By Allan Gaw, Michael Murphy, Robert Cowan, Denis O'Reilly, Michael Stewart and James Shepherd. Publisher: Churchill Livingstone.

[6] Review of Medical Physiology (Lange Basic Science) (Paperback) By William F. Ganong. Publisher: McGraw-Hill Medical

[7] Harper's Biochemistry (Lange Medical Books) (Paperback) By Robert K. Murray, Daryl K. Granner, Peter A. Mayes and Victor W. Rodwell. Publisher: Appelton and Lange.

[8] Clinical Biochemistry by Richard Luxton. Scion Publishing Ltd.

[9] Principles of Medical Biochemistry: With STUDENT CONSULT Online Access (Paperback) by Gerhard Meisenberg and William H. Simmons. Publisher: Mosby.

Course Code	Title of the Course	Credits
BCC060	EXPERIMENTS IN CLINICAL BIOCHEMISTRY AND MOLECULAR BIOLOGY	4

COURSE OUTCOME(S):

CO1 Specify the details of urine and blood analysis

CO2 Specify the characteristics of determination of enzyme activity

CO3 Identify the classification and characteristics of DNA quantification and analysis

CO4 Deliberate the details of isolation of nucleic acids from plant, animal and microbial sources

Group I:	**Urine analysis** 1. Qualitative analysis of urine for normal organic and inorganic constituents 2. Qualitative analysis of urine for abnormal constituents- Glucose, albumin, Ketone bodies. 3. Quantitative estimation of Creatine and Creatinine, Urea Uric acid Sulphate Chloride 4. Titrable acidity **Blood analysis** 5. Quantitative estimation of Urea Uric acid Creatine Cholesterol HDL–C and LDL–C 6. Blood glucose and GTT	
Group II:	**Determination of Enzyme activity of** 7. Alkaline phosphatase 8. SGOT 9. SGPT 10. LDH 11. Electrophoresis of lipoproteins: Serum proteins. 12. Albumin/Globulin Ratio. 13. Fractionation of serum proteins-Ammonium sulphate precipitation. 14. Isolation of DNA and RNA from biological sources. 15. Quantitative determination of DNA and RNA.	
Group III:	16. Determination of melting temperature of DNA (Tm) 17. Sub-cellular fractionation of rat liver by differential centrifugation and marker analysis 18. Determination of activities of marker enzymes 19. Preparation of erythrocyte ghosts 20. Kinetics of uptake of glucose by erythrocytes 21. Viability of cells by trypan blue dye exclusion 22. Study of morphology of *Drosophila melanogaster*	

	23. Study of mutants of *Drosophila melanogaster* 24. Study of polytene chromosomes of *Drosophila melanogaster*	

Group Study	Isolation of plasmid DNA, Restriction digestion of plasmid DNA, ligation of DNA fragment into a plasmid vector, preparation of competent cells, *E.Coli* transformation and amplification of DNA by PCR.	

References

[1] Practical Clinical Biochemistry, ed. Harold Varley, 4th edn. CBS Publishers (1988).
[2] Practical Clinical Biochemistry: Methods and Interpretation, ed. Ranjna Chawla, Jaypee Brothers Medical Publishers (1996).
[3] Practical and Clinical Biochemistry for Medical Students, ed. T.N. Pattabhiraman, Gajana Publishers (1994).
[4] Hawk's Physiological Chemistry, ed. Oser, 14th Edn.(1976), Tata-McGrawHill.
[5] Biochemistry, ed. Plummer Tata-McGraw Hill, (1971).
[6] Molecular Biology Techniques; Sue Carson, Heather Miller and D. Scott Witherow, Academic Press (2011).
[7] Principles and Techniques of Biochemistry and Molecular Biology; 7th Edn. Keith Wilson and John Walker (2012).
[8] Principles of Gene Manipulations; 6th Edn. S.B. Primrose, R.M. Twyman, and R.W. Old, Blackwell Science (2012).
[9] Gene Cloning and DNA analysis- An Introduction; T. A. Brown, 5th Edition, Wiley-Blackwell (2006).
[10] Laboratory methods in Enzymology; Part-A; Jon Lorsch, Academic Press (2014).
[11] Gene Cloning Laboratory Manual 4th Edn. Michael R. Green and Joseph Sambrook, CSHL Press (2014).
[12] Current Protocols in Molecular Biology; S Gallaghar, Wiley Interscience (2008).

Course Code	Title of the Course	Credits
BCC220	GENOMICS, PROTEOMICS AND BIOINFORMATICS	4

COURSE OUTCOME(S):

CO1 Specify the details of DNA sequencing methods

CO2 Specify the characteristics of determination of Proteins

CO3 Identify the classification and characteristics of microarray data

CO4 Deliberate the details of bioinformatics in biological databases and sequencing analysis

		No. of Lectures
Unit I:		**12**
1.1	**Structural Organization of Genome and Sequencing**	
1.1.1	Structural organization of genome in Prokaryotes and Eukaryotes, Organelle DNA–mitochondrial, chloroplast,	
1.1.2	DNA sequencing–principles and translation to large scale projects, Recognition of coding and non–coding sequences and gene annotation. Tools for genome analysis–RFLP, DNA fingerprinting, RAPD, PCR, Linkage and Pedigree analysis–physical and genetic mapping.	
1.1.3	Microbes, plants and animals, Accessing and retrieving genome project information from web, Comparative genomics, ESTs and SNPs.	

Unit II:		**12**
2.1	**Proteomics**	
2.1.1	Protein analysis (includes measurement of concentration, amino-acid composition, N-terminal sequencing),	
2.1.2	2–D electrophoresis of proteins, Microscale solution isoelectricfocusing, Peptide fingerprinting,	
2.1.3	LC/MS-MS for identification of proteins and modified proteins, MALDI-TOF	
2.1.4	SAGE and Differential display proteomics, Protein-protein interactions, Yeast two hybrid systems.	

Unit III:		**08**
3.1	**Functional Genomics, Proteomics and Metabolomics**	
3.1.1	Analysis of microarray data, Protein and peptide microarray–based technology; PCR–directed protein *in situ* arrays	
3.1.2	Structural proteomics	
3.1.3	Metabolomics	

Unit IV:		
4.1	**Biological Databases and Sequence Analysis**	
4.1.1	Introduction biological databases: Types (relational & object–oriented). Primary, secondary & specialized databases.	**16**
4.1.2	Types of databases–Nucleotide sequence database, EMBL, Genebank, Unigene, Genome biology, Protein dBase (Swiss–prot & Trembl and Motif) and 3D structure databases (PDB, SCOP, Cath, Genecards, SRS & Entrez).	
4.1.3	Computational approaches for gene identification, ORF and Human Genome Project.	
4.1.4	Basics of sequence analysis: Alignments using BLAST and FASTA, Multiple Sequence Alignment (CLUSTAL–X and CLUSTAL–W), Application of multiple sequence alignment	
4.1.5	Protein Structure Prediction in Bioinformatics–*Ab initio* based methods, Homology based methods, secondary structure prediction.	
4.1.6	Protein structure comparison–intermolecular and intramolecular methods. Phylogenetic construction by distance based methods	

References

[1] Voet D, Voet JG & Pratt CW, Fundamentals of Biochemistry, 2nd Edition. Wiley 2006
[2] Brown TA, Genomes, 3rd Edition. Garland Science 2006
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[5] Glick BR & Pasternak JJ, Molecular Biotechnology, 3rd Edition, ASM Press, 1998.
[6] Essential Bioinformatics (Paperback) byJin Xiong. Cambridge University Press.
[7] Bioinformatics: Methods & Protocols by Stephen Misener and Stephen A. Krawetz,
[8] Humana Press.
[9] Essentials of Bioinformatics by Irfan Ali khan and Atiya Khanum. Publisher: Ukaaz Publications.
[10] Bioinformatics: Sequence and Genome Analysis (Hardcover) by David W. Mount. Cold Spring Harbor Laboratory Press
[11] Introduction to Bioinformatics (Paperback) by Arthur M. Lesk. Oxford Univ Press.
[12] Introduction to Bioinformatics: A Theoretical and Practical Approach (Paperback) by David Womble, Stephen A. Krawetz and David D. Womble. Humana Press Inc., U.S.
[13] Applied Bioinformatics: An Introduction (Paperback) y Paul M. Selzer, Richard
[14] Marhofer and Andreas Rohwer. Publisher: Springer-Verlag Berlin and Heidelberg GmbH & Co. K.

Course Code	Title of the Course	Credits
BCC220	BIOTECHNOLOGY	4

COURSE OUTCOME(S):

CO1 Write down the characteristics of tools of genetic engineering

CO2 Learn in depth DNA Cloning

CO3 Write down the characteristics of Industrial biotechnology and gene therapy

CO4 Identify in depth biosafety and bioethics

		No. of Lectures
Unit I:		**12**
1.1	**Tools of Genetic Engineering**	
1.1.1	Basic principles–mechanism of natural gene transfer by Agrobacterium, generation of foreign DNA molecules.	
1.1.2	Restriction enzymes, their types and target sites, cutting and joining DNA molecules, linkers, adapters, homopolymers, enzymes used in genetic engineering.	
1.1.3	Cloning vehicles and their properties, natural plasmids, in vitro vectors, cosmids and T-DNA based hybrid vectors.	
1.1.4	Cloning strategies–cloning with single strand DNA vectors, cDNA cloning and gene libraries, recombinant selection and screening methods, expression of cloned genes–problems and solutions, shuffle vectors.	
1.1.5	DNA sequencing strategies–Sanger's and Maxam–Gilbert's methods, applications of PCR and DNA hybridization, Southern, Northern and Western blotting.	

Unit II:		**12**
2.1	**DNA Cloning and Sequencing**	
2.1.1	Techniques of tissue culture–culturing explants and haploids, protoplasts fusion and embryoids.	
2.1.2	Methods of gene transfer to plants, animals and bacteria-Ca transfection, electroporation, shotgun and others.	
2.1.3	Transgenic plants, GM foods and Biopesticides, gene knockouts and transgenic animals.	
2.1.4	Biodegradation and its applications, bioleaching.	

Unit III:		
3.1	**Industrial Biotechnology and Gene Therapy**	
3.1.1	Applications of biotechnology–industrial biotechnology–Fermentors, principle, types product recovery and purification of ethanol, citric acid, vitamin B12, streptomycin.	**16**
3.1.2	Enzyme biotechnology–production and uses of industrially important enzymes such as protease, immobilization of enzymes and their applications	
3.1.3	Waste treatment, bioenergy and biogas production.	
3.1.4	Gene therapy (somatic)-the principle and approaches.	

Unit IV:		
4.1	**Biosafety and Bioethics**	
4.1.1	Biotechnology–potential hazards, biological weapons, biosafety of GM foods and GMOs–substantial equivalence and safety testing, gene drain, the tangled genes	**08**
4.1.2	Human genome research–the objectives and approaches, genomics and genome prospecting–the controversies, issues of biotechnology-social and scientific, technology protecting systems and the terminator.	
4.1.3	IPR, its concepts and conditions–patenting of genes, cells and life forms, evaluation of life patenting.	

References

[1] Fermentation Biotechnology O.P. Ward. 1989 Prentice Hall.
[2] Biotechnology J.E. Smith Cambridge University Press 1996.
[3] Introduction to Biotechnology Brown, Campbell and Priest Blackwell Science 1987.
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[5] Molecular Biotechnology Glick and Pasternak, Panima Publ.
[6] From Genes to clones Winnaecker VCH Publication.
[7] Elements of Biotechnology P.K. Gupta, Rastogi Publication, 1998.
[8] Molecular Biology and Biotechnology. Walker and Gingold. 3rd ed. Panima Publ. 1999.
[9] Plant Biotechnology. Ignacimuthu, Oxford, IBH.
[10] Recombinant DNA Technology, Watson, Scientific American Publ.
[11] Principles of Genome analysis, Primrose, Oxford University Press, 1998.

Course Code	Title of the Course	Credits
BCC220	PHARMACEUTICAL BIOCHEMISTRY	4

COURSE OUTCOME(S):

CO1 Identify the details of ADME mechanism of drugs

CO2 Learn in details with application, if applicable, Drug receptor interactions

CO3 Deliberate in details with application, if applicable, Mode of action of anti cancer drugs

CO4 Write down in depth Drug tolerance and abuse

		No. of Lectures
Unit I:		**10**
1.1	**Drugs**	
1.1.1	Drugs: History of Drugs Classification of drugs, routes of drug administration, absorption and distribution of drugs.	
1.1.2	Factors influencing drug absorption and elimination of drugs.	

Unit II:		**14**
2.1	**Drug Receptor and Metabolism**	
2.1.1	Drug-Receptor interactions involvements of binding forces in drug receptor interaction, drug action not mediated by receptors.	
2.1.2	Drug metabolism: Mechanism of phase I and II enzyme reactions, biochemical importance of xenobiotic metabolism.	

Unit III:		**12**
3.1	**Anticancer Drugs**	
3.1.1	Cancer: Cancer and principles of cancer chemotherapy, mode of action of anti cancer drugs.	
3.1.2	Antimetabolites, antibiotics, alkylating agents and other agents,	

Unit IV:		**12**
4.1	**Adverse Drug Reactions**	
4.1.1	Adverse drug reactions and drug induced side effects.	
4.1.2	Biological effects of drug abuse and drug dependence.	
4.1.3	Drug tolerance and intolerance.	

References

[1] The Pharmacology volume I and II –Goodman and Gillman
[2] Basic Pharmacology –Foxter Cox
[3] Oxford text book of Clinical Pharmacology and Drug Theraphy ,D.G Grahme Smith and J.K.Aronson
[4] Pharmacology and Pharmatherapeutics – R.S.Satoskar,S.D.Bhandhakarand
[5] Essentials of Pharmacotherapeutics ,Barav.F.S.K
[6] Lippincotts illustrated review Pharmacology, Mary.J.Mycek,Richards ,Pamela

Course Code	Title of the Course (Open Elective)	Credits
BCC630	NUTRITION AND HEALTH	4

COURSE OUTCOME(S):

CO1 Identify the details of basic concepts of nutrition

CO2 Learn in details with application, if applicable, nutrients

CO3 Deliberate in details with application, if applicable, nutrition associated problems

CO4 Write down in depth social health problems

		No. of Lectures
Unit I:		**10**
1.1	**Basic Concepts in Nutrition**	
1.1.1	Understanding relationship between food, nutrition, health and food pyramid.	
1.1.2	Functions of food: Physiological, psychological and social Basic food groups and concept of balanced diet	
1.1.3	Energy: Functions, sources and concept of energy balance.	
1.1.4	Nutritional requirements: Physiological considerations and nutritional concerns for the following life stages: Adult man / woman Preschool children Adolescent children Pregnant woman, Nursing woman and infant Geriatrics	

Unit II:		**14**
2.1	**Nutrients**	
2.1.1	Functions, Recommended Dietary Allowances, dietary sources, effects of deficiency and/ or excess consumption on health of the following nutrients: Carbohydrates and dietary fibre Lipids Proteins Fat soluble vitamins: A, D, E and K Water soluble vitamins: Thiamin, Riboflavin, Niacin, Pyridoxine, Folate, Vitamin B12 and Vitamin C Minerals: Calcium, Iron, Zinc and Iodine	
2.1.2	Gut Microbiome	

Unit III:		
3.1	**Nutritional problems, their implications and related nutrition programmes**	
3.1.1	Etiology, prevalence, clinical features and preventive strategies of Undernutrition: Protein energy malnutrition, nutritional anemia's, vitamin A deficiency and iodine deficiency disorders Overnutrition: Obesity, Coronary Heart Disease and Diabetes	**14**
3.1.2	National Nutrition Policy and Programmes: Integrated Child Development Services (ICDS) Scheme Mid day Meal Programme (MDMP) National programmes for prevention of Anemia Vitamin A deficiency and Iodine Deficiency Disorders	

Unit IV:		
4.1	**Social health problems**	
4.1.1	Smoking Alcoholism AIDS including AIDS Control Programme	
4.1.2	Nutrition for special conditions: Nutrition for physical fitness and sport, BMI Feeding problems in children with special needs Considerations during natural and man-made disasters e.g. floods, war. Basic guidelines in disaster management	**10**

References

[1] Text Book f Biochemistry with Clinical correlations; Thomas Devlin [Ed.] (1997), Wiley –Liss.

[2] Harper's Review of Biochemistry, Murray et. al., (1997) 24th Edn., Lange

[3] Bryan Derrickson, Gerard J Tortora Principles of Anatomy and Physiology , twelfth Ed, 2011, Wiley & Sons Limited.

[4] Bamji MS, Krishnaswamy K and Brahmam GNV (Eds) (2009). Textbook of Human Nutrition, 3rd edition. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.

[5] Mudambi, SR and Rajagopal, MV. Fundamentals of Foods, Nutrition and Diet Therapy; 2012; New Age International Publishers

[6] Wardlaw GM, Hampl JS. Perspectives in Nutrition; Seventh Ed; 2007; McGraw Hill.

[7] Swaminathan M. Handbook of Foods and Nutrition; Fifth Ed; 1986; BAPPCO.

[8] Suri S. and Malhotra A. Food Science, Nutrition & Food Safety Pearson India Ltd. 2014.

[9] Edelstein S, Sharlin J (ed). Life Cycle Nutrition- An Evidence Based Approach; 2009; Jones and Barlett Publishers.

[10] ICMR (1989) Nutritive Value of Indian Foods. National Institute of Nutrition, Indian Council of Medical Research, Hyderabad.

[11] ICMR (2011) Dietary Guidelines for Indians – A Manual. National Institute of Nutrition, Indian Council of Medical Research, Hyderabad

[12] World Health Organization (2006). WHO Child Growth Standards: Methods and development: Length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age (d).

[13] Lakra P, Singh MD. Textbook of Nutrition and Health; First Ed; 2008; Academic 14 Excellence

Course Code	Title of the Course	Credits
BCD010	MOLECULAR BIOLOGY AND GENE REGULATION	4

COURSE OUTCOME(S):

CO1 Write down the characteristics of DNA characteristics and replication

CO2 Write down in depth Transcription and regulation

CO3 Learn in depth translation

CO4 Identify in depth translational regulation

		No. of Lectures
Unit I:		**14**
1.1	**DNA Replication and Gene Expression**	
1.1.1	Introduction: Historical perspective, types of RNA, Central dogma of molecular biology.	
1.1.2	DNA Replication: Nearest neighbor base frequency analysis. Replication of DNA semiconservative model-Meselson and Stahl experiment. Direction of replication of *E.coli*, discontinuous replication–Okazaki fragments.	
1.1.3	Composition and properties of DNA polymerase I, II and III. of *E.coli* DNA ligase, fidelity of replication. DNA topoisomerases and gyrases.	
1.1.4	Replication in viruses single stranded DNA virus, ϕX174, rolling circle model. Replication of mitochondrial DNA.	
1.1.5	Organization of prokaryotic and eukaryotic gene–promoters, introns, exons, other regulatory sequences, enhancers, silencers, function of introns.	
1.1.6	Regulation of Gene expression in prokaryotes: Operon model–Lac operon–structure and regulation; Galactose operon–role of two promoters; Arabinose operon–positive control; tryptophan operon–attenuation control.	
1.1.7	Regulation of gene expression at the level of DNA structure: Super coiling, DNA methylation, role of nucleosome structure of eukaryotic DNA in gene expression–eg. glucocorticoid gene, chromatin remodeling	

Unit II:		
2.1	**Transcription and Regulation**	
2.1.1	Transcription: RNA biosynthesis in prokaryotes and eukaryotes- initiation, elongation and termination. RNA polymerase I, II and III. RNA dependent RNA synthesis - RNA replicase of QB virus.	
2.1.2	Processing of eukaryotic mRNA–cap addition, poly A tail addition, intron splicing, RNA editing. Processing of t–RNA.	**10**
2.1.3	Regulation at the level of transcription: Transcription factors, TF II. Formation of initiation complex. Role of enhancers	
2.1.4	Regulation at the level of RNA processing: RNA export and RNA stability. Factors affecting RNA stability. RNA degradation.	
Unit III:		
3.1	**Translation**	
3.1.1	Translation: Genetic code, triplet codon, Universality features of the genetic code, assignment of codons studies of Khorana, Nirenberg, triplet binding techniques, degeneracy of codons, wobble hypothesis, evolution of genetic code and codon usage, variation in the codon usage.	
3.1.2	3D structure of prokaryotic and eukaryotic ribosomes, Translation: initiation, elongation and termination. Role of m–RNA and t–RNA; aminoacyl t–RNA synthetase and its role in translation accuracy, signal sequence, translational proof-reading, translational inhibitors.	
3.1.3	Post translational modification of proteins–signal peptide cleavage, disulphide bond formation, O–and N–Glycosylation, folding of nascent protein, role of chaperones, attachment of glycosyl anchor, and other modifications.	**12**

Unit IV:		
4.1	**Translational Regulation**	
4.1.1	Regulation at the level of translation: Secondary structure in the 5' and 3' untranslated region–eg. Regulation of Ferritin and Transformation of m-RNA. Role of upstream AUG codons. (eg. GCN 4 gene regulation), transplicing and translational introns, protein splicing introns.	**12**
4.1.2	Role of ribosomes in the regulation of translation: Proof–reading mechanism. Ribosomal optimization of translation. Regulation at the level of ribosome assembly. Regulation at the level of post-translational modification, protein stability, N–end rule, PEST and other sequences	

References

[1] Molecular Biology of the Cell, Alberts et al., Garland Publications, (2012).
[2] Molecular Biology, David Freifelder, Narosa Publishers, (1997).
[3] Molecular Biology Robert F. Weaver, McGraw Hill (2012).
[4] Molecular Biology of Gene; Watson, J.D. et al., 5th Edn. Pearson Education; (2004).
[5] Principles of Virology; S.J. Flint et al., ASM Press (2000).
[6] Biochemistry and Molecular Biology; 5th Edn. D.Papachristodoulou, A. Snape, W.H. Elliott, and D. C. Elliott Oxford University Press (2014)
[7] Chromatin structure and Gene Expression; 2nd Edn. Sarah Elgin, Jerry Workman, Oxford University Press (2000)
[8] Molecular Cell Biology; Harvey Lodish 5th Edn. (2010)
[9] Biochemistry 5th Edn. Jeremy M. Berg, John L. Tymoczko, Lubert Stryer (2011).
[10] Genome Stability: DNA Repair and Recombination; James Haber, Garland Science (2013)

Course Code	Title of the Course	Credits
BCD070	GENETICS AND GENETIC ENGINEERING	4

COURSE OUTCOME(S):

CO1 Deliberate in details with examples gene organization

CO2 Understand the classification and characteristics of population genetics

CO3 Deliberate the details of cloning vectors

CO4 Understand the details of applications of genetic engineering

		No. of Lectures
Unit I:		**12**
1.1	**Mendelism and Gene Organization**	
1.1.1	Basic principles of Mendelism–Laws of inheritance, dominance, codominance, epistasis, (eg. Comb shape in chickens). Pleiotropism. Cytoplasmic inheritances (eg. Shell Coiling)	
1.1.2	Organisation of genes in chromosomes–Single copy gene, gene families, tandemly repeating genes, pseudo genes	
1.1.3	Chromosome number–Ploidy, karyotyping, sex chromosome and dosage compensation. Mobile genetic elements,	
1.1.4	Chromosomal basis of human diseases–Extra or missing chromosome, abnormality in chromosome structure–deletion duplication, inversion and translocation.	
1.1.5	Gene and development–Model systems for studying development in Drosophila, genetic control of development in Drosophila, anteroposterior axis, specification role of maternal genes, segmentation of larval body, gap genes, pair rule genes, homeotic genes, complex gene interaction in development, sequential gene action.	

Unit II:		**12**
2.1	**Population Genetics and Mutations**	
2.1.1	Population Genetics–Genetic variation, Hardy–Weinberg Law, genetic frequency, migration, genetic equilibrium	
2.1.2	Mutations- nature of mutations–spontaneous and induced mutation, conditional lethal (eg. Temperature sensitive) mutation. Biochemical basis of mutation. Point mutation, base substitution mutation, missense, nonsense and silent mutations. Mutation rates. Chemical mutagens, radiation induced mutation, reverse mutations and suppressor mutations–intergenic and intragenic suppression, reversion as a means of detecting mutagens - Ames test	
2.1.3	Repair Mechanism–DNA repair mechanisms. Reciprocal	

	recombination, site specific recombination, *E. coli* rec system. Holliday model of recombination, SOS repair.	

Unit III:		
3.1	**Cloning Vectors, Gene Transfer and Sequencing Methods**	
3.1.1 3.1.2 3.1.3 3.1.4	Introduction to genetic engineering: Basic steps of gene cloning, enzymes used in genetic engineering. Cloning vectors: Plasmids, Phages, Cosmids, Phagemids, Yeast vectors, Shuttle vectors, Ti Plasmids, Ri plasmids. Methods of gene transfer. Isolation and purification of cellular and plasmid DNA. Methods for labeling nucleic acids and probes. Methods of DNA sequencing. DNA Microarray	**08**

Unit IV:		
4.1	**Amplification & Applications of Genetic Engineering**	
4.1.1 4.1.2 4.1.3	Amplification of DNA by PCR technique and applications. *Insitu* hybridization, analysis of DNA,RNA and protein by blotting techniques. Marker and Reporter genes. Applications of genetic engineering: Transgenic plants and animals DNA vaccines Gene therapy	**16**

References

[1] Singh, J.S., Singh, S.P. and Gupta, S. (2006) Ecology Environment and Resource Conservation. Anamaya Publications, New Delhi

[2] Wilkinson, D.M. (2007). Fundamental Processes in Ecology. An Earth System Approach. Oxford.

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[4] Daubenmier, R.F. (1970), Plant Communities, Wiley Eastern Private Limited

[5] Odum, E. (2008) Ecology. Oxford and IBH Publisher.

[6] Sharma, P.D. (2010) Ecology and Environment, (8th Ed.) Rastogi Publications, Meerut.

[7] Tom Strachan & Andrew P.Read 1999. Human Molecular Genetics (2nd Edition), John Wiley & Sons.

[8] Ricki Lewis, 1998. Human Genetics-Concepts & Applications (3rd Edition), McGraw-Hill.

[9] T. A. Brown, 1999. Genomes, John Wiley & Sons (Asia) PTE Ltd.

[10] Scott Freeman & Jon C. Herron, 2001. Evolutionary Analysis (2nd Edition), Prentice Hall.

[11] Garner E.J, Simmons, M.J. & Snustad, D.P.1991. Principles of Genetics, John Wiley & Sons Inc, N.Y

[12] Watson, J.D., Hopkins, N. H., Roberts, J. W. Steitz & Weiner, A. M., 1987. Molecular Biology of the Genes, The Benjamin/Cummings Publishing Company Inc., Tokyo.

Course Code	Title of the Course	Credits
BCD060	**PROJECT WORK OR DISSERTATION**	**8**

COURSE OUTCOME(S):

CO1 Identify the classification and characteristics of literature survey

CO3 Learn in depth define of objective of project work

CO3 Write down the classification and characteristics of design of experimental methods

CO4 Understand the details of result analysis and interpretation

BLUE PRINT OF QUESTION PAPER FOR C1 & C2 COMPONENT

JSS Mahavidyapeetha

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE

(Autonomous) B N Road, Mysuru - 25

M.Sc. Biochemistry

I/II/III/IV Semester First/Second Internal Assessment Test (Component 1/2)

Title of the Course & Code

Duration: 1hr **Max Marks: 20**

A) Answer any FOUR of the following **4X2=08**

1.
2.
3.
4.
5

B) Answer any ONE of the following **4X1=04**

1.
2.

C) Answer any ONE of the following **8X1=08**

1.
2.

BLUE PRINT OF QUESTION PAPER FOR C3 COMPONENT

JSS Mahavidyapeetha

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE

(Autonomous), Ooty Road, Mysuru – 570025

M.Sc Degree

I/II/III/IV Semester Examination, _____

BIOCHEMISTRY

Course Title & QP Code

Time: 3 Hours Max. Marks: 70

Instructions to Candidates: **Answer any Five questions from Part – A**
Any Four questions from Part – B
Any Three questions from Part – C

Part – A 2X5=10

1.
2.
3.
4.
5.
6.
7.

Part – B 6X4=24

8.
9.
10.
11.
12.
13.

Part – C 12X3=36

14.
15.
16.
17.
18.

CHOICE BASED CREDIT SYSTEM AND
CONTINUOUS ASSESSMENT AND GRADING PATTERN

SYLLABUS FOR

MASTER'S DEGREE PROGRAM
IN
BIO-TECHNOLOGY
(2018-19 ONWARDS)

JSS COLLEGE OF ARTS COMMERCE AND SCIENCE
(An Autonomous College of University of Mysore; Re-Accredited by NAAC with 'A' Grade)

POSTGRADUATE DEPARTMENT OF STUDIES IN BIO-TECHNOLOGY
Ooty Road, Mysore – 570 025, India

POSTGRADUATE DEPARTMENT OF STUDIES IN BIOTECHNOLOGY

Choice Based Credit System and Continuous Assessment and Grading Pattern Syllabus

M.Sc., PROGRAM IN BIOTECHNOLOGY

Scheme of Study – 2018-19 onwards

Credit matrix for Master's Degree Program in Biotechnology

Credits to be earned	I Sem	II Sem	III Sem	IV Sem	Total Credits
Hard Core Course	12	12	12	16	52
Soft Core Course	08	08	04	–	20
Open Elective Course	–	–	04	–	04
Semester Total	**20**	**20**	**20**	**16**	**76**

I SEMESTER			
Course title	**Hard Core(HC)/ Soft Core(SC)**	**Credit pattern (L:T:P)**	**Credits**
Biomolecules and Bioenergetics	HC	3:1:0	4
Bioanalytical Techniques	HC	3:1:0	4
Lab – I	HC	0:0:4	4
Choose any TWO from the following 1. Molecular Genetics 2. Microbiology 3. Cancer Biology 4. Cell Biology	SC	3:1:0	4
	SC	3:1:0	4
NON CREDIT COURSES			
Communication Skills			
		Total credits	**20**

II SEMESTER			
Course title	**Hard Core(HC)/ Soft Core(SC)**	**Credit pattern (L:T:P)**	**Credits**
Molecular Biology	HC	3:1:0	4
Immunology and Immunotechnology	HC	3:1:0	4
Lab – II	HC	0:0:4	4
Choose any TWO from the following 1. Cell Signalling and communication 2. Metabolomics 3. Food and Environmental Biotechnology 4. Pharmaceutical Biotechnology	SC	3:1:0	4
	SC	3:1:0	4
NON CREDIT COURSE			
Employability Skills			
		Total credits	**20**

III SEMESTER			
Course title	**Hard Core(HC)/ Soft Core(SC)/ Open Elective(OE)**	**Credit pattern (L:T:P)**	**Credits**
Bioprocess Engineering and Technology	HC	3:1:0	4
Genetic Engineering	HC	3:1:0	4
Lab – III	HC	0:0:4	4
Choose any ONE from the following 1. Biostatistics, Bioinformatics and Bioentrepreneurship 2. Clinical and Advanced Techniques in Biotechnology	SC	4:0:0	4
Applied Biotechnology * **(For other discipline students)**	OE	4:0:0	4
		Total credits	20
IV SEMESTER			
Course title	**Hard Core(HC)**	**Credit pattern (L:T:P)**	**Credits**
Plant Biotechnology	HC	3:1:0	4
Animal Biotechnology	HC	3:1:0	4
Project Work/Dissertation	HC	0:4:4	8
		Total credits	**16**
		Total credits to be earned for M.Sc. Biotechnology	**76**

∗ Open Elective Course shall be from different discipline of study

1. A student opting I, II and III semester has to appear for at least 12 credits. (Soft core course may be studied any time).
2. Minimum number of students per Soft core course is 15.

L – Lecture – 1 credit = 1 hour

T – Tutorial – 1 credit = 2 hours

P – Practical – 1 credit = 2 hours

ASSESSMENT:

Continous Assessment: C1 – 15% & C2 – 15% (at the end of 8th and 16th week respectively)

Assessment	**IA Test (20 Marks)**	**Assignment (5M)**		**Total (25 Marks)**	**Total reduced to 15 Marks**
		a - Collection of material - 2.5 Marks	b - Prepartion of report - 2.5 Marks		
C1					
C2					

Semester End Assessment: C3 – 70% – By written exam.

Conversion of grades in to credits should be based on relative evaluation calculations.

Program: M.Sc. Biotechnology

Program outcomes (PO):

PO1: To make the students develop interpersonal skills, written and oral communication and also to improve their body language and eye contact during presentations.

PO2: To train the students in group discussions to develop leadership qualities and to respect the others idea and take the decisions for the welfare of society.

PO3: To teach the students not to demoralize the others ideas and not to differentiate the intelligent and the ignorant, poor and the rich and to uphold the moral values in the society.

PO4: Upon completion of course students will have the ability to design the experiments to solve the current problems in the society related to health, environment and industries.

PO5: To make the students competent enough to write the research papers, project proposals and application of mathematics in understanding biological science.

Program Specific Outcomes (PSO):

PSO1: To make the students understand the nature, bio-molecules, their analysis and application in day to day life, so that we are transforming knowledge from nature to lab and lab to beside.

PSO2: Higher studies like M.Phil and Ph.D can be pursued to attain research positions.

PSO3: Various examinations such as CSIR-NET, ARS-NET GATE, ICMR, DBT and many other opens channels for career development.

PSO4: Students have various opportunities in different industrial sector.

PSO5: Several career opportunities are available for students with biotechnology background abroad

PSO6: In practical we teach the students to follow the standard operating procedures of the equipment, troubleshooting the problems and analyse and interpretation of data.

PSO7: To train the students regarding bio-safety in handling corrosive, explosive and radioactive and bio-hazardous compounds.

I SEMESTER

BIOMOLECULES AND BIOENERGETICS (HARD CORE) - 48 Hrs

COURSE CODE: BTA040

Course Outcome

CO1-Study of different biomolecules

CO2-Metabolism and their regulation

CO3-Enzymes and their role in metabolism

CO4- Application of thermodynamics to understand the basic concepts of life.

Unit – I **12 Hrs**

Chemical basis of life; Composition of living matter; Water – properties, pH, ionization and hydrophobicity; Emergent properties of biomolecules in water; Biomolecular hierarchy; Macromolecules; Molecular assemblies; Structure-function relationships

Amino acids – structure and functional group properties; Peptides and covalent structure of proteins; Ramchandran's plot; Elucidation of primary and higher order structures; Evolution of protein structure; Structure-function relationships in model proteins like ribonuclease A, myoglobin, hemoglobin and chymotrypsin.

Unit – II **12 Hrs**

Enzyme catalysis – general principles of catalysis; Quantitation of enzyme activity and efficiency; Enzyme characterization and Michaelis-Menten kinetics; activation, inhibition (reversible & irreversible) and covalent modification; Single substrate enzymes; Bisubstrate reaction (ping-pong and sequential), Applications of enzymes (food& Pharmacy).

Unit – III **12 Hrs**

Sugars - mono, di, and polysaccharides; Suitability in the context of their different functions-cellular structure, energy storage, signaling; Glycosylation of other biomolecules - glycoproteins and glycolipids; Lipids - structure and properties of important members of storage and membrane lipids; lipoproteins

Unit – IV **12 Hrs**

Bioenergetics-basic principles; Equilibria and concept of free energy; Coupled processes; Glycolytic pathway; Kreb's cycle; Oxidative phosphorylation; Photophosphorylation; Elucidation of metabolic pathways; Logic and integration of central metabolism; entry/ exit of various biomolecules from central pathways; Principles of metabolic regulation; Regulatory steps;

Nucleosides, nucleotides, nucleic acids - structure, diversity and function

Texts/References

1. V.Voet and J.G.Voet, Biochemistry, 3rd edition, John Wiley, New York, 2004.
2. A.L. Lehninger, Principles of Biochemistry, 4th edition, W.H Freeman and Company, 2004.
3. L. Stryer, Biochemistry, 5th edition, W.H. Freeman and Company, 2002.

BIOANALYTICAL TECHNIQUES (HARD CORE) - 48 HRS

COURSE CODE: BTA050

Course Outcome

CO1-To understand the separation of molecules by different chromatography, centrifugation and electrophorotic techniques

CO2-Analysis and characterization of molecules by spectroscopy techniques

CO3-Use of radioactive material in understanding metabolic pathways

Unit- I **12 Hrs**

Basic Techniques

Buffers; Methods of cell disintegration; Enzyme assays and controls; Detergents and membrane proteins; Dialysis, Ultrafiltration and other membrane techniques

Spectroscopy Techniques

UV, Visible and Raman Spectroscopy; Theory and application of Circular Dichroism; Fluorescence; MS, MALDI-TOF; NMR and Plasma Emission spectroscopy; Protein crystallization; Theory and methods; API-electrospray; Peptide Synthesis.

Imaging techniques: Compound microscope, fluorescent, phase contrast, TEM, SEM, cryo-electron microscope

Unit-II **12 Hrs**

Chromatography Techniques

TLC and Paper chromatography; Chromatographic methods for macromolecule separation - Gel permeation, Ion exchange, Hydrophobic, Reverse-phase and Affinity chromatography; HPLC and FPLC; Criteria of protein purity

Electrophorotic techniques

Theory and application of Polyacrylamide and Agarose gel electrophoresis; Capillary electrophoresis; 2DElectrophoresis; Gradient electrophoresis; Pulsed field gel electrophoresis

Unit- III **12 Hrs**

Centrifugation

Basic principles; (RCF, Sedimentation coefficient etc); Types of centrifuge -Microcentrifuge, High speed & Ultracentrifuges; Preparative centrifugation; Differential & density gradient centrifugation; Applications (Isolation of cell components); Analytical centrifugation; Determination of molecular weight by sedimentation velocity & sedimentation equilibrium methods

Unit- IV **12 Hrs**

Radioactivity

Radioactive & stable isotopes; Pattern and rate of radioactive decay; Units of radioactivity; Measurement of radioactivity; Geiger-Muller counter; Solid & Liquid scintillation counters (Basic principle, instrumentation & technique); Brief idea of radiation dosimetry; Cerenkov radiation; Autoradiography; Measurement of stable isotopes; Falling drop method; Applications of isotopes in biochemistry; Radiotracer techniques; Distribution studies; Isotope dilution technique; Metabolic studies; Clinical application; Radioimmunoassay

Texts/References

1. Freifelder D., Physical Biochemistry, Application to Biochemistry and Molecular Biology, 2nd Edition, W.H. Freeman & Company, San Fransisco, 1982.
2. Keith Wilson and John Walker, Principles and Techniques of Practical Biochemistry, 5th Edition, Cambridge University Press, 2000.

3. D. Holme& H. Peck, Analytical Biochemistry, 3rd Edition, Longman, 1998.
4. R. Scopes, Protein Purification - Principles & Practices, 3rd Edition, Springer Verlag, 1994.
5. Selected readings from Methods in Enzymology, Academic Press.

LAB – I (HARD CORE)

COURSE CODE: BTA060

Course Outcome

CO1 - Course objective is to introduce the students to the fundamental experiments in the field of Biochemistry, Microbiology and Genetics.

CO2 - Students get the insight to operate simple equipments like colorimeter and spectrophotometer.

CO3 - Identification of microorganisms by morphology and staining techniques. Study of growth kinetics.

CO4 - In genetics students are exposed to know about culture and maintenance of *Drosophila melanogaster* (model organism), Study of mutants, salivary gland chromosome and karyotyping techniques.

Practicals/ Experiments

1. Good laboratory practices
2. Measurement of pH
3. Preparation buffers and solutions
4. Determination of pKavalues of amino acids
5. Estimation of reducing sugar by DNS method
6. Estimation of proteins by Lowry's method
7. Ascending, descending and circular paper chromatography for separation of amino acids (1D & 2D)
8. TLC of amino acids/lipids (1D & 2D)
9. HPLC
10. Estimation of ascorbic acid by DNPH method
11. Estimation of urea
12. Estimation of Phosphate
13. Gel electrophoresis- native and SDS-PAGE and determination of molecular weight of proteins
14. Salivary amylase assay, time kinetics, specific activity, determination of optimum temperature and pH; Effect chloride ions on salivary amylase activity
15. Determination of Km and Vmax. and activation energy for an acid phosphatase (from potato)
16. Effect of inhibitors on enzyme activity
17. Purification of amylase from sweet potatoes: Extraction, ammonium sulphate fractionation, gel filtration. Monitoring of enzyme activity, % activity and % recovery during purification
18. Preparation of liquid and solid media for growth of microorganisms
19. Isolation and maintenance of organisms by plating, streaking and serial dilution methods, slants and stab cultures, storage of microorganisms
20. Isolation of pure cultures from soil and water
21. Growth, growth curve; measurement of bacterial population by turbidometry and serial dilution methods. Effect of temperature, pH, carbon and nitrogen sources on growth.
22. Microscopic examination of bacteria, yeast and molds and study of organisms by gram stain, acid fast stain and staining for spores.
23. Assay of antibiotics and demonstration of antibiotic resistance.
24. Culture of Drosophila melanogaster and Observation of drosophila mutants
25. Isolation of salivary gland chromosomes
26. Biotech Industry and/ or R & D institution visit/s

MOLECULAR GENETICS (SOFT CORE) – 48 Hrs

COURSE CODE: BTA230

Course Outcome

CO1- To understand the molecular mechanism of inheritance

CO2-Mutation and DNA repair mechanism

CO3-Gene mapping and study of chromosomal abnormalities

CO4-Phylogenetics and micro-evolution

CO4-Development of an organism

Unit- I **12 Hrs**

Laws of inheritance in haploid organisms- *Chlamydomonas* and *Neurospora*, uniparental, maternal and cytoplasmic inheritance in yeast, *Neurospora*, paramecium and plants

Genomic organization: Prokaryotes, eukaryotes, viral genome, extrachromosomal genome-plasmids, mitochondria & chloroplast, repetitive elements- LINES and SINES, simple sequence repeats

Mobile genetic elements: discovery, insertion sequence in prokaryotes, complex transposons (Tn10, Tn5, Tn9 and Tn3 as examples), mechanisms, control, consequences and applications of transposition by simple and complex elements.

Unit – II **12 Hrs**

Mutation: Types, causes and detection, mutant types – lethal, conditional, biochemical, loss of function, gain of function, germinal verses somatic mutants, Molecular basis of mutations,insertional mutagenesis

Recombination: Homologous and non-homologous recombination, Holliday model, site-specific recombination

DNA Repair: Mechanism of genetic repair- direct repair, photo reactivation, excision repair, mismatch repair, post-replicative recombination repair, SOS repair

Unit-III **12 Hrs**

Gene mapping methods: Linkage maps, tetrad analysis, mapping with molecular markers, mapping by using somatic cell hybrids, development of mapping population in plants.

Microbial genetics: Methods of genetic transfers – transformation, conjugation, transduction and sex-duction, mapping genes by interrupted mating, fine structure analysis of genes.

Quantitative genetics: Polygenic inheritance, heritability and its measurements, QTL mapping.

Unit-IV **12 Hrs**

Genes and development: Model systems for studying development- *Drosophila, Caenorhabditis, Arabidopsis*.Genetic control of development in Drosophila: anterioposterior axis specification, role of maternal genes, segmentation of larval body, gap genes, pair rule genes, homeotic genes, complex gene interaction in development, sequential gene action. Floral meristems and floral development in *Arabidopsis.*

Human Genetics: Human chromosomes, karyotype – construction, characteristics, staining techniques and nomenclature; chromosomal abnormalities – sex chromosomal and autosomal, inherited disorders, genetic counselling, gene therapy; Human Genome Project, Human Genome Map.

Population Genetics: Genetic variation, Hardy-Weinberg Law, random mating, genetic frequency, natural selection, genetic drift, migration, genetic equilibrium.

Evolution:Molecular basis of evolution, Molecular clock, Molecular phylogenetics

Reference Books

1. Genetics. Strickberger, M. W., Prentice Hall of India Pvt. Ltd.
2. Genetics – A Molecular Approach. Brown, T. A. Chapman and Hall.
3. Genes VII. Lewin, B. Pearson Education International. 2003.
4. Genetics- A Conceptual Approach. Benjemin A Pierce.

CANCER BIOLOGY (SOFT CORE) – 48 Hrs

COURSE CODE:

Course Outcome

CO1**-**Understanding the normal and cancerous cell

CO2-Protooncogens, tumor suppressor genes and apoptotic genes – regulation

CO3-Diagnosis and treatment of cancer

Unit-I

Cancer Biology: **12 Hrs**

Introduction, historical perspective, classification, Carcinogenesis, cancer initiation, promotion and progression, Cancer cell cycles, Genomic instability, Apoptosis, Genes and proteins as players in apoptosis, DNA viruses/ cell immortalization.

Unit-II **12 Hrs**

Cancer Genes I: Oncogenes and signal transduction

Cellular proto-oncogenes, oncogene activation, Growth factors, growth factor receptors, signal transduction , Transcription, Transcription factors and cancer, Retroviral oncogenes, Tumor suppressor, Tumor suppressor gene pathways, DNA methylation, epigenetic silencing of suppressor genes.

Unit-III **12 Hrs**

Understanding Cancer as a Disease: natural history of cancer development

Free radicals, antioxidants and metabolic oxidative stress and cancer, Epidemiology of selected cancers, Gene rearrangements, detecting oncogene abnormalities in clinical specimens, Cell: cell interactions, cell adhesion, angiogenesis, invasion and metastasis, Antiangiogenic therapy of cancer.

Unit-IV **12 Hrs**

Current concepts in cancer therapy

Strategies of anticancer chemotherapy, Strategies of anticancer gene therapy/translating therapies from the laboratory to the clinic, Gene discovery in cancer research, cancer genome anatomy project , Cancer immunity and strategies of anticancer immunotherapy, stem cells and their applications in cancer therapy.

Reference Books

1. Molecular Biology of the Cell. Bruce Alberts

MICROBIOLOGY (SOFT CORE) – 48 Hrs

COURSE CODE: BTA240

Course Outcome

CO1- To understand the microbial taxonomy

CO2-Handling, preservation and sterilization of microbes

CO3-Microbial interactions with different hosts

CO4-Application of microorganisms in the field of agriculture, environment and health sciences

Unit-I **12 Hrs**

Microbial Diversity & Systematics

The beginning of microbiology: The discovery of the microbial world – Hook, Anton van Leeuwenhoek and Cohn; Contribution of Pasteur and Koch. Development of pure culture methods; the enrichment culture methods. Methods in Microbiology: Pure culture techniques; the theory and practice of sterilization.

Classical and modern methods and concepts; Domain and Kingdom concepts in classification of microorganisms; Criteria for classification; Classification of Bacteria according to Bergey's manual; Molecular methods such as Denaturing Gradient Gel Electrophoresis (DGGE), Temperature Gradient Gel Electrophoresis (TGGE), Amplified rDNA Restriction Analysis and Terminal Restriction Fragment Length Polymorphism (T-RFLP) in assessing microbial diversity; 16S rDNA sequencing and Ribosomal Database Project.

Unit-II **12 Hrs**

Microbial Growth & Physiology

Ultrastructure of Archaea (Methanococcus); Eubacteria (*E.coli*); Unicellular Eukaryotes (Yeast) and viruses (Bacterial, Plant, Animal and Tumor viruses); Microbial growth: Batch, fed-batch, continuous kinetics, synchronous growth, yield constants, methods of growth estimation, stringent response, death of a bacterial cell. Factors affecting growth like temperature, acidity, alkalinity, water availability and oxygen. Microbial physiology: Physiological adoption and life style of Prokaryotes; Unicellular Eukaryotes and the Extremophiles (with classical example from each group)

Unit-III **12 Hrs**

Microbial Interactions and Infection

Host–Pathogen interactions; Microbes infecting humans, veterinary animals and plants; Pathogenicity islands and their role in bacterial virulence. Chemotherapy/antibiotics: Types, mode of action, resistance to antibiotics.

Unit-IV **12 Hrs**

Microbes and Environment

Role of microorganisms in natural system and artificial system; Influence of Microbes on the Earth's Environment and Inhabitants; Ecological impacts of microbes; Symbiosis (Nitrogen fixation and ruminant symbiosis); Microbes and Nutrient cycles; Microbial communication system; Quorum sensing; Microbial fuel cells; Prebiotics and Probiotics.

Texts/References

1. Pelczar MJ Jr., Chan ECS and Kreig NR., Microbiology, 5th Edition, Tata McGraw Hill, 1993.
2. Maloy SR, Cronan JE Jr., and Freifelder D, Microbial Genetics, Jones Bartlett Publishers, Sudbury, Massachusetts, 2006.

3. Crueger and A Crueger, (English Ed., TDW Brock); Biotechnology: A textbook of Industrial Microbiology, Sinaeur Associates, 1990.
4. G Reed, Prescott and Dunn's, Industrial Microbiology, 4th Edition, CBS Publishers, 1987.
5. M.T. Madigan and J.M. Martinko, Biology of Microorganisms, 11th Edition, Pearson Prentice Hall, USA, 2006.

CELL BIOLOGY (SOFT CORE) – 48 Hrs

COURSE CODE:

Course Outcome

CO1-Understanding the structure and function of bacterial, plant and animal cell

CO2-Cell signalling and communication

CO3-Study of growth factors and their function

CO4-Tumor biology of a cell

Unit-I **12 Hrs**

Membrane and membrane phenomenon: Membrane structure and principles of organization, Membrane proteins, glycoproteins and glycolipids, specialization of plasma membrane, transport across cell membrane – types of transport, ion channels, active transport and ion pumps, symport, antiport, plant and prokaryotic membrane transport proteins. Cell organelle and membrane proteins: Mechanism and regulation of vesicular transport, Golgi and post golgi storing, receptor mediated endocytosis.

Unit-II **12 Hrs**

Microfilament, cell motility and cell shape: actin, actin architecture and assembly, myosin, muscle contraction, microtubules structure and dynamics, microtubule associated protein, cilia, flagella, intermediate filaments.

Multicellularity: Extracellular matrix, hyaluronan and proteoglycan, matrix proteins and their receptors, adhesive proteins, cell junctions, structure and function of plant cell wall.

Cellular signaling: Extra cellular signaling, G-protein linked receptors, role of cAMP, receptor tyrosine kinases, Ca^{2+} as a second messenger, multiplex signaling pathways, insulin receptor and regulation of blood glucose, regulation of cell surface receptors and transcription factors in signaling pathways, Chemical messenger – peptide and steroid hormones, mechanism of hormone action.

Unit-III **12 Hrs**

Growth factor: Growth factor structure (PDGF, VEGF), mechanism of action (PDGF, VEGF), receptors, signal transduction, plant growth factors and hormones – auxins, cytokinins and other

Cell Cycle: General strategy of cell cycle, discrete cell cycle events, cell cycle control, early embryonic cell cycle, yeast cell cycle, molecular genetics of cell cycle control, cyclins, cyclin dependent kinase, inhibitors, cell division control in multicellular organism, apoptosis.

Unit-IV **12 Hrs**

Tumor biology: Retroviruses, retro viral transformation of host, development and causes of cancer, proto-oncogene, conversion from proto-oncogene to oncogene, tumor suppressor gene, role of p53 in cancer, cell culture uses in research, molecular medicine and cancer.

Nerve cells: Action potential, voltage gated ion channels, nicotinic acetylcholine receptor, other neurotransmitters and their transporters, sensory transduction – the visual and olfactory system.

Reference Books

1. Molecular Biology of the Cell. Alberts, B., *et al.,* 4th Edition. Garland Publ. Inc.
2. Molecular Cell Biology. 5th Edn. Lodish, H., *et al.,* W H Freeman.
3. Genes VII. Lewin, B. Pearson Education International.
4. Cell and Molecular Biology. Karp, J. John Wiley and Sons Inc.

NON CREDIT COURSE

COURSE CODE:

Course Outcome

CO1-Interpersonal skills (body language, eye contact)
CO2-Presentation skills
CO3-Writing emails, research papers and proposals and business reports

Communication Skills Module

Business Etiquette – Video Conferencing (VC): Introduction to Video Conferencing; Concept & uses of VC; VC Etiquette

Business Communication: Seven Cs of communication: Complete, Courteous, Considerate, Clear, Concise, Concrete, Correct; Verbal/ Nonverbal Communication

Writing Process: Identifying objective; Categorizing Information; Organizational Patterns; Designing document; Memo writing; Revision checklist; Releasing document

Business Proposal & Report Writing: Types of Proposals; Top-Down & Bottom-Up Approach; Study of Technical Bid & Cost Bid; Transmittal Letters; Formal Reports (Short and Long); Types of graphics & illustrations; Business Report Templates; Study of Sample Proposals;

Project Report Writing: Project Charter; Project Plan; Gant Chart; Activities List; Resources List; Risks List, Project Status Report; Project Closure Report; Types of graphics & illustrations; Study of Project Report Templates

Email Writing: Problems resulting out of emails; Contents of email, Importance of a good subject line; Dos and Don'ts; Using your email software to its maximum; Setting up signatures; Setting up accounts; Creating HTML stationary; Creating email templates for common emails; Using short mails for internal communication; Importance of acknowledging emails; Creating folder structure for easily accessing emails; Care to be taken while deleting emails, Archiving emails; Comparison of emails and letters; Writing typical emails, sending point-wise reply to emails

Cross-Cultural Training: Cross-Cultural Sensitivity; American, European, Australian, Middle-east and South-East Asian countries culture training; Cultural Foundations; Cross Cultural Communication; Communication Styles; Comparative Values (American – Indian); Regional Dialects; Cross-Cultural Customer Attitude & Expectations

Interpersonal Skills: Introduction & Importance of Interpersonal Skills; Cost of Poor interpersonal skills; Standing up for self assertiveness; Strategies to achieve self-assertiveness; Managing conflicts, disputes; Dealing with Diversity Interpersonal Relationship and influence

II SEMESTER

MOLECULAR BIOLOGY (HARD CORE) – 48 Hrs

COURSE CODE: BTB020

Course Outcome

CO1- The student will get an idea about the genomic organization of prokaryotes and eukaryotes.

CO2-Obtain in depth knowledge of genetic code, DNA replication and transcription.

CO3-Understand principles, concepts of translation, post translation mechanism

CO4-Regulation of gene expression in prokaryotes and eukaryotes

CO5-Gain the insight into molecular mechanism of antisense molecules, inhibition of splicing and application of antisense and ribozyme technologies.

Unit-I **12 Hrs**

Genome organization:Organization of bacterial genome; Structure of eukaryotic chromosomes; Role ofnuclear matrixin chromosome organization and function; Matrix binding proteins; Heterochromatin and Euchromatin; DNA reassociation kinetics (Cot curve analysis); Repetitive and unique sequences; Satellite DNA;DNA melting and buoyant density; Nucleosome phasing; DNase I hypersensitive regions

DNA topology: Closed and super coiled DNA, DNA topoisomerases,

DNA replication: Enzymes in DNA replication, DNA Pol I, II III, replication in single stranded DNA viruses, replication in prokaryotes, eukaryotic DNA replication, eukaryotic polymerases, role of other proteins and enzymes in replication, fidelity of replication, replication of mitochondrial DNA, inhibitors of replication.

Unit- II **12 Hrs**

Genetic code: Elucidation, Contributions of Khorana and others, triple binding assay, Wobble hypothesis.

Transcription: Transcription unit, RNA polymerase in prokaryotes, mechanism of transcription-initiation, elongation and termination. Eukaryotic transcription - eukaryotic RNA polymerase, transcription factors, initiation, elongation and termination of transcription, inhibitors of transcription; post transcriptional modifications – capping, polyadenylation, splicing, introns and exons. Structural organization of mRNA, tRNA and rRNA, nuclear export of mRNA and mRNA stability

Unit-III **12 Hrs**

Translation: Molecular anatomy and biogenesis of ribosome, partial reconstitution experiments; Amino acid activation- amino acylation of tRNA; prokaryotic and eukaryotic translation– mechanism of initiation, elongation and termination, inhibitors of translation, post translational modifications, protein glycosylation.

Protein localization: Synthesis of secretory proteins and membrane proteins; import into nucleus, mitochondria, chloroplast and peroxisomes.

Regulation of gene expression in Prokaryotes: Basic control circuits, positive and negative regulation; Operon concept – *lac*, *ara* and *trp* operons- catabolite repression, regulatory elements in prokaryotes, attenuation, antitermination, regulation of gene expression in Bacteriophage.

Unit-IV **12 Hrs**

Regulation of gene expression in Eukaryotes: *cis* control elements – promoters, enhancers, *trans* acting factors, DNA binding motifs of transcription factors, mechanism of regulation by transcription factors, NFkB histone acetyl transferase and deacylase, hormonal regulation of gene expression, post transcriptional control.

Antisense RNA and ribozymes: Molecular mechanism of antisense molecules, inhibition of splicing, disruption of RNA structure, hammerhead, hairpin ribozymes, Application of antisense and ribozyme technologies. RNA interference, RNA induced gene silencing.

Reference Books

1. Molecular Biology. Freifelder, D. Narosa Pub House.
2. Advance Molecular Biology. Twyman, R. M. Viva Book Pvt. Ltd.
3. Molecular Biology. JD Watson
4. Molecular Biology of the Cell. Bruce Alberts.
5. Genes, Benjamin XII ,2017

IMMUNOLOGY AND IMMUNOTECHNOLOGY (HARD CORE) – 48 Hrs

COURSE CODE: BTB050

Course Outcome

CO1- Study basic concepts of immunology

CO2- MHC and their role in transplantion

CO3-Cytokines and their role in immune system

CO4-Tumor immunology

CO5-Autoimmune diseases

CO6-Hypersensitivity

CO7-Vaccine production.

Unit-I **12 Hrs**

Immune system: Structure, functions and organization of cells and organs involved in immune systems – T cells, B-cells, macrophages, Eosinophils, Neutrophils, Mast cells; bone marrow, spleen, thymus, lymph node, peyer's patch; Infections and immune responses – Innate immunity, acquired immunity; clonal nature of immune response; Immunohaematology – blood groups antigens, blood transfusion and Rh incompatibilities.

Antigens: Types, haptens, adjuvants, antigenic specificity.

Antibodies:Structure of immunoglobulins, heterogeneity, sub-types – iso-, allo- and idio- types and their properties

Unit-II **12 Hrs**

Complements: Structure, components, properties and functions of complement pathways, biological consequences of complement activation; Immunological diversity;

Effector mechanism: T-cell cloning, mechanism of antigen recognition by T-cells and B-lymphocytes and their properties, receptors and related diseases.

Role of class II MHC molecules in T-cell cloning, antigen specific and alloreactive T-cell cloning, applications of T-cell cloning in understanding relevant antigens and T-cell subtypes; T-cell cloning in vaccine development

MHC and Tumor immunology: Structure and function of MHC and the HLA system; regulation of Ir-genes; Tumor immunology– Tumor specific antigens, Immune response to tumors, theory of surveillance, immune diagnosis of tumor; Tumor markers – Alpha fetofoetal proteins, carcinoembryonic antigen

Unit-III **12 Hrs**

Immune responses and Transplantation: HLA and tissue transplantation; Tissue typing methods for organ and tissue transplantation in humans; Graft versus host rejection, Host versus graft rejection; Xenotransplantation; Immunosuppression theory; Autoimmune diseases – Hashimoto's disease, Systemic lupus erythematosis, Multiple sclerosis, Myasthenia gravis, Rheumatoid arthritis and the remedies.

Allergy: Type I – Antibody mediated – Anaphylaxis, Type II – antibody dependent – Cytolytic and Cytotoxic, Type III – Immune complex mediated reactions**–** Arthus reaction, serum sickness, Type IV– Cell mediated hypersensitivity reaction– Tuberculin type.

Unit-IV **12 Hrs**

Lymphokines and Cytokines– assay methods, related diseases; Immunological tolerance; production of interleukins and interferons– applications.

Immunizations: Conventional vaccines, sub-unit vaccines, DNA vaccines, toxoids, antisera; common immunization – small pox, DPT, hepatitis, polio, measles

Reference Books

1. Immunology. Roitt, Gower Medical Publisher.
2. Fundamental Immunology. Paul W E Raven Press.
3. Immunology. Kuby
4. Immunology, JanewasTraves, Walpart, SHlomehik. Churchill Livingstone.
5. An introduction to Immunology. Rao, C. V. Nasora pub house.
6. Immunology – A short course. Coico, R., Sunshine, G. and Benjamini, E. John Wiley and sons.
7. Cellular Interactions and Immunobiology. BIOTOL series. Butterworth-Heinemann.

LAB – II (HARD CORE)

COURSE CODE: BTB060

Course Outcome

CO1-Students are trained to get the skills in the field of Molecular biology and Genetic engineering

CO2- , Isolation and purification of nucleic acids and their quantification

CO3-Study of antigen and antibody interactions.

CO4 -Preparation of wine and analysis of food samples

Practicals/ Experiments

1. Identification of normal and abnormal human karyotype
2. Localization of Barr bodies
3. Estimation of free fatty acids by titrametric method
4. Saponification value for commercial oil samples
5. Determination of iodine value of an oil
6. Determination of total carbohydrates by phenol-sulphuric acid method
7. Estimation of cholesterol
8. *In vitro* transcription
9. Total RNA extraction
10. Estimation of DNA by Diphenylamine (DPA) method
11. Estimation of RNA by orcinol method
12. Isolation of DNA different samples: plant leaves, coconut endosperm, yeast, animal tissues
13. Determination of purity and concentration of isolated DNA using spectrophotometer
14. Agarose gel electrophoresis of DNA
15. Analysis of microbial quality of foods – Litmus test, catalase test and dye reductase test in milk, estimation of lactic acid in milk
16. Preparation of wine
17. Estimation of percentage of alcohol in wine
18. Chemical method to differentiate between ethanol from methanol
19. Estimation of total acids in wine
20. Conjugation
21. Phage titration
22. Preparation of antigen and antibody production
23. Purification of IgG/IgY
24. Slide agglutination test/blood grouping
25. Antibody labeling
26. Immunoprecipitation test- ODD
27. ELISA for quantification of an antigen
28. Lymphocyte preparation
29. Rossette assay
30. Rocket immunoelectrophoresis

Biotech Industry and/ or R & D institution visit

CELL SIGNALLING AND COMMUNICATION (SOFT CORE) – 48 Hrs

COURSE CODE: BTB220

Course Outcome

CO1- Understanding the multi-cellularity of organisms

CO2-role of extracellular matrix in signalling

CO3-various signalling pathways from the cell surface to the nucleus

CO4-cell signalling in plants

CO5-microbe-plant and insect-plant interaction.

Unit-I **12 Hrs**

Multicellularity: Role of Extracellular matrix - hyaluronan and proteoglycan. Matrix proteins and their receptors, adhesive proteins and cell junctions in multicellularity. Structure and function of plant cell wall

The importance of the matrix in signal transduction: Cell surface receptors as reception of extra-cellular signals, Amplification of signal during transmission - a quantitative study,Tyrosine kinase and tyrosine phosphatase, Cell membrane components and adapter proteins required for signal transmission, Upstream and downstream signal transduction without cell surface receptor activation, G-protein coupled signaling; the secondary messengers in signal transduction pathways cAMP, Ca^{2+}, Reactive Oxygen Species and Hypoxia Signalling, Apoptosis Signaling Transduction Pathway, PI3K/AKT Cell Survival Pathway.

Unit-II **12 Hrs**

Various signal transduction pathways from cell surface to nucleus: MAP kinase pathway, SAP/JNK pathway, p38 pathway, ERK pathway, NFkB pathway, Cell survival pathway, Wnt signaling pathway, Jak/Stat pathway, Smad pathway,TGF β Signaling, EGFR, VEGF And their Signalling, Cytoskeleton And Cell Signalling, Carbohydrate Recognition Signaling, MMPs And Cell Signalling, Cross talk among cell surface receptors, Cross talks among cytoplasmic components, Translocation of signal components during signal transmission, From cytoplasm to cell membrane, NF-κB Signaling from cytoplasm to nucleus, Cell cycle and its Signalling.

The end point of signal transduction--- gene transcription: Nuclear receptors and transcription factors in signalling, Signalling from single gene expression to multiple gene expression: Super array as a tool for the study of multiple gene transcription, Practical application of the signal transduction research, RNA Interference And Cell Signalling, Senescence and Its Signaling Pathways.

Unit-III **12 Hrs**

Signal transduction in plants: Cross-talk with the environment- wound and mechanical signalling - fatty acid signalling, peptide signalling, oligosaccharide signalling; protein kinases and signal transduction. Abiotic stresses - Dehydration-stress, salt-stress, cold acclimation, heat-stress

Role of active oxygen species (AOS) in plant signal transduction: AOS in plants, AOS as signal molecules, AOS-part of a signalling network.

Action of phytohormones: Multiple signals regulating growth and development of plant organs and their adaption to environmental stresses.

Unit-IV **12 Hrs**

Symbiotic plant-microbe interaction: Rhizospheric signals (PGPR) and early molecular events in the ectomycorrhizal symbiosis; Lipo-chito-oligosaccharides (LCO) signalling in the interaction between rhizobia and legumes; endophytes.

Recognition and defencesignalling in plant-microbe interaction: Resistance genes - gene-for-gene resistance; co-evolution and specificity of R genes; the TIR domain, the NBS domain; genetic organization of resistance genes; quorum sensing.
Plant-insect interaction: Induction of direct and indirect defence

Reference Books

1. Animal Cell Biotechnology – Methods and Protocols. Nigel Tenkins.
2. Molecular biology of the Cell –Alberts et al.
3. Molecular Cell Biology. 5th Edn. Lodish, H, et al., W H Freeman
4. Cell and Molecular Biology. Karp, J.JohnWiey and Sons In.
5. The Cell-Molecular approach. 4th Ed. Geoffrey M Cooper and Robert E Hausman.
6. Cell Biology- A Laboratory Handbook. 3rd Ed, 4th Vol, Julio E Celis

METABOLOMICS (SOFT CORE) – 48 Hrs

COURSE CODE:

Course Outcome

CO1-Understanding the basic metabolism of plants

CO2-Different pathways involved in secondary metabolite production

CO3-Altering the metabolic pathways by changing the precussors

CO4-Purification of useful secondary metabolites and their kinetics and dynamics

CO5-Applications in food and pharmaceutical industries

Unit-I **12 Hrs**

Plant Metabolomics: Developments and history of plant metabolomics, Nature and prospecting of metabolism-related secondary plant products, tools and techniques, production in culture: optimization; selection, hormonal kinetics for secondary metabolites, production, mechanism and control.

Unit-II **12 Hrs**

Production of secondary metabolites: Induction, Alkaloids, antitumor compounds, food additives, steroids and saponins, detoxification of secondary metabolites, production of secondary metabolites by bioconversion, genetic transformation for production of secondary metabolites, large-scale production in bioreactors, Metabolomics-assisted breeding.

Unit-III **12 Hrs**

Microbial metabolomics: Systems biology of microbial metabolism; microbe sensors, *In silico* metabolomes, Food and Applied metabolomics, Biomarker discovery. Experimental Approaches-Genome sequencing, Gene expression arrays, Nuclear Magnetic Resonance, Mass spectroscopy, Capillary electrophoresis, Two dimensional gel electrophoresis, Gene expression arrays, Pathway analysis, HPLC, Protein sequencing, Bench-scale fermentation, AFLP/RLFP analysis.

Unit-IV **12 Hrs**

Pharmacometabolomics: personalized medicine and future of health system, Pathways discovery and disease pathophysiology, Bioinformatics analysis of targeted metabolomics; Environmental metabolomics, Bioactive compounds and Pharmacognosy, Clinical Applications of Metabolomics, Nutrigenomics and Metabolomics, Novel Technologies for Metabolomics, Data Handling for Metabolomics.

Reference Books

1. V.Voet and J.G.Voet, Biochemistry, 3rd edition, John Wiley, New York, 2004.
2. A.L. Lehninger, Principles of Biochemistry, 4th edition, W.H Freeman and Company, 2004.

FOOD AND ENVIRONMENTAL BIOTECHNOLOGY (SOFT CORE) – 48 Hrs

COURSE CODE: BTB210

Course Outcome

CO1-Comprehensive insight into the fermented foods and enzymes in food industry

CO2-Obtain knowledge of functional foods, genetically modified foods and nutraceuticals.

CO3-Students will be able to understand current status of biotechnology in environment protection.

CO4-Understand the principles of bioremediation and significance of GMO to the environment.

Unit-I **12 Hrs**

Fermented foods, milk-based products, fermented vegetables, fermented meats, fish, beverages, vinegar, mould fermentation - tempeh, soysauce, rice wine.

Enzymes in dairy industry, cheese making and whey processing, impact of enzyme technology (protein hydrolysates, bioactive peptides), Enzymatic processing of fruit juices; role of enzymes in baking, meat and meat processing, phytase in animal feeds, DNA-based methods for food authentication, comparative methods of toxicity testing in (novel) foods, biological approach to tailor-made foods, application of generic technologies in food and nutritional sciences; anti-cancer components in foods.

Unit-II **12 Hrs**

Functional foods and Biotechnology: applying molecular, biochemical, cellular and bioprocessing concepts, use of specific phenolic metabolites from botanical species. Pre- and Pro-biotics, single cell protein, single cell lipids. Manipulation of fruit ripening process.

Food processing, principles and practices, food ingredients and processing aids from biotechnological processes, corn sweeteners, bacterial starter cultures, Food spoilage, preservation, mycotoxins in food commodities. Genetically modified foods, designer foods, Nutraceuticals, detection of GM foods.

Unit-III **12 Hrs**

Renewable and non-renewable resources, current status of biotechnology in environment protection. Characterization of waste. Waste water management: Bioreactors for waste-water treatment, Aerobic biological treatments, anaerobic biological treatments, treatment of industrial effluents-dairy, distillery, paper and sugar industries. Membrane-based waste water treatment.

Oil pollution – treatment with microorganisms.

Unit-IV **12 Hrs**

Bioremediation: Concepts and principles, bioremediation using microbes, in situ and ex situ bioremediation, biosorption and bioaccumulation of heavy metals.

Xenobiotics: Degradation capabilities of microorganisms with reference to toxicology, pesticides, herbicides, polyaromatic hydrocarbons.

Renewable energy: Relevance of GMO to the environment.

Solid waste management: Waste as a source of energy, biotechnology in paper and pulp industry, production of oil and fuels from wood waste, anaerobic and aerobic composting, vermiculture, biofuels.

Reference Books

1. Food Microbiology. Frazier, W. C. and Westhoff, D. C. Tata McGraw Hill.
2. Agriculture Bio-technology. Purohit. Agrobios India.
3. Food Bio-technology. Knorr, D. Marcel Dekker Inc.
4. Environmental Bio-technology. Jogand, S. N. Himalaya Publishing House, New Delhi.

PHARMACEUTICAL BIOTECHNOLOGY (SOFT CORE) – 48 Hrs

COURSE CODE:

Course Outcome

CO1-Rules and regulation regarding development of drugs

CO2- Study of Pharmacodynamics and pharmacokinetics of drugs

CO3-Different phases of clinical trials and drug toxicity studies.

CO4-GMP and GLP in production management and quality control and assessment

Unit- 1 **12 Hrs**

Introduction to pharmaceuticals and Drug development process: Introduction to pharma industry, history of the pharmaceutical industry, traditional pharmaceuticals of biological origin (animal, plant and microbial)biopharmaceuticals and pharmaceutical biotechnology, age of biopharmaceuticals, biopharmaceuticals: current status and future prospects.

Steps involved in drug development process, drug delivery systems, preclinical studies and principles practices, phases of clinical trials. Regulatory authorities in India, USA and Europe and Japan, prescription, non- prescription drugs and orphan drugs.-

Unit-II **12 Hrs**

Drug Receptors, Pharmacodynamics and pharmacokinetics.: Different types of drug receptors, second messengers (cAMP, Ca2+ and phosphoinositides) and their signalling mechanism, relation between drug concentration and respose, concentration effect curves, concentration- effect curves, relation between drug dose and clinical responses.Volume of distribution of drug, clearance, drug accumulation, bioavailability, alternative routes of administration and the first pass effect, therapeutic drug monitoring

Unit-III **12 Hrs**

Drug biotransformation and drug toxicity:The role of biotransformation in drug disposition, phase I metabolism (microsomal oxidation, hydroxylation, dealkylation), phase II metabolism (Drug conjugation pathway) CYP families, clinical relevance of drug metabolism, drug-drug interaction.

Mechanisms of toxicity, production of toxic metabolites, harmful immune response, idiosyncratic toxicity, contexts of drug toxicity, drug overdose, drug- drug interactions, pathology of drug toxicity. Cellular toxicity, organ and tissue toxicity.

Unit-IV **12 Hrs**

The drug manufacturing process and drugs of biopharmaceutical origin: Guides to good manufacturing practice, manufacturing facility. Clean rooms, cleaning, decontamination and sanitations (CDS), CDS of the general manufacturing area, CDS of the Process equipment, generation of purified water, water for injection, documentation, specifications, Concept and testing of pre- formulations & their parameters. Tablets: Compressed, granulation, coatings, pills and capsules, parenteral preparations, herbal extracts, oral liquids, Ointments. Processing and packing instructions.

Therapeutic enzymes: asparginase, DNAse, Glucocerebrosidase, galactosidase and urate oxidase, superoxide dismutase, Lactase.

Reference Books

1. Textbook of Pharmaceutical Biotechnology. Chandrakant Kokate, Pramod H.J, SS Jalalpure. Elsevier Health Sciences, 2012
2. Pharmaceutical Biotechnology: Concepts and Applications. Gary Walsh. John Wiley & Sons, 2013
3. Pharmaceutical Biotechnology, Second Edition. Michael J. Groves. Taylor & Francis, 2005

NON CREDIT COURSE

EMPLOYABILITY SKILLS MODULE

COURSE CODE:

Course Outcome

CO1- Concepts of corporate communication
CO2- English grammar skills
CO3- Develop strategies for negotiation and marketing
CO4- Personality development and interview skills
CO5- This course will enable students to learn about the project management, entrepreneurship.

Campus to Corporate: Transition from College to Corporate world; Perceptions v/s Real Corporate life; Working in Teams; Basics of corporate communication

Corporate & Office Etiquette: Elements of a good handshake; Visiting cards exchange & How to manage business cards; Small Talk & Networking; Basics dining etiquette

English Grammar: A quick round up: Nouns, Pronouns, Adjectives, Verbs, Adverbs, Tenses, Prepositions, Clauses, Subject and Predicate, Punctuations, Subject- verb agreement, Confusing prepositions, Missing Articles, Editing paragraphs

Negotiation Skills: Introduction to Bargaining and Negotiation; The Negotiation Process: Four Stages; An Analytical framework of Negotiation; Bargaining Approaches; Strategy for Value Added Negotiation

Selection & Interviewing Skills: Current market for talent & methods for attracting & sourcing; Best practices for different hiring situations - Campus, Market, Head hunter agencies; Selection process design & assessment centers; Effective interview

Personality Development: Self assessment: SWOT; Understanding Personality - Identifying different personalities; Levels of Human Learning; Change v/s Transformation; Sensitivity - Sharpen your senses; Creativity and Lateral thinking; Developing Positive Mental Attitude; Emotional Quotient; Handling Criticism; Positive Health; Food habits and Meditation; Goal setting - Creative Visualization - Law of Attraction; Living a created life - Personal Leadership

III Semester

BIOPROCESS ENGINEERING AND TECHNOLOGY (HARD CORE) – 48 Hrs

COURSE CODE:

Course Outcome

CO1-To have the **c**omprehensive insight into the different type of fermenter
CO2-To obtain knowledge of media design and industrial culture
CO3-Students will be able to understand different type of fermenter and bioreactor.
CO4-Understand the principles of downstream processing
CO5- To understand the enzyme technology and their applications in industry.

Unit-I **12 Hrs**

Basic principle of Biochemical engineering and Microbial Growth Kinetics:

General Introduction to metabolic pathways involved in microbial products, concepts of over production, primary and secondary metabolites, estimation of biomass. Isolation, screening and maintenance of industrially important microbes; Microbial growth kinetics, Strain improvement for increased yield and other desirable characteristics.

Batch culture, continuous culture, fed batch culture, the growth cycle, effect of nutrients, growth rate and cell cycle.

Unit II **10 Hrs**

Media design and industrial cultures: Introduction, typical media, Oxygen requirement, antifoams, media formulation, energy sources, carbon and nitrogen source, other components, media optimization , Media sterilization, Batch process (thermal death kinetics), continuous sterilization process. Sterilization of fermenter and other ancillaries, filter sterilization of air and media. Rheological properties of medium. Screening for industrial useful metabolites, maintenance of stock cultures

Unit III **10 Hrs**

Types of fermenters and bioreactors: design, control system, operation, optimization, control and monitoring of variables such as temperature, agitation, pressure, pH, online measurements and control, Scale up of bioreactors. Bubble column, airlift reactor, packed bed, fluidized bed, trickle bed, Membrane reactor, Photobioreactor, Solid state fermenter, Animal and plant cell bioreactors. Scale up and Scale down studies of bioreactors. Biosensor

Unit IV **16 Hrs**

Downstream processing (Recovery and purification of products) of biologicals: Separation of cells, foam separation, disintegration of micro organism, mechanical and non mechanical methods,flocculation, filtration, plate filters, rotary vacuum filters, centrifugation, Stoke's law, continuous centrifugation, basket centrifuge, bowl centrifuge, , membrane filtration, ultra filtration and reverse osmosis, chromatographic techniques, absorption, spray drying, drum drying, freeze drying.

Enzyme Technology: production, recovery, stability and formulation of bacterial and fungal enzymes-amylase, protease, penicillin acylase, glucose isomerase; Immobilised Enzyme and Cell based biotransformation steroids, antibiotics, alkaloids.

Texts/ References

1. Jackson AT., Bioprocess Engineering in Biotechnology, Prentice Hall, Engelwood Cliffs, 1991.
2. Shuler ML and Kargi F., Bioprocess Engineering: Basic concepts, 2nd Edition, Prentice Hall, Engelwood, Cliffs, 2002.

3. Stanbury RF and Whitaker A., Principles of Fermentation Technology, Pergamon press, Oxford, 1997.
4. Baily JE and Ollis DF., Biochemical Engineering fundamentals, 2nd Edition, McGraw-Hill Book Co., New York, 1986.
5. Aiba S, Humphrey AE and Millis NF, Biochemical Engineering, 2nd Edition, University of Tokyo press, Tokyo, 1973.
6. Comprehensive Biotechnology: The Principles, Applications and Regulations of Biotechnology in Industry, Agriculture and Medicine, Vol 1, 2, 3 and 4. Young M.M., Reed Elsevier India Private Ltd, India, 2004.
7. Mansi EMTEL, Bryle CFA. Fermentation Microbiology and Biotechnology, 2nd Edition, Taylor & Francis Ltd, UK, 2007.

GENETIC ENGINEERING (HARD CORE) - 48 Hrs

COURSE CODE:

Course Outcome

CO1-To have the **c**omprehensive insight into the different enzymes used in Genetic engineering lab

CO2-To obtain knowledge of construction of vectors

CO3-Students will be able to understand different type ofcloning methods.

CO4-Understand the principles of PCR& types

CO5- To know the different sequence methods

Unit I **10 Hrs**

Basics Concepts: DNA Structure and properties; Restriction Enzymes; DNA ligase, Klenow enzyme, T4 DNA polymerase, Polynucleotide kinase, Alkaline phosphatase; CRISPR- cas9, Cohesive and blunt end ligation; Linkers; Adaptors; Homopolymeric tailing; Labeling of DNA: Nick translation, Random priming, Radioactive and non-radioactive probes, Hybridization techniques: Northern, Southern and Colony hybridization, Fluorescence in situ hybridization; Chromatin Immunoprecipitation; DNA-Protein Interactions-Electromobility shift assay; DNaseI footprinting; Methyl interference assay

Unit II **10 Hrs**

Cloning Vectors: Plasmids; Bacteriophages; M13 mp vectors; PUC19 and Bluescript vectors, Phagemids; Lambda vectors; Insertion and Replacement vectors; Cosmids; Artificial chromosome vectors (YACs; BACs); Animal Virus derived vectors-SV-40; vaccinia/bacculo & retroviral vectors; Expression vectors; pMal; GST; pET-based vectors; Protein purification; His-tag; GST-tag; MBP-tag etc.; Intein-based vectors; Inclusion bodies; Methodologies to reduce formation of inclusion bodies; Baculovirus and pichia vectors system, Plant based vectors, Ti and Ri as vectors, Yeast vectors, Shuttle vectors

Unit III **6 Hrs**

Cloning Methodologies: Insertion of Foreign DNA into Host Cells; Transformation; Construction of libraries; Isolation of mRNA and total RNA; cDNA and genomic libraries; cDNA and genomic cloning; Expression cloning; Jumping and hopping libraries; Southwestern and Far-western cloning; Protein-protein interactive cloning and Yeast two hybrid system; Phage display; Principles in maximizing gene expression

Unit IV **22 Hrs**

PCR and Its Applications: Primer design; Fidelity of thermostable enzymes; DNA polymerases; Types of PCR – multiplex, nested, reverse transcriptase, real time PCR, touchdown PCR, hot start PCR, colony PCR, cloning of PCR products; Tvectors; Proof reading enzymes; PCR in gene recombination; Deletion; addition; Overlap extension; and SOEing; Site specific mutagenesis; PCR in molecular diagnostics; Viral and bacterial detection; PCR based mutagenesis, Mutation detection: SSCP, DGGE, RFLP, Oligo Ligation Assay (OLA), MCC (Mismatch Chemical Cleavage, ASA (Allele-Specific Amplification), PTT (Protein Truncation Test)

Sequencing methods: Enzymatic DNA sequencing; Chemical sequencing of DNA; Automated DNA sequencing; RNA sequencing; Chemical Synthesis of oligonucleotides; Introduction of DNA into mammalian cells; Transfection techniques; Gene silencing techniques; Introduction to siRNA; siRNA technology; Micro RNA; Construction of siRNA vectors; Principle and application of gene silencing; Gene knockouts and Gene Therapy; Creation of knock out mice; Disease model; Somatic and germ-line therapy- in vivo and ex-vivo; Suicide gene therapy; Gene replacement; Gene targeting; Transgenics; cDNA and intragenic arrays; Differential gene expression and protein array.

Text/References

1. S.B. Primrose, R.M. Twyman and R.W.Old; Principles of Gene Manipulation. 6th Edition, S.B.University Press, 2001.
2. J. Sambrook and D.W. Russel; Molecular Cloning: A Laboratory Manual, Vols 1-3, CSHL, 2001.
3. Brown TA, Genomes, 3rd ed. Garland Science 2006
4. Selected papers from scientific journals.
5. Technical Literature from Stratagene, Promega, Novagen, New England Biolab etc.
6. Genes, Benjamin XII , 2017

LAB-III (HARD CORE)

COURSE CODE:
Course Outcome
CO1 -
CO2 -
CO3 -
CO4 -
CO5 -

Practicals/ Experiments

1. Animal cell culture: preparation of media, culture and maintenance of cell lines, trypsinization
2. Culture of transformed cells
3. MTT assay for cytotoxicity
4. Western blotting and detection
5. Study of fermenter (demo)
6. Immobilization of yeast by calcium alginate, gel entrapment and assay for enzyme *invertase*
7. Assay of catalase.
8. Study of alcohol fermentation – alcohol from different substrates – estimation of alcohol content
9. Solid state fermentation
10. Determination of the activity of enzyme protease
11. Determination of the activity of enzyme amylase
12. Estimation of Vitamin E
13. Estimation of Vitamin C
14. Estimation of aminoacid by ninhydrin method
15. Preparation of MS media
16. Induction of callus
17. Micropropagation
18. Suspension culture- production of secondary metabolites
19. Preparation of synthetic seeds
20. Database search for nucleotide and aminoacid sequences using BLAST
21. Study of sequence alignment
22. Construction of trees/dendrogram using sequence analysis
23. Structure prediction using homology searches
24. RAPD
25. Transformation
26. Bacterial gene expression
27. RFLP mapping
28. Isolation of plasmid DNA from *E.coli*
29. Restriction digestion of DNA
30. DNA ligation
31. production of citric acid by *A.niger* by submerged fermentation.
32. Estimation of citric acid by titrametric method
33. PCR
34. Isolation of antibiotic producing actinomycetes from soil sample

CLINICAL AND ADVANCED TECHNIQUE IN BIOTECHNOLOGY (SOFT CORE) – 48 Hrs

COURSE CODE:

Course Outcome

CO1**-**Diagnosis of diseases using enzymes as markers
CO2-analysis of blood and urine sample to interpret the diseases
CO3-Study of metabolic disorders and their diagnosis
CO4- Clinical trails of designed drugs/ biomolecules
CO5-Tools of Histopathalogy, Immunotechnology, microarray and DNA chips in understanding the diseases

Unit I **16 Hrs**

Diagnostic Enzymology: Mechanisms of elevated enzyme activities. Some important enzymes – alkaline phosphates, creatine kinase, LDH, AST, ALT – isozyme changes

Blood: Composition, cells, functions of plasma proteins and lipo proteins in diseases. Disorders of hemoglobin – Thalassemia, sickle cell anemia. Anemias – Microcytic, normocytic and macrocytic.

Advanced methods in clinical analysis: Blood, urine and quantitative determination of metal ions in body fluids

Liver: Biochemical indices of hepatobiliary diseases. Bile pigments – formation of bilirubin, urobilinogen bile acids, jaundice – pre-hepatic, hepatic and post-hepatic; liver function tests, diseases of the liver – hepatitis, cholestasis, cirrhosis, Gallstones.

Unit II **8 Hrs**

Kidney: Assessment of renal function – creatine clearance, renal calculi, uremia, laboratory investigation of kidney disorders.

Cardiovascular Disorders: major cardio vascular system – Atherosclerosis – risk factors, pathogenesis. Diagnosis and prognosis

Disorders of Amino Acid and nucleotide metabolism: Gout Lesch – Nyhan syndrome, orotic acid urea phenyl ketonuria, alkaptonuria, maple-syrup urine.

Clinical trails of designed drugs/biomolecules.

Molecular detection of diseases, Amniocentesis

Unit III **12 Hrs**

Microscopy: Phase Contrast Microscopy, Fluorescence Microscopy, Confocal and Inverted Microscopy), Electron Microscopy (Transmission Electron Microscopy, Scanning Electron Microscopy)

Diagnostics and immunological techniques: applications of immunological and molecular diagnostic methods (RIA, ELISA, PCR, DNA finger printing) in forensic science and disease diagnosis. *In vitro* antigen-antibody reactions, Coombs' test, complement titration test (Direct and indirect), Immunoflourescence, Immuno-enzymatic and ferritin technique, Immuno-electromicroscopy. Immuno-electrophoresis, Western blot analysis. Hybridoma technology – Monoclonal and polyclonal antibodies and their application

Unit IV **12 Hrs**

Nanobio-technology: Introduction, types and synthesis of nanomaterial, protein – based nano structures, DNA-based nano structures. Applications of nanomaterials, nano biosensors, drug and gene diversity, disease diagnostics, cancer therapy, risk potential of nanomaterials.

DNA chip technology and micro arrays: Types of DNA chips and their production, hybridization, application of micro arrays on DNA chips.

Genomic research: Methods for whole genome sequencing, genome sequence data, e-PCR, genome sequence to annotation- methods for annotation of genome sequence.

Reference Books

1. Biochemistry – With Clinical Correlations. Devlin.
2. Clinical Biochemistry. Latner.
3. Principles of Instrumental Analysis. 5th Ed. Douglas A Skoog, James Holler and Timothy A Nieman.
4. Analytical and Preparative Separation Methods of Biomacromolecules. Hassan Y Aboul – Enein.
5. Microbiology – Principles and Explorations. 5th Ed. Jacquelyn G Black.
6. Genetic Engineering: Primose, S. B.
7. An introduction to molecular Bio-technology (Ed.) Wink.
8. Principles of gene manipulation and genomics. Primose, S. B. and Twyman, R. M.
9. Gene cloning and DNA analysis an Introduction. Brown, T. A. Blackwell Science Company.
10. Molecular Biology and Biotechnology. Walker, J. M. and Rapley, R. Panima Publishing Corporation.
11. Molecular Biotechnology – Principles and application of Recombinant DNA. Glicks, R. Bernard and Pasternak, J. Jack. Panima Publishing Corporation.
12. Molecular Biomethods Hand Book. Rapley, R and Walker, M. Jhon. Humana Press.
13. Genes (VIII edition) Benjamin Lewin, Pearson Education International

BIOSTATISTICS, BIOINFORMATICS AND BIOENTREPRENEURSHIP (SOFT CORE) – 48 HRS

COURSE CODE:

Course Outcome

CO1-Application of statistics to understand and analyse the experimental results of biological sciences
CO2-retrival of biological data
CO3-phylogenetic analysis
CO4-primer designing
CO5-drug discovery and molecular docking

Unit I **12 Hrs**

Statistical concept: Data structure, sampling methods, collection, classification and tabulation of data, graphical and diagrammatic representation, histogram, frequency polygon, frequency curve, bar graph, pie chart.

Measure of central frequency: **Mean, median, mode, mean deviation, standard deviation, standard error**

Types of distribution of data: Normal, binomial, Poisson, Z-test, t-test and ANOVA.

Correlation and regression

Unit II **18 Hrs**

Bioinformatics: Introduction, history, internet and bioinformatics, knowledge, discovery and data mining, problems faced in bioinformatics area, opportunities in bioinformatics, human genome project.

Biological databases and their management: database concept, introduction, history of databases, databases management systems, types of database, Codd rules, data normalization biological databases – introduction, application and its importance, biological database and their functioning, types of biological database, microbiological database, primary sequence database, carbohydrate database, RNA database, genome database, organism database, biodiversity.

Sequence database: Introduction, nucleotide sequence database, protein sequence database, the EMBL nucleotide sequence database, structure databases.

Bioinformatics software: Clustal V Multiple sequence alignment, Clustal W Version 1.7, Ras Mol, Oligo, Mol script, TREEVIEW, ALSCRIPT, genetic analysis software, Phylip.

Computational biology: Introduction, data mining and sequence analysis, database similarities searches, practical aspects of multiple sequence alignment, phylogentic analysis, predictive methods using nucleic acid and protein sequences, submitting DNA sequences to the databases.

Unit III **10 Hrs**

Innovation: Idea to enter into business, Designing and development of new products as per market demands and their future prospective. Needs of customer, branding, distribution, promotion and advertising.

Types of bio-industries and IPR: biopharma, bioagri and bioservices. IP protection & commercialization strategies- freedom to operate.

Accounting and Finance : Business plan preparation, contracts, partnerships, business feasibility analysis by SWOT, socio-economic costs benefit analysis; funds/support from Government agencies like MSME/banks and private agencies like venture capitalists:/angel investors for bio entrepreneurship; business plan proposal for virtual start up company. statutory and legal requirements for starting a company/venture; basics in accounting practices: concepts of balance

sheet, profit and loss statement, Valuation, Cash flow, double entry. Information technology for business administration and expansion. Technology transfer.

Incubation centres: Govt. (C-CAMP, KBITS, CFTRI) and Private incubation centres for start-ups.

Unit IV **8 Hrs**

Marketing : Market conditions, segments, prediction of market changes; identifying needs of customers; Market linkages, branding issues; developing distribution channels - franchising; policies, promotion, advertising; branding and market linkages for virtual start-up company.

Business Strategy & HR: Entry and exit strategy; pricing strategy; negotiations with financiers, bankers, government and law enforcement authorities; dispute resolution skills; external environment/ changes; avoiding/managing crisis; broader vision–global thinking; mergers & acquisitions.

Regulatory understanding:- GLP, GMP, GCP, PCB, IBSC, ISO

Bioentrepreneurship and case study: Importance of entrepreneurship; advantages of being entrepreneur - freedom to operate; introduction to bioentrepreneurship – biotechnology in a global scale; Scope in bioentrepreneurship; innovation – types, out of box thinking; skills for successful entrepreneur – creativity, leadership, managerial, team building, decision making, Risk assessment, opportunities for bioentrepreneurship- development programs of public and private agencies (MSME, DBT, BIRAC, Start-up & Make in India).

References:

1. Singh Narendra, Project management and control, (Himalaya publishing house)
2. Prasanna Chandra, Projects: Planning, Analysis, selection, implementation& review (Tata McGrow Hill)
3. P. GopalaKrishna& V.E. Rama Moorthy, Project management (Mac Millan India)
4. Chandra prasanna, proect preparation, Appraisal and Implementation (Tata Mcgrow Hill)
5. A. N. Desai, The dynamics of Entrepreneurial development and management (Himalaya publishing house)
6. Biostatistical Analysis. Zar J. H. Printice-Hall International.
7. Methods in Biostatistics. Mahajan, B. K. Smt. Hindu Mahajan
8. Bioinformatics. David W. Mount.
9. Bioinformatics A Practical Guide to the Analysis of Genes and Proteins Andreas D. Baxevanis and B. F. Francis Ouellette. A John Wiley & Sons, Inc., Publication.
10. Biostatistics. Daniel.
11. Handbook of Biostatistics A Review and Text. Christopher and Carvounis.

APPLIED BIOTECHNOLOGY (OPEN ELECTIVE) – 48 Hrs

Unit I **12 Hrs**

Scope of Biotechnology in India and Karnataka.

Structure of plant,animal and bacterial cells. Biomolecules and their importance.

Enzyme Biotechnology

Introduction to application of enzymes in industry: Food & beverage, detergent, textile pharmaceutical and leather.

Unit II **14 Hrs**

Applications of Plant Cell and tissue culture technology

Improvement of hybrids, encapsulated seeds, production of disease resistant, stress resistant plants, secondary metabolites from cell cultures

Transgenic plants for crop improvement, molecular farming from transgenic plants, edible vaccines. Bioethics in plant genetic engineering**.**

Unit III **10 Hrs**

Animal Cell Culture Techniques

Manipulation of reproduction in animals: Artificial insemination,embryo transfer, embryo splitting, embryo sexing

In vitro fertilization technology(IVF): Embryo cloning, embryonic stem cells Invitro-fertilization and embryo transfer in humans. Transgenic animals

Valuables products from animal cell culture (Tissue plasminogen activator, Blood factor VIII, erythropoietin.)

Hybridoma technology: Production of monoclonal and polyclonal antibodies and their applications. Bioethics in animal genetic engineeringcryopreservation, quantitation of cells, cytotoxicity assays.

Unit IV **12 Hrs**

Industrial and microbial biotechnology

Growth media, sources of nutrition, sterilization, design of fermenter, batch, fed batch and continuous culture.

Production of primary metabolites (vitamins, organic acids, alcohols and aminoacids). Production of secondary metabolites (antibiotics)

Biopesticides (Biological control of plant pathogens, pests and weeds.).

Biofertilizers (microbial inoculants)

Food Biotechnology – Genetically modified foods, Nutraceuticals, detection of genetically modified foods. Production of single cell proteins and mycoproteins.

Reference Books

1. Biotechnology. B. D. Singh
2. Biotechnology. R. C. Dubey

OPEN ELECTIVE –FUNDAMENTALS OF BIOINFORMATICS

Contact Hours/ Week	:	4	Credits	:	4
Total Lecture Hours	:	48			

Course Outcomes:

- Ability to use popular bioinformatics tools to generate biologically meaningful results
- Ability to interpret biological results generated by a bioinformatics tool
- Application of some basic models and algorithms
- The students will gain an understanding of the computational challenges (and their solutions) in the analysis of large biological data sets; they will understand how some of the commonly used bioinformatics tools work, how to use these tools effectively

Unit I **12 Hrs**

Introduction to Bioinformatics and Biological Database:

Introduction to bioinformatics, Review of Central Dogma, Genome organization -Prokaryotic and Eukaryotic. Overview of Genome Projects – Human genome project. Introduction to DNA and protein databases and their classification, file formats, information retrieval tools – Entrez, SRS, ARSA. Nucleotide and Protein sequence and structure databases (NCBI, EMBL, DDBJ and PDB). Focus on GenBank, UniProt, and Gene Ontology.

Unit II **12 Hrs**

Sequence Alignment and Database Similarity Searching:

Pairwise alignment: Alignment algorithm: Pairwise: Dot matrix method, Dynamic programming Method (Needleman-Wunsch & Smith Waterman), Scoring Matrices – PAM and BLOSUM, Database Similarity Searching: FASTA and BLAST. BLAST variants, Statistical parameters for BLAST output – e value, p value and Bit Score.

Unit III **12 Hrs**

Multiple sequence alignment:

Iterative, Progressive alignment. Application of MSA – 1. Phylogenetics – Phylogenetics Basics, Terminologies, Gene versus species phylogeny, Forms of tree representation: Maximum Parsimony and Distance methods 2. Gene prediction: Gene prediction in prokaryotes and eukaryotic 3. Protein Motif and Domain Prediction: Identification of Motif and Domains in MSA – PSSM and Profile HMMs.

Unit IV **12 Hrs**

Protein sequence analysis:

Analysis of Scalar parameters: Protparam and pepstats: Hydropathy analysis (Membrane protein prediction): Kyte-Doolittle plot, Helical Wheel representation. Secondary structure prediction, Protein structure building-Homology modelling (Comparative modelling only) – SWISS MODEL server and MODELLER, Protein Structure Visualization: Rasmol, Pymol, CN3D, Swiss PDB viewer, Chimera and Discovery studio visualizer

Applications of Bioinformatics: Bioinformatics in pharmacy: overview of drug discovery process, structure based and ligand-based drug design (CADD). Pharmacokinetics: absorption, distribution, metabolism, excretion and toxicity of drugs.

REFERENCE BOOKS:

1	David W Mount	"Bioinformatics sequence and Genome analysis", Cold Spring Harbor Laboratory Press, 2nd Edition, 2013, 9989332257358
2	Jin Xiong	Essentials Bioinformatics, Cambridge university press,3rd Edition, 2006, 9789335657325
3	Neil C. Jones and Pavel A. Pevzner	An Introduction to Bioinformatics Algorithms, MIT Press,5th Edition, 2005, 8789432449328
4	Steffen Schulze-Kremer	Molecular Bioinformatics: Algorithms and Applications, Walter de Gruyter, 4th Edition, 1996, 9789432449327
5	Attwood T K, D J Parry-Smith	Introduction to Bioinformatics, Pearson Education, 3rd Edition, 2005, 9789332447329
6	Michael R Barnes and Ian C grey	Bioinformatics for Geneticists, John Wiley & Sons Ltd, The Atrium, Southern Gate, Chichester, West Sussex PO19 8SQ, England
7	Rui Jiang, Xuegong Zhang. Michael Q. Zhang	Basics of Bioinformatics, Springer Heidelberg New York Dordrecht London,
8	Supratim Choudhuri	Bioinformatics for Beginners, Academic Press.
9	Peter Lake and Paul Crowther	Concise Guide to Databases. Springer London Heidelberg New York Dordrecht
10	Arthur M. Lesk	Introduction to Bioinformatics, Oxford University Press Inc., New York
11	Mahmood A. Mahdavi	Bioinformatics –Trends and Methodologies, InTech Janeza Trdine 9, 51000 Rijeka, Croatia
12	Catherine Hack and Gary Kendal	Bioinformatics: Current Practice and Future Challenges for Life Science Education: Biochemistry and Molecular Biology Education Vol. 33, No. 2, pp. 82–85, 2005
13	Teresa K. Attwood	The Babel of Bioinformatics, SCIENCE, Volume 290, Number 5491, Issue of 27 Oct 2000, pp. 471-473.

IV SEMESTER

PLANT BIOTECHNOLOGY (HARD CORE) – 48 Hrs

Unit I **10 Hrs**

Plant tissue culture-General: Historical background: Requirements for in-vitro culture- Tissue culture laboratory, Preparation of media, sterilization. Conventional plant breeding and plant tissue culture.

Cell and Tissue Culture Technology: **Role of hormones in growth and development of plants, tissue-specific hormones. Callus Induction, Organogenesis, Somatic embryogenesis, cell suspension culture and synthetic seeds**

Somaclonal variations: Isolation of somoclonal variants, Factors affecting somoclonal variants – applications

Micropropagation: Propagation from pre-existing meristem, shoot apical meristem, shoot and node culture, micropropagation stages and applications

Unit II **15 Hrs**

Germplasm preservation: cryopreservation, cryoprotectant, warming rate and recovery, gene banks, applications.

Seed Health Technology

Introduction: Importance of Seed health, important seed-borne diseases; Seed Health diagnostics; Management of seed-borne diseases.

Haploid Technology: Methods of haploid culture, Factors affecting anther and microspore cultures, applications. Cytoplasmic male sterility in Indian Mustard.

Protoplast Technology: Isolation, purification and culture of protoplasts, protoplast fusion and somatic hybridization, applications of somatic hybrids/ cybrids.

Secondary metabolite production: Induction of secondary metabolites by plant cell culture, technology of plant cell culture for production of chemicals, biotransformation using plant cell culture. Bioreactor systems and models for mass cultivation of plant cells.

Unit III **7 Hrs**

Plant transformation techniques: Methods of gene transfer in plants, *Agrobacterium* mediated transfer- mechanism of DNA transfer, general features of Ti and Ri plasmids, role of *vir* genes, design of expression vectors, use of promoters and reporter genes; viral vectors, direct gene transfer methods- electroporation, microinjection, particle bombardment, selection of transformants, screening and field trials.

Unit IV **16 Hrs**

Transgenic plants: Herbicide resistance, resistance against biotic stress- bacterial, viral, fungal and insect resistance, abiotic stress, improved crop productivity, improved nutritional quality, transgenic plants for floriculture, Qualitative trait loci and marker studies.

Growth- promoting bacteria in plants: Biological nitrogen fixation, genetic manipulation for nitrogen fixation. Biocontrol of phytopathogens.

Molecular farming: Transgenic plants as production systems-production of alkaloids, steroids, colouring agents, flavoring agents, biodegradable plastics, industrial enzymes, therapeutic proteins, biopharmaceuticals, edible vaccines, plantibodies.

Intellectual Property Rights (IPR): IPRs and agricultural technology- implications for India, WTO, WIPO, GATT, TRIPS. Plant Breeder's Rights, legal implications, commercial exploitation of traditional knowledge, protection. Ethical issues associated with consumption of GM food, labelling of GM crops and foods.

Reference Books

1. Plant Signal Transduction. Scheel D and Wasterpack C. Oxford University Press.
2. Introduction to Plant Pathology. Strange R N. John Wiley and Sons Ltd.
3. Applied plant virology. Walkey. Chapman and Hall London.
4. Molecular Plant Pathology by Agrios.
5. Plant Tissue Culture Concepts and Laboratory Exercise. Trigiano R. N. and Gray, D. L. CRC Press.
6. Plant Tissue culture – Supplement-7. Lindsey, K. Springer International Edition.
7. Introduction to Plant Tissue Culture. Razdon, M. K. Oxford and IBH Publishing Co. Pvt Ltd.
8. Introductory to plant physiology. Noggle, R., Fritz, J. G. Prentice Hall of India Pvt. Ltd.
9. Plant Molecular Biology – A Practical Approach. Shaw, C. H. Panima Publishing Corporation.
10. A Laboratory Manual of Plant Biotechnology. Purohit. Publisher Agrobios.
11. Introduction to Plant Biotechnology. Chawla, H. S.
12. Practical Application of Plant Molecular Biology. Henry, R. J. Chapman and Hall.
13. Plant Biotechnology – Laboratory manual. Chawla, H. S. Oxford and IBH publishing Co. Pvt. Ltd.
14. Biotechnology. Gupta, P. K. Rastogi Publications.
15. Biochemistry and Molecular Biology of Plants. Buchanan, Gmissem and Jones.
16. Genetic Engineering of Crop Plants. Lyrett, G. W., Grierson, D.
17. Plant Molecular Biology. Grierson and S. N. Covey.

ANIMAL BIOTECHNOLOGY (HARD CORE) – 48 Hrs

Unit I **10 Hrs**

Culture of animal cells: Advantages and limitations of tissue culture, aseptic handling, facilities required, media and cell lines. Primary culture: Isolation of mouse and chick embryos, human biopsies, methods for primary culture, nomenclature of cell lines, sub culture and propagation, immoretalization of cell lines, cell line designation, selection of cell line and routine maintenance.

Cloning and Selection: Cloning protocol, stimulation of plating efficiency, suspension cloning, isolation of clones, isolation of genetic variants, interaction with substrate, selective inhibitors.

Unit II **16 Hrs**

Cell separation and characterization: Density based, antibody based, magnetic and fluorescence based cell sorting. Characterization of cells based in morphology, chromosome analysis, DNA content, RNA and protein, enzyme activity, antigenic markers, cytotoxicity assays, cell quantitation, cell culture contamination: monitoring and eradication, cryopreservation.

Culturing of specialized cells: Epithelial, mesenchymal, neuro ectodermal, hematopoietic gonad and tumor cells, Lymphocyte preparation, culture of amniocytes, fish cells, confocal microscopy. Stem cell culture and its applications

Organic and embryo culture: Choice of models, organ culture, histotypic culture, filter-well inserts, neuronal aggregates whole embryo culture eggs, chick and mammalian embryos.

Unit III **16 Hrs**

Cell and Tissue engineering: Growth factors for *in situ* tissue regeneration, biomaterials in tissue engineering, approaches for tissue engineering of skin, bone grafts, nerve grafts. Hemoglobin based blood substitutes, bio antificial or biohybrid organs. Limitations and possibilities of tissue engineering.

In vitro **fertilization and Embryo transfer:** *In vitro* fertilization in Humans, Embryo transfer in Humans, Super ovulation and embryo transfer in farm animals e.g: Cow.

Cloning of Animals: Methods and uses. Introduction, nuclear transfer for cloning, cloning from-embryonic cells, adult and fetal cells. Cloning from short term cultured cells: cloning of sheep, monkeys, mice, pets, goats and pigs. Cloning from long term cultured cells: Cloning of cows from aged animals. Cloning efficiency, Cloning for production of transgenic animals, gene targeting for cloned transgenic animals, cloning for conservation, human cloning: ethical issues and risks.

Unit IV **6 Hrs**

Transfection methods and transgenic animals: Gene transfer or transfection, transfection of fertilized eggs or embryos, unfertilized eggs, cultured mammalian cells, targeted gene transfer. Transgenic animals and applications: mice and other animals, sheep, pigs, goats, cows and fish.

The legal and socio-economic impact of biotechnology at national and international levels, public awareness. Biosafety regulations- guidelines for research in transgenic animals, public awareness of the processes of producing transgenic organisms

Reference Books

1. Anthony Atala, Robert P Lanza. 2002, Methods of tissue engineering, Academic press
2. Ian Freshney R. 2005, Culture of animal cells–A manual of basic techniques, John Wiley and Sons Inc. Hoboken, New Jersey
3. Animal Cell Culture – A Laboratory Manual. Frushney.
4. Animal Biotechnology. Ballinic, C. A., Philip, J. P and Moo Young, M. Pergamon Press.
5. Genetic Engineering of Animals. Puhler, A. VCH Publisher.
6. Methods of Tissue Engineering. Anthony Atala, Robert P. Lanza.
7. Animal Cell Biotechnology – Methods and Protocols. Nigel Tenkins.

PROJECT WORK/DISSERTATION (HARD CORE)

COURSE CODE:

Course Outcome

CO1-Review of recent research articles published in high impact journals and presentation by students.

CO2-Students do conduct review of literature followed by hands on training to do piece of research work.

CO3-They would be skill full to understand the experiment and interpret the result.

CO4-They get an idea to compile the data and present in the form of dissertation.

- Includes exhaustive review of literature on the topic selected, design of work, standardization of techniques and execution of work
- Compiling of the data generated in the form of thesis. Interpretation of the result correlating with the advanced information available in the literature.
- Research Paper presentation.

JSS COLLEGE OF ARTS COMMERCE AND SCIENCE

(An Autonomous College of University of Mysore; Re-Accredited by NAAC with 'A' Grade)

OOTY ROAD, MYSURU- 25

PG DEPARTMENT OF BOTANY

Choice - Based Credit System (CBCS)

BOTANY

M.Sc. DEGREE SYLLABUS

2018-19 ONWARDS

(MODIFIED ON 2022)

JSS MAHAVIDYAPEETHA
JSS COLLEGE FOR ARTS, COMMERCE AND SCIENCE
(AUTONOMOUS) OOTY ROAD, MYSURU- 25

POST GRADUATE DEPARTMENT OF BOTANY

M.Sc., Botany Choice - Based Credit System (CBCS) Syllabus
(CBCS-CGPA-Modified (2018-19)
CORE SUBJECT: BOTANY – [POST GRADUATE]

DEGREE: M.Sc., BOTANY

1st and 3rd semester Changes made at BOS meeting held on 13.01.2022 (in %)
HC 1.3 Systematics of Angiosperms (5.17%)
HC 3.3 Plant Biotechnology (40.22%)
SC 3.3 Plant Propagation and Plant Breeding (1.7%)
OE 3.1 Plant Propagation Techniques (1.35%)
(CHANGES MADE ARE HIGHLIGHTED IN THE TEXT)

FIRST SEMESTER				**Credits: 22**
No.	**Course/Paper Code**	**Title of the Course/ Paper**	**Hrs/Week L:T:P**	**Credits**
1	**HARD CORE 1.1**	**Virology, Bacteriology, Mycology and Plant Pathology**	**2:2:2**	2:1:1
2	**HARD CORE 1.2**	**Phycology, Bryophytes, Pteridophytes and Gymnosperms**	**2:2:2**	2:1:1
3	**HARD CORE 1.3**	**Systematics of Angiosperms**	**2:2:2**	2:1:1+ (2 credits for submission of tour report) 2:1:3
4	**SOFT CORE 1.1****	**Fungal Biology and Biotechnology**	**2:2:2**	2:1:1
5	**SOFT CORE 1.2****	**Algal Biology and Biotechnology**	**2:2:2**	2:1:1
6	**SOFT CORE 1.3****	**Lichenology and Mycorrhizal Technology**	**2:2:2**	2:1:1
7	**SOFT CORE 1.4****	**Phytopathology**	**2:2:2**	2:1:1

*Field Study/Tour: The student shall undertake a field trip for a minimum of 2-3 days and shall submit the herbaria and tour report for evaluation-2 credits.
**Any two soft core papers shall be studied.

SECOND SEMESTER			Credits: 18	
No.	**Course/Paper Code**	**Title of the Course / Paper**	**Hrs/Week L:T:P**	**Credits**
1	**HARD CORE 2.1**	**Reproductive Biology of Angiosperms and Plant Morphogenesis**	**2:2:2**	2:1:1
2	**HARD CORE 2.2**	**Cell Biology and Genetics**	**2:2:2**	2:1:1
3	**HARD CORE 2.3**	**Plant Breeding and Evolutionary Biology**	**2:2:2**	2:1:1
4	**SOFT CORE 2.1***	**Plant Anatomy and Histochemistry**	**2:0:2**	2:0:1
5	**SOFT CORE 2.2***	**Ethno-Botany and Intellectual Property Rights (IPR)**	**2:0:2**	2:0:1
6	**SOFT CORE 2.3***	**Economic Botany**	**2:0:2**	2:0:1
7	**OPEN ELECTIVE 2.1**	**Medicinal Plants**	**2:2:0**	2:1:0
	** Any two soft core papers shall be studied.			

THIRD SEMESTER			Credits: 16	
No.	**Course/Paper Code**	**Title of the Course /Paper**	**Hrs/Week L:T:P**	**Credits**
1	**HARD CORE 3.1**	**Biochemistry and Plant Physiology**	**2:2:2**	2:1:1
2	**HARD CORE 3.2**	**Molecular Biology**	**2:2:2**	2:1:1
3	**HARD CORE 3.3**	**Plant Biotechnology**	**2:2:2**	2:1:1
4	**SOFT CORE 3.1***	**Molecular Genetics of Plants**	**2:2:2**	2:1:1
5	**SOFT CORE 3.2***	**Molecular Plant Pathology**	**2:2:2**	2:1:1
6	**SOFT CORE 3.3***	**Plant Propagation and Plant Breeding**	**2:2:2**	2:1:1
7	**SOFT CORE 3.4***	**Phyto-chemistry and Herbal Technology**	**2:2:2**	2:1:1
8	**OPEN ELECTIVE 3.1**	**Plant Propagation Techniques**	**2:2:0**	2:1:0
	* Any one soft core courses/papers shall be studied.			

FOURTH SEMESTER				Credits: 16
No.	**Course/Paper Code**	**Title of the Course /Paper**	**Hrs/Wk L:T:P**	**Credits**
1	**HARD CORE 4.1**	**Ecology, Conservation Biology and Phytogeography**	**2:2:2**	2:1:1
2	**HARD CORE 4.2**	**Project Work ***	**4:2:2**	8
3	**SOFT CORE 4.1***	**Seed Technology**	**2:2:2**	2:1:1
4	**SOFT CORE 4.2***	**Seed Pathology**	**2:2:2**	2:1:1
5	**SOFT CORE 4.3***	**Bio -Analytical Techniques**	**2:2:2**	2:1:1
6	**OPEN ELECTIVE 4.1**	**Plant Diversity and Human Welfare**	**2:2:0**	2:1:1
	***Project Work:** The student shall undertake a Project Work in the Department or in any other University or Institute under the guidance of a Research Supervisor and shall submit a Project Report duly signed by Student and Research Supervisor for Evaluation.			

Semester- Wise Credit Pattern:
I Semester= 22 [HC- 12+2=14 + 08 (SC)]
II Semester= 24 [HC- 12 + 08 (SC) + 04 (OE)]
III Semester= 18 (HC- 08 + 06 (SC) + 04 (OE)]
IV Semester= 20 (HC-12 +04 (SC) + 04 (OE)]

In total= 46 HC + 26 (SC) + 12 (OE)= The Department is offering 84 Credits of B.Sc. Honors/ M.Sc. Botany (CBCS) Course including three Open Elective Course to the outside Department Students/

Important Note:
Student is required to earn the credit for qualifying B.Sc. Honors/ M.Sc. Botany from Department of Botany as follows:

Hard Core offered by the Department= 46 (Against maximum of 56)
Soft Core offered by the Department = 26 (Against minimum of 16)
Minimum Open Elective to be earned by the Student (Outside the Department) = 04
A total of 76 Credit is required for qualifying B.Sc. Honors/ M.Sc. Botany Course.

SCHEME OF EXAMINATION/ASSESSMENT
MODEL QUESTION PAPER (THEORY)
JSS COLLEGE FOR ARTS, COMMERCE AND SCIENCE
(AUTONOMOUS) OOTY ROAD, MYSURU- 25

POST GRADUATE DEPARTMENT OF BOTANY

M.Sc., Degree ------Semester Examination May/June-20--
BOTANY
Course/Paper: ……
Course/Paper Code……..

Time: 3 Hrs **Max Marks: 70**

Instructions: 1) Answer all questions.
2) Draw neat and labelled diagrams wherever necessary.

I. Answer the following; (10MCQs of 1 Marks each) **10 X 1 = 10**
2 from Unit I
3 from Unit II
2 from Unit III
3 from Unit IV

II. Answer the following; **4 X 5 = 20**
2 from Unit I with internal choice
2 from Unit II with internal choice
2 from Unit III with internal choice
2 from Unit IV with internal choice

III. Answer the following; **4 X10 = 40**
2 from Unit I with internal choice
2 from Unit II with internal choice
2 from Unit III with internal choice
2 from Unit IV with internal choice

SCHEME OF PRACTICAL EXAMINATION/ASSESSMENT
MODEL QUESTION PAPER (PRACTICALS)

JSS COLLEGE FOR ARTS, COMMERCE AND SCIENCE
(AUTONOMOUS) OOTY ROAD, MYSURU- 25

POST GRADUATE DEPARTMENT OF BOTANY

M.Sc., Degree I Semester Examination May/June-2018
BOTANY
Course/Paper: ……
Course/Paper Code……..

Time: 3 Hrs **Max Marks: 70**

Q I. Conducting Experiment/Micro-preparation /Plant identification 15
Q II. Minor experiment/ Demonstrations/ Procedure Writing 10
Q III. Critically comments (3x5 Marks) 15
Q IV. Identification 5x2 Marks) 10
Q V. Viva-voce examination 10
Q VI. Class Records/ Submissions 10

PO M.SC. BOTANY

Sl. No.	PO
1.	Conduct investigations of complex problems by the use of research-based knowledge on an independent term project.
2.	Transfer of appropriate knowledge and methods from one topic to another within the subject.
3.	Carry out practical work, in the field and in the laboratory, with minimal risk.
4.	Able to think logically and organize tasks into a structured form and assimilate knowledge and ideas based on wide reading of text books and through the internet.
5.	Apply the scientific knowledge of basic science, life sciences and fundamental process of plants to study and analyse any plant form.
6.	Knowledge and understanding of the range of plant biology in terms of structure, function and environmental relationships.
7.	Apply reasoning informed by the contextual knowledge to assess plant diversity, and the consequent responsibilities relevant to the biodiversity conservation practice.

PSO M.SC. BOTANY

Sl. No.	COURSE	PSO
1.	Algal Biology and Biotechnology	Phylogeny, thallus organisation, economic and ecological importance of alagal community
2.	Biochemistry and Plant Physiology	Biomolecules, metabolic pathways and stress physiology in plants
3.	Cell Biology and Genetics	Cell originals and Mendelian principles
4.	Ecology, Conservation Biology and Phytogeography	Diversity of vegetation, distribution and its conservation
5.	Economic Botany	Economic values of different crop plants and their applications
6.	Major Project	Hands on experience in various fields of plant science
7.	Molecular Biology	Molecular level organisation in prokaryotes and eukaryotes with respect to various mechanisms involved
8.	Plant Anatomy and Histochemistry	Anatomical features and organisation of cells in plants
9.	Plant Breeding and Evolutionary Biology	Plant breeding methods, procedures and their application for crop improvement
10.	Plant Biotechnology	Tissue culture techniques and its application in development of resistant varieties
11.	Plant Propagation and Plant Breeding	Propagation methods and plant breeding procedures and their application in different fields
12.	Plant Propagation Techniques	Propagation methods and procedures and their application in different fields
13.	Phycology, Bryophytes, Pteridophytes and Gymnosperms	Distribution, classification and phylogeny of lower plant communities
14.	Phytopathology	Concepts of plant diseases defence mechanisms in plants and study of plant diseases
15.	Reproductive Biology of Angiosperms and Plant Morphogenesis	Embryological study of growth and development using plant models
16.	Seed Technology	Industrial scale processing of seeds up to marketing

17.	Systematics of Angiosperms	Angiospermic plant family study with their phylogeny
18.	Virology, Bacteriology, Mycology and Plant Pathology	Diversity, distribution of microorganism with respect to their economic aspects

CO M.SC. BOTANY

Sl. No.	COURSE	CO
1.	Algal Biology and Biotechnology	Specify in depth of thallus organization and phylogeny in algae
2.	Algal Biology and Biotechnology	Understand the details of toxins, blooms and distributions of algae
3.	Algal Biology and Biotechnology	Deliberate in depth about cultivation and marketing algae
4.	Algal Biology and Biotechnology	Specify the details of Algal products and uses
5.	Biochemistry and Plant Physiology	Learn in details with biomolecules and their function
6.	Biochemistry and Plant Physiology	Understand in depth about solute transport and photosynthesis in plants
7.	Biochemistry and Plant Physiology	Specify the details of metabolism of nitrogen, lipids and plant hormones
8.	Biochemistry and Plant Physiology	Understand in depth about Stress physiology
9.	Cell Biology and Genetics	Learn in detail about cell membranes transport and proteins
10.	Cell Biology and Genetics	Deliberate the Functions of cell organelles, programed cell death
11.	Cell Biology and Genetics	Specify the extensions of Mendelian principles
12.	Cell Biology and Genetics	Learn about Sex determination and dosage compensation
13.	Ecology, Conservation Biology and Phytogeography	Understand the diversity of ecosystem and types of ecosystems
14.	Ecology, Conservation Biology and Phytogeography	Learn the in details of pollution and environmental biology
15.	Ecology, Conservation Biology and Phytogeography	Study the importance of biodiversity and conservation biology
16.	Ecology, Conservation Biology and Phytogeography	Detailed study of phytogeography and crop distribution
17.	Economic Botany	Specify the details of cereals, millets, pulses, oil yielding plants and study of horticultural plants and floriculture
18.	Economic Botany	Deliberate the characteristics of sugar yielding plants, spices and condiments
19.	Economic Botany	Understand the importance of fibre, timber and gum yielding plant
20.	Economic Botany	Deliberate on the medicinal plants and their applications
21.	Major Project	Learn the details of literature survey and methodology in research
22.	Molecular Biology	Identify the characteristics of genetic materials and its replication
23.	Molecular Biology	Learn the details of molecular basis of mutation, repair and recombination
24.	Molecular Biology	Deliberate the details of RNA formation, processing of RNA and post-RNA
25.	Molecular Biology	Understand in depth of gene regulation in prokaryotes and eukaryotes
26.	Plant Anatomy and Histochemistry	Learn in details of primary vegetative body of the plants
27.	Plant Anatomy and Histochemistry	Deliberate in details of differentiation in vascular tissues and study of apical meristems in shoot and root
28.	Plant Anatomy and Histochemistry	Deliberate the characteristics of secondary growth
29.	Plant Anatomy and	Understand the details of plant histochemistry

	Histochemistry	
30.	Plant Breeding and Evolutionary Biology	Learn in depth about plant breeding methods and techniques
31.	Plant Breeding and Evolutionary Biology	Understand the details of breeding for specific purposes
32.	Plant Breeding and Evolutionary Biology	Learn the details of Nature of evolution
33.	Plant Breeding and Evolutionary Biology	Identify the characteristics of variation and speciation
34.	Plant Biotechnology	Understand in depth about plant tissue culture and its techniques
35.	Plant Biotechnology	Specify the genetic engineering and tools used in it
36.	Plant Biotechnology	Understand the details of genetic manipulation, transgenic approaches to produce resistant plants
37.	Plant Biotechnology	Learn the details of engineering of crop plants for production of secondary metabolites
38.	Plant Propagation and Plant Breeding	Learn the details of importance of plant propagation, vegetative propagation and micro propagation
39.	Plant Propagation and Plant Breeding	Understanding of basic concepts of plant breeding and genetics
40.	Plant Propagation and Plant Breeding	Study types, purposes of plant breeding
41.	Plant Propagation and Plant Breeding	Deliberate study of advanced breeding aspects
42.	Plant Propagation Techniques	Learn the details of importance of plant propagation
43.	Plant Propagation Techniques	Understand in depth about types of vegetative propagation
44.	Plant Propagation Techniques	Learn the techniques of budding and layering
45.	Plant Propagation Techniques	Deliberate in details with examples of micro propagation in forestry and horticulture plants
46.	Phycology, Bryophytes, Pteridophytes and Gymnosperms	Understand the details of diversity, distribution, pigmentation and life cycle of algae
47.	Phycology, Bryophytes, Pteridophytes and Gymnosperms	Deliberate in depth of Bryophytes life cycle, classification, phylogeny and Economic importance
48.	Phycology, Bryophytes, Pteridophytes and Gymnosperms	Understand the details of Pteridophytes life cycle, phylogeny, classification, economic importance and anatomy
49.	Phycology, Bryophytes, Pteridophytes and Gymnosperms	Write down in details with examples Gymnosperms history, reproduction, edconomic importance and interrelationship
50.	Phytopathology	Learn the details of the concept, causative agents and disease cycle of plant pathogens
51.	Phytopathology	Deliberate the details of defense mechanisms in plants and its genetics
52.	Phytopathology	Study of Management of plant diseases
53.	Phytopathology	Identify in details with examples of diseases in crop plants
54.	Reproductive Biology of Angiosperms and Plant Morphogenesis	Understanding the microsporogenesis and historical overview
55.	Reproductive Biology of Angiosperms and Plant Morphogenesis	Specify in details with examples about megasporogeneis, fertilization, endosperm and embryo
56.	Reproductive Biology of Angiosperms and Plant Morphogenesis	Specify the details of models and concepts of plant morphogenesis
57.	Reproductive Biology of Angiosperms and Plant Morphogenesis	Understand in details with examples of plant growth and development, photomorphogenesis
58.	Seed Technology	Understand the seed science and concepts
59.	Seed Technology	Study the seed production and processing methods

60.	Seed Technology	Learn about seed quality parameters and tests
61.	Seed Technology	Deliberate the procedure of seed certification
62.	Systematics of Angiosperms	Understand the principles and applications of Taxonomy of angiosperms
63.	Systematics of Angiosperms	Specify the details of taxonomic literature
64.	Systematics of Angiosperms	Deliberate in details with examples Dicot and monocot family and features of classification systems
65.	Systematics of Angiosperms	Specify in details molecular systematics with examples of softwares and databases
66.	Virology, Bacteriology, Mycology and Plant Pathology	Learn the classification and characteristics of viruses, viroids, prions and diseases of it
67.	Virology, Bacteriology, Mycology and Plant Pathology	Deliberate in details with examples of Bacteria, archeabacteria, actinomycetes and mycoplasma and its economic importance
68.	Virology, Bacteriology, Mycology and Plant Pathology	Specify the Fungal diversity, life cycle and economic importance of fungi
69.	Virology, Bacteriology, Mycology and Plant Pathology	Understand in details of etiology, distribution and management of plant disease

BOTANY: I SEMESTER- HARD CORE 1.1

VIROLOGY, BACTERIOLOGY, MYCOLOGY AND PLANT PATHOLOGY

Theory-32 Hrs

Unit-1: Virology: Origin and evolution of viruses; Classification of viruses-ICTV and Baltimore Systems; Genome diversity in viruses; Methods of cultivation of viruses; Purification and detection of viruses; Transmission of viruses; Mechanism of replication of DNA and RNA viruses; Viroids - Structure and multiplication; Prions - structure and multiplication; Prion diseases.

Unit-2: Bacteriology: Introduction and classification of Bacteria by Bergey's Manual of Determinative and Sytematic Bacteriology; C. R. Woese- Three domain classification of Bacteria; Archaebacteria and Eubacteria - diversity and evolution; Nutritional types of bacteria; Bacterial growth; Recombination in bacteria (conjugation transformation, and transduction); Brief account on actinomycetes; Structure and multiplication of Mycoplasma and Phytoplasmas; Economic importance of bacteria.

Unit -3: Mycology: Present status of fungi; Outline classification of fungi (Ainsworth-1973). Vegetative organization in fungi; Nutrition in fungi (saprotrophs, biotrophs, necrotrophs; symbiotrophs); Methods of reproduction in fungi - Asexual and sexual methods; Spore liberation in fungi; Evolution of sex in fungi; Heterothallism and parasexuality; Life cycle pattern and phylogeny of Myxomycotina, Mastigomycotina, Zygomycotina, Ascomycotina, Basidiomycotina and Deuteromycotina; Fungi and their economic importance.

Unit-4: Plant Pathology: Concepts and scope of plant pathology; Plant diseases and crop losses; Classification of plant diseases; Parasitism and disease development; Effect on physiology of host; Host range of pathogens; Defence Mechanisms in Plants; Plant Disease epidemics and plant disease forecasting; Methods of plant disease management; Study of plant diseases- Sandal Spike, Citrus Canker, Bacterial Blight of Paddy, Late Blight of Potato, Downy Mildew of Bajra, Tikka Disease of Ground nut, Grain Smut of Sorghum. Phloem Necrosis of Coffee, Root Knot Disease of Mulberry.

Practicals-32 Hrs

1) Laboratory guidelines, design, tools, equipments and other requirements for studying microorganisms.
2) Measuring the dimensions of microorganisms using Micrometry.
3) Determining total count of microbes using Haemocytometer.
4) Gram and special staining of bacteria.
5) Preparation of NA, PDA, sterilization, pouring, inoculation and culturing of bacteria/fungi.
6) Staining of fungi including VAM fungi.
7) Identification of fungi.
8) Measurement of bacterial growth by Spectrophotometer.
9) Recording environmental factors (Temperature, RH, and Rainfall and wind velocity).
10) Splash liberation of spores from diseased tissue.
11) Estimation of total phenols in diseased and healthy plant tissues.
12) Study of the following diseases: Sandal Spike, Citrus canker, Bacterial Blight of paddy, Late Blight of Potato. Downy Mildew of Bajra, Tikka disease of ground nut, Grain smut of Sorghum, Phloem Necrosis of Coffee, Root Knot disease of Mulberry.

References

1) Madigan, M .T. 2012. Brock Biology of Microorgasms, 13t edn. Benjamin Cummings.
2) Willey, J, Sherwood, L. and Woolverton, C.J. 2013. Prescott`s Microbilogy 9th edn. Mc Graw- Hill Educations.
3) Wagner, E.K, and Hewlett, M.J. 2009. Basic Virology. Blackwell Science Ltd. 2nd edn. USA.
4) Kodo, C.I. and Agarwal, H.O. 1972. Principles and Techniques in Plant Virology, Van Nostrand, Reinhold Company, New York.
5) Conrat, F.H., Kimball, P.C. and Jay, L. 1988.V irology. Prentice Hall, Englewood Chiff, New Jercy.
6) Jawaid, A. Khan and Jeanne Dijkstra. 2002. Plant Viruses as Molecular Pathogens. Food Products Press, NY
7) Alexopoulos, C.J. Mims, C.W. and Blackwell, M. 2013. Introductory Mycology 4th edn. Wiley.
8) Singh, R. S. 2009. Plant Disease. 9th edn. Oxford and IBH Pub.Co., New Delhi.
9) Agrios, G. N. 2005. Plant Pathology 5th edn. Academic Press, San Diego.
10) Rangaswamy, G. and Mahadevan, A. 2002. Diseases of crop plants in India, Prentice Hall of India Pvt.Ltd. New Delhi.
11) Mehrotra, R. S. 2003. Plant Pathology. 2nd edn. Tata Mc Graw-Hill Pub. Co. Ltd., New Delhi.
12) Cann, A.J. 2012. Principles of Molecular Virology 5th edn. Elsevier Ltd, USA.
13) Flint, S.J. Enaquist, L.W., Rancnicllo, V. R. and Skalka, A.M. 2009. Principles of Virology pathogenesis and control. 3rd edn. APS Press, USA.
14) Hall, R. 2014. Plant Virology, 5th edn. Elsevier, USA.
15) Aneja, K.R. 2003. Experiments in Microbiology plant Pathology and Biotechnology, 4th edn. New Age International Publishers, New Delhi.
16) Holt, J.G., Krige, N.R., Sneath., P.H.A. Stuley, J.T. and Williams, S.T. 2010. Bergey`s Manual of Determinative Bacteriology, 9th edn. Williams and Wilkins, USA.

BOTANY: I SEMESTER - HARD CORE 1.2

PHYCOLOGY, BRYOPHYTES, PTERIDOPHYTES AND GYMNOSPERMS

Theory-32 Hrs

Unit-1: Phycology: Diversity and distribution of algae; Unicellular, colonial, filamentous, heterotrichous, parenchymatous, pseudoparenchymatous, siphonous forms; General characteristics, classification and phylogeny of algae; Pigmentation in algal groups; Role of photosynthetic and accessory pigments; Life cycles in algae - haplontic, diplontic, isomorphic, heteromorphic; Economic importance of algae.

Unit -2: Bryophytes: Introduction, general characteristics, classification and phylogeny of Bryophytes; Distribution, habitat, external and internal morphology and reproduction; Comparative account on gametophytes and sporophytes of bryophytes; Economic and ecological importance.

Unit -3: Pteridophytes: Introduction, classification and phylogeny; Morphology, anatomy reproductive biology and phylogeny; Psilophytes, Lycophytes, Sphenophytes, Filicophyta; Evolution of sorus; evolution of sporangium; Gemetophyte development - homosporous and heterosporous ferns; Heterospory and seed habit; Stelar evolution in Pteridophytes; Ecology of Pteridophytes; Economic importance.

Unit- 4: Gymnosperms: Distribution, general characteristics, classification and phylogeny of Gymnosperms; Range in morphology, anatomy, reproduction and interrelationships of - Cycadales, Ginkgoales, Coniferales, Gnetales; Pteridosperms; Economic importance of Gymnosperms.

Practicals-32 Hrs

1-4) Algae: Study of Cyanophyceae: *Anabaena, Oscillatoria*; Study of Chlorophyceae: *Oedogonium*, *Pediastrum;* Study of Phaeophyceae: *Turbinaria, Ectocarpus*; Study of Rhodophyceae: *Gracilaria*, *Batrachospermum*; Economic products of algae.

5-7) **Bryophytes:** Study of morphology, anatomy and reproductive morphology - Hepaticopsida- *Marchantia, Dumortiera*; Anthocerotopsida- *Anthoceros, Notothylas*; Bryopsida- *Bryum* and *Polytrichum*.

8-10) **Pteridophytes:** Study of vegetative habit, anatomy and reproductive morphology of *Psilotum, Lycopodium, Isoetes, Ophioglossum, Botrychium, Angiopteris, Pteris, Hymenophyllum, Marselia, Salvinia, Azolla;* **Paleobotany**- Study of Lepidodendrales, Calamitales, Sphenophyllales and Coenopteridales (Fossil Pteriodophytes).

11-12) **Gymnosperms:** Study of morphology, anatomy and reproductive morphology of *Zamia, Pinus* and *Ephedra, Ginkgo, Auracaria, Podocarpus, Gnetum, Agathis, Cupressus*, *Thuja*; Economic importance of Gymnosperms.

References:

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5) Prempuri, 1981. Bryophytes, Morphology, Growth and Differentiation. Atmaram and sons, New Delhi.
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17) Biswas, C. and Johri, B. M. 1997. The Gymnosperms. New Age Publishers, New Delhi.
18) Rashid A. 1986. An Introduction to Pteridophytes. Vikas, New Delhi.
19) Sporne K. R. 1969. Morphology of Gymnosperms. Hutchinson University Library, London.
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23) Vashishta, P.C. (2008). Botany for Degree Students: Pteridophyta. S. Chand & Co. Ltd., New Delhi.

BOTANY: I SEMESTER - HARD CORE 1.3
SYSTEMATICS OF ANGIOSPERMS

Theory-32 Hrs

Unit-1: Introduction to plant systematics; Plant classification systems-artificial, natural and phylogenetic systems; Contributions of Carolus Linnaeus, Michel Adanson, de Jussieu, de Candolle to plant classification; Concepts of taxonomic hierarchy; Taxonomic Categories-Genus concept; Species concept; Intraspecific categories; subspecies; varieties and forms; History of botanical nomenclature; ICBN and ICN aims and principles; Rules and recommendations; Rule of priority; Typification; Author citation, Legitimate and illegitimate names; Name changes and synonyms; Effective and valid publication; Herbarium and its significance; Botanical gardens.

Unit-2: **Taxonomic Literature:** General taxonomic indices, world floras and manuals; Monographs and revisions; Bibliographies, catalogues and reviews; Periodicals, glossaries and dictionaries; Hortus Malabaricus; Taxonomic websites-IPNI, Plant List, Tropicos, Botanico-Periodicum-Huntianum (BPH); Biodiversity Heritage Library (BHL); Botanicus, Index Herbariorum; Taxonomic Keys- bracketed keys, indented keys, numbered keys, edge punched and body punched keys.

Unit-3: Study of plant classification Systems; Broad outlines of Bentham and Hooker's system, Engler and Prantl's system, Hutchinson's system, Takhtajan's system, and Cronquist's system; Numerical Taxonomy-principles, selection of characters, merits and demerits; Angiosperm Phylogeny Group (APG) III & IV classification; Study of angiosperm families-Magnoliaceae, Nympheaceae, Urticaceae, Papaveraceae, Euphorbiaceae, Acanthaceae, Rubiaceae, Alismataceae, Cyperaceae, Commelinaceae, Zingiberaceae, Liliaceae, Dioscoreaceae and Orchidaceae.

Unit-4: Molecular Systematics: Nuclear, mitochondrial and chloroplast genes. Gene sequencing, analysis of molecular data, alignment of sequences; Phylogenetic tree construction-Maximum Likelihood and Neighbour Joining Methods; Phylogenetic analysisrooted and unrooted trees; Data analysis- alignment, substitution, model building; Phylogentic softwares-CLUSTAL W, MEGA, Mesquite, PAUP, PHYLIP, Treefinder, TreeBase.

Practicals-32 Hrs

1) Methods of preparation and maintenance of Herbaria.
2-4) A field trip of three days to a floristically rich area to study plants belonging to different families (Every student shall submit a report for evaluation for two credits).
5-10) Identification of the flowering plants in and around Mysore using keys, floras and monographs.
11-12) Construction of phylogenetic tree based on molecular data of plant species retrieved from GenBank.

References:

1. Cronquist, A. 1981. An Integrated system of classification of flowering plants. Columbia University Press, New York.
2. Simpson, M.G. 2006. Plant Systematics. Elsevier, Amsterdam.

3. Judd, W.S., Campbell, C.S., Kellogg, E.A., Stevens, P.A. and Donoghue, M.J. 2002. Plant Systematics: A phylogenetic Approach. Sinauer Associates, Inc., Massachusetts.
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8. Johri, B.M. and Bhatacharjee, S.P. 1994. Taxonomy of Angiosperms. Narosa Publishers, New Delhi.
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10. Chase, M.W. and Reveal, J.L. 2009. A phylogenetic classification of the land plants to accompany APG III. Botanical Journal of Linnaean Society, 161: 122-127.
11. Nei, M. and Kumar, S. 2000. Molecular Evolution and Phylogenetics. Oxford Univ. Press, New York
12. APG-IV. 2016. An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants APG-IV. Botanical Journal of Linnaean Society, 181: 1-20.

BOTANY: I SEMESTER - SOFT CORE 1.1
FUNGAL BIOLOGY AND BIOTECHNOLOGY

Theory-32 Hrs

Unit-1: Introduction and historical overview of mycology; General characteristics and importance of fungi in human life; Fungi –Taxonomy and Systematics; Fungi in genetic and applied research; Estimation of Fungal diversity; Quantitative Indices- species richness, species evenness and species abundance; Molecular methods used for fungal diversity estimation-nuclear genome, messenger RNA transcripts, Ribosomal/DNA sequence comparisons and mitochondrial genome.

Unit-2: Macro fungi and micro fungi living on plant substrata; Lignicolous macrofungi; Lichenized fungi; Sequestrate fungi; Endophytic fungi; Saprobic soil fungi; Fungi in stressful environment; Mutualistic, arbuscular, and endomycorrhizal fungi; Yeasts; Fungicolous fungi; Fungi in fresh and marine water habitats; Fungi associated with aquatic animals; Fungi as parasites of humans and plants; Fungi associated with animals, insect, arthropod and nematodes; Coprophilous fungi.

Unit-3: Fungal Fermentation and Food Products: Food and Beverages; Single cell proteins-Myco-proteins; Food processing by fungi-bread, soybean products, cheese and fermented milk; Fungal secondary metabolites-antibiotics, immunosuppressive agents, anti-tumour agents, fungal toxins as medicines; Fungal pigments; Steroid transformation; Fungal enzymes; Bio-control agents; Application of molecular biology in fungal biotechnology.

Unit-4: Mushrooms and fungi in medicine; Toxic macromycetes; Mushroom cultivation; Model organisms- *Saccharomyces cerevisiae*/*Neurospora crassa*; Bio-deterioration of food grains and mycotoxins; Fungal communities of herbivore dung; The fungal communities of composts; Fungal interactions and practical exploitation; Heavy metals in fungi-accumulation and sorption; Biotechnology of wood rotting fungi.

Practicals-32 Hrs

1) Study of Myxomycetes and Chytridiomycetes
2) Study of Plasmodiophoromycetes and Oomycetes
3) Study of Zygomycetes
4) Study of Ascomycetes
5) Study of Basidiomycetes
6) Study of Deuteromycetes 7)Study of Lichens
8) Study of VAM fungi
9) Detection of aflatoxin B1
10) Cultivation of Oyster mushroom.
11) Alcoholic fermentation of grape juice by *Saccharomyces*.
12) Cultivation of *Penicillium* and testing antibiotic principle.
13) Study of edible and poisonous mushrooms.
14) Study of fungal model organisms - *Saccharomyces cerevisiae*/*Neurospora crassa*

References:

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2) Deacon, J. W. 1997. Modern Mycology 3rd edn. Blackwell Science publishers, London.

3) Mehrotra, R.S. and Aneja, K.R. 1990. An Introduction to Mycology, New Age International (P) Limited, New Delhi.
4) Mueller, G M; Bills, GF and Foster, M.S. 2004. Biodiversity of Fungi, Elsevier Academic Press, New York.
5) Rai, M. and Bridge, P.D. 2009. Applied Mycology, CABI International, UK.
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7) Webster, J. and Weber, R.W.S. 2007. Introduction to Fungi. 3rd edn. Cambridge University Press, Cambridge.

BOTANY: I SEMESTER - SOFT CORE 1.2
ALGAL BIOLOGY AND BIOTECHNOLOGY

Theory-32 Hrs

Unit-1:Algal Biology: Historical development of Phycology and contributions of Phycologists; Thallus organization in algae-Cyanophyceae, Chlorophyceae, Charophyceae, Euglenophyceae, Xanthophyceae, Bacillariophyceae, Phaeophyceae and Rhodophyceae; General characteristics, algal classification, affinities and phylogeny- polyphasic approach; Molecular markers for phylogenetic study; Algal physiology- ultra-structure of cells; Photosynthesis and respiration.

Unit-2: Algal blooms and Toxins: Blooms produced by algal groups; Toxins produced by cyanobacteria, diatoms, dinoflagellates, prymnesiophytes and eugleoids; bioaccumulation and biomagnification; effects of toxins on aquatic life and humans; Scenario in coastal waters of India- monitoring and safety measures; Algal communities of extreme environments- Thermal hot springs, cold springs, snow and ice; **Fresh water algae**-Ecological classification of fresh water organisms; Lentic communities of algae (pond, lake, bog, swamp); Lotic communities (streams, rivers, rapids; **Marine algae-** Marine biota; zonation; quantitative study of phytoplanktons, marine communities of algae.

Unit-3: Algal Biotechnology: Algal culture techniques; general principles; physical parameters; culture media; strain improvement; **Algal cultivation methods-**conventional, advanced; **Cultivation of microalgae-*Spirulina*** and ***Dunaliella***; Media, seeding, cultivation systems, harvesting; processing, drying methods, packaging, marketing; Algal cultivation and production in India; **Cultivation of macroalgae- *Porphyra;*** Nutritional value; importance of life cycle; methods of cultivation in advanced countries; Pillar, semi raft floating and open sea cultivation.

Unit-4: Applications of algae/products: Pollution indicators, treatment of waste water plants, heavy metal toxicity and phyco-remediation; Bio-fouling and biofuel production; Algal products as sources of nutraceuticals; Food colorants; Aquaculture feed; Therapeutics and cosmetics; Medicines; Dietary fibres from algae and uses; Biotechnological applications of algal silica and oils.

Practicals-32 Hrs

1) Study of fresh water planktonic forms in the lake samples.
2) Study of fresh water diatoms.
3) Chlorophyceae: *Ulva, Caulerpa, Halimeda, Acetabularia.*
4) Xanthophyceae: Mounting of *Botrydium* from soils.
5) Phaeophyceae: *Dictyota, Sargassum, Cystophyllum.*
6) Rhodophyceae: *Gracilaria, Gelidium.*
7) Cyanophyceae: *Microcystis*, *Nostoc, Spirulina.*
8) Estimation of carotene content in algal cells .
9) Culturing of microalgae: *Spirulina/ Chlorella/Scenedesmus/Dunaliella.*
10) Applications of algal products: Agar, spirulina tablets/powder, beta-carotene, phycobiliproteins, triglycerides, Mycosporine like amino acids (MAA), diatom silica as nanoparticles.
11) Visit to National Institute of Oceanography, Goa.
12) Study of algal herbaria.

References

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2) Chapman and Chapman, V.J. 1973. The Algae. Macmillan Co., New York.
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11) Chu, W. 2012. Biotechnological Applications of Microalgae. IeJSME 6(1): S24-S37.

BOTANY: I SEMESTER - SOFT CORE 1.3
LICHENOLOGY AND MYCORRHIZAL TECHNOLOGY

Theory-32 Hrs

Unit-1: Introduction: Photobionts- identification, reproduction, and taxonomy of photobionts; Occurrence within lichens; Mycobionts- Lichenized versus nonlichenized fungi; Bryophilous and folicolous lichens; Thallus morphology and anatomy; Growth forms - crustose lichens, foliose lichens, fruticose lichens; Vegetative structures- Homoiomerous thallus, stratified thallus, cortex, epicortex, and epinecral layer, photobiont layer and medulla, lower cortex, Attachment organs and appendages; Cyphellae and pseudocyphellae; Cephalodia (Photosymbiodemes); Reproductive structures- sexual reproduction in lichen-forming ascomycetes; Mating systems, dikaryon formation, Ascomal ontogeny, Ascosporogenesis; Ascus structure and function; Generative reproduction: ascoma, perithecia, apothecia, Thallinocarpia, Pycnoascocarpia, Hysterothecia, Asci, Basidioma; Vegetative reproduction- aposymbiotic propagules, symbiotic propagules; Systematics of lichenized fungi- History, classification and phylogeny.

Unit-2: Morphogenesis- Acquisition of a compatible photobiont; Recognition and specificity; Structural and functional aspects of the mycobiont–photobiont interface; Genotypes and phenotypes, growth patterns; Biochemistry and secondary metabolites- intracellular and extracellular products; The fungal origin of the secondary metabolites; Major categories of lichen products; Application to pharmacology and medicine; Harmful properties of lichen substances, lichens in perfume, lichens in dyeing; Stress physiology and the symbiosis- stress tolerance, limits to stress tolerance; harmful effects of stress, constitutive and inducible stress tolerance, evolution of stress tolerance in lichens; Modes of water uptake, light, temperature, carbon dioxide; The carbon economy of lichens.

Unit-3: Nitrogen, its metabolism and potential contribution to ecosystems, Methods of determination of nitrogen fixation; Nutrients- chemical and physical properties of nutrients and metals; Nutrient requirements, sources of nutrients, accumulation mechanisms, compartmentalization of elements within lichens; Metal toxicity, metal tolerance; Environmental role of lichens- dispersal, establishment, pedogenesis and biodeterioration; Community structure, succession, ecosystem dynamics; Animal and lichen interactions; Forest management, conservation, environmental monitoring; Lichen sensitivity to air pollution- lichens in relation to sulfur dioxide, oxidants and lichens, hydrogen fluoride and organopollutants.

Unit-IV: Mycorrhizal fungi: Introduction and classification; Types of mycorrhizas- Arbutoid mycorrhizas, ectomycorrhizas, vesicular arbuscular mycorrhizas or arbuscular mycorrhizas, ectendomycorrhizas, ericoid mycorrhizas, monotropoid mycorrhizas and orchid mycorrhizas; Phoshate solubilisation; Ecological significance of AM fungi; Importance of mycorrhiza in evolution of land plants; Role of mycorrhiza in agriculture, horticulture and forestry.

Practicals-32 Hrs

1-3) Survey of lichen vegetation in the study area: Frequency, density and abundance.
4) Determination of species richness and species diversity.
5) Isolation and maintenance of cyanobionts and phycobionts
6) Isolation and maintenance of mycobionts

7) Analysis of secondary metabolites of lichens.
8) Biological activity of secondary metabolites of the lichens.
9) Culture methods for lichens and lichen symbionts.
10) Root clearing and staining technique to study arbuscular mycorrhizal fungi.
11) Assessment of % root colonization of arbuscular mycorrhizal fungi.
12) Isolation and identification of arbuscular mycorrhizal fungi.

References:

1) Thomas H. Nash , 2008. Lichen Biology, 3rd edn. Cambridge University Press, The Edinburgh Building, Cambridge CB2 8RU, UK
2) Awasthi D.D. 2000. Lichenology in Indian subcontinent: A supplement to "A hand book of lichens". Publisher: M/s Bishen Singh Mahendra Pal Singh, Dehra Dun.
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5) Larry Peterson R., Hugues B. Massicotte, Lewis H. Melville, 2004. Mycorrhizas: Anatomy and Cell Biology, CAB International, UK.

BOTANY: I- SEMESTER - SOFT CORE 1.4
PHYTOPATHOLOGY

Theory-32 Hrs

Unit-1: Concept of plant disease, Economic aspects of plant diseases; Types of plant diseases- Infectious diseases and non-infectious diseases; Causative agents of plant diseases; Angiospermic parasites; Development of plant pathology; Plant pathology in practice- Plant Clinic and Plant Doctor Concept; Parasitism and pathogenicity; Disease triangle; Infections and colonization; Weapons of plant pathogens; Effect of pathogen on physiology of host plant (photosynthesis, translocation and transpiration, respiration, permeability, transcription and translation).

Unit-2: Defence mechanisms in Plants- Pre-existing structural and chemical defences, induced structural and biochemical defences; Plant disease epidemiology- Elements of an epidemic and development of epidemics; Plant Disease forecasting; Genes and Diseases, Gene for gene concept, non-host resistance; Types of plant resistance to pathogens (Horizontal and Vertical Resistance); 'R' Genes and 'avr' genes; Genetics of virulence in pathogens and resistance in host plants; Breeding for disease resistance.

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Unit-3: Management of Plant Diseases: Exclusion, eradication, cross protection, direct protection, integrated disease management, chemical methods of plant disease control; Biotechnological approaches to plant disease management; Gene silencing and disease control; Mechanism of gene silencing and control of viral diseases; Engineered resistance to viral, bacterial, fungal and insect diseases of crop plants.

Unit-4:Study of diseases of crop plants: Potato Spindle Tuber Disease, Tobacco Mosaic Disease, Sandal Spike Disease, Bacterial blight of Paddy, Citrus Canker, Late Blight of Potato, Downy Mildew of Maize, Blight of Paddy, Angular leaf spot of Cotton, Tikka disease of ground nut, Rust of coffee, Grain and Head smut of Sorghum. Leaf blight of Paddy, Blast of Paddy, Powdery mildew of cucurbits, Wilt of Tomato, Phloem Necrosis of Coffee, Root Knot of Disease of Mulberry and Vegetables; Non-parasitic diseases of plants; Seed-borne diseases.

Practicals-32 Hrs

1) Isolation of bacterial, fungal, and nematode plant pathogens of crop plants.
2) Study of mineral deficiency diseases of Tomato and French bean.
3) Estimation of foliar infection by Stover's method.
4) Study of spore germination.
5) Estimation of total phenols in diseased and healthy plant tissues.
6) Mycoflora analysis by Standard Blotter Method SBM/agar plating method.
7)-9) Study of Tobacco mosaic, Bacterial blight; Downy mildew of Maize; Powdery mildew of cucurbits; Grain smut of sorghum; Leaf rust of Coffee; Root Knot of Mulberry. Bunchy top of banana, Grassy shoot of sugar cane, Little leaf of Brinjal; Potao Spindle Tuber Disease (PSTVd)
10) Study of effect of pathogens on seed germination and vigour index.
11) Study of effect of fungicide on seed-borne pathogens.
12) Study of Fungal bio-control agents.

References:

1) Agrios, G. N. 2005. Plant Pathology 5th edn. Academic Press, San Diego.
2) Dickinson, M. 2003. Molecular Plant Pathology, Garland Publishing Inc, CT.
3) Ingram,D.S. and Robertson, N.F. 1999. Plant Diseases, Collins Publishers, London.

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BOTANY: II- SEMESTER- HARDCORE 2.1

REPRODUCTIVE BIOLOGY OF ANGIOSPERMS AND PLANT MORPHOGENESIS

Theory-32 Hrs

Unit-1: Reproductive Biology of Angiosperms: Historical overview; Contributions of P. Maheshwari; BM Johri; BGL Swamy to the development of embryology in India; Microsporogenesis and Microgametogenesis- wall layers and functions; Tapetum- types, concept of male germ unit and its significance; Pollen morphological features; Unusual features-pollen development in Cyperaceae, pollen embryosac; Concept and scope of palynology.

Unit-2: Megasporogenesis and Megagametogenesis; Ovular structure and types; Development of monosporic, bisporic, tetrasporic and special types of embryo sacs; Ultra structure and nutrition of female gametophyte, concept of female germ unit and its significance; Fertilization- a general account, double fertilization, single fertilization, heterofertilization and polyspermy; Pollen recognition and rejection reactions - types, structures, methods to overcome incompatibility reactions; Endosperm- types, haustorial variations, ruminate and composite endosperm; Embryo- structure, development of monocot, dicot and grass embryo; Significance of embryonal suspensor; Experimental Embryology- scope and applications.

Unit-3: Plant Morphogenesis: Models of morphogenesis- comparison of plant v/s animal morphogenetic pathways: Embryo, *Arabidopsis thaliana*; Concepts- cell fate/ fate maps, gradients, stem cells in plants and their significance in development, polarity, symmetry, totipotency of cell types, pleuripotency, plasticity, differentiation, redifferentiation, dedifferentiation and regeneration in *Acetabularia* and *Arabidopsis thaliana.*

Unit-4: Plant Growth and Development: Types, shoot apical meristems, root meristems; control of cell division in meristems; Quiescent center and meresteme de attente; *Arabidopsis*- vascular patterning and leaf development, abnormal growth; Cellular basis of growth- maintenance of cell shape; Cytoskeletal elements; Photomorphogenesis- definition, history, Hartmann's technique; Photoreceptors and photo morphogenesis, localization and properties; Effect of blue light-mediated photomorphogenesis with suitable examples.

Practicals-32 Hrs

Reproductive Biology of Angiosperms:

1) Study of microsporangium- slides: wall layers, tapetal types, two-celled and three-celled pollen; pollen tetrads.

2) Study of pollen germination: *Balsam, Delonix, Hibiscus* and *Peltaphorum*

3) Study of megasporangium-slides: female gametophyte development in *Penstemon, Xyris pauciflora,* 2, 4, 8-nucleate stages, mature embryo sac.

4) Endosperm mounting- *Cucumis sativus, Grevellia robusta* and *Croton sparsiflorus*

5) Embryo: Slides-monocot, dicot and grass embryo.

6) Embryo mounting : *Crotalaria.*

Plant Morphogenesis:

7) Study of stem cells in plants: SAM, RM.

8) Regeneration abilities of shoot apical meristems of dicots on media with combinations of growth regulators.

9) Study of totipotency in cell types: stomata, epidermal cells, stem and leaf explants on a tissue culture media.

10) Polarity in stem cuttings: *Pothos* spp.

11) Study of regeneration in succulents *Kalanchoe*, *Byrophyllum.*

12) Study of leaf galls of plants: *Pongamia pinnata and Achyranthes aspera*: Morphological observations and histology.
13) Study of *Arabidopsis thaliana* as a model plant.

References:

1) Johri, B. M. 1984. The embryology of Angiosperms. Springer Verlag.
2) Johri, B. M. 1982. The experimental embryology of vascular plants. Springer Verlag, New York.
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BOTANY: II- SEMESTER - HARD CORE 2.2
CELL BIOLOGY AND GENETICS

Theory-32 Hrs

Unit-1: Bio Molecules and Membranes: Structure, composition of bio-molecules and their stabilizing interactions (carbohydrates, lipids, proteins and nucleic acids); Unit membrane structure and functions; Membrane proteins, membrane transport and the electrical properties; Intra-cellular compartments and protein sorting; Intracellular membrane traffic; Cytoskeletons.

Unit-2: Functions of Organelles: Cell wall, membranes, nucleus, mitochondria, Golgi bodies, lysosomes, spherosomes, peroxisomes, ribosomes, endoplasmic reticulum, Plastids, chloroplast, vacuoles and cytoskeleton; Cell cycle and mechanism of cell cycle regulations; A brief account of cell signalling, receptors, second messengers; General mechanism of signal transduction pathway; Programmed cell death in life cycles of plants.

Unit-3: Extensions of Mendelian Principles co-dominance, incomplete dominance, gene interactions, multiple alleles, lethal alleles, pleiotropy, penetrance and expressivity, polygenic inheritance, linkage and crossing over, sex linked inheritance, sex limited and influenced traits, genome imprinting, extra nuclear inheritance; C**oncept of the gene**-classical-alleles, multiple alleles, pseudo-alleles, complementation test, experiments on rII locus and lozenge locus, modern- jumping genes, overlapping and genes within genes, split genes, nested genes, fusion genes; **Gene mapping methods-** linkage maps, tetrad analysis; Recombination in bacteria mapping genes in bacteria by interrupted mating technique, fine structure mapping, transduction and transformation mapping, mapping genes in Bacteriophages**,**

Unit-4: Sex Determination and Dosage Compensation: Chromosomal and genetic basis of sex determination; Mechanism of sex determination in *Melandrium*, *C. elegans*, Drosophila and humans, dosage compensation mechanisms in humans, Drosophila and *C. elegans*. **Transposable elements**- discovery in maize and bacteria, transposal elements in bacteria and bacteriophage, types and functions; Transposable elements in eukaryotes- Plants, *Drosophila* and Humans, mechanisms of transpositions;Transposable elements in research.

Practicals-32 Hrs

1) Determination of reducing sugars by Nelson-Somogyim's method.
2) Estimation of total soluble sugars by volumetric method.
3) Quantitative determination of free Amino acid content in germinating seeds.
4) Estimation of ascorbic acid in plant tissues.
5) Estimation of Phospholipids by TLC.
6) Slides/Charts/photos NP (Cytology Genetics and Embryology).
7) Study of mitosis in normal and induced root tips cells of Onion.
8) Study of meiosis in onion flower buds , translocation in Rhoeo.
9) Study of special chromosomes- B chromosomes, and sex chromosomes.
10) Determination of chiasma frequency in onion.
11) -12)To solve genetic problems on linkage, ordered and unordered tetrads.

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BOTANY: II SEMESTER HARD CORE 2.3
PLANT BREEDING AND EVOLUTIONARY BIOLOGY

Theory-32 Hrs

Unit-1: Introduction: Objective and role of plant breeding; Evolution of plant breeding, scope of plant breeding, sciences related to plant breeding, Vavilov's concept of origin of centers of origin of crop plants; Recent trends in plant breeding; **Breeding Methods-**plant introduction and acclimatization, domestication and agriculture, pure line, clonal, mass and progeny selections, recurrent selection, pedigree, bulk and back cross methods; Heterosis breeding synthetic and composite varieties; **Breeding Techniques-**Mutation breeding, polyploidy, hybridization, tissue culture techniques in crop improvement, protoplast fusion, electrophoration, electro-fusion, biolistics, somatic hybridization, transgenic plants (GMO's); The role of Gene technology in plant breeding.

Unit-2: Breeding for Specific Purposes: Breeding for disease resistance, insect resistance, drought and salinity, quality trait, multiple cropping systems, ideotype breeding, breeding for Adaptation; **Crop breeding and seed production-** Breeding field crops, seed production techniques, release of new varieties, intellectual property rights, computer application in plant breeding, crop breeding Institutes/Centers; Genetic resources and germplasm conservation; Scientific Plant breeding; Green revolution; The elite crop (Golden rice); Contributions of **Dr.**
M.S. Swaminathan, Dr. Norman E. Borlaug and N.I. Vavilov.

Unit-3: Nature of Evolution : The origin, theories of evolution of life, earth and the universe,; Conditions of the early earth, emergence of the first living cell, origin of prokaryotic and eukaryotic cells, life in the Palaeozoic, Mesozoic and Coenozoic era. **Development of Evolutionary thoughts;** Ecological context, before Darwin, Darwinism, Darwin's evolutionary theory, Neo – Darwinism, modern synthesis: **Fossil evidence of Ancient life,** fossilization,; Interpreting geological time scale and fossil records; Evidences from comparative, morphology, patterns of development, comparative physiology and biochemistry, biogeography, palaeontology, taxonomy, anatomy and embryology, plant and animal breeding; Evidence from changing earth and sea; Extinctions; Evolutionary ecology.

Unit-4: Natural Selection : Types of natural selection, selective forces, selection models, sexual selection, selection and non adaptive characters, Adaptive radiation, artificial selection, **Variation- g**ene flow, genetic drift, gene mutation - Mendelian concept, chromosomal mutation, architectural changes in chromosomes; The Hardy – Weinberg law, polyploidy in plant evolution**;** Speciation and origin of higher categories **-**Types of speciation, models of speciation, pattern of speciation, isolating mechanism and species formation, signification of speciation; Molecular evolution.

Practicals-32 Hrs

(1) Study of floral biology of crops - typical examples of self and cross pollinated plants.
(2) Selfing and hybridization techniques - Bagging and emasculation.
(3) Pollen viability: germination test and TTC test.
(4) Studying of centre's of origin of cultivated crops - N.I. Vavilov Concept.
(5) Mode of pollination study in different crops.
(6) Identification of crop breeding institutes/ centers and logos.
(7) Studying and identification of contributors of plant breeding - M.S. Swaminathan, N.I. Vavilov, Norman . E. Borlaug .
(8) Study of contributions of scientists to evolutionary biology.
(9)-12) Study of models and photographs related to evolution.

References

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3) Griffith, A.J.F., Gelbart, W.M. Muller, J.H. and Lewintin, R.C. 1999. Modern Genetic analysis. W.H. Freeman and co. New York.
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BOTANY: II- SEMESTER - SOFT CORE 2.1
PLANT ANATOMY AND HISTO-CHEMISTRY

Theory-32 Hrs

Unit-1: Plant Anatomy: Primary vegetative body of the plant; Anatomical features of leaf, stem and root (dicot and monocot); leaf of fern and gymnosperm; Structure of modified leaves- Kranz anatomy and C4 photosynthesis; Ultra-structure and chemistry of the cell wall; formation of the cell wall and its uses.

Unit-2: Anatomy of Vascular Tissue: Ultra structure and differentiation of xylem and phloem tissues; Apical meristems- shoot apex in Pteridophytes, Gymnosperms and Angiosperms, theories, root apical meristems.

Unit -3: Secondary Growth: Vascular cambium, secondary xylem of gymnosperms and dicots and secondary phloem of Gymnosperms and dicots; Periderm and bark; Anomalous secondary growth in monocots and climbers; Leaf ontogeny - Dicot- simple, compound, Monocot; Floral anatomy-flower parts, floral meristem, vascular system.

Unit-4: Plant Histochemistry: Tests for minerals, carbohydrates, lignins, polyphenols, proteins, lipids and nucleic acids; Study of instruments: (a) Camera lucida (b) Micrometry (c) Microtome. Principles of histo-chemical stains; Killing, fixing and staining of plant tissues; Double staining- TBA method.

Practicals-32 Hrs

1) Staining of xylem and phloem elements.
2) Study of anatomy of roots in: *Ficus, Musa, Dieffenbachia*, *Vanda.*
3) Study of anamalous secondary growth in the following examples: Stem of *Aristolochia*, *Nyctanthes, Pyrostegia, Peperomia, Tinospora, Achyranthes*.
4) Study of Ecological anatomy.
5) Study of Vasculature in floral organs.
6) Studying double staining technique.
7-11) Embedding: TBA method, embedding for electron microscope, Sectioning**,** Microtomes, whole mounts maceration.
12) Histochemical- PAS Test**,** Sudan black- lipids**,** Feulgen reaction – Nucleic acids.

References:

1) Abraham, F. 1982. Plant Anatomy. 3rd edn. Pergaon Press. Oxford.
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BOTANY: II- SEMESTER - SOFT CORE 2.2

ETHNO-BOTANY AND INTELLECTUAL PROPERTY RIGHTS (IPR)

Theory - 32 Hrs

Unit-1: Ethno-botany: Introduction, concept, scope and objectives; Ethno-botany as an interdisciplinary science; The relevance of ethno-botany in the present context; Ethnic groups; Ethno-botany- Major and minor ethnic groups of India and their life styles; Forest Vs. ethnic groups; Plants in tribal life with reference to Magico-religious rituals and social customs; Sacred groves.

Unit-2: Methodology used in the study of Ethnobotany and Ethno pharmacology: Field work, Herbarium, Ancient Literature, Archaeological findings, temples and sacred places, protocols. Preliminary phyto-chemical analysis of ethno-botanical important medicinal plants.

Unit-3: Role of ethno-botany in modern Medicine with special examples; Medico-ethno-botanical Sources in India with special reference to Karnataka; Tribals Vs. Agriculture: Shifting, Podu and Jhum cultivation; Role of ethnic groups on surrounding environment; Crop genetic sources; Endangered taxa and forest management (participatory forest management); Ethno- botany as a tool to protect interests of ethnic groups; Sharing of wealth concept with few examples from India.

Unit-4: Study of Intellectual Property Rights – patents, trademark, geographical indication, copyright; IPR and Traditional Knowledge; Bio-piracy of traditional knowledge; Ethno botany and legal aspects; National and international organizations and treaty related to traditional knowledge – WIPO, TKDL, TRIPS, CBD, Nagoya protocol etc., Ethno botany as a source (recent) of already known drugs: a) *Withania* as an antioxidant and relaxant b) *Sarpagandha* in brain ailments c) *Becopa* and *Centella* in epilepsy and memory development in children d) *Phyllanthus fraternus* in diabetic and viral jaundice e) *Artemisia* as a powerful cerebral anti malarial agent and its possible use in tuberculosis.

Practicals-32 Hrs

1) Survey and collection important ethno botanical plants by using questionnaire and interview.
2) Preliminary phyto- chemical analysis of medicinal plants.
3) Study of biological functional properties of crude drugs – Anti microbial activity.
4) Study of methods of *in-situ* or *ex-situ* conservation of important medicinal plants.
5) Study of techniques used in Pharmacognosy – organoleptic, anatomy and chemical methods.
6) A visit to a Tribal area to conduct field work and collect ethno botanical information / data.
7) Listing of Crude drugs in Pansali shops (local crude drugs shops) and their identification (little known drugs only).
8) -12) Visit to nearby Western Ghats and Sacred Groves.

References:

1) Jain, S.K. 1995. Manual of Ethno-botany, Scientific Publishers, Jodhpur.
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BOTANY: II- SEMESTER - SOFT CORE 2.3
ECONOMIC BOTANY

Theory -32 Hrs

Unit- 1: Economic Botany: The origin of cultivated plants and Agriculture; The future role of plants in relation to mankind; Introduction to Green revolution; Study of origin, distribution, cultivation and utility of the useful parts of the following- - rice, wheat, maize, barley, sorghum and millets; Red gram, green gram, black gram, horse gram, pea, cow pea, bengal gram; Oil Yielding plants- sunflower, safflower, groundnut, linseed, rape seed; A brief account of economically important horticultural and floricultural plants.

Unit- 2: Economic Botany: Study and utility of the useful parts of the following- Sugar yielding plants- sugar cane and sweet potato, sugar beet and *Stevia*; Spices and condiments - ginger, turmeric, cardamom, cinnamon, clove, saffron, all spice, black pepper, nutmeg, red pepper, coriander, cumin, fennel and *Vanilla.*

Unit -3: Economic Botany Study and utility of the useful parts of the following- fibre- cotton, jute, flax, hemp, Sunn hemp, China grass, coconut and Kapok; Timber yielding plants- *Tectona* and *Dalbergia*; Dyes- indigo, henna; Masticatories and fumitories-areca nut, betel leaf, tobacco; rubber- Para rubber and other substitutes; Gums- Gum Arabic, Karaya gum.

Unit-4: Medicinal Botany: Scope and importance of medicinal plants; Indigenous medicinal Sciences; Important medicinal plants and their uses; Major exporters and importers of traditional medicinal plants and plant products; Application of natural products to certain diseases- jaundice, cardiac, infertility, diabetics, blood pressure and skin diseases; Poisonous plants.

Practicals-32 Hrs

1) Utility, uses and economic importance of cereals and millets.
2) Utility, uses and economic importance of horticultural and floricultural plants
3) Utility, uses and economic importance of pulses and oil yielding crops.
4) Utility, uses and economic importance of sugar yielding crops.
5) Utility, uses and economic importance of spice and condiments.
6) Utility, uses and economic importance of fiber and timber yielding plants.
7) Utility, uses and economic importance of dye, rubber and gum yielding plants
8) Utility, uses and economic importance of masticatories and fumitories
9) -12) Study of medicinal and poisonous plants.

References:

1) Hill, A.F. 1952. Economic Botany, TataMcGraw Hill, New Delhi.
2) Kochhar, S.L. 1998. Economic Botany of Tropics, Macmillan India Publishers, New Delhi.
4) Pandey, B.P. 2000. Economic Botany. S. Chand & Company, New Delhi.
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BOTANY: II SEMESTER- OPEN ELECTIVE 2.1
MEDICINAL PLANTS

Theory-32 Hrs

Unit-1: Medicinal Plants: History, scope and importance of medicinal plants; Indigenous medicinal sciences; History, origin, panchamahabhutas, saptadhatu and tridosha concept, Rasayana, plants used in ayurvedic treatments, Siddha: Origin of Siddha medicinal systems, Basis of Siddha system, plants used in Siddha medicine. Unani: History, concept: Umoor-e-tabiya, tumors treatments/ therapy, polyherbal formulations.

Unit-2: Medicinal Plants Conservation: Conservation of endangered and endemic medicinal plants; Endemic and endangered medicinal plants; Red list criteria; *In-situ* conservation-biosphere reserves, sacred groves, national parks; *Ex situ* conservation- botanic gardens, ethno medicinal plant gardens; Propagation of medicinal plants - objectives of the nursery, its classification, important components of a nursery, sowing, pricking, use of green house for nursery production, propagation through cuttings, layering, grafting and budding.

Unit - 3: Funding for Cultivation of Medicinal Plants: Sources of financial aids for medicinal plant cultivation: Aims and objectives, Functions and activities of the board, Schemes and Projects for Financial assistance, Funding of projects; Procedure for processing project proposal for approval, Implementation and monitoring.

Unit- 4: Ethno botany and Folk medicines: Definition; Ethno botany in India: Methods to study ethno botany; Applications of Ethno botany: National interacts. Ethno medicine. Application of natural products to certain diseases- Jaundice, cardiac, infertility, diabetics, Blood pressure and skin diseases. Brief introduction to poisonous plants.

References:

1) Trivedi, P. C. 2006. Medicinal Plants: Ethnobotanical Approach, Agrobios, India.
2) Purohit and Vyas, 2008. Medicinal Plant Cultivation: A Scientific Approach, 2nd edn.
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BOTANY: III- SEMESTER - HARD CORE 3.1
BIOCHEMISTRY AND PLANT PHYSIOLOGY

Theory -32 Hrs

Unit-1: Biochemistry- Brief account of plant structural and functional molecules-carbohydrates, proteins, lipids and nucleic acids**;** classification, structural and functional properties of bio molecules; Biochemistry of cell membranes; **Lipids-**building and storage molecules, classification and significance; **Proteins-** classification, structure- primary, secondary, tertiary and quaternary structure; properties of proteins; **Enzymes**-Nomenclature, nature and properties of enzymes, active sites, co-enzymes, kinetics of enzyme action, catalysis, specificity and inhibition, allosteric enzymes, ribozyme and abzyme.

Unit-2:Solute transport: Transport of solutes across the membranes Transmembrane proteins, Transport of ions, solutes and macro-molecules, Mechanism of translocations in phloem; Role played in signal transduction pathway stomatal physiology; **Phytosynthesis in higher plants** (i) Photophosphorylation - Calvin cycle; **Photorespiration** - C4 – Pathway, CAM in plants; Oxidative Phosphorylations; Glycolysis -TCA – Cycle and terminal oxidation.

Unit-3: Plant Hormones- plant hormones-discovery, biosynthesis, metabolism, transport and physiological effects of plant hormones and their applications; **Nitrogen metabolism** -(i) Molecular mechanism of N2 fixation (ii) Biosynthesis of amino acids (iii) Assimilation of nitrate and ammonium; **Lipid metabolism-** fats and oils biosynthesis and oxidation of lipids; Physiology of seed germination and flowering.

Unit -4: Stress Physiology: Water deficit and its physiological consequences; Drought tolerance mechanisms, Salinity stress and plant responses. Heat stress and heat shock proteins; Metal toxicity in plants. Biotic stress, HR and SAR mechanisms; **Mineral nutrition**-in plants and deficiency diseases; **Plant development-** physiology of flowering; **Phytochrome**- photochemical and biochemical properties of phytochrome; Concept of photoperiodism and vernalization and its influence on flowering;

Practicals-32 Hrs

1) Estimation of protein by Lowry's method
2) Determination of water potential of tissue by plasmolytic method
3) Determination of water potential by Gravimetric method
4) Quantitative estimation of chlorophyll a, chlorophyll b and total chlorophyll in plant tissue
5) Determination of diurnal fluctuation of acid content of CAM plants (TAN)
6) Determination of temperature quotient (Q10) of water uptake
7) Separation of chlorophyll pigments/Anthocyanin by TLC
8) Protein analysis by SDS PAGE method.
9) Estimation of Alpha-amylase activity in germinating seedling.
10) Silver staining of proteins.
11-12) Visit to Molecular Biology Laboratories.

References:

1) Barkla, B.J., and Pantajo, O. 1996. Physiology of ion transport across the tonoplast of higher plants. Ann. Rev. Plant Physiol. 47: 159-184.
2) Clayton, R.K. 1980. Photosynthesis: Physical mechanisms and chemical patterns. Cambridge Uni. Press, Cambridge.
3) Cohn, E.E., and Stumf, P.K. 1992. Outlines of Biochemistry. Wiley Eastern Pvt. Ltd.
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photooxidation. Nature 384: 557- 560.
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BOTANY: III- SEMESTER - HARD CORE 3.2
MOLECULAR BIOLOGY

Theory-32 Hrs

Unit-1: Organization of chromosomes and genes in prokaryotes and eukaryotes - Operon, interrupted genes, gene families, unique and repetitive DNA, heterochromatin, euchromatin, transposons, mitochondrial and chloroplast genome organization, Transposable elements in prokaryotes and eukaryotes, genetic and evolutionary significance, **DNA replication**- patterns, Messelson and Stahl's and Taylor's experiment, enzymes of replication, mechanism of DNA replication in prokaryotes and Eukaryotes, proof reading and error correction mechanisms.

Unit-2: Molecular mechanism of mutation, repair and recombination:- Mutation-DNA damage by spontaneous mutations, physical and chemical mutagens and their molecular mechanisms, **Repair mechanisms**- direct reversal of damage, base and excision repair, recombinational repair, SOS repair, translation repair synthesis, transcription coupled repair, **Recombination**- homologous recombination, models of recombination, mechanisms, protein machinery of homologous recombination, genetic consequence of homologous recombination, gene conversion, site specific recombination, mechanism and biological significance, non homologous recombination- transposition, molecular mechanisms of transposition- conservative, replicative and retro-transposition.

Unit-3: RNA synthesis, processing and translation: transcription activators and repressors, promoters, RNA polymerases and transcription factors, mechanism of transcription in prokaryotes and eukaryotes, **RNA processing**- capping, polyadenylation, splicing, alternative splicing, RNA editing, exon shuffling and RNA transport, **Translation and processing**- ribosomes, tRNA aminoacylation, aminoacyl tRNA synthetase, genetic code, wobble hypothesis, deciphering of the code, translation mechanism , translation proof reading, translation inhibitors and post translational modifications.

Unit-4: Regulation of gene expression in Prokaryotes: Operon concept, regulation at transcription initiation- lac and trp operon control, regulation of lytic and lysogenic cycles in lambda phage, regulation beyond transcription initiation-premature termination- trp operon, ribosomal proteins as translational repressors, riboswitches, **Regulation of gene expression in eukaryotes**-transcription activators and repressors, regulation after transcription initiation- alternative splicing, translational control in ferretin and tranferrin mRNA, RNA interference, role of chromatin in regulation of gene expression and gene silencing.

Practicals-32 Hrs

1) Isolation of DNA from CTAB method.
2) Isolation of DNA from Onion.
3) Isolation of DNA from mulberry leaves.
4) Estimation of DNA by DPA method.
5) Extraction of RNA by trizol/ phenol-chloroform methods.
6) Estimation of proteins by Biuret method.
7) Estimation of protein by Bradford method.
8) Determination of Tm value of DNA.

9-12)Photo graphs/ charts related to molecular biology/Molecular Biologists.

References:

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Walter. 2008. Molecular biology of the cell, 5th edn., Garland science, Taylor & Francis Group, LLC, 270 Madison Avenue, NewYork ,USA.
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12) Bowle.2002. Molecular Biology of Plants. Vol 1 & 2 Oxford University Press.

BOTANY: III-SEMESTER - HARD CORE 3.3
PLANT BIOTECHNOLOGY

Theory-32 Hrs

Unit-1: Plant Tissue Culture: Scope and importance of plant tissue culture - Media composition and types, hormones and growth regulators, explants for organogenesis; Micro propagation, embryo and endosperm culture, somatic embryogenesis, variation and cell line selection, adrogenesis and microspore culture, significance of haploids, diploidization and bulbosum technique; Cryopreservation, germplasm collection; Somatic Hybrids- Isolation and protoplast culture and somatic hybridization and its significance, Synthetic seed production and somaclonal variations.

Unit-2: Genetic Engineering: Milestones in plant recombinant DNA technology; Importance of gene manipulation in future perspectives; **Tools in Genetic Engineering-** Enzymes in genetic engineering - restriction endonucleases, types and their actions, other DNA modifying enzymes; Cloning vectors- plasmids isolation and purification - Ti Plasmid, pBR322, pUC-series. Phage vectors-M13 phage vectors, Cosmids -types, phasmids or phagemids, shuttle vectors-types; YAC and BAC vectors, Lambda phage vectors, Lamda phage DNA as a vectors; Cloning vectors and expression vectors; Vectors for plant cells; Vectors for animal cells, baculovirus vectors- adenoviruses, retroviruses, transposons as vectors, Synthetic construction of vectors.

Unit 3: Applications of Genetic Engineering for pest, disease and stress tolerance: The genetic manipulation of herbicide resistance with suitable examples; The genetic manipulation of pest and disease resistance with suitable examples; Transgenic approaches to viral and bacterial disease resistance. Engineering for stress tolerance and Metabolic Engineering of Plants; Future prospects for GM crops.

Unit 4: Biofertilizers: Preparation and applications of biofertilizers such as Rhizobium, Azotobacter, Blue Green Algae and VAM. Single Cell proteins (SCP): Health benefits and advantages of single cell proteins- *Spirulina.* Biofuels: Ethanol and Biofuel production from plants. Mushroom cultivation and its advantages. Bioremediation: Phytoremediation; Biodegradation, Xenobiotics. Biotechnology of medicinal and aromatic plants for human welfare.

Practicals-32 Hrs

1) Preparation of plant tissue culture media and types.
2) Organ culture (Shoot tip, nodal and leaf culture) for callus Initiation and regeneration.
3) Anther culture for the production of haploids.
4) Suspension culture and production, separation and estimation of secondary metabolites.
5) Encapsulation of somatic embryos and production of Synthetic seed.
6) Extraction of secondary metabolites using Soxhlet extractor and Identification of In vitro secondary metabolites-alkaloids, steroids and flavonoids.
7) Restriction digestion of plasmid and genomic DNA and gel electrophoresis.

8) Isolation of genomic DNA from bacteria/plants and purification by agarose gel electrophoresis.
9) Restriction analysis of plasmids, gel purification of DNA, small and large scale purification of plasmids.
10) Preparation of competent *E. coli* cells. Bacterial transformation and recovery of plasmid clones.
11) Gene cloning in plasmids, analysis of recombinant plasmids.
12) DNA amplification by PCR, RT-PCR, Real Time PCR.
13) Analysis of DNA and RNA and Protein by Southern, Northern and Western blotting.
14) Primer design for PCR.

References:

1) Slater, N. Scott and M. Fowler. Plant Biotechnology 2003: The genetic manipulation of plants. Oxford University Press, Oxford.
2) Plant Biotechnology. 2000. J.H. Hammond, P. Mcgarvey, and V. Yusibov (eds). Springer Verlag, Heidelberg.
3) Text Book of Biotechnology. 2004. H.K. Das (ed). Wiley India Pvt. Ltd., New Delhi.
4) Plant Biotechnology -The Genetic Manipulation of Plants, Adrian Slater, Nigel Scott and Mark Flower, Oxford University Press, (2000).
5) Plant Genetic Transformation and Gene Expression by (eds) J.Draper *et.al*. Blackwell Scientific Publications, Oxford (1988).
6)Reinert, J. 1982. Plant Cell and Tissue Culture: A Laboratory Manual. Narosa Publishing House, New Delhi.
7)Chawla H.S., 2009, Plant Biotechnology. Oxford and IBH Publishing Co. Pvt. Ltd, New Delhi.
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10) Roberta, H. Smith, 2012. Plant Tissue Culture: Techniques and Experiments 3 edition. Academic Press; US.

BOTANY: III- SEMESTER- SOFT CORE 3.1
MOLECULAR GENETICS OF PLANTS

Theory-32 Hrs

Unit-1: Plants as genetic tools in Biology: *Arabidopsis, Rice, Maize, Saccharomyces;* Genome organization in plants; *Arabidopsis thaliana*- an experimental model for understanding plant development and functions; Plant genes and regulation; nucleus and chromatin organization; Histones and histone modifications; DNA packaging, organization and types of DNA sequences; functional and non- functional sequences, organization of plant nuclear genes, plastid genes and mitochondrial genes.

Unit-2: Genes responding to hormones, phytochrome, responses to abiotic stresses; Genes induced by water stress and freezing stress; Genes involved in photosynthesis and nitrogen fixation and their regulation; Molecular development of leaf and flower - ABC and revised model of flower development; Genes involved in fertilization, seed development, embryo development.

Unit-3: Genetics of *Agrobacterium:* Biology and genetics of *Agrobacterium tumefaciens;* The Ti- plasmid, *Vir* genes and expression, Mechanism of T-DNA transfer and integration; Basic features of vectors for plant transformation; Proteomics, genomics and bioinformatics; Structural and functional genomics, comparative genomics - biochemical, evolutionary, physiological and phylogenomics; Tools to study functional genomics.

Unit-4: Proteomics- functional and comparative proteomics; Protein distribution, characterization and identification, differential display proteomics, detection of functional linkages; Pharmacogenomics; Bioinformatics- tools of bioinformatics, data bases and data base management, bioinformatics in taxonomy, biodiversity, agriculture; Bioinformatics in drug design and drug discovery.

Practicals-32 Hrs

1) *Arabidopsis thaliana*- study of plant system and its biology.
2) *Arabidopsis* RNA extraction (total and polysomal) for Northern blotting.
3) Expression of foreign genes in plant cells through *Agrobacterium tumefaciens* (Chart)
4) Production of tobacco transgenic plants and assay for the introduced transgenic (Chart)
5) Co-cultivation of tobacco *Agrobacterium tumefaciens*
6) -12) Learning gene bank formats- EMBL format, FASTA format, Swiss- PROT, Ex PASy

References:

1) Buchmann, B.B., Gruissem, W., and Jones, R.L. 2000. Biochemistry and Molecular Biology of Plants. ASPP Press, USA.
2) Ausubel, F.M., Brent, R., Kingston, R.E., Moore, D.D., Seidman, J.G., Smith, J.A., and Struhl, K. 2005. Current protocols in molecular biology. Current Edition.
3) Brown, T.A. 2000. Essentials of Molecular Biology. Vol. I & II, Oxford University Press.
4) Potrykus, I., and Spangenberg, G. 1995. Gene transfer to plants. Springer, Berlin, Heidelberg.
5) Watson, J.D., and Baker, T.A., Bell, S.P. Gannm, A. and Levine, M. 2004. Molecular Biology of Genes. 5th edn., Pearson Education.
6) Gilmartin, P.M., and Bowler, C. 2002. Molecular Biology of Plants. Vol. I & II, Oxford University Press.
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11) Draper, J. 1988. Plant Genetic Transformation and Gene Expression. Blackwell Scientific Publications, Oxford.
12) Old, R.W., and Primrose, S.B. 2004. Principles of Gene Manipulation. An introduction to Genetic Engineering. 5th Edition, Blackwell Science Publications.

BOTANY: IV- SEMESTER- SOFT CORE 3.2
MOLECULAR PLANT PATHOLOGY

Theory-32 Hrs

Unit-1: Concepts and scope of physiological and molecular plant pathology; Molecular approaches to plant disease diagnosis; Nucleic acid based probes for detection of plant pathogens including non-culturable organisms; **Pathogenicity and Disease Development**-factors; induced resistance, virulence and pathogenecity factors; Plant-pathogen interactions with emphasis on incompatible interactions and induced resistance.

Unit -2: Pathogenesis: Necrogenic plant pathogenic bacteria with emphasis on hrp and avr genes and virulence factors; Fungal plant pathogens with emphasis on virulence and pathogenicity factors; Plant viruses with emphasis on virus replication, virus transport in plants and control of plant viruses with transgenic plants; **Signal Transuduction-** recognition of the pathogen by the host, transmission of the alarm signal to the host defense providers; Necrotic defense reaction, defense through hypersensitive response; Molecular basis of induced biochemical reaction; Local and systemic acquired resistance (SAR).

Unit-3:Genetics of Plant Diseases and Resistance: Genes and diseases; physiological specialization among plant pathogens; Variability in viruses, bacteria and fungi; Levels of variability in pathogens and loss of virulence in plant pathogens; Genetics of virulence in pathogens and of resistance in host plants; Molecular plant breeding for disease resistance.

Unit-4: Genetics and molecular basis of host-pathogen interaction: Evolution of parasitism; genetics oh host-pathogen interaction; Gene for gene relationship; Criteria for gene for gene type relationship; Molecular basis of host pathogen interaction; Host-parasite-interaction. **Biotechnological methods of plant disease management;** Genetic engineering and crop protection; Cross protection; Gene silencing and disease control- mechanism of gene silencing and control of viral diseases; Engineered resistance to viral, bacterial, fungal and insect diseases of crop plants.

Practicals-32 Hrs

1-2) Testing hypersensitivity reaction on *Nicotiana and Bajra.*
3) Estimation of lypoxygenease in diseased and healthy plants.
4) Estimation of polyphenols in diseased and healthy
plants. 5-7) Studying systemic acquired resistance in
crop plants.
8) Genetic testing of disease resistance in plants.
9-11) Molecular detection of viruses, Mycoplasma, fungi and bacteria from infected plants.
12) In-vitro testing of pathogen virulence.
Visit to agricultural research station to study diseases on different crop plants.

References:

1) Singh, R. S. (1973). Plant Disease. Oxford and IBH Pub.Co. New Delhi.
2) Agrios, G. N. (1994). Plant Pathology 2nd Edn. Academic Press NY.
3) Johnston A and Both, C. 1983-Plant Pathologists Pocket-book. 2nd Edn.
Commonwealth Mycological Institute, Oxford and IBH Pub. Co. Calcutta.
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Hall of India Pvt. Ltd. New Delhi.
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7) Vidhyasekaran, P. 2004. Encylopedia of Plant Pathology.Viva Books Pvt.Ltd. New Delhi.

BOTANY: III SEMESTER- SOFT CORE 3.3
PLANT PROPAGATION AND PLANT BREEDING

Theory-32 Hrs

Unit-1: **Plant Propagation:** History, scope and importance of plant propagation; Propagation structures with reference to green house equipment and media; Seed propagation and vegetative propagation; Propagation by cuttings; Biology and techniques of grafting; Techniques of budding; Layering and its natural modifications; Propagation by specialized stems and roots; Micro propagation **–** techniques and applications in forestry and horticulture; Limitations and applications of vegetative propagation; Propagation methods of some selected plants – Citrus, Grape, Mango, Mulberry, Hibiscus, Rose, Croton, Eucalyptus.

Unit-2: Plant Breeding: History of plant breeding, objectives of plant breeding, salient achievements of plant breeding; Centres of origin of crop plants, Exploration and collection of plant genetic resources, evaluation of germplasm collection, documentation, conservation of plant genetic resources, utilization of genetic resources; The theory of pure line selection – Genetic basis, sources of genetic variation in pure lines, the land variety (races); Mendelian experiments of plant hybridization; Quantitative Inheritance; Applications of biometrical genetics in plant breeding.

Unit-3: Plant Breeding: Types of plant breeding; Fertility regulating mechanisms - manual or mechanical control, genetic control, incompatibility, male sterility, genetic engineering for male sterility, chemical control, genetic basis of heterosis; Synthetic and composite varieties **-**genetic basis, procedure for developing synthetic and composite varieties - genetic basis, procedure for developing synthetic varieties; Breeding for resistance to disease and insect pests.

Unit - 4 :Mutation Breeding: Significance of induced mutations in plant breeding; Polyploidy in plant breeding**- t**ypes of polyploids, induction of polyploidy, phenotypic effects of polyploidy, significance of polyploids; Tissue culture in crop improvement; Molecular approaches to crop improvement- probes, gel electrophoration, electrofusion, biolistics, gene cloning, transgenic plants (GMO's), molecular markers, construction of genetic maps, application of DNA makers in plant breeding, the role of gene technology in plant breeding; Crop breeding Institutes/Centers, Molecular biology in relation to intellectual property rights.

Practicals-32 Hrs

1) Study of types of vegetative propagation: Cutting, Grafting, budding, layering.
2) Study of propagation by modified stems and modified roots.
3) Preparation of media, explants, culture, initiation of shoot multiplication.
4) Pot and green house implants (demonstration) (5) Studying of floral biology.
6) Hybridization techniques - bagging and emasculation.
7) Pollen viability test : Seed germination test, TTC test.
8) Mode of pollination study in different crops.
9) Visit to crop breeding stations/institutes / centres.
10) Estimation of protein quality, Amino acid Analysis and determination of oil and fatty acids.
11) Observation of colour and conditions of mature anthers in different crops.
12) Identification of and studying of important plant breeders.

References:

1) Abbottt, A.J. and Atkin, R.K. eds. 1987. Improving vegetatively propagated crops.

Academic press, New York.
2) Bose, T.K., Sadhu, M.K., & Das, P., 1986. Propagation of Tropical and Subtropical Horticultural crops, Nowya Prakash, Calcutta.
4) Hartmann, H.T., Kester E.D., Davis, F.T., and Geneve, R.L. 1997. Plant propagation. Principles and practices. Prentice Hall of India Private Limited, New Delhi.
5) Krishnamurthy. H.M. 1981. Plant Growth substances including application in Agriculture.
6) Pierik, L.M. 1987. In vitro culture of Higher plants Murtinus Nijhoff pub. Dordrecht.
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9. Sadhu, M.K. 1989. Plant propagation Wiley eastern Ltd. N. Delhi.

BOTANY: III SEMESTER SOFT CORE 3.4
PHYTOCHEMISTRY AND HERBAL TECHNOLOGY

Theory-32 Hrs

Unit-1: **Phytochemisrty:** Scope of phytochemistry, plants as source of chemical compounds, primary and secondary metabolites and its applications; Definition, source of herbal raw materials, identification, authentication, standardization of medicinal plants as per WHO guidelines and different herbal pharmacopoeias; Natural pigments, natural products as markers for new drug discovery.

Unit-2: Extraction, isolation and purification of phytochemicals: Selection of plant samples, processing and storage of samples for extraction; Factors influencing the choice of extraction, principles of extraction methods, infusion, decoction, digestion, maceration, percolation, solvent extraction, fluid extraction, ultrasound, microwave assisted extraction, advantage and disadvantage involved in each method; Isolation of selected primary and secondary metabolites – amino acids, proteins and carbohydrate; Phenolics, flavonoids, alkaloids, lipids, oils, terpenes and saponins; Purification techniques for primary and secondary metabolites – solvent-solvent fractionation and chromatography techniques.

Unit-3: Characterisation of Phytochemicals: Preliminary, qualitative and quantitative techniques – paper chromatography, thin layer chromatography, column chromatography-HPLC, GC (qualitative and quantitative), colour reactions for amino acids, sugars, phenolics, flavonoids, alkaloids, terpenes, saponins, oils, lipids; Spectroscopic estimations/gravimetric determination of total sugars, amino acids, proteins, phenolics, flavonoids, alkaloids, terpenes, saponins, oils, lipids; Characterisation using spectroscopic techniques - UV/VIS, FTIR, DSC (differential scanning calorimeter), NMR, MS, MALDI. XRD – single crystal and powder.

Unit-4: Standardisation and Validation of Photochemical: Quality determination of herbal drugs; Role of processing methods and storage conditions on quality of drugs; Standardisation parameters- impurity limit, ash content, extractable matter, moisture content, other phytochemicals, microbial contaminants, pesticides; Validation of drug – guidelines, limit of detection and quantification of impurities, organoleptic properties, physical, chemical, biological characteristics, stability testing, storage conditions and packing system/unit.

Practicals-32 Hrs

1) Survey and collection of medicinal plants for analysis.
2) Selection of plant part, processing and storage of samples for further analysis.
3) Extraction methods - aqueous and sequential solvent extraction of compounds.
4) Preliminary phytochemical analysis of active principles from the extracts.
5) Antibacterial/antifungal activity of crude /active principles
6) Identification of secondary metabolites using TLC- phenolics, flavonoids, alkaloids, terpenes, saponins etc.
7) Column chromatographic separation of active principles.
8) Characterisation of active principle using spectroscopy, HPLC, GCMS, LCMS, FTIR, and MALDI TOF.
9) -12) Submission of report on TEN important curative principles of Indian medicinal plants.

References:

1) Braithwaite, A. and Smith, F.J. 1996. Chromatographic Methods. 5th edn., Blackie Academic & Professional, London.
2) Bourne, U.K. Kokate, Purohit, C.K. and Gokhale S.B. 1983. Pharmacognosy. Nivali Prakashan Publication.
3) Braithwaite, A. and Smith, F. J. 1996. Chromatographic Methods. 5th edn. Blackie Academic & Professional, London.
4) Sadasivam. S. and A. Manickam, 0000. Bio Chemical methods 2nd edn. New Age International Pvt Ltd. New Delhi.
5) Harborne, J.B. 1984. Phytochemical Methods, 2nd edn. Chapman and Hall, London. Harborne J.B., 1973. Phytochemical methods a guide to modern techniques of plants analysis. Chapman and Hall Ltd. London.

BOTANY: III SEMESTER- OPEN ELECTIVE 3.1
PLANT PROPAGATION TECHNIQUES

Theory-32 Hrs

Unit-1: History, scope and importance of plant propagation; Propagation structures with reference to green house equipment and media; Seed propagation – the development of seeds, techniques of seed production and handling principles and media.

Unit-2: Vegetative propagation: Techniques of propagation by cuttings; stem cuttings – hard wood, semi hard wood, soft wood and herbaceous, leaf cuttings, leaf bud cuttings, root cuttings; Biology and techniques of grafting: Whip and tongue, wedge and cleft, bark, side grafting, approach.

Unit-3: Techniques of budding: T- budding patch budding, chip budding, ring budding; Layering and its natural modifications- simple layering, tip layering, mound or stool layering, air layering, compound or serpentine layering and trench layering; Propagation by specialized stems and roots.

Unit- 4: Micro propagation – techniques and applications in forestry and horticulture; Advantage, limitations and applications of vegetative propagation, Somaclonal variations; Propagation methods of some selected plants – Citrus, gape, mango, mulberry, hibiscus, rose, Croton, Eucalyptus.

References:

1) Abbott, A.J. and Atkin, R.K. (eds.) 1987. Improving vegetatively propagated crops. Academic press, New York.
2) Bose, T.K., Sadhu, M.K., and Das, P., 1986. Propagation of Tropical and Subtropical Horticultural crops, Nowya Prakash, Calcutta.
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7) M.K. Razdan 1994. An Introduction to Plant tissue culture, Oxford and IBH Pub. Co., PVT. Ltd., Bombay and Calcutta.
8) Mac Donald, B. 1987. Practical woody plant propagation for nursery growers. Portland, OR: Timber press.
9) Sadhu, M.K. 1989. Plant propagation Wiley eastern Ltd. N. Delhi.

BOTANY: IV- SEMESTER- HARD CORE 4.1
ECOLOGY, CONSERVATION BIOLOGY AND PHYTOGEOGRAPHY

Theory-32 Hrs

Unit-1: Introduction and scope of Ecology: Plants and the environment- plant adaptation, ecotypes, habitat ecology- fresh water and marine water ecology (ecosystems), wetlands and their characteristics; Ecosystem function; The distribution of biomes; Major Terrestrial Biomes; Forests-Tropical Forests-Temperate Forests, Taiga, Grasslands, Savanna, Temperate Grasslands/Prairies, Tundra, Deser and Chaparral.

Unit-2: Environmental Biology: Global warming: Greenhouse gases - causes and consequences; Ozone depletion- causes and consequences; Air, water and soil pollution - major pollutants, their source, permissible limits - and control methods; Radioactive pollution- Ionising radiation, disposal of radioactive waste, nuclear accidents; Environmental Education Programmes - WWF, UNEP, MAB; Role of plants in solving energy crisis and ameliorating global warming.

Unit-3: Biodiversity and Conservation Biology: Science in the service of Biodiversity, biodiversity and its value, biodiversity issues, concerns, management; Biodiversity hot spots; Biodiversity- threats and current status of biodiversity; IUCN categories, Red Data book and Red lists, invasive alien species as threat to biodiversity; Conservation strategies- past, present, and future; Attitudes about conservation; conservation movements; CITES (Convention on international trade in endangered species), WCU (World Conservation Union); Endangered species Act. 2002 (GOI); Protected areas, Network of India- history, size, scale and management; Heritage trees.

Unit-4: Phytogeography: Biogeography of the world, India and Karnataka; Climatic zones, tectonics, continental movements; Types of plant distribution – discontinuous distribution - land bridge theory, continental drift; continuous distribution-cosmopolitan, circumpolar, circumboreal, circumaustral, pantropical; Distribution of plants - islands; Phytochorea of the world, India; Plant dispersal, migrations and isolation; Eendemic plants of Western Ghats and Eastern Himalayas; Origin, distribution and acclimatization of coffee, cardamom, sugarcane, cashew, ragi, maize, wheat, rice and cotton; Remote sensing and GPS, study of vegetation by GIS (Geographical Information system).

Practicals-32 Hrs

1) Study of local vegetation by quadrate method.
2) Water analysis for pollution studies.(Bio-monitoring: TDS, Hardness, Chlorides, CO_2 COD, DO, BOD)
3) Rapid detection of bacteriological quality of water with special reference to feacal coliforms.
4) Morphology and anatomy of plants in relation to habitats - Xerophytes, Mesophytes, Hydrophytes.
5) *In situ* and *Ex situ* method of conservation.
6) Eminent phytogeographers of the world (photos).
7) Continental drift (charts).
8) Application of Remote Sensing, GIS and GPS in Forestry and Wild life management.
9) Biogeography of the world – Oceans, deserts, islands, mountains.

10) Biogeography of India –rivers, mountains, islands.
11) Floristic regions of world – India and Karnataka.
12) Study of endemic plants of India.
13) Origin, acclimatization and distribution of Coffee, Cardamom, Sugarcane, Cashew, Ragi, Maize, Wheat, Rice and Cotton.

References:

1) Polunin, N. 1961. Introduction to plant geography.
2) Good R.D. 1974. Geography of the flowering plants.
3) James H. B. 1998. Biogeography.
4) Cain, S.A. 1944. Foundations of plant Geography.
5) Croiat, 1952. Manual of Phytogeography.
6) Edgar A. 1972. Plants, Man and Life.
7) Valentine, D. H. 1972. Taxonomy, Phytogeography & Evolution.
8) Phil Gibson J. and Gibson Terri, R. 2006. Plant ecology.
9) Primack, R. B. 2006. Essentials of conservation biology.

10) Ricklefs, R. E. 2001. The Economy of Nature.
11)Narasaiah M. L., 2005. Biodiversity and Sustainable Development.
12)Tondon P, Abrol Y. P, Kumaria S., 2007. Biodiversity and its significance.
14) Krishnamurthy K. V. 2007. An Advanced Textbook on Biodiversity: Principles and Practice.
15) Christian Leveque and Jean-Claude Mounolou (2003). Biodiversity.
16) Jeffries Michael J. 2006. Biodiversity and conservation.

BOTANY: IV- SEMESTER- SOFT CORE 4.2
PROJECT WORK

BOTANY: IV- SEMESTER- SOFT CORE 4.1
SEED TECHNOLOGY

Theory-32 Hrs

Unit-1: Seed Technology: Introduction to seed science and technology and its goals; Development of seed technology industry in India; Seed as basic input in agriculture; Seed Biology - Seed development, morphology and anatomy of dicot and monocot seeds; Seed structure and functions; Seed programmes and organizations; Seed village concept, seed production agencies, seed industry and custom seed production in India; International Seed Science and Technology Organizations.

Unit-2:Seed Production: General principles of seed production in self and cross pollinated and vegetatively propagated crops; Hybrid seed production; Maintenance of inbred lines and breeders seeds; Synthetic and composite seeds; Improved seed and their identification; Germplasm banks; **Seed Processing**-Harvesting, seed drying, seed cleaning and grading; Equipments; Seed Storage- types of storage structure; seed factors affecting storage life, effect of storage on relative humidity, temperature and moisture; Seed deterioration; Seed treatment.

Unit-3: Seed Quality Testing: Devices and tools used in seed testing; ISTA and its role in seed testing; Seed sampling- physical purity and heterogeneity test; Seed moisture content-importance and determination and methods; Viability and vigour testing; Genetic purity testing -objective and criteria for genetic purity testing, seed health testing, field and seed standards, designated diseases, objectionable weeds; Significance of seed borne diseases, seed health testing and detection methods for seed borne fungi, bacteria, viruses and nematodes; Preparation and dispatch of seed testing reports, storage of guard samples, application and use of seed standards and tolerances.

Unit- 4: Seed Certification: Principles and philosophy of seed certification, purpose and procedures, national seed programme; National Seed Corporation (NSC) - agencies responsible for achieving self-reliance in seed production and supply of quality of seeds (State Seeds Corporation; National Seed Development Council (NSDC); Central Seed Committee(CSC) ; Seed market surveys, seed industry in relation to global market; Concept of WTO, GATT, IPR, Plant Variety Protection and its significance seed technology; UPOV and its role.

Practicals-32 Hrs

1) Determination of physical purity of seed samples.
2) Determination of density or weight per thousand seeds.
3) Determination of seed Heterogeneity.
4) Visual examination of dry seeds for disease symptoms.
5) Determination of moisture content by hot air oven method.
6) Seed viability test- TTC method.
7) Determination of seed germination by TP/BP/Sand method.
8) Evaluation of seedlings vigour by BP/Sand methods.
9) Seed vigour evaluation by (a) conductivity test (b) Hiltner's test (c) Performance test(d) Accelerated ageing test (e) Cold test.
10) Examination of suspensions obtained from washings of seed.
11) Infection sites studied by planting seed components.
12) Detection of seed-borne fungi and their characters of five seed borne pathogens. Vist: Visit to seed industries/seed companies/ seed research stations.

References:

1) ACAR.2009. Handbook of Agriculture. Indian Council of Agricultural Research, New Delhi.

2) ACAR.2013. Handbook of Horticulture. Indian Council of Agricultural Research, New Delhi.

3) Agarawal, P. K. 2005. Principles of Seed Technology.2nd edn. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.

4) Basra, A. S. 2006. Handbook of Seed Science and Technology, The Haworth Press, USA.

5) Copeland, L. O. and McDonald, M. B. 2001. Principles of Seed Science and Technology. 4th edn. Chapman & Hall.

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7) Michael, B. and Bewley, D. 2000. Seed technology and its biological basis. Wiley- Blackwell.

8) Neergaard, P. 2005. Seed Pathology, Palgrave, Macmillan, Denmark. Science, Technology and Uses. CABI, UK.

9) Vanangamudi, K., Natarajan, K., Saravanan, T., Natarajan, N., Umarani, R., Bharathi, A. and Srimathi, P. 2006. Advances in Seed Science and Technology: Vol: III: Forest Tree Seed Technology and Management, Agrobios, New Delhi.

BOTANY: IV- SEMESTER- SOFT CORE 4.2
SEED PATHOLOGY

Theory - 32 Hrs

Unit-1: Seed Pathology: Introduction, historical development, development of seed health testing; Reduction in crop yields loss in due to seed-borne diseases; Seed-borne pathogens **(**Fungi, Bacteria, Mycoplasma-like Organisms, fastidious Vascular Bacteria, Spiroplasmas, Viruses, Viroids, Nematodes); Location of seed-borne inoculums, histopathology of some seed-borne pathogens; Seed infection, mechanism of seed infection, seed infestation or contamination; Factors affecting seed infection; Longevity of seed-borne pathogens.

Unit-2: Seed transmission and inoculation, factors affecting seed transmission; Cultural practices, epidemiology and inoculum thresholds of seed-borne pathogens; Classification of seed-borne; Role of Seed-borne inoculum in disease development; Economic loss due to seed borne pathogens; Certification program; Seed health tests, Nonparasitic seed disorders; Deterioration of grains; Storage fungi, field and storage fungi; Invasion by storage fungi; effects of seed deterioration.

Unit-3: Detection of Seed-borne Diseases: Examination of dry seeds; Isolation of fungi, Bright-field microscopic examination, observation under UV light, measurement of gases, Determination of FAV, Moldy smell, collection of seed exudates; Immunoassays, ergosterol estimation; Avoiding damage to seeds during harvesting; Processing, threshing, storage conditions, reducing seed moisture to safe limits, seed treatment, resistance.

Unit-4: Mycotoxins - Fungi known to produce mycotoxins, Factors affecting mycotoxin production the effects and control of mycotoxins, storage conditions, sorting of grains, cultural operations, chemical treatment, biological control, detoxification, regulatory measures, use of resistant cultivars; Control of seed-borne pathogens; Selection of seed production areas; Crop management, crop rotation, isolation distances, rouging, biological control, chemical method, mechanical method, physical methods; Certification- certification standards, plant quarantine, national and international regulations.

Practicals-32 Hrs

1-5) Detection of seed-borne fungi and their identification.
6) Detection of Seed-borne bacteria.
6) Detection of seed-borne viruses.
7) Detection of seed-borne insects by egg-plug staining.
8) Detection seed-borne nematodes.
9) Effect of deterioration of grains by Storage Fungi.
10) Detection of seed-borne fungi by PCR.
11) Estimation of ergosterol by UV-visible Spectrophotometer.
12) Detection of mycotoxins by thin Layer chromatography.

References

1) Agarwal, V. K. and Sinclair, J. B. 1996. Principles of Seed Pathology, 2nd edn. CRC Press, Tayler and Francis, USA.
2) Neergaard, P. 1977. Seed Pathology. Vol. I..Macmillan Press, Cornell University, USA.
3) Agrios, G. N. 1994 -Plant Pathology 2nd edn. Academic Press, New York.
4) Mehrotra, R. S. 1983-Plant Pathology Tata Mc. Graw Hill Pub. Co. Ltd., New Delhi.

5) Rangaswamy, G. and Mahadevan, K. 2002. Diseases of Crop plants in India. Prentice Hall of India Private Limited New Delhi.
6) Agarawal, P. K. 2005. Principles of Seed Technology.2 nd edn. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.
7) Basra, A. S. 2006. Handbook of Seed Science and Technology, The Haworth Press, USA.
8) Copeland, L.A. 1995. Principles of Seed Science and Technology- Kluwer Academic Publishers, The Netherlands.
9) Vanangamudi, K., Natarajan, K., Saravanan, T., Natarajan, N., Umarani, R., Bharathi, A. and Srimathi, P. 2006. Advances in Seed Science and Technology: Vol: III: Forest Tree Seed Technology and Management, Agrobios, New Delhi.

BOTANY: IV- SEMESTER- SOFT CORE 4.3
BIO- ANALYTICAL TECHNIQUES

Theory-32 Hrs

Unit- 1: Spectroscopy: Principles of UV-Visible spectroscopy, chromophores and their interaction with UV-visible radiation and their utilization in structural, qualitative and quantitative analysis of drug molecules; Infrared Spectroscopy, Infrared radiation and its interaction with organic molecules, vibrational mode of bonds, instrumentation and applications, interpretation of IR spectra; FTIR and ATR, X-ray diffraction methods.

Unit-2: Nuclear Magnetic Resonance Spectroscopy: Magnetic properties of nuclei, field and precession, instrumentation and applications of NMR; Chromatographic techniques- Principles and applications- types- column, paper, thin layer and gas chromatography, HPLC, HPTLC, size exclusion chromatography, Affinity chromatography, Mass spectrometry, MALDI-TOF.

Unit-3: Electrophoresis: Principle and application of PAGE, SDS PAGE, immunostaining, immuno-electrophoresis, Iso-electric focusing, 2D electrophoresis Centrifugation- Principles, techniques of preparative and analytical centrifugation. Ultracentrifuges, molecular weight determination, sedimentation analysis, RCF. Microscopy- principles and applications of electron microscope (SEM and TEM), CryoEM, Preparations of specimen for electron microscopy- freeze drying, freeze etching, fixing, staining; confocal, fluorescent, flow cytometry - principles and applications.

Unit-4: Molecular Biology Techniques: Primer designing; Principles and applications of PCR; Blotting techniques; Hybridization techniques; Micro-array; Next Generation Sequencing- Nucleic acid sequencing.

Practicals-32 Hrs

1) Calibration of bio-analytical instruments.
2) Principles and instrumentation and applications of imaging techniques:
3) Separation of fatty acids/lipids by TLC/HPTLC.
4) Separation of proteins by PAGE, SDS- PAGE.
5) Agarose gel electrophoresis of DNA/RNA.
6) Immunoelectrophoresis
7) Agar gel diffusion, counter immuno electrophoresis.
8) Verification of Beer Lambert law with the U.V. spectrophotometer.
9) Demonstration of blotting techniques.
10) Performing PCR for amplification of ITS regions of fungi/ bacteria.

References

1) Braithwaite, A. and Smith, F.J. 1996. Chromatographic Methods. 5th edn. Blackie Academic & Professional London.
2) Budzikiewicz, H., Djerassi, C. and Williams, D.H. 1968. Mass Spectrometry of Organic Compounds. Holden-Day, San Francisco, CA
3) Harborne, J.B. 1984. Phytochemical Methods. 2nd edn. Chapman and Hall, London.
4) Harborne J.B. (1973) Phytochemical methods a guide to modern techniques of plants analysis. Chapman and Hall, London Ltd.

BOTANY: II SEMESTER - OPEN ELECTIVE 4.1
PLANT DIVERSITY AND HUMAN WELFARE

Theory-32 Hrs

Unit -1: Plant Diversity and Significance: Role of plant diversity in ameliorating energy crisis and global warming; Types of biodiversity-genetic diversity, species diversity, plant diversity at the ecosystem level; Agro-biodiversity and cultivated plant taxa, wild taxa; **Values and uses of Biodiversity-** Ethical and aesthetic values, precautionary principle, methodologies for valuation, uses of plants and microbes.

Unit -2: Loss of Biodiversity: Major causes of for biodiversity loss; Loss of genetic diversity, Loss of species diversity; Loss of ecosystem diversity; Loss of agro-biodiversity; Projected scenario for biodiversity loss; Management of Plant Biodiversity- Organizations associated with biodiversity management; Methodology for execution-IUCN, UNEP, UNESCO, WWF, NBPGR; Biodiversity legislation and conservations; Biodiversity information management and communication.

Unit -3: Conservation of Biodiversity: Conservation of genetic diversity, species diversity and ecosystem diversity, *In situ* and *ex situ* conservation, Social approaches to conservation, Biodiversity awareness programmes, Conservation of Heritage Trees.

Unit-4: Role of plants in relation to Human Welfare: Importance of forestry their utilization and commercial aspects, Avenue trees, Ornamental plants of India, Alcoholic beverages through ages, Fruits and nuts- Fruit crops of Karnataka and their commercial importance; Wood and its uses.

References:

1) Krishnamurthy K. V. 2007. An Advanced Textbook on Biodiversity: Principles and Practice. Oxford & IHB Publishing Co. Pvt. Ltd. New Delhi.
2) Christian Leveque and Jean-Claude Mounolou, 2003. Biodiversity. John Wiley & Sons Ltd, The Atrium, Southern Gate, Chichester, West Sussex PO19 8SQ, England.
3) Jeffries Michael J. 2006. Biodiversity and conservation, 2nd edn. Taylor and Francis Group, New York.

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE

(Autonomous)

B N ROAD, MYSURU- 570 025

DEPARTMENT OF MATHEMATICS

Syllabus

CHOICE BASED CREDIT SYSTEM

For B.Sc programmes

- **Physics, Mathematics, Chemistry**
- **Physics, Mathematics, Computer Science**
- **Physics, Mathematics, Electronics**
- **Physics, Mathematics, Computer Maintenance**

2017-18

PROGRAMME: BSc PCM, PROGRAMME CODE: BSc-01 (2017-18)

SL No	SEMESTER	Title of the paper	DSC/DSE/SEC	Course code	No. of Credits			Total Credits
					L	T	P	
1	I Semester	Differential Calculus	DSC-I	CMA 27001	4	0	2	6
2	II Semester	Differential Equations	DSC-II	CMB27001	4	0	2	6
3	III Semester	Real Analysis	DSC-III	CMC 27001	4	0	2	6
4	IV Semester	Algebra	DSC-IV	CMD 27001	4	0	2	6
5	V Semester	Linear Algebra	DSE-I	CME 27001	5	0	1	6
6	VI Semester	Complex Analysis	DSE-II	CMF 27001	5	0	1	6
7	V Semester/ VI Semester	Vector calculus	SEC	CMF 27201	2	0	0	0

PROGRAMME: BSc PMCS, PROGRAMME CODE: BSc-02 (2017-18)

SL No	SEMESTER	Title of the paper	DSC/DSE/SEC	Course code	No. of Credits			Total Credits
					L	T	P	
1	I Semester	Differential Calculus	DSC-I	CMA 27002	4	0	2	6
2	II Semester	Differential Equations	DSC-II	CMB27002	4	0	2	6
3	III Semester	Real Analysis	DSC-III	CMC 27002	4	0	2	6
4	IV Semester	Algebra	DSC-IV	CMD 27002	4	0	2	6
5	V Semester	Linear Algebra	DSE-I	CME 27002	5	0	1	6
6	VI Semester	Complex Analysis	DSE-II	CMF 27002	5	0	1	6
7	V Semester/ VI Semester	Vector calculus	SEC	CMF 27202	2	0	0	0

PROGRAMME: BSc PMCM, PROGRAMME CODE: BSc-03 (2017-18)

SL No	SEMESTER	Title of the paper	DSC/DSE/SEC	Course code	No. of Credits			Total Credits
					L	T	P	
1	I Semester	Differential Calculus	DSC-I	CMA 27003	4	0	2	6
2	II Semester	Differential Equations	DSC-II	CMB27003	4	0	2	6
3	III Semester	Real Analysis	DSC-III	CMC 27003	4	0	2	6
4	IV Semester	Algebra	DSC-IV	CMD 27003	4	0	2	6
5	V Semester	Linear Algebra	DSE-I	CME 27003	5	0	1	6
6	VI Semester	Complex Analysis	DSE-II	CMF 27003	5	0	1	6
7	V Semester/ VI Semester	Vector calculus	SEC	CMF 27203	2	0	0	0

PROGRAMME: BSc PME, PROGRAMME CODE: BSc-04 (2017-18)

SL No	SEMESTER	Title of the paper	DSC/DSE/SEC	Course code	No. of Credits			Total Credits
					L	T	P	
1	I Semester	Differential Calculus	DSC-I	CMA 27004	4	0	2	6
2	II Semester	Differential Equations	DSC-II	CMB27004	4	0	2	6
3	III Semester	Real Analysis	DSC-III	CMC 27004	4	0	2	6
4	IV Semester	Algebra	DSC-IV	CMD 27004	4	0	2	6
5	V Semester	Linear Algebra	DSE-I	CME 27004	5	0	1	6
6	VI Semester	Complex Analysis	DSE-II	CMF 27004	5	0	1	6
7	V Semester/ VI Semester	Vector calculus	SEC	CMF 27204	2	0	0	0

Scheme of Assessment:

Credits L:T:P	Percentage			Maximum marks in the Exam /Assessment			Exam Duration	
	Th	Pr	IA	Th	Pr	IA	Th	Pr
4:0:2	50	20	30	70	70	30	3h	3h
4:0:1	70	-	30	70	-	30	3h	-
2:0:0	70	-	30	50	-	30	2h	-

Note: L-Lecture, T-Tutorial, P-Practical; Th- Theory, Pr-Practical,

I A- Internal Assessment

Programme Outcome for Bachelor of Science in Physics, Chemistry, Mathematics:

After completing the graduation in the Bachelor of Science the students are able to:

PO1. Demonstrate proficiency in Mathematics and the Mathematical concepts needed for a proper understanding of Physics.

PO2. Demonstrate the ability to justify and explain their thinking and/or approach.

PO3. Develop state-of-the-art laboratory and professional communication skills.

PO4. Apply the scientific method to design, execute, and analyze an experiment

PO5. Explain scientific procedures and experimental observations.

PO6. Appreciate the role of chemistry in the society.

PO7. Use this as a basis for ethical behaviour in issues facing chemists /drugs.

PO8. Understand chemistry as an integral part for addressing social, economic, and environmental problems.

PO9. Understand the value of Mathematical proof .

PO10. Demonstrate proficiency in writing and understanding proofs.

PO11. Apply mathematical problems and solutions in aspects of science and technology.

PO12. Gain experience to investigate the real world problems

PO13. Apply mathematical ideas and models to those problems.

Programme Specific Outcome for Bachelor of Science in Physics, Chemistry, Mathematics

After completing the graduation in Physics, Chemistry and Mathematics the students are able to:

PSO1. Find career opportunities.

PSO2. Develop competence to write competitive examinations.

PSO3. Develop proficiency in the analysis of complex physical problems.

PSO4. Mathematical or other appropriate techniques to solve problems.

PSO5. Apply appropriate techniques for the qualitative and quantitative analysis of chemicals in laboratories and in industries.

PSO6. Create a hypothesis and appreciate how it relates to broader theories.

PSO7. Demonstrate skills in the use of Computers.

Programme Outcome for Bachelor of Science in Physics, Mathematics, Computer Science:

After completing the graduation in the Bachelor of Science the students are able to:

PO1. Demonstrate proficiency in Mathematics and the Mathematical concepts needed for a proper understanding of Physics.

PO2. Demonstrate the ability to justify and explain their thinking and/or approach.

PO3. Develop state-of-the-art laboratory and professional communication skills.

PO4. Apply the scientific method to design, execute, and analyze an experiment.

PO5. Explain scientific procedures and experimental observations.

PO6. Understand the value of Mathematical proof.

PO7. Demonstrate proficiency in writing and understanding proofs.

PO8. Apply mathematical problems and solutions in aspects of science and technology.

PO9. Gain experience to investigate the real world problems

PO10. Apply mathematical ideas and models to those problems.

PO11. Apply Mathematical principles for computing and logical design.

PO12. Design, implement, and evaluate a computational system to meet desired needs within realistic constraints.

PO13. Use the System principles in the design and development of software for systems of varying complexity.

Programme Specific Outcome for Bachelor of Science in Physics, Mathematics, Computer Science

After completing the graduation in the Bachelor of Science the students are able to:

PSO1. Find career opportunities.

PSO2. Develop competence to write competitive examinations.

PSO3. Develop proficiency in the analysis of complex physical problems.

PSO4. Mathematical or other appropriate techniques to solve problems.

PSO5. Create a hypothesis and appreciate how it relates to broader theories.

PSO6. Demonstrate skills in the use of Computers.

PSO7. Join as Entry level Technical job role for an IT Industry.

PSO8. Build small database ERP software/ web applications.

Programme Outcome for Bachelor of Science in Physics, Mathematics, Computer Maintenance:

After completing the graduation in the Bachelor of Science the students are able to:

PO1. Demonstrate proficiency in Mathematics and the Mathematical concepts needed for a proper understanding of Physics.

PO2. Demonstrate the ability to justify and explain their thinking and/or approach.

PO3. Develop state-of-the-art laboratory and professional communication skills.

PO4. Apply the scientific method to design, execute, and analyze an experiment.

PO5. Explain scientific procedures and experimental observations.

PO6. Understand the value of Mathematical proof.

PO7. Demonstrate proficiency in writing and understanding proofs.

PO8. Apply mathematical problems and solutions in aspects of science and technology.

PO9. Gain experience to investigate the real world problems

PO10. Apply mathematical ideas and models to those problems.

PO11. Design, implement, and evaluate a computational system to meet desired needs within realistic constraints.

PO12. Apply System design and development principles in the construction of software systems of varying complexity.

PO13. Apply the knowledge, techniques, skills, and modern tools in computer maintenance.

PO14. Understand networking applications to include basic electronics, programming, operation, and computer networks.

Programme Specific Outcome for Bachelor of Science in Physics, Mathematics, Computer Maintenance

After completing the graduation in the Bachelor of Science the students are able to:

PSO1. Find career opportunities.

PSO2.Develop competence to write competitive examinations

PSO3. Develop proficiency in the analysis of complex physical problems.

PSO4. Mathematical or other appropriate techniques to solve problems.

PSO5. Create a hypothesis and appreciate how it relates to broader theories.

PSO6. Demonstrate skills in the use of Computers.

PSO7. Start small enterprise in PC Maintenance/ Networking field.

PSO8. Join organizations related to Computer Hardware and Networking Maintenance.

Programme Outcome for Bachelor of Science in Physics, Mathematics, Electronics:

After completing the graduation in the Bachelor of Science the students are able to:

PO1. Demonstrate proficiency in Mathematics and the Mathematical concepts needed for a proper understanding of Physics.

PO2. Demonstrate the ability to justify and explain their thinking and/or approach.

PO3. Develop state-of-the-art laboratory and professional communication skills.

PO4. Apply the scientific method to design, execute, and analyze an experiment.

PO5. Explain scientific procedures and experimental observations.

PO6. Understand the value of Mathematical proof.

PO7. Demonstrate proficiency in writing and understanding proofs.

PO8. Apply mathematical problems and solutions in aspects of science and technology.

PO9. Gain experience to investigate the real world problems

PO10. Apply mathematical ideas and models to those problems.

PO11. Apply appropriate troubleshooting techniques to electronic circuits or systems and perform test procedures.

PO12. Assist, Assemble, modify and test electronic circuits in accordance with job requirements, f.

PO13. Communicate effectively in technical and non-technical environments.

Programme Specific Outcome for Bachelor of Science in Physics, Mathematics, Electronics

After completing the graduation in the Bachelor of Science the students are able to:

PSO1. Find career opportunities.

PSO2. Develop competence to write competitive examinations

PSO3. Develop proficiency in the analysis of complex physical problems.

PSO4. Mathematical or other appropriate techniques to solve complex physical problems.

PSO5. Create a hypothesis and appreciate how it relates to broader theories.

PSO6. Demonstrate skills in the use of Computers for control, data acquisition, and data analysis in experimental investigations.

PSO7. Apply knowledge of Physics, Mathematics and Electronics fundamentals to solve problems in electronic circuits & communication systems.

PSO8. Apply appropriate troubleshooting techniques to electronic circuits or systems and perform test procedures.

SEMESTER -I

Course code: CMA27001/ CMA27002/ CMA27003/ CMA27004

Credits: Theory – 04, Practical – 02 **Theories: 60 Lectures**

COURSE OUTCOME:

After successful completion of the course, the student is able to

CO1. Learn in details with examples curvature
CO2. Learn in depth applications of taylor's theorem
CO3. Understand the details of mean value theorems
CO4. Learn the details of linear approximation theorem
CO5. Understand in details with examples partial derivatives
CO6. Specify in details with examples asymptotes
CO7. Identify the classification and characteristics of envelopes
CO8. Deliberate the details of maxima and minima
C09. Understand in details with examples indeterminate forms

DSC I: Differential Calculus

Unit I : Limit and Continuity (ε and δ definition), Types of discontinuities, Differentiability of functions, Successive differentiation, Leibnitz's theorem, Partial differentiation, Euler's theorem on homogeneous functions.

Unit II: Linear Approximation theorem, Tangents and normals, Monotone functions, Maxima and Minima, Curvature, Radius of curvature, Centre of curvature , Evolutes

Unit III : Rolle's theorem, Mean Value theorems, Taylor's theorem with Lagrange's and Cauchy's forms of remainder, Taylor's series, Maclaurin's series of sinx, cosx, e^x, log(l+x), $(1+x)^m$, Maxima and Minima, Indeterminate forms.

Unit IV: Asymptotes, Envelopes, Singular points – Multiple points – Cusp, Node and conjugate points, Orthogonal Trajectories, Tracing of curves,

Reference Books:

1. Frank Ayres and Elliott Mendelson, Schaum's Outline of Calculus, 5th ed.USA: Mc. Graw Hill., 2008.
2. G B Thomas and R L Finney, Calculus and analytical geometry, Addison Wesley, 1995.
3. H.Anton,I.Birens and S. Davis,Calculus,John Wiley and Sons, Inc.,2002
4. J Edwards, An elementary treatise on the differential calculus: with Applications and numerous example, Reprint. Charleston, USA BiblioBazaar, 2010.

5. Lipman Bers – Calculus, Volumes 1 and 2
6. N. Piskunov – Differential and Integral Calculus
7. N P Bali, Differential Calculus, India: Laxmi Publications (P) Ltd.., 2010.
8. Serge Lang – First Course in Calculus
9. S Narayanan & T. K. Manicavachogam Pillay, Calculus.:S. Viswanathan Pvt. Ltd., vol. I & II 1996.
10. Shanthi Narayan and P K Mittal, Differential Calculus, Reprint. New Delhi: S Chand and Co. Pvt. Ltd., 2014.

PRACTICAL COMPONENT-1

1. Introduction to Scilab.
2. Operators; trigonometric, inverse trigonometric functions in scilab.
3. Plotting of standard Cartesian curves using Scilab.
4. Plotting of standard polar curves using Scilab.
5. Plotting of standard parametric curves using Scilab.
6. Introduction to Maxima.
7. Creating variables, functions.
8. Creating a Maxima program (simple examples, loops, control sequence).
9. Differentiation and integration using maxima inbuilt functions.
10. Plotting of standard curves- Cartesian, Polar using Maxima.
11. Plotting of standard parametric curves using Maxima.
12. Geometrical meaning of Rolle's theorem of the functions on the given interval.
13. To verify Rolle's theorem , Lagrange's theorem and cauchy's mean value theorem
14. Finding Taylor's theorem for a given function.
15. To illustrate left hand and right hand limits for discontinuous functions.
16. To illustrate continuity of a function.
17. To illustrate differentiability of a function.

SEMESTER-II

Course code: CMB27001/ CMB27002/ CMB27003/ CMB27004

Credits: Theory – 04, Practical – 02 **Theories: 60 Lectures**

COURSE OUTCOME:

After successful completion of the course, the student is able to

CO1. Understand in depth variable separable

CO 2. Specify the characteristics of homogeneous equations

CO3. Identify the details of exact equation

CO4. Learn in depth simultaneous differential equations

CO5. Write down in depth total differential equation

CO6. Identify in depth linear non homogeneous equations

CO7. Write down in depth linear partial differential equation

CO8. Deliberate the characteristics of lagrange's method

DSC II: Differential Equations

Unit I: Linear differential equations of First order, Separation of variables, Equations with homogeneous coefficients, Exact differential equations, Linear differential equations of the form $\frac{dy}{dx}+Py=Q$, Integrating factors, rules to find an integrating factor ,Bernoulli's Equations, Equations with coefficients linear in x and y.

Unit II: First order higher degree equations solvable for x, y, p, Clairaut's form. Methods for solving higher-order differential equations. Basic theory of linear differential equations, Wronskian, and its properties. Solving a differential equation by reducing its order, Simultaneous differential equations and Total differential equations.

Unit III: Linear homogenous equations with constant coefficients, Linear non-homogenous equations, The method of variation of parameters, Exact equations, Inverse Differential operators, The Cauchy-Euler equation.

Unit IV: Order and degree of partial differential equations, Concept of linear and non-linear partial differential equations, Formation of first order partial differential equations, Linear partial differential equation of first order, Lagrange's method, Charpit's method.

Reference Books:

1. Daniel A Murray – Introductory Course to Differential equations
   Earl David Rainville and Philip Edward Bedient – A short course in Differential equations, Prentice Hall College Div; 6th edition.
2. M D Raisinghania, Advanced Differential Equations, S Chand and Co. Pvt. Ltd., 2013.
   F.Ayres, Schaum's outline of theory and problems of Differential Equations, 1st ed. USA McGraw-Hill, 2010
3. S Narayanan and T K Manicavachogam Pillay, Differential Equations .: S V Publishers Private Ltd., 1981.
4. G F Simmons, Differential equation with Applications and historical notes, 2nd ed.: McGraw-Hill Publishing Company, Oct 1991.
5. G. Stephonson – An introduction to Partial Differential Equations.
6. B. S. Grewal – Higher Engineering Mathematics
   E. Kreyszig – Advanced Engineering Mathematics
7. E. D. Rainville and P E Bedient – A Short Course in Differential Equations
8. D. A Murray – Introductory Course in Differential Equations.
9. G. P. Simmons – Differential Equations
10. F. Ayres – Differential Equations (Schaum Series)
11. Martin Brown – Application of Differential Equations.
12. Shepley L.Ross,Differential Equations, 3rd Ed,John Wiley and Sons,1984.

PRACTICAL COMPONENTS-II

1. Obtaining partial derivatives of some standard functions
2. Solution of Differential equation and plotting the solution-I
3. Solution of Differential equation and plotting the solution-II
4. Solution of Differential equation and plotting the solution-III
5. Solution of Differential equation and plotting the solution-IV
6. Finding complementary function and particular integral of constant coefficient second and higher order ordinary differential equations.
7. Solving second order linear partial differential equations in two variables with constant coefficient.

8. Solutions to the problems on total and simultaneous differential equations.
9. Solutions to the problems on different types of partial differential equations.
10. Solution of Cauchy problem for first order partial differential equation.
11. Plotting the characteristics for the first order partial differential equation.
12. Plot the integral surfaces of a given first order partial differential equation with initial data.

SEMESTER III

Course code: CMC27001/ CMC27002/ CMC27003/ CMC27004

Credits: Theory – 04, Practical – 02 **Theories: 60 Lectures**

COURSE OUTCOMES:

After successful completion of the course, the student is able to

CO1. Deliberate in details with examples finite and infinite sets

CO2. Identify the details of countable and uncountable sets

CO3. Specify the details of sequence

CO4. Learn the characteristics of infinite series

CO5. Deliberate in details with examples comparison test

CO6. Identify the characteristics of sequence and series of function

CO7. Learn the details of uniform convergence

CO8. Understand in details with examples power series and radius of convergence.

DSC III: **Real Analysis**

Unit I: Finite and infinite sets, examples of countable and uncountable sets.Real line, bounded sets, supremum and infimum, completeness property of R, Archimedean property of R, intervals. Concept of cluster points and statement of Bolzano-Weistrass theorem.

Unit II: Real Sequence, Bounded sequence, Cauchy convergence criterion for sequences. Cauchy's theorem on limits, order preservation and squeeze theorem, monotone sequences and their convergence .

Unit III: Infinite series. Cauchy convergence criterion for series, positive term series, geometric series, comparison test, convergence of p-series, Root test, Ratio test, alternating series, Leibnitz's test , Definition and examples of absolute and conditional convergence.

Unit IV: Sequences and series of functions, Point wise and uniform convergence. Mn-test, M-test, Statements of the results about uniform convergence and integrability and differentiability of functions, Power series and radius of convergence.

Reference Books:

1. S.C Malik –Real Analysis
2. Murray R Speigel – Laplace Transforms
3. S.C.Malik and Savita Arora, *Mathematical Analysis*, 2nd ed. New Delhi, India: New Age international (P) Ltd., 1992
4. Richard R Goldberg, Methods of Real Analysis, Indian ed.
5. Asha Rani Singhal and M .K Singhal, A first course in Real Analysis
6. E.Kreyszig- Advanced Engineering Mathematics, Wiely India Pvt. Ltd.
7. Raisinghania M. D., Laplace and Fourier Transforms S. Chand publications.

Practical components-III

1. Illustration of convergent, divergent and oscillatory sequences.
2. Plotting of recursive sequences.
3. Study of convergence of sequences through plotting
4. Illustration of convergent, divergent and oscillatory series.
5. To study the convergence and divergence of infinite series by plotting their sequences of partial sums.
6. Using Cauchy's criterion on the sequence of partial sums of the series to determine convergence of series.
7. Cauchy's root test by plotting n^{th} roots.
8. Ratio test by plotting the ratio of n^{th} and $(n+1)^{th}$ terms.

9. Testing the convergence of binomial, exponential and logarithmic series and finding the sum.
10. To find the sum of the series and it's radius of convergence.

SEMESTER IV

CMD27001/ CMD27002/ CMD27003/ CMD27004

(Credits: Theory-04, Practicals-02) **Theory: 60**

Lectures

COURSE OUTCOMES:

After successful completion of the course, the student is able to

CO1. Understand in details with examples abelian group

CO2. Identify in details with examples permutation group

CO3. Learn the details of subgroups

CO4. Identify the classification and characteristics of cosets

CO5. Specify the details of commutative ring

CO6. Write down in depth ideals

CO7. Deliberate the characteristics of integral domains and fields

CO8. Write down in details with examples homomorphism

DSC IV: Algebra

Unit I: Definition and examples of groups, examples of abelian and non-abelian groups, the group Zn of integers under addition modulo n and the group U(n) of units under multiplication modulo n. Cyclic groups from number systems, complex roots of unity, cyclic group, groups of symmetries ,the permutation group , Group of quarter nion's.

Unit II: Subgroups, cyclic subgroups, the concept of a subgroup generated by a subset and the commutator subgroup of group, examples of subgroups including the center of a group. Cosets, Index of subgroup, Lagrange's theorem, order of an element, Normal subgroups: their definition, examples, and characterizations, Quotient groups.

Unit III: Definition and examples of rings, examples of commutative and non- commutative rings: rings from number systems, Zn the ring of integers modulo n, ring of real quaternion's, rings of matrices, polynomial rings, and rings of continuous functions. Sub rings and ideals.

Unit IV: Integral domains and fields, examples of fields: Zp, Q, R, and C. Field of rational functions. Homeomorphisms', Isomorphism'.

Reference Books :

1. Natarajan, Manicavasagam Pillay and Ganapathy – Algebra
2. I. N. Herstien – Topics in Algebra.
3. Joseph Gallian – Contemporary Abstract Algebra, Narosa Publishing House, New Delhi, Fourth Edition.
4. G. D. Birkhoff and S Maclane – A brief Survey of Modern Algebra.
5. J B Fraleigh – A first course in Abstract Algebra.
6. Michael Artin – Algebra, 2nd ed. New Delhi, India: PHI Learning Pvt. Ltd., 2011.
7. Vashista, A First Course in Modern Algebra, 11th ed.: Krishna Prakasan Mandir, 1980.
8. R Balakrishan and N.Ramabadran, A Textbook of Modern Algebra, 1st ed. New Delhi, India: Vikas publishing house pvt. Ltd., 1991.
9. T. K. Manicavasagam Pillai and K S Narayanan – Modern Algebra Volume 2

Practical component-IV

1. Verifying whether a given operator is binary or not.
2. To find identity element of a group.
3. To find inverse element of a group.
4. Finding all possible subgroups of a finite group.
5. Examples to verify Lagrange's theorem.

6. Illustrating homomorphism and isomorphism of groups.
7. Verification of normality of a given subgroup.
8. Verifying Cayley's theorem and isomorphism theorems.
9. Examples for finding left and right coset and finding the index of a group.
10. Examples on different types of rings.
11. Examples on integral domains and fields.
12. Examples on subrings, ideals and subrings which are not ideals.
13. Homomorphism and isomorphism of rings – illustrative examples.
14. Solving polynomial equations.
15. Findind G.C.D of polynomials.
16. Finding units and associates.
17. Test for rational roots.

SEMESTER V

CME 27001/CME27002/CME27003/CME27004

(Credits: Theory-04, Practicals-02) **Theory: 60 Lectures**

COURSE OUTCOMES:

After successful completion of the course, the student is able to

CO1. Understand the details of vector space

CO2. Specify the characteristics of dimension of subspaces

CO3. Write down the characteristics of euclidean vectorspace

CO4. Understand the details of orthogonal projection

CO5. Learn in depth linear transformations

CO6. Understand in details with examples rank and nullity

CO7. Learn in details with examples eigen values and eigen vectors

CO8. Write down the characteristics of isomorphism, automorphism theorems

DSE I: Linear Algebra

Unit I: Vector spaces, subspaces, algebra of subspaces, quotient spaces, linear combination of vectors, linear span, linear independence, basis and dimension, dimension of subspaces, Direct sum of two subspaces.

Unit II: Inner Product, Inner Product of any two vectors in V (R), Euclidean Vectorspace, Orthogonal Vectors, Ortho normal Basis, Orthogonal Projection, Orthogonal Compliment.

Unit III: Linear transformations, algebra of linear transformations , matrix representation of a linear transformation, null space, range, rank and nullity of a linear transformation,

Unit IV: Eigen values and Eigen vectors, Characteristic Polynomial. Isomorphism, Auto morphism, theorems, invertibility of non singular linear transformation, change of coordinate matrix.

Reference Books:

1. I. N. Herstien – Topics in Algebra.
2. Stewart – Introduction to Linear Algebra
3. S. Kumaresan – Linear Algebra
4. G. D. Birkhoff and S Maclane – A brief Survey of Modern Algebra.
5. Gopalakrishna – University Algebra
6. Saymour Lipschitz – Theory and Problems of Linear Algebra.
7. S.C Mallik –Real Analysis.
8. B.S Grewal – Higher engineering mathematics.

Practical components –V

Credit :2 Hour: 4 Hour per week

1. Vector space, subspace – illustrative examples.
2. Expressing a vector as a linear combination of given set of vectors.
3. Examples on linear dependence and independence of vectors.

4. Basis and Dimension – illustrative examples.
5. Verifying whether a given transformation is linear.
6. Finding matrix of a linear transformation.
7. Problems on rank and nullity.
8. Find characteristics polynomials.
9. To find Eigen values and their multiplicity.
10. Calculation of Eigen vector.
11. Change of basis.
12. Linear transformations to matrices and vice versa.
13. Matrix with respect to change of basis.
14. Orthogonal and orthonormal sets.
15. Gram- Schmidt orthogonalisation of the columns.

SEMESTER VI

CMF 27001/CMF27002/CMF27003/CMF27004

\(Credits: Theory-04, Practicals-02) **Theory: 60 Lectures**

COURSE OUTCOMES:

After successful completion of the course, the student is able to

CO1. Understand the details of complex numbers

CO2. Write down the details of Cauchy-Riemann equations

CO3. Deliberate the characteristics of analytic function

CO4. Understand in depth harmonic function

CO5. Write down the characteristics of Cauchy integral formula

CO6. Identify the details of the fundamental theorem of algebra

CO7. Write down in depth bilinear transformations

CO8. Deliberate in depth conformal mapping

DSE II: Complex Analysis

Unit I: Complex numbers, Polar and exponential form of complex numbers, Triangular inequality, Geometry of complex numbers, Equations of lines and circles in complex form ,Functions of complex variables, Limits, Limits involving the point at infinity, continuity. Properties of complex numbers, regions in the complex plane, Derivatives, differentiation formulas, Cauchy-Riemann equations, sufficient conditions for differentiability.

Unit II: Analytic functions, examples of analytic functions, exponential function, Logarithmic function, trigonometric function, Harmonic functions, Construction of Analytic functions.

Unit III: Definite integrals of functions. Contours, Contour integrals and its examples, upper bounds for moduli of contour integrals. Cauchy-Goursat theorem, Cauchy integral formula, Cauchy's inequality, Liouville's theorem and the fundamental theorem of algebra. Convergence of sequences and series.

Unit IV: Linear and Bilinear Transformations, Cross ratio of four points , Conformal mapping, Transformations of the form $z^2, \frac{1}{z}, sinz, cosz, e^z, \sinh z, \cosh z\ etc$,Laurent series and its examples, Poles and residues.

Reference Books:

1. L. V. Ahlfors – Complex Analysis
2. Bruce P. Palica – Introduction to the Theory of Function of a Complex Variable
3. Serge Lang – Complex Analysis
4. Shanthinarayan – Theory of Functions of a Complex Variable
5. S. Ponnuswamy – Foundations of Complex Analysis
6. R. P. Boas – Invitation to Complex Analysis.
7. R V Churchil & J W Brown, Complex Variables and Applications,5th ed.:McGraw Hill Companies., 1989.
8. A R Vashista, Complex Analysis, Krishna Prakashana Mandir, 2012.

Practical components -VI

1. Declaring a complex number and graphical representation.

2. Complex numbers and their representations, operations like addition, multiplication, division, modulus, graphical representations of polar form.
3. To plot the complex functions and analyze the graph

   (i)f(z)= z, (ii) $f(z) = z^3$, (iii) $f(z) =(z^4- 1)^{1/4}$
4. Some problems on Cauchy – Riemann equations (polar forms).
5. Implementation of Milne – Thomson method of constructing analytic functions (simple examples).
6. Illustrating orthogonality of the surfaces obtained from the real and imaginary parts of an analytic function.
7. Verifying real and imaginary parts of an analytic function being harmonic (in polar coordinates)
8. Examples connected with Cauchy's integral theorem.
9. To compute the poles and corresponding residues of complex functions.
10. Illustrating the angle preserving property in a transformation.
11. Illustrating the circles are transformed to circles by a bilinear transformation.
12. To perform conformal mapping and bilinear transformations.

Vector Calculus

CMF 27201/CMF27202/CMF27203/CMF27204

(Credits: Theory-04) **Theory: 60**

Lectures

COURSE OUTCOMES:

After successful completion of the course, the student is able to

CO1. Learn the characteristics of differentiation of vector function.

CO2. Deliberate the characteristics of cross product

CO3. Specify in details with examples dot product

CO4. Write down the characteristics of gradient

CO5. Understand the characteristics of divergence

CO6. Specify in depth curl

Skill Enhancement Course (SEC - II)

Unit I: Differentiation and partial differentiation of a vector function. Derivative of sum, dot product and cross product of two vectors.

Unit II: Gradient, divergence and curl, Standard derivations and Exercise ,

Reference Books:

1. Murray R Spiegel – Theory and problems of vector calculus.
2. Shanthinarayan and J N Kapur – A text book of Vector calculus.
3. B.S Grewal – Higher engineering mathematics.
4. Shanthi Narayan and P K Mittal, Differential Calculus, Reprint. New Delhi: S Chand and Co. Pvt. Ltd., 2014.

Question Paper Pattern
Mathematics

Time: 3 Hours Max. Marks: 70

Section – A

I. Answer any five questions. **5 x2 = 10**

1.
2.
3.
4.
5.
6.
7.
8.

Section – B

II. Answer any three questions. **3 x 5 = 15**

1.
2.
3.
4.
5.

III. Answer any three questions. **3 x 5 = 15**

1.
2.
3.
4.
5.

IV. Answer any three questions. **3 x 5 = 15**

1.
2.
3.
4.
5.

V. Answer any three questions. **3 x 5 = 15**

1.
2.
3.
4.
5.

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE
(An autonomous College of University of Mysuru)
Re-accredited by NAAC with 'A' grade
Ooty road, Mysuru-570 025, Karnataka

ESTD-1964

CHOICE BASED CREDIT SYSTEM
CONTINUOUS ASSESSMENT GRADING PATTERN
(CBCS-CGPA)

B. Sc., DEGREE SYLLABUS (CBCS)

MICROBIOLOGY

(**Amended syllabus to be implemented W. E. F. (2020 – 2021)**

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE, OOTY ROAD, MYSURU-25
DEPARTMENT OF MICROBIOLOGY
PROFORMA OF INSTRUCTIONS AND EXAMINATION FOR B.Sc. PROGRAMME IN MICROBIOLOGY (CBCS)
DURATION OF THE COURSE: 3YEARS (6SEMESTER)
PROGRAMME:BScBMBt, PROGRAMME CODE:BSc06 (2017-18)

Year	Semester	Course code & Core course	Title of the paper	Lecture + Practicals hours per week	No. of credits			Total credits	Total hours		Percentage			Maximum Marks in exam/Assessment			Exam Duration	
					L	T	P		Th	Pr	Th	Pr	IA	Th	Pr	IA	Th	Pr
I B.Sc	I	**CMA28006** DSC-I :Theory	Introduction to Microbiology and Microbial diversity	04	4	-	2	**06**	60	60	50	20	30	70	70	30	3h	3h
		DSC-I: Pract-I	Introduction to Microbiology and Microbial diversity: Based on theory	04														
	II	**CMB28006** DSC-II: Theory	Bacteriology	04	4	-	2	**06**	60	60	50	20	30	70	70	30	3h	3h
		DSC-II: Pract-II	Bacteriology: Based on theory	04														
II B.Sc	III	**CMC28006** DSC-III:Theory	Microbial Physiology and Metabolism	04	4	-	2	**06**	60	60	50	20	30	70	70	30	3h	3h
		DSC-III: PractIII	Microbial Physiology and Metabolism Based on theory	04														
	IV	**CMD28006** DSC-IV: Theory	Microbial Genetics and Genetic Engineering	04	4	-	2	**06**	60	60	50	20	30	70	70	30	3h	3h
		DSC-IV: Pract-IV	Microbial Genetics and Genetic Engineering Based on theory	04														
III B.Sc.	V	**CME28006 / CME28206** DSE-V: Theory	No. of courses:1 DSE- A: Environmental Microbiology DSE-B: Agricultural Microbiology	04	4	-	1	**5**	60	45	50	20	30	70	70	30	3h	3h
		DSE- V:Pract-V	Based on theory	02														
		CME28406/ CME28606 SEC	No. of courses:1 SEC-A : Microbial diagnosis in health clinics SEC-B: Microbial analysis of Air and water	02	2	-	-	**02**	30	-	70	-	30	50	-	30	2h	--
	VI	**CMF28006/ CMF28206** DSE-VI: Theory	No. of courses:1 DSE-A:Industrial and Food Microbiology DSE -B : Medical Microbiology and immunology	04	4	-	1	**5**	60	45	50	20	30	70	70	30	3h	3h
		DSE-VI: Pract-VI	Based on theory	02														
				Total credits				**36**										

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE, OOTY ROAD, MYSURU-25
DEPARTMENT OF MICROBIOLOGY
PROFORMA OF INSTRUCTIONS AND EXAMINATION FOR B.Sc. PROGRAMME IN MICROBIOLOGY (CBCS)
DURATION OF THE COURSE: 3YEARS (6SEMESTER)
PROGRAMME:BScBBM, PROGRAMME CODE:BSc07 (2017-18)

Year	Semester	Course code & Core course	Title of the paper	Lecture + Practicals hours per week	No. of credits			Total credits	Total hours		Percentage			Maximum Marks in exam/Assessment			Exam Duration	
					L	T	P		Th	Pr	Th	Pr	IA	Th	Pr	IA	Th	Pr
I B.Sc	**I**	**CMA28007** DSC-I :Theory	Introduction to Microbiology and Microbial diversity	04	4	-	2	**06**	60	60	50	20	30	70	70	30	3h	3h
		DSC-I: Pract-I	Introduction to Microbiology and Microbial diversity: Based on theory	04														
	II	**CMB28007** DSC-II: Theory	Bacteriology	04	4	-	2	**06**	60	60	50	20	30	70	70	30	3h	3h
		DSC-II: Pract-II	Bacteriology: Based on theory	04														
II B.Sc	**III**	**CMC28007** DSC-III:Theory	Microbial Physiology and Metabolism	04	4	-	2	**06**	60	60	50	20	30	70	70	30	3h	3h
		DSC-III: PractIII	Microbial Physiology and Metabolism Based on theory	04														
	IV	**CMD28007** DSC-IV: Theory	Microbial Genetics and Genetic Engineering	04	4	-	2	**06**	60	60	50	20	30	70	70	30	3h	3h
		DSC-IV: Pract-IV	Microbial Genetics and Genetic Engineering Based on theory	04														
III B.Sc.	**V**	**CME28007 / CME28207** DSE: Theory	No. of courses:1 DSE- A: Environmental Microbiology DSE-B: Agricultural Microbiology	04	4	-	1	**5**	60	45	50	20	30	70	70	30	3h	3h
		DSE- V:Pract-V	Based on theory	02														
		CME28407/ CME28607 SEC	No. of courses:1 SEC-A : Microbial diagnosis in health clinics SEC-B: Microbial analysis of Air and water	02	2	-	-	**02**	30	-	70	-	30	50	-	30	2h	--
	VI	**CMF28007/ CMF28207** DSE: Theory	No. of courses:1 DSE-A:Industrial and Food Microbiology DSE -B : Medical Microbiology and immunology	04	4	-	1	**5**	60	45	50	20	30	70	70	30	3h	3h
		DSE Pract-VI	Based on theory	02														
				Total credits				**36**										

B.Sc., Microbiology

DEPARTMENT OF MICROBIOLOGY

PROGRAMME: BSc BMBT

PROGRAMME CODE: BSC06

PROGRAMME OUTCOMES: B.Sc., BMBT

After completing the graduation in the Bachelor of Science the students are able to:

PO1. Demonstrate the ability to justify and explain their thinking and/or approach, both written and oral. Demonstrate the ability to present clear, logical and succinct arguments, including prose and mathematical language. Write and speak using professional norms, and demonstrate an ability to collaborate effectively.

PO2. Develop state-of-the-art laboratory skills and professional communication skills.

PO3. Apply the scientific method to design, execute, and analyze an experiment and also to explain their scientific procedures as well as their experimental observations.

PO4. Demonstrate an understanding of fundamental biochemical principles, structure and biological function of biomolecules, metabolic pathways and their regulation.

PO5. Work as a laboratory technician, biochemists or medical scientist.

PO6. Possess knowledge of ethical practices in science.

PO7. Describe/ explain the processes used by microorganisms for their replication, survival, and interaction with their environment and host populations.

PO8. Explain the theoretical basis of the tools, technologies and methods common to microbiology.

PO9. Apply the scientific method as a demonstration that they understand its application furthering our knowledge of the microbial world.

PO10. Design and develop solution to Biotechnology problems by applying appropriate tools while keeping in mind safety factor for environmental & society.

PO11. Create, select, and apply appropriate techniques, resources, and modern tools including prediction and modelling to different activities with an understanding of the limitations.

PO12. Support biotechnology research activity with strong technical background knowledge.

B.Sc., Microbiology

PROGRAMME: BSc BBM

PROGRAMME CODE: BSC07

PROGRAMME OUTCOMES: B.Sc., BBM

After completing the graduation in the Bachelor of Science the students are able to:

PO1. Identify the taxonomic position of plants using principles and methods of nomenclature and classification in Botany.

PO2. Understand the impact of the plant diversity in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO3. Use interdisciplinary approaches with quantitative skills to work on biological problems.

PO4. Demonstrate the ability to justify and explain their thinking and/or approach, both written and oral. Demonstrate the ability to present clear, logical and succinct arguments, including prose and mathematical language. Write and speak using professional norms, and demonstrate an ability to collaborate effectively.

PO5. Develop state-of-the-art laboratory skills and professional communication skills.

PO6. Apply the scientific method to design, execute, and analyze an experiment and also to explain their scientific procedures as well as their experimental observations.

PO7. Demonstrate an understanding of fundamental biochemical principles, structure and biological function of biomolecules, metabolic pathways and their regulation.

PO8. Work as a laboratory technician, biochemists or medical scientist.

PO9. Possess knowledge of ethical practices in science.

PO10. Describe/ explain the processes used by microorganisms for their replication, survival, and interaction with their environment, hosts, and host populations.

PO11. Explain the theoretical basis of the tools, technologies and methods common to microbiology.

PO12. Apply the scientific method as a demonstration that they understand its application furthering our knowledge of the microbial world.

B.Sc., Microbiology

DEPARTMENT OF MICROBIOLOGY
PROGRAMME: BSc BMBt
PROGRAMME CODE:BSC06
PROGRAMME SPECIFIC OUTCOME: B.Sc., BMBt

After completing the graduation in the Bachelor of Science the students are able to;

PSO 1: Gain and understanding of biochemical and molecular processes that occur in and between cells to expand understanding of biology

PSO2: Be knowledgeable in proper procedures and regulations in handling and disposal of chemicals.

PSO3: Communicate scientific information effectively, especially relating to microbes and their role in ecosystem and health related issues.

PSO4: Acquire, articulate, retain and demonstrate laboratory safety skills applicable to microbiological research or clinical methods, including accurately reporting observations and analysis.

PSO5: Demonstrate effectively the applications of biochemical and biological sciences

PSO6: Decide and apply appropriate tools and techniques in biotechnological manipulation.

POS7: Justify societal, health, safety and legal issues and understand his or her responsibilities in biotechnological practices.

PROGRAMME: BSc BBM

PROGRAMME CODE:BSC07

PROGRAMME SPECIFIC OUTCOME: B.Sc., BBM

After completing the graduation in the Bachelor of Science the students are able to;

PSO 1: Demonstrate effectively the applications of biochemical and biological sciences.

PSO2: Inculcating proficiency in all experimental techniques and methods of analysis.

PSO3: Acquire, articulate, retain and demonstrate laboratory safety skills applicable to microbiological research or clinical methods, including accurately reporting observations and analysis.

PSO4: Communicate scientific information effectively, especially relating to microbes and their role in ecosystem and health related issues.

PSO5: Be knowledgeable in proper procedures and regulations in handling and disposal of chemicals.

PSO6: Gain and understanding of biochemical and molecular processes that occur in and between cells to expand understanding of biology

B.Sc., Microbiology

DSC-I

I B.Sc., I SEMESTER

TITLE: INTRODUCTION TO MICROBIOLOGY AND MICROBIAL DIVERSITY

60hrs (4hrs/week) (THEORY) credits: 4

COURSE CODE-CMA28006 / CMA28007

Course outcome:

After successful completion of this course students are able to:

CO1: Gain basic knowledge about Microbiology starting from history to Microorganisms.

CO2: An entire picture about the taxonomical classification of Microbes.

CO3: Understand the basic microbial structure, function and study of the comparative characteristics of prokaryotes and eukaryotes.

CO4: Understand the structural similarities and differences among various physiological groups of fungi, protozoa and algae.

CO5: Know how viruses are classified and understand the structure of viruses.

CO6: Know the replication strategies of representative viruses.

UNIT: I No. of Hours: 15

HISTORY OF DEVELOPMENT OF MICROBIOLOGY

A. Milestones in the historical development of Microbiology. Germ theory of disease, Development of various microbiological techniques. Golden era of microbiology: Contributions of Anton von Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Alexander Fleming.

B. Development in the field of Soil Microbiology: Contributions of Martinus W. Beijerinck, Sergei N. Winogradsky and Selman A. Waksman.

C. Development in the fields of Medical Microbiology and Immunology: Contributions of Paul Ehrlich, Elie Metchnikoff and Edward Jenner.

D. Recent developments in the field of Microbiology.

E. Branches of Microbiology.

F. Scope of Microbiology

UNIT: II No. of Hours: 15

MICROBIAL DIVERISITY

A. Systems of classification

Definition of taxonomy and systematics. Taxonomic ranks. Classification systems - artificial and phylogenetic. Numerical taxonomy. System of classification: Haeckel's three- kingdom, Whittaker's five-kingdom classification and Cavalier-Smith's eight kingdom classification.

General characteristics of different groups – a. Acellular microorganisms: Virus, Viroids, Prions. b. Cellular microorganisms: Bacteria, Algae, Fungi and Protozoa

Difference between prokaryotic and eukaryotic microorganisms.

B. **Algae**

a. History of phycology with emphasis on contributions of Indian scientists; Ghosh, M.O.P. Iyengar, T.V. Desikachary, Y. Bhardwaja, M. S. Randhawa and R. N. Singh (in brief).

b. Structure of typical algal cell (E.g: *Chlamydomonas*) - occurence, thallus organization, Pigments, flagella, eyespot, food reserves and vegetative, asexual and sexual reproduction.

c. Outline classification (Fritsch, 1935).

d. Study of thallus structure, reproduction and economic importance of the following: *Chlorella, Spirogyra,* Diatoms and *Gracilaria*

UNIT: III **No. of Hours: 15**

FUNGI AND PROTOZOA

A. Fungi

a. Historical development of Mycology including significant contributions of eminent Mycologists: E J Butler, J F Dastur and C.V.Subramanian.

b. General characteristics of fungi including habitat, distribution, nutritional requirements, fungal cell ultra- structure, thallus organization and aggregation, fungal wall structure, asexual and sexual reproduction.
Definition- Heterokaryosis, Heterothallism and Parasexuality.

c. Outline classification as per Alexopoulus and Mims (1979)

d. Study of thallus structure, reproduction, life cycle and economic importance of the following: *Pythium, Saccharomyces, Penicillium, Agaricus and Fusarium.*

B. Protozoa

Outline classification, Morphology, reproduction and life cycle of: *Euglena, Paramoecium, Entamoeba* and *Plasmodium.*

UNIT: IV **No. of Hours: 15**

VIRUSES

A. Definition, early developments in Virology. General properties of viruses – size, shape and chemical composition, viral classification.

B. Study of structure of the following viruses:

1 Bacteriophages – T-4 phage (replication in brief)
2 Cyanophages
3 Phytophagenae – TMV
4 Zoophagenae – Influenza virus and HIV

C. Significance of Viruses

D. Viroids and Prions-a brief account.

Total marks 100: 50(Theory) + 30 (C1+C2)+ 20 (Practicals)

B.Sc., Microbiology

DSC-I

I B.Sc., I SEMESTER

TITLE: INTRODUCTION TO MICROBIOLOGY AND MICROBIAL DIVERSITY (PRACTICALS)

TOTAL HOURS: 60 **CREDITS: 2**

1. Microbiology Good Laboratory Practices and Biosafety.
2. Study of contributions of microbiologists
3. Study of typical prokaryotic and eukaryotic cell
4. Demonstration of the presence of microflora in the environment by exposing nutrient agar Plates to air.
5. Staining and mounting of Algae (Eg. *Spirogyra*) and Fungi (Eg. *Rhizopus*).

6-7.Study of the following Algae – *Chlamydomonas, Chlorella, Spirogyra, Diatoms and Gracilaria*

8-10. Study of the following Fungi – *Pythium, Rhizopus, Saccharomyces, Penicillium, Agaricus and Fusarium*

11. Microscopic examination of free-living Protozoa of a pond.

12-13. Study of the following Protozoans – *Euglena, Paramoecium, Entamoeba.* And *Plasmodium*

14. Demonstration of plaque assay for coliphages.
15. Study of photographs of the following: Bacteriophages, TMV and HIV

DSC-II

B.Sc., Microbiology

I B.Sc., II SEMESTER
TITLE: BACTERIOLOGY
TOTAL HOURS: **60hrs (4hrs/week) (THEORY) CREDITS: 4**
COURSE CODE-CMB28006 / CMB28007

Course Outcome:
Enable the students to have sound knowledge about:

CO1: Bacteria, microscopes and basic laboratory techniques.
CO2: Demonstrate theory and practical skills in microscopy, their handling techniques and staining procedures.
CO3: Various Culture media and their applications and also understand various physical and chemical means of sterilization.
CO4: Know about microbial techniques for isolation of pure cultures of bacteria.
CO5: To identify the bacteria based on staining and cultural characteristics.
CO6: Able to perform routine culture handling tasks safely and effectively.
CO7: The maintenance and preservation of cultures.

UNIT I No. of Hours: 15

BACTERIAL CELL ORGANIZATION

A. Outline classification of bacteria as per Bergey'manual of Systematic Bacteriology. Occurrence, shape and arrangement of bacterial cell. Structure of eubacteria- cell wall (Gram positive, Gram negative, L-forms), Glycocalyx, capsule, cell membranes, periplasmic space, flagella, fimbriae, cilia and pili. Cell Membrane.
Cytoplasm: Ribosomes, mesosomes, inclusion bodies, nucleoid, chromosome and plasmids.
Endospore: Structure, formation and stages of sporulation.
Reproduction in Bacteria. General characteristics of Archaea.

B. Bacterial diversity:

a. Methanogens, Rickettsiae, Chlamydiae, Mollicutes (Mycoplasmas), Spirochaetes and Actinomycetes
b. Cyanobacteria: Occurrence, structure, reproduction and economic importance of the following: *Microcystis, Spirulina & Anabaena*

Unit: II No. of Hours: 15

BACTERIOLOGICAL TECHNIQUES

A. Cultivation of bacteria

a. Culture media – Types, Cultivation of aerobic and anaerobic bacteria.
b. Pure culture and Cultural characteristics: Pure culture techniques- Serial dilution, Pour plate, Spread plate, Streak plate and Micromanipulator technique. Cultural characteristics of bacteria – plate cultures/solid media and broth cultures/liquid media.
c. Maintenance and Preservation of pure cultures – Sub culturing, overlaying with mineral oil, refigeration (4°C), lyophilization and cryopreservation.

B. Microbiological stains and staining techniques

a. Types of stains: Acidic (Nigrosin), Basic (Crystal violet, Methylene blue); Stains for bacteria (Methylene blue, Nigrosin), Mechanisms of staining (in brief).

b. Preparation of bacterial smears for light microscopy – fixation, simple staining, Negative staining, Differential staining – Gram's staining and Acid fast staining; Structural staining – capsule, flagella, cell wall, endospore and nuclear staining.

c. Hanging drop method for bacterial motility.

UNIT: III **No. of Hours: 15**

MICROSCOPY

A. **Light Microscope: a.** Different types of microscopes, their construction and working principles. Simple microscope (dissection microscope), Compound microscope - bright field, dark field, phase contrast, stereomicroscope and fluorescence microscope.

b. Micrometry.

B. Electron Microscope: Principle, construction and applications of Scanning and Transmission electron microscopes. Preparation of specimens for electron microscopic studies: TEM – Dehydration and fixation, ultra sectioning, Negative staining, shadow casting and freeze etching (in brief) and SEM – Dehydration, shadow casting and surface replica (in brief)

UNIT: IV **No. of Hours: 15**

PHYSICAL AND CHEMICAL METHODS OF MICROBIAL CONTROL

Methods of sterilization

A. Physical methods:

a) Heat – i) Dry heat – Hot air oven
ii) Incineration –Incinerator, direct flaming.
iii) Moist heat method – Autoclave and Pressure cooker
iv) Tyndallization (fractional steam sterilization)

b) Filtration–Types of filters: Membrane filter, HEPA filter (e.g., Laminar air flow) and Berkefeld filter (Diatomaceous earth)

c) Radiation methods – UV rays, Gamma rays and Cathode rays

B. Chemical method: Definition of terms - Disinfectants, antiseptics, sanitizers, Microbicides: virucide, algicide, fungicide and sporicide. Microbistatic: bacteriostatic and fungistatic.

Use and mode of action - Alcohols, Aldehydes, Halogens, Phenols, Heavy metals, Quaternary Ammonium compounds and Sterilizing gases (ethylene oxide).

Total marks 100: 50 (Theory) + 30(C1+C2) + 20 (Practicals)

DSC-II

B.Sc., Microbiology

I B.Sc., II SEMESTER
TITLE: BACTERIOLOGY
PRACTICAL

TOTAL HOURS: 60hrs (4hrs/week) **CREDITS: 2**

1. Study of photographs of microscopes mentioned in the theory syllabus
2. Study of simple and compound microscopes, including oil immersion objectives
3. Microscopic measurements of microorganisms or spores using Stage and Ocular micrometer.
4. Preparation of stains and mordant– Methylene blue, Crystal Violet, Safranin, Nigrosin, Carbol fuchsin, Malachite green and Gram's iodine.
5. Simple staining and Negative staining.
6. Differential staining (Gram's staining).
7. Structural staining- (cellwall and endospore of bacteria).
8. Demonstration of laboratory equipments – Autoclave, Pressure cooker, Hot air oven, Incubator, Refrigerator, Inoculation hood or chamber, Membrane filter, Colony counter. BOD incubator, pH meter & Biosafety cabinet.
9. Preparation of Chromic acid and its use.
10. Cleaning and Sterilization of glasswares. Preparation of culture media – Nutrient broth, Nutrient agar, Potato dextrose agar, Czapeck dox agar and Mac Conkey's agar.
11. Cultivation of microorganisms on Agar plate (Point inoculation), Broth, Anaerobic cultivation (Candle jar or Gas pack method).
12. Preparation of Physiological saline and Serial dilution.
13. Method of obtaining pure cultures of Microorganisms – Streak plate, Pour plate and Spread plate method.
14. Maintenance of pure culture – Sub culturing, Slope culture and refrigeration, Mineral oil overlay method and Stab culture
15. Demonstration of bacterial motility by Hanging drop technique

DSC-III

B.Sc., Microbiology

II B.Sc., III SEMESTER
TITLE: MICROBIAL PHYSIOLOGY AND METABOLISM
THEORY
TOTAL HOURS: 60hrs (4hrs/week) CREDITS: 4
COURSE CODE-CMC28006 / CMC28007

After successful completion of this course students are able to:
CO1. Inculcate the knowledge regarding microbial growth, functions, physiology and metabolism.
CO2. Understand the microbial transport systems and microbial metabolism
CO3. Know the microbial growth in response to environmental factors.
CO4. Get equipped with various methods of bacterial growth measurement.
CO5. Know about the biological nitrogen fixation.
CO6. Knowledge of properties, structure, function of enzymes, enzyme kinetics and their regulation.

UNIT I **No. of Hours: 15**

MICROBIAL NUTRITION

A. Classification of microorganisms based on energy- Phototroph and Chemotroph, Electron- Lithotroph and Organotroph and Carbon source- Autotroph and Heterotroph
Major nutritional type of Microorganisms: Chemolithoautotroph, Chemolithoheterotroph, Chemoheterotroph, Chemolithotroph, Photolithoautotroph and Photoorganoheterotroph. .
B. Nutritional requirements of Microorganisms. Elementary nutrients: Carbon, nitrogen, phosphorous, sulphur, oxygen and energy sources. Trace elements: Vitamins and Growth factors.
C. Uptake of nutrients: Diffusion- Simple and Facilitated, Active transport (use of Proton Motive force, ATP: ABC transporter), Group translocation, Iron uptake**.**

MICROBIAL GROWTH

A. Definition, Growth rate and generation time. The growth curve in batch culture - Phases of growth and their significance. Diauxic growth.
B. Microbial growth in response to environment -Temperature (psychrophiles, mesophiles, thermophiles, extremophiles, thermodurics, psychrotrophs), pH (acidophiles, alkaliphiles, neutophiles), solute and water activity (halophiles, xerophiles, osmophilic), Oxygen (aerobic, anaerobic, microaerophilic, facultative aerobe, facultative anaerobe) and barophilic.
D. Measurement of growth by cell number (Haemocytometer) and cell mass (Turbidometer).
E. Batch culture and continuous culture of microorganisms – Chemostat, Turbidostat. Synchronization of cell division.

UNIT II **No. of Hours: 15**

METABOLISM

A. Microbial Enzymes: Definition, Nomenclature, Classification, Properties, Mode and Mechanism of enzyme action, Factors effecting enzyme action, Enzyme regulation, Inhibition: Competitive and Noncompetitive and Allosteric enzymes, their importance.

Cofactors and Coenzymes.

B. Nitrogen metabolism: Biological N_2 Fixation-Symbiotic and asymbiotic N_2 Fixation, nodule formation, bacteroids, Leg haemoglobin in Nitrogen fixation, Mechanism and Biochemistry of Nitrogen fixation, Role of Nitrogenase and Hydrogenase in Nitrogen fixation. Nitrogen assimilation**.**

C. Lipid metabolism: Breakdown of lipids by microorganisms, beta-oxidation of fatty acids.

UNIT III **No. of Hours: 15**

CHEMOHETEROTROPHIC METABOLISM

A. Aerobic respiration: Concept of respiration: aerobic, anaerobic respiration and Fermentation. Ultra structure of Mitochondrion, Sugar degradation pathways i.e. EMP, ED, Pentose phosphate pathway, Formation of acetyl CoA from pyruvate, TCA cycle, Electron transport system and Oxidative phosphorylation**.**

B. Anaerobic respiration and Fermentation

Anaerobic respiration with special reference to dissimilatory nitrate reduction (Denitrification; nitrate /nitrite and nitrate/ammonia respiration; fermentative nitrate reduction). Fermentation - Alcohol fermentation and Pasteur effect. Lactate fermentation (homofermentative and heterofermentative pathways).

UNIT IV **No. of Hours: 15**

CHEMOLITHOTROPHIC AND PHOTOTROPHIC METABOLISM

A. Introduction to aerobic and anaerobic chemolithotrophy with an example each. Hydrogen oxidation (definition and reaction) and methanogenesis (definition and reaction)

B. Photosynthesis: Definition, Photosynthetic microorganisms, Anoxygenic and Oxygenic photosynthesis, Light as a source of energy, Pigments of photosynthetic bacteria and photosynthetic apparatus in prokaryotes and eukaryotes. Mechanism of photosynthesis in bacteria. Comparison of photosynthesis in bacteria and eukaryotes.

Total marks 100: 50(Theory)+30(C1+C2)+ 20 (Practicals)

DSC-III

B.Sc., Microbiology

II B.Sc., III SEMESTER

TITLE: MICROBIAL PHYSIOLOGY AND METABOLISM PRACTICAL

TOTAL HOURS: : 60hrs (4hrs/week) **CREDITS: 2**

1. Effect of temperature on growth of microorganisms.
2. Effect of pH on growth of microorganisms.
3. Effect of carbon and nitrogen sources on growth of *E.coli*
4. Effect of salt on growth of *E. coli*
5. Study and plot the growth curve of *E. coli* by turbidometric method
6. Measurement of growth by cell number using Haemocytometer.
7. Study of bacteroids from root nodules.
8. Production of ammonia from organic compounds- Ammonification.
9. Acid and gas production from carbohydrates- Demonstration of fermentation of lactose
10. Starch hydrolysis.
11. Gelatin hydrolysis.
12. Detection of Catalase production by microorganisms.
13. Urease test
14. Isolation and culturing of photosynthetic bacteria
15. Demonstration of fermentation of glucose using Kuhne's fermentation vessel.

DSC-IV

B.Sc., Microbiology

II B.Sc., IV SEMESTER

TITLE: MICROBIAL GENETICS AND GENETIC ENGINEERING

THEORY

TOTAL HOURS: 60hrs (4hrs/week) **CREDITS: 4**

COURSE CODE-CMD28006 / CMD28007

Course outcome

Enable the students to have sound knowledge about:

CO1. Genetics of microorganisms and also about recombinant DNA technology used in microbiological research.

CO2. Know the terms and terminologies related to molecular biology and microbial genetics.

CO3. Understand the properties, structure and function of genes in microorganisms at the molecular level.

CO4. Conceptual knowledge about DNA and RNA as a genetic material, **e**nzymology and replication strategies.

CO5. Understand the molecular mechanisms involved in transcription and translation.

CO6. The importance of genetic code and wobble hypothesis.

CO7.The molecular mechanisms underlying mutations, DNA damage and repair mechanisms.

CO8. The concept of recombination and elucidate the gene transfer mechanisms in prokaryotes and eukaryotic microorganisms.

CO9. Understand about techniques in genetic engineering

CO10. Social and ethical issues concerning genetic engineering

CO11. Applications of genetic engineering in various fields

UNIT: I **No. of Hours: 15**

MICROBIAL GENETICS

A. History and development of genetics. Chromosomes: Chromosome number, Morphology, Karyotype and Idiogram. Chemical composition. Prokaryotic and Eukaryotic chromosomal organization

Cell division: Mitosis, Meiosis and Cell cycle in brief.

B. a. Recombination in bacteria: Transformation, Transduction (types) and Conjugation process.

b. Extra-chromosomal genetic elements and their importance. Types of plasmids – F plasmid, R Plasmids, colicinogenic plasmids, Ti plasmids, linear plasmids, yeast- 2 μ plasmid.

c. Prokaryotic and Eukaryotic transposable elements. Transposition

d. Chemical basis of heredity: Evidence for DNA (Griffith experiment and Hershey and chase experiment) and RNA as genetic material (Fraenkel-Conrat's experiment).

e. DNA Structure: Miescher to Watson and Crick- historic perspective, Chemistry of nucleic acids. Watson and Crick model of DNA, Types of DNA, denaturation and renaturation . Organization of DNA: Prokaryotes, Eukaryotes and Viruses. RNA Structure and function. Organelle DNA -- mitochondria and chloroplast DNA.

UNIT-II **No. of Hours: 15**

B.Sc., Microbiology

MOLECULAR GENETICS

A. DNA Replication –Types, Modes and mechanism of DNA replication by semiconservative method, Replication in Prokaryotes (Cairn's model). Mechanism of DNA replication: Enzymes and proteins involved in DNA replication –DNA polymerases, DNA ligase, primase, telomerase – for replication of linear ends .

B. Genetic code – features, Wobble hypothesis and evolution of genetic code. Protein synthesis – Transcription and Translation in prokaryotes. Regulation of gene expression in prokaryotes (Lac operon concept).

C. Gene mutation: Types of mutations. Mutagenic agents: Physical and chemical mutagens. Significance of mutations.
DNA damage and repair: Photo reactivation and SOS repair

UNIT -III **No. of Hours: 15**

GENETIC ENGINEERING

A. a. Genetic engineering: Milestones in genetic engineering and biotechnology. Cloning tools; restriction modification systems: types I,II and III. mode of action, nomenclature, applications of type II restriction enzymes in genetic engineering

b. DNA modifying enzymes and their applications: DNA polymerases, terminal deoxynucleotidyl transferase, kinases and phosphatases, and DNA ligases

c. Cloning vectors –1. Cloning plasmids (pBR 322 and pUC 18). 2. Viruses as cloning vehicles (Lambda DNA, M13). 3. Hybrid vectors (Cosmid, YAC).

d. Cloning host (*E. coli*) **.**

B. Methods in Molecular cloning: Transformation of DNA-Calcium chloride method. Gene delivery-Microinjection, Electroporation, Biolistic method (gene gun), *Agrobacterium*- mediated delivery.

C. Screening and detection of transformants: Blue white selection, replica plate technique and antibiotic resistance.

UNIT –IV **No. of Hours: 15**

TECHNIQUES IN GENETIC ENGINEERING

A. a. Gene cloning: DNA isolation (Phenol-Chloroform method). DNA separation by Gel electrophoresis: Agarose gel – principle and method, Transformation methods.

b. DNA libraries: Brief account of genomic library -application

c. Blotting – Southern and Western.

d. Gene screening and Isolation – Nucleic acid hybridization method (DNA) – Colony and Plaque hybridization.

e. DNA sequencing: Brief account of Sanger's dideoxynucleotide synthetic method.

f. DNA amplification – Principle of PCR.

g. DNA fingerprinting- Restriction Fragment Length Polymorphism (RFLP)

B. Applications of Genetic Engineering:

a. Medical Application.

b. Industrial Application.

c. Agricultural Application.

d. Environmental Application.

C. Social and ethical issues concerning Genetic Engineering.

Total marks 100: 50(Theory)+30(C1+C2)+ 20 (Practicals)

B.Sc., Microbiology

DSC-IV

II B.SC., IV SEMESTER

TITLE:MICROBIAL GENETICS AND GENETIC ENGINEERING PRACTICALS

TOTAL HOURS: 60hrs (4hrs/week) **CREDITS: 2**

1. Study of mitosis in onion root.
2. Demonstration of meiosis from flower buds of onion / *Chlorophytum / Tradescantia*.
3. Demonstration of Bacterial Conjugation
4. Demonstration of bacterial transformation and transduction
5-6. Preparation of Master and Replica Plates
7. Isolation of streptomycin resistant strain of *E.coli* by gradient plate method.
8. Isolation and Quantification of Nucleic acids (DNA) from *E.coli* or Yeast.
9. Demonstration of AMES test
10. Demonstration of Amplification of DNA by PCR
11. Demonstration of Southern blotting
12. Study survival curve of bacteria after exposure to ultraviolet (UV) light
13. Isolation of Plasmid DNA from *E.coli*
14-15. Demonstration of the following models or photographs of – DNA, t-RNA, mRNA, Transformation, Conjugation and Transduction, Transcription, Translation and DNA replication.

B.Sc., Microbiology

DSE- A
V SEMESTER
TITLE: ENVIRONMENTAL MICROBIOLOGY
(THEORY)

TOTAL HOURS: 60hrs (4hrs/week) **CREDITS: 4**

COURSE CODE-CME28006 / CME28007

Course outcome

Enable the students to have sound knowledge about:

CO1. The role of microorganisms in soil, air, water, waste water and bioremediation.
CO2. Know about the diversity of microorganism and microbial communities inhabiting a wide range of ecological habitats.
CO3. Learn the occurrence, abundance and distribution of microorganisms in the environment and their role in the environment
CO4. Understand various biogeochemical cycles – Carbon, Nitrogen, Phosphorus cycles etc. and microbes involved in these cycles.
CO5. Understand various plant microbes interactions especially rhizosphere, phyllosphere and mycorrhizae and their applications especially the biofertilizers and their mass production.
CO6. Understand the basic principles of bioremediation.
CO7. The various methods to determine the Sanitary quality of water and sewage Treatment methods employed in waste water treatment

UNIT 1 **No. of Hours: 15**

SOIL MICROBIOLOGY

A. Introduction: Definition, Soil types, Soil profile and Physical characteristics of soil- Mineral particles, Organic residues, Water and Gases. Soil fertility. Role of microorganisms in soil formation (in brief).

B. Microbial flora of Soil: A brief account of Bacteria, Fungi, Algae, Actinomycetes, Protozoa and Viruses.

C. Biogeochemical cycles: Carbon cycle: Microbes involved in carbon cycle
Nitrogen cycle: Nitrogen fixation, ammonification, nitrification, denitrification and nitrate reduction
Phosphorus cycle: Phosphate immobilization and solubilisation.
Sulphur cycle: Microbes involved in sulphur cycle

D. Associated soil microorganisms with plants- the Rhizosphere and Rhizoplane microflora, Actinorrhizae, and Mycorrhizae (AM), Tripartite and Tetra partite association.

E. Interaction among soil microorganisms – Neutralism, Mutualism, Commensalism, Antagonism and Parasitism. (In brief).
Microbe-Plant interaction: Symbiotic and non symbiotic interactions
Microbe-animal interaction: Microbes in ruminants, nematophagus fungi and symbiotic luminescent bacteria

UNIT: II **No. of Hours: 15**

AEROBIOLOGY

A. Introduction: Definition, history and development, aim and scope of aerobiology.

B. Microbes and atmosphere: Atmospheric layers, sources of microorganisms, Air spora of indoor and outdoor environment. Factors affecting air spora. Significance of air borne microbes. Management of air-borne microbes. Human air borne diseases (Tuberculosis, Rhinitis and Aspergillosis).

C. Techniques of trapping air-borne microorganisms: Impactors- The slit sampler, Hirst spore trap, Andersen sampler, Rotorod sampler, Vertical cylinder spore trap, Burkard spore traps. Impingers and Filtration. Advantages and disadvantages of the techniques.

UNIT-III **No. of Hours: 15**

AQUATIC MICROBIOLOGY

A. Introduction: Natural waters- atmospheric water, surface water and ground water. Distribution of microorganisms in aquatic environment-Neuston, plankton (Phytoplankton, Zooplankton). Aquatic microorganisms-lakes, ponds, streams, rivers estuaries, and marine plankton. Lotic and benthic population.

B. Water pollution: Sources, water borne diseases- Viral (jaundice), Bacterial (cholera) and Protozoan (amoebic dysentery). Biological indicator of water pollution.

C. Determination of sanitary quality of water: SPC, Tests for coliforms, MPN, IMViC reactions and membrane filter.

D. Water purification in Municipal water supply, Parameters of potable water (According to WHO).

SEWAGE MICROBIOLOGY

A. Introduction: Sources of waste water- Domestic, Agricultural and Industrial. Physical, chemical and microbiological characteristics of waste water

B. Waste water treatment: Single dwelling unit-Septic tank. Municipal waste treatment – Primary (screening, coagulation and sedimentation), Secondary (trickling filter, activated sludge process, oxidation pond), Tertiary (reverse osmosis, ion exchange method and electro-dialysis in brief).

C. Solid waste recycling- Anaerobic digestion process, Biogas and Composting.

MICROBIAL BIOREMEDIATION

In situ –Intrinsic, engineered and *Ex situ* bioremediation- Solid phase system (composting, composting process), Slurry phase system (aerated lagoons, low shear air lift reactor). Bioremediation of hydrocarbons- use of genetically engineered bacterial strains. Bioremediation of xenobiotics, Microbial leaching.

B.Sc., Microbiology

UNIT: IV **No. of Hours: 15**

AGRICULTURAL MICROBIOLOGY

A. Introduction – Classification of plant diseases on the basis of spread and severity of infection

B. Microbes and Plant diseases - Entry of pathogens into host-prepenetration, penetration, post penetration.

C. Microbes in Agriculture: Biofertilizers: Definition and Types. Mass production of Bacterial inoculants (*Rhizobium , Azospirillum & Cyanobacteria)*. Biopesticides: Definition, Types – Bacterial, Viral, Fungal and Protozoan, Mode of action, Microbial herbicides.

D. Plant diseases: Study of Symptoms, Etiology, Epidemiology, Management of the following diseases – Bean Mosaic, Sandal spike, Citrus canker, Downy mildew of Bajra, Powdery mildew of mulberry, Rust of sorghum, Blast of paddy, Red rot of sugarcane, Tikka disease of groundnut.

DSE(A)

B.Sc., Microbiology

V SEMESTER

TITLE: ENVIRONMENTAL MICROBIOLOGY

PRATICALS

TOTAL HOURS: 45hrs (3hrs/week) **CREDITS: 1**

1. a. Isolation and identification of fungi from soil by serial dilution method.
   b. Isolation and enumeration of bacteria from soil by serial dilution method.
2. Study of AM fungi
3. Isolation of Nitrogen fixing bacteria- *Rhizobium*
4. Study of antagonism between microorganisms

5a. Gram's staining of citrus canker specimen

b. Observation of specimens - Bean mosaic, Sandal spike, Citrus canker, Downy mildew of Bajra, Powdery mildew of mulberry, Rust of sorghum, Blast of paddy, Red rot of Sugarcane, Tikka disease of groundnut.

6. Isolation of airborne microorganisms (Bacteria and Fungi) by Petriplate exposure method.
7. Demonstration of air samplers: equipments / photographs of vertical cylindrical spore trap, Rotorod sampler, Hirst's spore trap, Andersen's sampler, Liquid impingement method (bead bubbler device) and Membrane filter.
8. Microscopic observation of different water samples for biological indicators of water pollution.
9. a. Standard analysis of water sample
   b. Determination of MPN.
10. IMViC reactions.
11. Water quality test by Hydrogen sulphide strip test.
12. Display of photographs of water purification process (Baffles, Flocculator, Clarifier, Sand filter, Back wash, Chlorinometer and Chloroscope).
13. Determination of biological oxygen demand (BOD) of water.
14. a. Estimation of total solids in sewage.
    b. Display of photographs - Septic tank, Trickling filter, Activated sludge process, Oxidation ponds, Sedimentation tank, and anaerobic digester.
15. a. Demonstration of composting
    b. Display of photographs: composting, composting process, aerated lagoons, low shear air lift reactor and microbial leaching.

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NOTE: Visit to water treatment plant/ sewage treatment plant/ industrial effluent treatment plant/Agricultural research institute. Each student shall submit an independent report on the visit along with the practical record for the internal assessment.

DSE- B

B.Sc., Microbiology

V SEMESTER

TITLE: AGRICULTURAL MICROBIOLOGY

THEORY

TOTAL HOURS: 60hrs (4hrs/week) CREDITS: 4

COURSE CODE-CME28206 / CME28207

TOTAL HOURS: 60hrs (4hrs/week) CREDITS: 4

Course outcome

On successful completion of this course the student will gain knowledge about:

CO1. Microorganisms in agriculture, plant pathology and control of plant diseases and their significance

CO2. Understand the land mark in the field of Agricultural microbiology.

CO3. Gain knowledge about biofertilizers and biopesticide in agriculture.

CO4. Know about the stages in disease development, epidemiology and host pathogen interaction.

CO5. Know about principles and practices involved in the management of plant diseases by different methods.

CO6. Understand the important plant diseases caused by phytoplasma, viruses and viroids. Bacteria and fungi

UNIT I No. of Hours: 15

INTRODUCTION AND HISTORY OF PLANT PATHOLOGY

A. Concept of plant disease- definitions of disease, disease cycle & pathogenicity, symptoms associated with microbial plant diseases, types of plant pathogens, Koch's postulates, economic losses and social impact of plant diseases.

B. Significant landmarks in the field of plant pathology- Contributions of Anton DeBary, Millardet, T J Burrill, E. Smith, Adolph Mayer, Dmitri Ivanowski, Diener, Stakman, H.H. Flor, Van Der Plank. Contributions of eminent Indian plant pathologists- E J Butler, B B Mundkar, K V Subbarao and M J Thirumalachar.

MICROORGANISMS IN AGRICULTURE

A. Biofertilizers: Definition, Types- Nitrogen fixing, Phosphate solubilizing and cellulolytic microbes. Mass production of Bacterial inoculants (*Rhizobium, Azospirillum, Azotobacter, Cyanobacteria*). Mode of application, Advantages and limitations.

B. Biopesticides: Definition, Types – Bacterial, Viral, Fungal and Protozoan, Mode of action, Microbial herbicides.

UNIT:II No. of Hours: 15

PHYTOPATHOLOGY

B.Sc., Microbiology

A. Stages in development of a disease : Introduction – Classification of plant diseases on the basis of spread and severity of infection.

Microbes and Plant diseases: Entry of pathogens into host- prepenetration (Infection) penetration, post penetration (invasion, colonization, dissemination of pathogens and perennation).

B. Plant disease epidemiology: Concepts of monocyclic, polycyclic and polyetic diseases, disease triangle & disease pyramid, forecasting of plant diseases.

C. Host Pathogen Interaction

a. Microbial Pathogenicity

Virulence factors of pathogen: Role of Enzymes-pectic enzymes, Toxins: Host specific (Tabtoxin) and host non-specific (Victorin and T toxin) and growth regulating substance in disease development- Auxins and Gibberellins.

b. Defense Mechanisms in Plants

Defence mechanism in plants: Preexisting (fungitoxic exudates and phenolic compounds) Structural (formation of cork layers, abscission layer and tyloses) and Biochemical defense mechanism (simple phenolic compounds), Hypersensitivity (in brief).

UNIT: III **No. of Hours: 15**

CONTROL OF PLANT DISEASES

A. Principles & practices involved in the management of plant diseases by different methods, *viz.* regulatory - quarantine, crop certification, avoidance of pathogen, use of pathogen free propagative material : a. Cultural-Host eradication, crop rotation, sanitization, polythene traps and mulches(in brief).

B. Chemical- Inorganic chemicals: Copper compounds-Bordeaux mixture and Bordeaux paste, Organic chemicals- Organic sulfur compounds (Dithiocarbamates), Systemic fungicide, Heterocyclic compounds (Benomyl), antibiotics (Agrimycin).

C. Physical method-Soil sterilization by heat, soil solarization, hot water treatment of propagative organs and hot air treatment of storage organs (in brief)

D. Biological methods- suppressive soils, antagonism, antagonistic plants and trap plants (in brief).

E. IDM-Perennial Crop and annual crop (in brief).

UNIT:IV **No. of Hours: 15**

SPECIFIC PLANT DISEASES

Study of some important plant diseases giving emphasis on its etiological agent, symptoms, epidemiology and control

A. Important diseases caused by fungi

Late blight of potato - *Phytophthora infestans*
Powdery mildew of wheat - *Erysiphe graminis*
Ergot of rye - *Claviceps purpurea*
Loose smut of wheat - *Ustilago nuda*
Wilt of tomato - *Fusarium oxysporum* f.sp. *lycopersici*
Red rot of sugarcane - *Colletotrichum falcatum*

Blast of rice-*Magnaporthe grisea*

B. Important diseases caused by phytopathogenic bacteria: Bacterial leaf blight of rice, Bacterial cankers of citrus

C. Important diseases caused by phytoplasmas: Sandal spike

D. Important diseases caused by viruses: Papaya ring spot, Bunchy top of banana, Bean mosaic.

E. Important diseases caused by viroids: Potato spindle tuber.

Total marks 100: 50(Theory)+30(C1+C2)+ 20 (Practicals)

B.Sc., Microbiology

DSE- B
V SEMESTER
TITLE: AGRICULTURAL MICROBIOLOGY
PRACTICAL

TOTAL HOURS: 30hrs (2hrs/week) **CREDITS: 01**

1. Demonstration of Koch's postulates in fungal disease.
2-5. Study of important diseases of crop plants by cutting sections of infected plant material - Late blight of potato, Powdery mildew of wheat, Ergot of rye, Loose smut of wheat, Wilt of tomato, Red rot of sugarcane, Blast of rice
6. Gram's staining of citrus canker specimen
7-8. Mounting of fungal pathogen- *Phytophthora infestans, Fusarium, Colletotrichum* and *Magnaporthe grisea.*
9. Observation of specimens-Bean mosaic and sandal spike
10. Observation of root nodule formation in plants (*Trigonella/Crotolaria*)
11. Demonstration of Indole acetic acid (IAA) production by soil fungi
12. Plant disease control by fungicides
13. Chemical determination of IAA produced by soil fungi *in vitro*
14. Isolation of fungal pathogens from soil
15. Isolation of fungal pathogens from diseased parts of plant

NOTE: Visit to Agricultural research station. Each student shall submit an independent report on the visit along with the practical record for the internal assessment.

B.Sc., Microbiology

SEC-A

TITLE: MICROBIAL DIAGNOSIS IN HEALTH CLINICS

SEMESTER – V

TOTAL HOURS: 30hrs (2hrs/week) **CREDITS: 2**

COURSE CODE-CME28406 / CME28407

Course outcome

CO1. Student will gain experience in health clinics such as examination, collection of clinical samples and diagnosis.

CO2.Demonstrate scientific quantitative skills, such as the ability to evaluate experimental design, read graphs, and understand and use information from scientific papers.

UNIT: I **No of Hours: 5**

IMPORTANCE OF DIAGNOSIS OF DISEASES

Bacterial, viral, fungal and protozoan diseases of various human body systems. Disease associated clinical samples for diagnosis.

UNIT:II **No of Hours: 5**

COLLECTION OF CLINICAL SAMPLES

Collection of clinical samples (oral cavity/sputum, throat, skin, blood, CSF, urine and faeces) and handling clinical specimens. Method of transport of clinical samples to laboratory and storage.

UNIT :III **N o of Hours: 15**

DIRECT MICROSCOPIC EXAMINATION AND CULTURE

Examination of sample by staining - Gram stain, Ziehl-Neelson staining for tuberculosis, Giemsa stained, Thin blood film for malaria, Preparation and use of culture media – Blood agar,Chocolate agar,Lowenstein-Jensen medium, MacConkey agar, Distinct colony properties of various bacterial pathogens.

Serological and Molecular Methods

Serological Methods – Agglutination, Precipitation, ELISA and PCR.

Test for Typhoid, Dengue ,HIV and Swine flu

Laboratory exposure to students: demonstration of staining.

UNIT: IV **No of Hours: 5**

TESTING FOR ANTIBIOTIC SENSITIVITY IN BACTERIA

Importance, Determination of resistance/sensitivity of bacteria using disc diffusion method, Determination of minimal inhibitory concentration (MIC) of an antibiotic by serial dilution method

B.Sc., Microbiology

SEC-II

TITLE: MICROBIOLOGICAL ANALYSIS OF AIR AND WATER

SEMESTER – V

TOTAL HOURS: 30hrs (2hrs/week) **CREDITS: 2**

COURSE CODE-CME28606 / CME28607

Course outcome

CO1. Know about bioaerosols, airsample collection and analysis.
CO2.Control measures of air microbes.
CO3. know about the water borne diseases and their management.
CO4.To identify water borne pathogens.

UNIT: I **No of Hours: 10**

AIR MICROBIOLOGY

Bioaerosols, Air borne microorganisms (bacteria, Viruses, fungi) and their impact on human health and environment, significance in food and pharma industries and operation theatres, allergens

Air Sample Collection and Analysis

Bioaerosol sampling, air samplers, methods of analysis, CFU, culture media for bacteria and fungi.

Control Measures

Fate of bioaerosols, inactivation mechanisms – UV light, HEPA filters, desiccation and Incineration

UNIT:II **No of Hours: 5**

WATER MICROBIOLOGY

Water borne diseases and their management: Cholera, Typhoid, Gastroenteritis and Traveller's diarrhoea.

UNIT: III **No of Hours: 5**

MICROBIOLOGICAL ANALYSIS OF WATER

Sample Collection, Treatment and safety of drinking (potable) water, methods to detect potability of water samples: (a) standard qualitative procedure: presumptive/MPN tests, confirmed and completed tests for faecal coliforms (b) Membrane filter technique.

UNIT: IV **No of Hours: 5**

LABORATORY SAFETY MEASURES

Precipitation, chemical disinfection, filtration, high temperature, UV light

Laboratory exposure to students: demonstration of air borne and water borne microbes.

B.Sc., Microbiology

DSE- A
VI SEMESTER
TITLE: INDUSTRIAL AND FOOD MICROBIOLOGY
THEORY
TOTAL HOURS: 60hrs (4hrs/week) CREDITS: 4
COURSE CODE-CMF28006 / CMF28007

Course outcome
Enable the students to get sufficient knowledge about:

CO1.Food related microorganisms, their contamination, spoilage and preservation
CO2. Understand the beneficial role of microorganisms in fermented dairy products.
CO3. Know the significance and activities of microorganisms in food
CO4. Understand the food borne intoxication and infections.
CO5. Learn about food safety and quality control.
CO6. Know the principles involving various methods of food preservation.
CO7. Understand how microbiology is applied in manufacture of industrial products
CO8. Know about design of bioreactors , medium formulation & design for microbial fermentation, the different types of fermentation processes
CO9. Identify techniques applicable for strain Improvement of microorganism
CO10.The underlying principles in downstream processing

UNIT: I **No of Hours: 15**

INDUSTRIAL MICROBIOLOGY

A. Brief history and developments in industrial microbiology
B. Microorganisms of industrial importance; Isolation, Screening and Preservation of industrial important microbes..
C. Strain improvement of Microorganisms for industrial purposes.
D.A brief account of production medium, inoculum medium, raw materials-Molasses, corn steep liquor, sulphite waste liquor,yeast extract and whey. Buffers, Precursors, Inhibitors and Antifoam agents.
E. Fermenters and fermentation process: Design, types and basic function of fermenters, sterilization, devices for aeration and agitation (in brief).
Types of fermenters – laboratory, pilot-scale and production fermenters
Components of a typical continuously stirred tank bioreactor
Fermentation process – Surface, Submerged and Solid state fermentation. Types- Batch and Continuous fermentation.
Downstream processing: Steps in recovery and purification of fermented products – Precipitation, Filtration, Centrifugation, Distillation, Cell disruption, Solvent recovery, chromatography, Drying and crystallization.

UNIT: II **No of Hours: 15**

INDUSTRIAL PRODUCTION

A. a. Organic acids – Citric acid.

b. Antibiotics – Penicillin.

c. Enzymes –Pectinase and amylase.

d. Alcohol – Ethanol.

e. Amino acid –Glutamatic acid.

B. Mushroom cultivation – Oyster mushroom (bag method). Nutritional value.

C. Role of microorganisms in the production and recovery of minerals and petroleum.

D. Single cell protein: *Spirulina*.

Unit: III **No of Hours: 15**

FOOD MICROBIOLOGY

A. Introduction to Food Microbiology: Definition, Concept and Scope. Food as a substrate for microorganisms, Factors influencing microbial growth in foods (intrinsic and extrinsic factors)**.**

B. Sources of contamination, Microbial spoilage of foods – fruits, vegetables, meat, poultry, canned foods, cereals and cereal products.

C. Methods of food preservation: Physical method – high temperature, low temperature, canning. Drying – solar drying, drum drying, spray drying and Radiation.
Chemical methods – chemical preservatives – (propionates, benzoate, sorbates, nitrates and nitrites, sugar and salt)

D. Food borne intoxication and infection:
Bacterial intoxication- Staphylococcal intoxication and Botulism.
Bacterial infection- Salmonellosis.
Mycotoxin –Types and importance of toxins with special reference to Aflatoxins.

E. Food safety and quality control. –A brief account on FPO, HACCP, Food laws and Food standards (in brief)

UNIT:IV **No of Hours: 15**

DAIRY MICROBIOLOGY

A. Introduction to Dairy Microbiology: Source of milk contamination. Types of microorganisms in milk.

B. Methods to detect microbial spoilage by SPC, Reductase test.

C. Biochemical changes of milk - Souring, Gassy fermentation, Proteolysis, Lipolysis, and Ropiness.

D. Fermented dairy products (a brief account of characteristic and therapeutic value). Acidophilus milk, Yoghurt, Butter milk, Srikhand. Types of cheese. Probiotics and their benefits.

E. Preservation of milk and milk products – Pasteurization and Sterilization. Microbiological standard for milk and milk products (in brief).

Total marks 100: 50(Theory)+30(C1+C2)+ 20 (Practicals)

B.Sc., Microbiology

DSE- A
VI SEMESTER
TITLE: INDUSTRIAL AND FOOD MICROBIOLOGY
PRACTICAL

TOTAL HOURS: 30hrs (2hrs/week) **CREDITS: 01**

1-2. Isolation and enumeration of bacteria from utensils
Isolation and identification of fungi from food utensils
3-4. Isolation and enumeration of bacteria from spoiled vegetables
Isolation and identification fungi from spoiled vegetables.
5-6. Isolation and enumeration of bacteria from spoiled fruits.
Isolation and identification of fungi from spoiled fruits.
7-8.Isolation and identification of *Aspergillus* on groundnut by standard blotters Method (ISTA,1982).
9. Estimation of lactic acid in milk.
10. Determination of phosphatase activity of milk
11. Turbidity test to detect boiled and unboiled milk.
12. Methylene blue reductase test to determine the quality of milk.
13. Preparation of wine from grapes.
14 a. Preparation of alcohol using jaggery or molasses.
b. Estimation of percentage alcohol in a given sample by specific gravity method.
15. Production of citric acid using *Aspergillus niger*

NOTE: Visit to food industries or food research laboratories, dairy industries and distilleries. Each student shall submit an independent report on the visit along with the practical record for the internal assessment.

B.Sc., Microbiology

DSE- B

VI SEMESTER

TITLE: MEDICAL MICROBIOLOGY AND IMMUNOLOGY

THEORY

TOTAL HOURS: 60hrs (4hrs/week) **CREDITS: 4**

COURSE CODE-CMF28206 / CMF28207

Course outcome

The course provides a solid foundation to understand:

CO1. The human immune response towards microbes in medical microbiology, knowledge is gained about the relationship between microorganism and human disease, pathogenicity, Laboratory diagnosis, treatment and prophylaxis.

CO2. Demonstrate an understanding of key concepts in immunology.

CO3. Understand the overall organization of the immune system.

CO4. To make them understand the salient features of antigen antibody reaction & its uses in diagnostics and various other studies.

CO5 .Learn about immunization and their preparation and its importance.

UNIT :I **No of Hours: 15**

MEDICAL MICROBIOLOGY

A. Introduction – History and development of medical microbiology. Normal microflora of the human body: Importance of normal microflora, normal microflora of skin, throat, gastrointestinal tract, urogenital tract

B. Infection and disease transmission – Signs, symptoms, syndrome. Types of Infection: opportunistic infection and Nosocomial infection, mode of transmission.

C. Host pathogen interaction – Infection, Invasion, Pathogen, Pathogenicity, microbial virulence, microbial toxins, opportunistic and true pathogens.

D. Antimicrobial chemotherapy – General characteristics and types of antibiotics. Mode of action of -Penicillin, Aminoglycosides, Erythromycin, Chloramphenicol, Antifungal drugs- Griseofulvin, Nystatin Antiviral drugs-Acyclovir, Amantadine and Azidothymidine .Multiple Drug Resistance (in brief).

UNIT:II **No. of Hours:15**

HUMAN DISEASES

A. Collection, transportation, culturing and identification of clinically important pathogens.

B. Pathogen –Cultural and Biochemical characteristics,clinical symptoms, laboratory diagnosis, prophylaxis and treatment of the following diseases:

a. Air borne: Influenza, Diphtheria, Blastomycosis

b. Direct contact: Warts, Syphilis, Sporotrichosis

c. Vector borne: Dengue, Malaria

d. Water borne: Typhoid, Amoebic dysentry

UNIT III **No. of Hours:15**

IMMUNOLOGY: IMMUNE CELLS AND ORGANS

A. Historical account and introduction to immune system – Blood and Plasma system.

B. Types of immunity – Innate (non specific) and Adaptive immunity (specific). Hummoral and cell mediated immunity.

C. Structure, Functions and Properties of: Immune Cells –T cell, B cell, Macrophage, Neutrophil, Eosinophil, Basophil, Mast cell, Dendritic cell, Phagocytes and NK cells. Cells and tissues of immune systems-Structure and role of primary lymphoid organs (bone marrow,thymus),secondary lymphoid organs (spleen, lymph nodes and tonsils).

UNIT-IV **No. of Hours:15**

IMMUNOLOGY: ANTIGENS AND ANTIBODIES

A. Antigens – Characteristics of an antigen (Foreignness, Molecular size and Heterogeneity); Haptens; Epitopes (T & B cell epitopes), Adjuvants.

B. Antibodies – Basic structure of immunoglobulin (Ig G). Biological properties of Immunoglobulin classes, monoclonal antibodies, antigen antibody reactions – salient features. precipitation reaction, neutralization test, opsonisation , agglutination reaction, compliment fixation. Immunotechniques – RIA, ELISA and ELISPOT. Hypersensitivity (Type I to V - in brief).
Immunoprophylaxis – Vaccine – Types – killed, Live and Attenuated (Bacterial and Viral) and Toxoid with an example each.
National Immunization program (Tabular form).

Total marks 100: 50(Theory)+30(C1+C2)+ 20 (Practicals)

B.Sc., Microbiology

DSE- B
VI SEMESTER
TITLE: MEDICAL MICROBIOLOGY AND IMMUNOLOGY PRACTICALS

TOTAL HOURS: 30hrs (2hrs/week) **CREDITS: 01**

1. Determination of blood group and Rh factor.
2. Enumerate RBC in given blood sample
3. Enumerate WBC in given blood sample
4. Demonstration of precipitation reaction-Double diffusion in two dimensions (Ouchterlony procedure).
5. Antibiotic sensitivity test.
6. Estimation of urine bacteria by calibrated loop- direct streak method.
7. Determination of susceptibility to dental caries-Snydal test
8. Identification of dermatophytes from human skin.
9. Detection of typhoid by Widal test
10. Rapid plasma reagin (RPR) card test for syphilis
11. Identify bacteria on the basis of cultural, morphological and biochemical characteristics: IMViC,TSI, nitrate reduction, urease production and catalase tests

12-15.Material/ microscopic observation/ display of photographs of human pathogens as per theory syllabus: Influenza virus, *Corynebacterium diphtheriae*, *Blastomyces dermatitidis,* Human papilloma virus*, Tryponema pallidum, Sporothrix schenckii, Plasmodium,* Dengue viruses (DENV), *Salmonella typhi* and *Entamoeba histolytica*)

NOTE: Visit to pharmaceuticals and pathological laboratories. Each student shall submit an independent report on the visit along with the practical record for the internal assessment.

B.Sc., Microbiology
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B.Sc., Microbiology

PATTERN OF QUESTION PAPER (CBCS)
SUBJECT: MICROBIOLOGY
DSCI-DSCIV
(THEORY: I SEMESTER TO IV SEMESTER)

Time: 3hours Max marks: 70

I. Answer the following 1X5=05Marks
1
2
3
4
5

II Answer any five of the following: 3X5=15 Marks
(Seven questions to be given and four to be answered)-short answer type
6
7
8
9
10
11
12

III Answer any four of the following: 5X4=20
(Six questions to be given and four to be answered)-short answer type

13
14
15
16
17
18

III Answer any three of the following 10X3=30
(Five questions to be given and four to be answered- essay type questions)

19
20
21
22
23

C1+C2=30(15+15) Continuous assessment

B.Sc., Microbiology

PATTERN OF QUESTION PAPER (CBCS)
SUBJECT: MICROBIOLOGY
DSE (A & B) - DSE(A & B)
(THEORY: V SEMESTER TO VI SEMESTER)

Time: 3hours Max marks: 70

I. Answer the following 1X5=05Marks
1
2
3
4
5

II Answer any five of the following: 3X5=15 Marks
(Seven questions to be given and four to be answered)-short answer type
6
7
8
9
10
11
12

III Answer any four of the following: 5X4=20
(Six questions to be given and four to be answered)-short answer type

13
14
15
16
17
18

III Answer any three of the following 10X3=30
(Five questions to be given and four to be answered- essay type questions)

19
20
21
22
23

C1+C2=30(15+15) Continuous assessment

B.Sc., Microbiology

PATTERN OF QUESTION PAPER (CBCS)
SUBJECT: MICROBIOLOGY (SEI-SEII)
SEC(A) – SEC(B)
(THEORY: V SEMESTER)

Time: 2 hours Max marks: 50

I. Answer the following 1X3=03
1
2
3

II Answer any four of the following: 3X4=12
(Six questions to be given and four to be answered)-short answer type
6
7
8
9
10
11

III Answer any three of the following: 5X3=15
(Five questions to be given and three to be answered)-short answer type

12
13
14
15
16

III Answer any two of the following 10X2=20
(Four questions to be given and two to be answered- essay type questions)

17
18
19
20

C1+C2=30(15+15) Continuous assessment

B.Sc., Microbiology

DSC-I
SCHEME OF THEORY EXAMINATION
I B.Sc., I SEMESTER
TITLE: INTRODUCTION TO MICROBIOLOGY AND MICROBIAL DIVERSITY

Times:3hrs **Max Marks:70**

Question Paper to be set for total of 106marks including choices

UNITS	1 mark questions	3 mark questions	5 mark questions	10 mark questions	Total Marks
UNITS: **1** **History of development of microbiology**	2	3	1	1	26
UNIT:2 **Microbial Diversity**	1	2	2	1	27
UNIT:3 **Fungi and Protozoa**	1	-----	1	2	26
UNIT:4 **Viruses**	1	2	2	1	27

I Main: 1x5=05Marks
II Main: 3x7=21Marks
III Main: 5x6=30Marks
IVMain: 10x5=50Marks

DSC-1
SCHEME OF PRACTICAL EXAMINATION
I B.Sc., I SEMESTER: PRACTICAL-I
TITLE: INTRODUCTION TO MICROBIOLOGY AND MICROBIAL DIVERSITY

Time: 3hours **Max marks: 70**

I. Identify the materials **A, B** and **C** with labelled diagrams and reasons 5X2=10
(1 material each from Algae and Fungi as per syllabus)
(Identification -1mark; diagram and reasons-4mark)

II. Write critical notes on **D, E** and **F.** 5X3=15
(Photographs/materials of Bacteriophages /TMV/HIV/ Plaque assay/ prokaryotic and Eukaryotic cell/Microbiologists/Exposed plates to air)

III. Identify the slides **G, H** and **I** with labelled diagrams and reasons 5X3=15
(One slide each from Algae, Fungi and Protozoa as per the theory syllabus)
(Identification –1mark; labelled diagram with reasons-4mark)

IV. Stain the given material **J** by…….method. Write the principle, procedure and leave the preparation for evaluation 10
(Wet mounting of Algae/Fungi)
(Preparation-4 marks; Principle and Procedure-4 marks)

V. Record 10

VI. Viva 10

Total marks: 70: [50 (Practical Exam) + 20 (10 -record+ 10- viva)]

DSC-II

B.Sc., Microbiology

SCHEME OF THEORY EXAMINATION
I B.Sc.,II SEMESTER
TITLE: BACTERIOLOGY

Times:3hrs **Max Marks:70**

Question Paper to be set for total of 106 marks including choices

UNITS	1 mark questions	3 mark questions	5 mark questions	10 mark questions	Total Marks
UNITS: **1** Bacterial cell organization	2	-	1	2	27
UNIT:2 Bacteriological techniques	1	2	2	1	27
UNIT:3 Microscopy	2	3	1	1	26
UNIT:4 Physical and chemical methods of Microbial control	-	2	2	1	26

I Main: 1x5=05Marks
II Main: 3x7=21Marks
III Main: 5x6=30Marks
IVMain: 10x5=50Marks

DSC-II
SCHEME OF PRACTICAL EXAMINATION
I B.Sc., II SEMESTER: PRACTICAL-II
TITLE: BACTERIOLOGY

Time: 3hours **Max marks: 70**

I. Write critical notes on **A, B, C** and **D** 3X4=1 2
(Microscopes-Charts/Photographs/Instruments/Oil immersion objective/ Stains / Laboratory equipments/Chromicacid/Detergents/Microbiologists/Media/cultivation of microorganisms/pure cultures/maintenance of culture) as per the theory syllabus.

II. Measure the length/breadth/diameter of the given material **E** using Stage and Ocular Micrometer. Write the procedure and result. 15
(Procedure-6marks; calibration -4marks; Results-5marks)

III. Stain the given material **F** by…….method. Write the principle, procedure and leave the preparation for evaluation. 08
(Simple staining/Negative staining/Gram-staining/Cell wall/ Endospore)
(Preparation-4marks; Principle and Procedure-4 marks)

IV. Demonstrate/ Perform the experiment **G** giving the principle and procedure. Record the result. 15
(Demonstration- 5marks; principle-5mark; procedure-3marks; results-2marks)
(Serial dilution/ measurement of growth by cell number using Haemocytometer/ Pour plate/Spread plate/Streak plate/Point inoculation)

V. Record. 10

VI. Viva 10

Total marks: 70: [50 (Practical Exam) + 20 (10 -record+ 10- viva)]

DSC-III
SCHEME OF THEORY EXAMINATION

B.Sc., Microbiology

II B.Sc.,III SEMESTER

TITLE: MICROBIAL PHYSIOLOGY AND METABOLISM

Times:3hrs **Max Marks:70**

Question Paper to be set for total of 106marks including choices

UNITS	1 mark questions	3 mark questions	5 mark questions	10 mark questions	Total Marks
UNITS: **1** Mcrobial Growth & Microbial nutrition	2	-	1	2	27
UNIT:2 Metabolism	1	2	2	1	27
UNIT:3 Chemoheterotrophic metabolism	2	3	1	1	26
UNIT:4 Chemolithotrophic & phototrophic metabolism	-	2	2	1	26

I Main: 1x5=05Marks
II Main: 3x7=21Marks
III Main: 5x6=30Marks
IVMain: 10x5=50Marks

DSC-3

II B.Sc.-IIISEMESTER

SCHEME OF PRACTICAL EXAMINATION

PRACTICAL III: MICROBIAL PHYSIOLOGY AND METABOLISM

Time: 3hours **Max. marks :70**

I. Demonstrate the experiment **A**, giving principle and procedure. Record the results. 15
(Demonstration-5marks; principle -5mark; procedure -3marks; result-2mark)
(Ammonification /Effect of temperature on growth of microorganisms/Effect of pH on the growth of microorganisms /Effect of salt concentration on growth of microorganism/ Effect of carbon and nitrogen on growth of microorganism).

II. Perform/conduct the experiment **B,** giving principle and procedure. Record the results. 10
(Demonstration-5marks; principle -2mark; procedure -2marks; result-1mark)
(Fermentation of lactose / starch hydrolysis/gelatin hydrolysis / catalase activity/urease test)

III. Prepare a temporary slide of **C** and identify the microorganisms giving reasons. Leave the preparation for evaluation. 10
(Preparation of slide-5marks, identification- 1mark, reason-4mark, Material to be given is root nodules)

IV. Write critical notes on **D, E & F** 5X3=15
(Fermentation of lactose / glucose/Starch hydrolysis/Gelatin hydrolysis / Catalase Activity/Urease test/Haemocytometer/Turbidometer/fermentation of glucose by Kuhne's fermentation vessel)

V. Record 10

VI. Viva 10

Total marks: 70: [50 (Practical Exam) + 20 (10 -record+10- viva)]

DSC-IV

SCHEME OF THEORY EXAMINATION

II B.Sc.,IV SEMESTER

B.Sc., Microbiology

TITLE: MICROBIAL GENETICS AND GENETIC ENGINEERING

Times: 3hrs **Max Marks:70**

Question Paper to be set for total of 106marks including choices

UNITS	1 mark questions	3 mark questions	5 mark questions	10 mark questions	Total Marks
UNITS: **1** Microbial Genetics	2	-	1	2	27
UNIT:2 Molecular Genetics	1	2	2	1	27
UNIT:3 Genetic Engineering	2	3	1	1	26
UNIT:4 Tools of Genetic Engineering	-	2	2	1	26

I Main: 1x5=05Marks
II Main: 3x7=21Marks
III Main: 5x6=30Marks
IVMain: 10x5=50Marks

DSC-IV

II B.Sc.-IV SEMESTER

SCHEME OF PRACTICAL EXAMINATION

PRACTICAL IV: MICROBIAL GENETICS AND GENETIC ENGINEERING

Time: 3hours **Max. marks :70**

I. Identify the materials **A, B**and **C** with labelled diagrams and reasons 5X3=15
(conjugation/transduction/ AMES test/Amplification of PCR/Southern blotting/Plasmid DNA/Streptomycin resistant mutant)
(Identification -1mark; diagram and reasons-4mark)

II. Write critical notes on **D, E** and **F.** 5 X3=15
(DNA model /Transcription and Translation model/DNA replication model/t-RNA/Plasmids /Episomes/ mRNA, transformation, conjugation and transduction)

III. Demonstrate the experiment **G,** giving principle and procedure. Record the results. 10
(Replica plating /Quantification of DNA/Conjugation/transformation/transduction, Isolation of streptomycin resistant strain of *E.coli* by gradient plate method)
(Demonstration-5marks; principle -5mark; procedure -3marks; result-2mark)

IV. Prepare the slide **H** giving the procedure and results. 10
(Preparation of slide-5marks, Procedure-2 reason-2mark, Diagram-1)
(onion root tip or flower buds mentioned in the practical syllabus)

V. Record 10

VI. Viva 10

Total marks: 70: [50 (Practical Exam) + 20 (10 -record+ 10- viva)]

DSE-A

SCHEME OF THEORY EXAMINATION

B.Sc., Microbiology

III B.Sc.,V SEMESTER

TITLE: ENVIRONMENTAL MICROBIOLOGY

Times: 3hrs **Max Marks:70**

Question Paper to be set for total of 106marks including choices

UNITS	1 mark questions	3 mark questions	5 mark questions	10 mark questions	Total Marks
UNITS: **1** Soil Microbiology	2	-	1	2	27
UNIT:2 Aerobiology	1	2	2	1	27
UNIT:3 Aquatic, sewage & bioremediation	2	3	1	1	26
UNIT:4 Agricultural Microbiology	-	2	2	1	26

I Main: 1x5=05Marks
II Main: 3x7=21Marks
III Main: 5x6=30Marks
IVMain: 10x5=50Marks

DSE-B

SCHEME OF THEORY EXAMINATION

III B.Sc.,V SEMESTER

TITLE: AGRICULTURAL MICROBIOLOGY

Times: 3hrs **Max Marks:70**

Question Paper to be set for total of 106marks including choices

UNITS	1 mark questions	3 mark questions	5 mark questions	10 mark questions	Total Marks
UNITS: **1** Introduction & History of Plant pathology & Microorganism in Agriculture	-	2	2	1	26
UNIT:2 Phytopathology	1	2	2	1	27
UNIT:3 Control of Plant diseases	2	3	1	1	26
UNIT:4 Specific Plant disease	2	-	1	2	27

I Main: 1x5=05Marks
II Main: 3x7=21Marks
III Main: 5x6=30Marks
IVMain: 10x5=50Marks

DSE-A

III B.Sc.-VSEMESTER

SCHEME OF PRACTICAL EXAMINATION

B.Sc., Microbiology

PRACTICAL V: ENVIRONMENTAL MICROBIOLOGY

Time: 3hours **Max. marks :70**

I. Demonstrate /perform the experiment **A**, giving principle and procedure. Record and interpret the result. 10

(Demonstration- 5marks; principle-2marks; procedure-2marks; results-1marks)

(Petriplate exposure method/standard analysis of water/ determination of MPN/ Isolation of Bacteria /Fungi from soil by serial dilution method/Antagonism between microorganisms).

II. Demonstrate /perform the experiment **B**, giving principle and procedure. Record and interpret the result. (Demonstration-3marks; principle-3mark; procedure-2mark; results-2marks) 10

(Demonstration of BOD of sewage/Estimation of total solids in sewage/IMViC/Hydrogen sulphide strip test).

III. Record the source and importance of microorganisms in the material **C** with Identification and label the diagrams. 10

(Source of the microorganisms and identification-5marks; labelled diagram- 3marks; importance-2marks).

(Pond water, agar plates exposed to air, biological indicators of water pollution).

IV. Write critical notes on **D, E** and **F** 3x4=12

(Identification -1mark; critical comments-4marks)

(Air samplers, Results of standatrd analysis of water, MPN, IMViC reactions,Hydrogen sulphide stip test, photograghs of baffles ,flocculator, clarifier,sand filter,back wash, chlorinometer,chloroscope,septic tank, Trickling filter, activated sludge process, oxidation pond, sedimentation tank, anaerobic digester, biogas plant, composting, composting process, aerated lagoons, low shear air lift reactor and microbial leaching/ Azolla/ VAM/Rhizosphere microflora/Plant diseases as per theory syllabus).

V. Prepare a temporary stained slide of **G**.Identify with labelled sketch and reasons. 08
Leave the preparation for evaluation.

(Identification -1mark; preparation-4marks; labeled diagram and reasons-3marks).

(Anabaena from Azolla/VAM/Rhizobium/Citrus canker)

VI. Record 10

VII. Viva 10

DSE-B

III B.Sc.-V SEMESTER

SCHEME OF PRACTICAL EXAMINATION

PRACTICAL V: AGRICULTURAL MICROBIOLOGY

Time: 3hours **Max. marks :70**

I. Demonstrate /perform the experiment **A**, giving principle and procedure. Record and Interpret the result. 15

(Demonstration-5marks; principle-4marks; procedure-4marks; results-2marks). (Isolation of Fungi from soil by serial dilution method/ from diseased parts of plants, chemical determination of IAA/plant disease control by fungicide).

II. Prepare a temporary stained slide of **B**. Identify with labeled sketch and reasons. Leave the preparation for evaluation. 15

(Identification -2mark; preparation-5marks; labeled diagram-4 and reasons-4marks).

(Plant diseases as per theory syllabus)

III. Identify the slides/materials **C, D, E** and **F** with labelled diagrams and reasons 4X5=20

(Identification-1mark; reasons-2marks; labeled sketch-1mark).

(Plant diseases as per theory syllabus/ Koch postulates)

IV. Record +Report 10

V. Viva 10

Total marks: 70: [50 (Practical Exam) + 10 (record+ report) + 5-(viva)]

DSE-A

B.Sc., Microbiology

SCHEME OF THEORY EXAMINATION

III B.Sc.,VI SEMESTER

TITLE: FOOD MICROBIOLOGY AND INDUSTRIAL MICROBIOLOGY

Times: 3hrs **Max Marks:70**

Question Paper to be set for total of 106marks including choices

UNITS	1 mark questions	3 mark questions	5 mark questions	10 mark questions	Total Marks
UNITS: **1** Industrial microbiology	2	-	1	2	27
UNIT:2 Industrial production	2	3	1	1	26
UNIT:3 Food Microbiology	1	2	2	1	27
UNIT:4 Dairy Microbiology	-	2	2	1	26

I Main: 1x5=05Marks
II Main: 3x7=21Marks
III Main: 5x6=30Marks
IVMain: 10x5=50Marks

DSE-B

SCHEME OF THEORY EXAMINATION

III B.Sc.,VI SEMESTER

TITLE: MEDICAL MICROBIOLOGY AND IMMUNOLOGY

Times: 3hrs **Max Marks:70**

Question Paper to be set for total of 106marks including choices

UNITS	1 mark questions	3 mark questions	5 mark questions	10 mark questions	Total Marks
UNITS: **1** Medical microbiology	2	-	1	2	27
UNIT:2 Human diseases	1	2	2	1	27
UNIT:3 Immune cells& organs	2	3	1	1	26
UNIT:4 Antigens and antibody	-	2	2	1	26

I Main: 1x5=05Marks
II Main: 3x7=21Marks
III Main: 5x6=30Marks
IVMain: 10x5=50Marks

B.Sc., Microbiology

SCHEME OF PRACTICAL EXAMINATION
III B.Sc. – VI SEMESTER
TITLE: FOOD MICROBIOLOGY AND INDUSTRIAL MICROBIOLOGY

Time:3hours. **Max.marks:70**

I. Demonstrate / Perform the experiment **A**, giving principle and procedure. Record and interpret the result. 15
(Demonstration -5marks; principle-4marks; procedure-4marks; results and interpretation-2marks).
(Isolation of microorganisms from utensils/spoiled vegetables/spoiled fruits).

II. Conduct the test for **B**. Write the principle and procedure. Record and interpret the results. 15
(Demonstration -5 marks; principle-4 marks; procedure-4 marks; results and interpretation- 2marks).
(Turbidity test, Phosphatase test, MBRT test, Estimation of % of alcohol in a given sample by specific gravity bottle method).

III. Write critical notes on **C, D** and **E**. (Identification -1mark; critical comments-1marks). 4X3=12
(Cheese, Yoghurt, Srikhand, Bread, Molasses, Wine, Alcohol, *Aspergillus* on groundnut, Citric acid production/alcohol from jaggery).

IV .Prepare temporary stained slide of **F.** Identify with labelled sketch and reasons. 08
Leave the preparation for evaluation.
(Identification -1mark; preparation-5marks; reasons- 4marks).
(*Spirullina, Chlorella*, Aspergillus *niger* and Yeast).

V. Record +Report 10

VI. Viva 10

DSE-B
SCHEME OF PRACTICAL EXAMINATION
III B.Sc. – VI SEMESTER
TITLE: IMMUNOLOGY AND MEDICAL MICROBIOLOGY

Time:3hours **Max.marks:70**

I. Demonstrate / Perform the experiment **A**, giving principle and procedure. Record and interpret the result. 15
(Demonstration -5marks; principle-4marks; procedure-4marks;results and interpretation- 2).
(Antibiotic sensitivity test/Determination of blood group and Rh factor/Demonstration of precipitation reaction-ODD).

II. Demonstrate the experiment **B.** write the principle and procedure. Record and interpret the results. 15
(Demonstration -5marks; principle-4marks; procedure-4marks; results and interpretation-2m).
(RPR/Urine bacteria by calibrated loop /Enumerate RBC in given blood sample/ Enumerate WBC in given blood sample/ Snyder test).

III. Write critical notes on **C, D**, and **E**. 4x3=12
(Identification -1mark; critical comments-1marks)
(Antibiotic sensitivity test, Estimation of urine bacteria by calibrated loop/IMViC/TSI/Nitrate reduction/urease production/catalase/ Ouchterlony procedure, RPR, Widal test, Slides/ Photographs of human pathogens as per theory syllabus).

IV. .Prepare temporary stained slide of **F**. Identify with labeled sketch and reasons.
Leave the preparation for evaluation. 08
(Identification -1mark; preparation-5marks; reasons- 4marks).
(Petri plates with Fungal colonies/Bacterial colonies).

V. Record +Report 10

VI. Viva 10

Total marks: 70: [50 (Practical Exam) + 10 – (record+ report) + 5-(viva)]

SEC- A

B.Sc., Microbiology

SCHEME OF THEORY EXAMINATION

III B.Sc.,V SEMESTER

TITLE: MICROBIAL DIAGNOSIS IN HEALTH CLINICS

Times: 3hrs **Max Marks:50**

Question Paper to be set for total of 86 marks including choices

UNITS	1 mark questions	3 mark questions	5 mark questions	10 mark questions	Total Marks
UNITS: **1** Importance of diagnosis of diseases	1	1	1	1	19
UNIT:2 Collection of clinical samples	1	2	1	1	22
UNIT:3 Deirect microscopic examination and culture	--	1	2	1	23
UNIT:4 Testing for antibiotic sensitivity in bacteria	1	2	1	1	22

I Main: 1x3=03Marks
II Main: 3x6=18Marks
III Main: 5x5=25Marks
IVMain: 10x4=40Marks

SEC-B

SCHEME OF THEORY EXAMINATION

III B.Sc.,V SEMESTER

TITLE: MICROBIOLOGICAL ANALYSIS OF AIR AND WATER

Times: 3hrs **Max Marks:70**

Question Paper to be set for total of 86marks including choices

UNITS	1 mark questions	3 mark questions	5 mark questions	10 mark questions	Total Marks
UNITS: **1** Air microbiology	1	1	1	1	19
UNIT:2 Water microbiology	1	2	1	1	22
UNIT:3 Microbial analysis of water	--	1	2	1	23
UNIT:4 Control Measures	1	2	1	1	22

I Main: 1x3=03Marks
II Main: 3x6=18Marks
III Main: 5x5=25Marks
IVMain: 10x4=40Marks

DEPARTMENT OF MICROBIOLOGY

B.Sc., Microbiology

LIST OF BOS MEMBERS (2018-19)

SL.NO.	NAME
1	Dr. M. Seema –Chairman Lecturer and Head Department of Microbiology JSS College, Ooty road,Mysuru-25
2	Dr.B.Kavitha Associate Professor Department of Microbiology Government Science College Nrupathunga road Bengaluru- 560 001
3	M.Girish Assistant Professor and HOD Department of Microbiology JSS College for women, Saraswathipuram Mysuru
4	Dr. D.C. Mohana Associate Professor DOS in Microbiology and Biotechnology Bangalore University, Bengaluru

Approved list of Paper setters and Valuers

B.Sc., Microbiology

Sl No.	Name	College address

B.Sc., Microbiology

1	Dr..M .Seema	Chairperson, Dept. of Microbiology JSS College, Ooty road, Mysore
2	H.P.Spoorthy	Assistant prof. Dept. of Microbiology JSS College, Ooty road, Mysore
3	Dr.S.Mahadevamurthy	Associate Prof & HOD Dept. of Microbiology Yuvaraja's college Mysore.
4	Dr.Syeda Kauser Fathima	Associate Prof. of Microbiology Maharani's Science College for women JLB road Mysore.
5	Dr. H.S. Jayanth.	Asso.Prof.of Microbiology Dept. of Microbiology Yuvaraja's college Mysore.
6	Dr.Nagarathnamma	Asso. Prof. of Microbiology Government women college Mandya
7	Sri. M. Girish	Assistant prof. Dept. of Microbiology JSS College for Women Saraswathipuram,Mysore
8	Dr. P.K.Maheshwar	Assistant Prof. Dept. of Microbiology Yuvaraja's college,Mysore.
9	Smt. M.S.Shobha	Assistant Prof, Dept. of Microbiology Maharani's Science College Mysore
10	Sri. R.A. Manjunath	Assistant Prof. Dept. of Microbiology Saradavilas College,Mysore
11	Dr.M.P. Ragavendra	Assistant Prof. Dept. of Microbiology Maharani's Science College,Mysore
12	Dr.K.Girish	Assistant Prof. Dept. of Microbiology Maharani's Science College, Mysore

B.Sc., Microbiology

13	Sri. G.S. Siddegowda	Assistant Prof. Dept. of Microbiology Maharani's Science College Mysore
14	Dr.N.S.Devaki	Assistant Prof. Dept. of Molecular Biology Yuvaraja's College , Mysore
15	Syeda Farahna Parveen	Assistant Prof. Dept. of Microbiology St.Philomina's College, Mysore
16	Smt. Vanitha	Assistant Prof. Dept. of Microbiology Maharani's Science College,Mysore
17	Smt. Revanamba	Assistant Prof. Dept. of Microbiology Maharani's Science College,Mysore
18	Mahadevaprasad	Assistant prof. Dept. of Microbiology JSS College for Women Saraswathipuram,Mysore
19	Dr.Nagalambika	JSS University,Mysuru
20	RajaRajeshwari.R	Assistant prof. Dept. of Microbiology SDM College JLB Road,Mysuru
21	Uzma Bathool	Assistant Prof. Dept. of Microbiology St.Philomina's College, Mysore
22	Shruthi Prakash	Assistant Prof. Dept. of Microbiology Mahajana's Science College,Mysuru
23	Athiya sultan	Assistant prof. Dept. of Microbiology SDM College JLB Road,Mysuru
24	C.Poornima Devi	Assistant Prof. Dept. of Microbiology Yuvaraja's college,Mysore
25	Dr.Rakshith	Assistant Prof. Dept. of Microbiology Yuvaraja's college,Mysore
26	Vasundara Devi R	Assistant Prof. Dept. of Microbiology Maharani's Science College,Mysore
	Niveditha Prakash	Assistant prof.

B.Sc., Microbiology

27		Dept. of Microbiology JSS College for Women Saraswathipuram,Mysore
28	Dr.K.Sumana	JSS University,Mysuru

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE

(Autonomous)

OOTY ROAD, MYSURU- 570 025

DEPARTMENT OF PHYSICS

Syllabus

CHOICE BASED CREDIT SYSTEM

For B.Sc. Programmes

- **Physics, Mathematics, Chemistry**
- **Physics, Mathematics, Computer Science**
- **Physics, Mathematics, Electronics**
- **Physics, Mathematics, Computer Maintenance**

2017-18

Department of Physics

PROGRAMME: BSc PCM, PROGRAMME CODE: BSc-01 (2017-18)

Semester	Course Code	Course Title	Course type	No. of credits			
				L	T	P	Total
I	CMA29001	Mechanics	**DSC-1**	04	-	02	06
II	CMB29001	Electricity and Magnetism	**DSC-2**	04	-	02	06
III	CMC29001	Thermal physics and Statistical mechanics	**DSC-3**	04	-	02	06
IV	CMD29001	Waves and Optics	**DSC-4**	04	-	02	06
Discipline Specific Elective papers (DSE 1): Choose any 1							
V	CME29001	Digital, Analog circuits and Instrumentation	**DSE-1A**	04	-	01	05
	CME29201	Solid State Physics	**DSE-1B**	04	-	01	05
	CME29601	Mathematical Physics	**DSE-1D**	04	-	01	05
Discipline Specific Elective papers (DSE 2): Choose any 1							
VI	CMF29001	Elements of Modern Physics	**DSE-1A**	04	-	01	05
	CMF29201	Nuclear and particle physics	**DSE-1B**	05	-	-	05
	CMF29401	Quantum Mechanics	**DSE-1C**	04	-	01	05
Skill Enhancement Course (SEC)							
V	CME69001	Renewable Energy and Energy harvesting	**SEC-1A**	2	-	-	2
	CME69201	Radiation Safety	**SEC-1B**	2	-	-	2
	CME69401	Basic Instrumentation Skills	**SEC-1C**	2	-	-	2
	CME70601	Applied Optics	**SEC-1I**	2	-	-	2

PROGRAMME: BSc PMCS, PROGRAMME CODE: BSc-02 (2017-18)

Semester	Course Code	Course Title	Course type	No. of credits			
				L	T	P	Total
I	CMA29002	Mechanics	**DSC-1**	04	-	02	06
II	CMB29002	Electricity and Magnetism	**DSC-2**	04	-	02	06
III	CMC29002	Thermal physics and Statistical mechanics	**DSC-3**	04	-	02	06
IV	CMD29002	Waves and Optics	**DSC-4**	04	-	02	06
Discipline Specific Elective papers (DSE 1): Choose any 1							
V	CME29002	Digital, Analog circuits and Instrumentation	**DSE-1A**	04	-	01	05
	CME29202	Solid State Physics	**DSE-1B**	04	-	01	05
	CME29602	Mathematical Physics	**DSE-1D**	04	-	01	05
Discipline Specific Elective papers (DSE 2): Choose any 1							
VI	CMF29002	Elements of Modern Physics	**DSE-1A**	04	-	01	05
	CMF29202	Nuclear and particle physics	**DSE-1B**	05	-	-	05
	CMF29402	Quantum Mechanics	**DSE-1C**	04	-	01	05
Skill Enhancement Course (SEC)							
V	CME69002	Renewable Energy and Energy harvesting	**SEC-1A**	2	-	-	2
	CME69202	Radiation Safety	**SEC-1B**	2	-	-	2
	CME69402	Basic Instrumentation Skills	**SEC-1C**	2	-	-	2
	CME70602	Applied Optics	**SEC-1I**	2	-	-	2

PROGRAMME: BSc PMCM, PROGRAMME CODE: BSc-03 (2017-18)

Semester	Course Code	Course Title	Course type	No. of credits			
				L	T	P	Total
I	CMA29003	Mechanics	**DSC-1**	04	-	02	06
II	CMB29003	Electricity and Magnetism	**DSC-2**	04	-	02	06
III	CMC29003	Thermal physics and Statistical mechanics	**DSC-3**	04	-	02	06
IV	CMD29003	Waves and Optics	**DSC-4**	04	-	02	06
Discipline Specific Elective papers (DSE 1): Choose any 1							
V	CME29003	Digital, Analog circuits and Instrumentation	DSE-1A	04	-	01	05
	CME29203	Solid State Physics	DSE-1B	04	-	01	05
	CME29603	Mathematical Physics	DSE-1D	04	-	01	05
Discipline Specific Elective papers (DSE 2): Choose any 1							
VI	CMF29003	Elements of Modern Physics	DSE-1A	04	-	01	05
	CMF29203	Nuclear and particle physics	DSE-1B	05	-	-	05
	CMF29403	Quantum Mechanics	DSE-1C	04	-	01	05
Skill Enhancement Course (SEC)							
V	CME69003	Renewable Energy and Energy harvesting	**SEC-1A**	2	-	-	2
	CME69203	Radiation Safety	**SEC-1B**	2	-	-	2
	CME69403	Basic Instrumentation Skills	**SEC-1C**	2	-	-	2
	CME70603	Applied Optics	**SEC-1I**	2	-	-	2

PROGRAMME: BSc PME, PROGRAMME CODE: BSc-04 (2017-18)

Semester	Course Code	Course Title	Course type	No. of credits			
				L	T	P	Total
I	CMA29004	Mechanics	**DSC-1**	04	-	02	06
II	CMB29004	Electricity and Magnetism	**DSC-2**	04	-	02	06
III	CMC29004	Thermal physics and Statistical mechanics	**DSC-3**	04	-	02	06
IV	CMD29004	Waves and Optics	**DSC-4**	04	-	02	06
Discipline Specific Elective papers (DSE 1): Choose any 1							
V	CME29004	Digital, Analog circuits and Instrumentation	**DSE-1A**	04	-	01	05
	CME29204	Solid State Physics	**DSE-1B**	04	-	01	05
	CME29604	Mathematical Physics	**DSE-1D**	04	-	01	05
Discipline Specific Elective papers (DSE 2): Choose any 1							
VI	CMF29004	Elements of Modern Physics	**DSE-1A**	04	-	01	05
	CMF29204	Nuclear and particle physics	**DSE-1B**	05	-	-	05
	CMF29404	Quantum Mechanics	**DSE-1C**	04	-	01	05
Skill Enhancement Course (SEC)							
V	CME69004	Renewable Energy and Energy harvesting	**SEC-1A**	2	-	-	2
	CME69204	Radiation Safety	**SEC-1B**	2	-	-	2
	CME69404	Basic Instrumentation Skills	**SEC-1C**	2	-	-	2
	CME70604	Applied Optics	**SEC-1I**	2	-	-	2

Assessment Maximum marks - 100

Course type	C1		C2		C3 Exam Marks		Assigned Marks (Percentage)			Total
	Theory	Lab	Theory	Lab	Theory	Lab	Theory	Lab	IA	
DSC	**10**	**05**	**10**	**05**	**70**	**70**	**50**	**20**	**30**	**100**
DSE	**10**	**05**	**10**	**05**	**70**	**70**	**50**	**20**	**30**	**100**
DSE (non practical)	**15**	**-**	**15**	**-**	**70**	**-**	**70**	**--**	**30**	**100**
SEC	**15**	**-**	**15**	**-**	**50**	**-**	**70**	**--**	**30**	**100**

Note:

1. **C1 will be conducted for 20 Marks (Theory) with one hour duration - 10 Marks (Lab) with continuous assessment and it will be reduced to assigned marks.**
2. **C2 will be conducted for 20 Marks (Theory) with one hour duration - 10 Marks (Lab) with continuous assessment and it will be reduced to assigned marks.**
3. **C3 will be conducted for 70 Marks (Theory) with three hours duration - 70 Marks (Lab) with 3 hours duration and to be reduced to assigned marks.**
4. **For non-practical course C3 will be conducted for 70 Marks (Theory) with three hours duration.**
5. **In case of SEC, C1 and C2 will be conducted for 15 Marks each with one hour duration and C3 will be conducted for 50 Marks with 2 hours duration.**

Programme Outcome for Bachelor of Science in Physics, Chemistry, Mathematics:

After completing the graduation in the Bachelor of Science the students are able to:

PO1. Demonstrate proficiency in Mathematics and the Mathematical concepts needed for a proper understanding of Physics.

PO2. Demonstrate the ability to justify and explain their thinking and/or approach

PO3. Develop state-of-the-art laboratory and professional communication skills

PO4. Apply the scientific method to design, execute, and analyze an experiment

PO5. Explain scientific procedures and experimental observations

PO6. Appreciate the role of chemistry in the society

PO7. Use this as a basis for ethical behaviour in issues facing chemists /drugs

PO8. Understand chemistry as an integral part for addressing social, economic, and environmental problems

PO9. Understand the value of Mathematical proof

PO10. Demonstrate proficiency in writing and understanding proofs

PO11. Apply mathematical problems and solution in aspects of science and technology

PO12. Gain experience to investigate the real world problems

PO13. Apply mathematical ideas and models to those problems

Programme Specific Outcome

Bachelor of Science in Physics, Chemistry, Mathematics

After completing the graduation in the Bachelor of Science the students are able to:

PSO1. Find career opportunities

PSO2. Develop competence to write competitive examinations

PSO3. Develop proficiency in the analysis of complex physical problems

PSO4. Use of mathematical or other appropriate techniques to solve problems

PSO5. Apply appropriate techniques for the qualitative and quantitative analysis of chemicals in laboratories and in industries

PSO6. Create a hypothesis and appreciate how it relates to broader theories

PSO7. Demonstrate skills in the use of computers

Programme Outcome for Bachelor of Science in Physics, Mathematics, Computer Science:

After completing the graduation in the Bachelor of Science the students are able to:

PO1. Demonstrate proficiency in Mathematics and the Mathematical concepts needed for a proper understanding of Physics

PO2. Demonstrate the ability to justify and explain their thinking and/or approach

PO3. Develop state-of-the-art laboratory and professional communication skills

PO4. Apply the scientific method to design, execute, and analyze an experiment

PO5. Explain scientific procedure and experimental observations

PO6. Understand the value of Mathematical proof

PO7. Demonstrate proficiency in writing an understanding proofs

PO8. Apply mathematical problems and solutions in aspects of science and technology.

PO9. Gain experience to investigate the real world problems

PO10. Apply mathematical ideas and models to those problems.

PO11. Apply Mathematical principles for computing and logical design.

PO12.Design, implements, and evaluates a computational system to meet desired needs within realistic constraints

PO13. Use the System principles in the design and development of software for systems of varying complexity.

Programme Specific Outcome

Bachelor of Science in Physics, Mathematics, Computer Science

After completing the graduation in the Bachelor of Science the students are able to:

PSO1. Find career opportunities

PSO2. Develop competence to write competitive examinations.

PSO3. Develop proficiency in the analysis of complex physical problems

PSO4. Use of mathematical or other appropriate techniques to solve problems

PSO5. Create a hypothesis and appreciate how it relates to broader theories.

PSO6. Demonstrate skills in the use of Computers

PSO7. Join as Entry level Technical job role for an IT Industry

PSO8. Build small database ERP software/ web applications.

Programme Outcome for Bachelor of Science in Physics, Mathematics, Computer Maintenance:

After completing the graduation in the Bachelor of Science the students are able to:

PO1. Demonstrate proficiency in Mathematics and the Mathematical concepts needed for a proper understanding of Physics

PO2. Demonstrate the ability to justify and explain their thinking and/or approach

PO3. Develop state-of-the-art laboratory and professional communication skills

PO4. Apply the scientific method to design, execute, and analyze an experiment

PO5. Explain scientific procedure and experimental observations

PO6. Understand the value of Mathematical proof

PO7. Demonstrate proficiency in writing and understanding proofs

PO8. Apply mathematical problems and solutions in aspects of science and technology.

PO9. Gain experience to investigate the real world problems

PO10. Apply mathematical ideas and models to those problems

PO11. Design, implement and evaluate a computational system to meet desired needs within realistic constraints

PO12. Apply system design and development principals in the construction of software systems of varying complexity

PO13. Apply the knowledge techniques , skills and modern tools in computer maintenance

PO14. Understand networking applications to include basic electronics, programming, operation and computer network

Programme Specific Outcome

Bachelor of Science in Physics, Mathematics, Computer Maintenance

After completing the graduation in the Bachelor of Science the students are able to:

PSO1. Find career opportunities

PSO2. Develop competence to write competitive examinations

PSO3. Develop proficiency in the analysis of complex physical problems

PSO4. Use of mathematical or other appropriate techniques to solve them

PSO5. Create a hypothesis and appreciate how it relates to broader theories.

PSO6. Demonstrate skills in the use of Computers

PSO7. Start small enterprise in PC Maintenance/ Networking field.

PSO8. Join organizations related to Computer Hardware and Networking Maintenance.

Programme Outcome for Bachelor of Science in Physics, Mathematics, Electronics:

After completing the graduation in the Bachelor of Science the students are able to:

PO1. Demonstrate proficiency in mathematics and the mathematical concepts needed for a proper understanding of physics.

PO2. Demonstrate the ability to justify and explain their thinking and/or approach

PO3. Develop state-of-the-art laboratory skills and professional communication skills.

PO4. Apply the scientific method to design, execute, and analyze an experiment

PO5. Understand the value of Mathematical proof

PO6. Gain experience to investigate the real world problems

PO7. Explain scientific procedures and their experimental observations

PO8. Demonstrate proficiency in writing and understanding proofs.

PO9. Apply mathematical problems and solutions in aspects of science and technology

PO10. Apply mathematical ideas and models to problems.

PO11. Apply appropriate troubleshooting techniques to electronic circuits / systems and perform test procedures

PO12. Assist, Assemble, modify and test electronic circuits in accordance with job requirements.

PO13. Communicate effectively in technical and non-technical environments

Programme Specific Outcome

Bachelor of Science in Physics, Mathematics, Electronics

After completing the graduation in the Bachelor of Science the students are able to:

PSO1. Find career opportunities

PSO2. Develop competence to write competitive examinations.

PSO3. Develop proficiency in the analysis of complex physical problems.

PSO4. Use mathematical or other appropriate techniques to solve complex physical problems.

PSO5. Create a hypothesis and appreciate how it relates to broader theories.

PSO6. Demonstrate skills in the use of Computers for control, data acquisition, and data analysis in experimental investigations

PSO7. Apply knowledge of Physics, Mathematics and Electronics fundamentals to the solve problems in electronic circuits & communication systems

PSO8. Apply appropriate troubleshooting techniques to Electronic circuits / systems and perform test procedures

SEMESTER I

Course code: CMA29001/ CMA29002/ CMA29003/ CMA29004
Credits: Theory – 04, Practical – 02 **Theories: 60 Lectures**

COURSE OUTCOME:

After successful completion of the course, the student is able to

CO1.Learn the details of Elasticity

CO2.Understand the classification and characteristics of motion of a point particle

CO3.Understand in details with examples Frames of reference and relative motion

CO4.Deliberate the classification and characteristics of Dynamics of particle in conservative field

CO5.Specify the classification and characteristics of Special theory of relativity and gravitation

CO6.Write down the characteristics of Surface tension and viscosity

MECHANICS: DSC1

Unit-1

Vectors: Vector algebra (with special reference to the rules of addition and multiplication), Scalar and vector products with specific examples.

Motion of a point particle: The position vector *r(t)* of a moving point particle and its Cartesian components. Velocity and acceleration as the vector derivatives. Derivatives of a vector with respect to a parameter; Derivation of planar vector of a constant magnitude. Radial and transverse components of velocity and acceleration for arbitrary planar motion, deduction of results for uniform circular motion-centripetal force. **(05 Lectures)**

Frames of references and relative motion:

Newton's laws of motion and inertial mass. Galilean transformation; Galilean principle of relativity, Plumb line accelerometer and a freely falling elevator, Non-inertial frames and fictitious force, uniformly rotating frame of reference and coriolis force. Effect of rotation of earth on acceleration due to gravity. **(07Lectures)**

Dynamics of a particle in conservative fields:

Work done by force acting on a particle, work-energy theorem. Conservative and non conservative force field. Conservation of energy. Conservative force as a negative gradient of potential, central force as an example of conservative force field. **(05 Lectures)**

Conservation of momentum: Conservation of linear momentum, centre of mass, rocket equation. Angular momentum and torque, law of conservation of angular momentum, angular momentum of a system taking centre of mass of the system. **(06 Lectures)**

Dynamics of rigid bodies: Moment of inertia, radius of gyration, calculation of momentum of inertia of rectangular plate, circular plate and solid sphere, kinetic energy of rotation. **(04 Lectures)**

Oscillations: Simple harmonic motion. Differential equation of SHM and its solutions. Kinetic and Potential Energy, Total Energy and their time averages. Damped oscillations. (**03 Lectures)**

Unit-2

Gravitation: Newton's Law of gravitation. Motion of a particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant). Kepler's Laws, derivations of Kepler's law, satellite in circular orbit and applications, geosynchronous orbits, weightlessness, basic idea of global positioning system (GPS). **(08Lectures)**

Special Theory of Relativity: Postulates of Special Theory of Relativity. Lorentz transformation equations, Length contraction, time dilation, relativistic addition of velocities. Mass-Energy relation, energy-momentum relation**.** **(06 Lectures)**

Elasticity:

Review of concepts of modulii of elasticity, Hooke's Law and Poisson's ratio(σ). Relation between the elastic constants ***q, k, n*** and ***σ***, limiting values for **σ.** Work done in stretching. Elastic potential energy. Bending moment. Theory of light single cantilever. I-section girders. Torsion; calculation of couple per unit twist. The Torsional pendulum, Static torsion, Searle's double bar experiment.

Surface Tension: Review of basic concepts. Pressure inside curved liquid surface. Surface tension

and interfacial tension by drop-weight method. Surface tension and angle of contact of mercury by Quincke's method.

Viscosity: Review of basic concepts; Variation of Viscosity of liquids with temperature and pressure.

(16 Lectures)

Reference Books:

- Halliday, Resnick, Jearl Walker, "Principles of Physics" 9th edition, Wiley, 2013.
- Berkeley Physics Course, Vol-1 "Mechanics", 2nd edition, Charles Kittle, Walter D Knight, Malvin A
- D S Mathur, "Elements of properties of matter", S Chand and company, New Delhi, Reprint-2007.
- D S Mathur, "Mechanics", S Chand and company, New Delhi, Reprint-2001.
- Brij Lal and N Subrahmanyam, "Properties of matter", 6th edition, Eurasia publishing house Ltd. New Delhi, Reprint-1993.
- Mechanics by Shankara Narayana & Chopra.
- Mechanics by Bhargava and Sharma.

PHYSICS LAB: DSC 1A LAB: MECHANICS

(Minimum of eight is to be conducted)

1. To determine the Moment of Inertia of a Flywheel.
2. Young's modulus by the single cantilever method.
3. Determination of the Young's modulus by Dynamic method (graphical and calculation method).
4. Drop weight method; Determination of surface tension of liquid and the interfacial tension between two liquids
5. Torsional pendulum; Determination of the rigidity modulus
6. To determine the Elastic Constants of a Wire by Searle's method.
7. Oscillations of a spiral Spring and calculate a) Spring Constant b) Value of g
8. Bar pendulum: Determination of the acceleration due to gravity and radius of gyration (Both graphical and calculation methods).
9. Determination of young's modulus by the method of uniform bending.
10. Determination of rigidity modulus by the static torsion method.

11. To determine the Height of a Building using a Sextant.
12. To determine g by Kater's Pendulum
13. To determine the Modulus of Rigidity of a Wire by Maxwell's needle
14. To determine **g** and velocity for a freely falling body using Digital Timing Technique

Reference Books:

- Advanced Practical Physics for students, B.L.Flint and H.T.Worsnop, 1971, Asia Publishing House.
- Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers.
- Engineering Practical Physics, S.Panigrahi & B.Mallick,2015, Cengage Learning India Pvt. Ltd.
- A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.

SEMESTER II

Course code: CMB29001/ CMB29002/ CMB29003/ CMB29004
Credits: Theory – 04, Practical – 02 **Theories: 60 Lectures**

COURSE OUTCOME:

After successful completion of the course, the student is able to

CO1.Deliberate in detail with examples vector analysis

CO2.Write down in detail with application, electrostatics and magnetostatic

CO3.Write down the classification and characteristics of AC Circuits

CO4.Specify in details with application, if applicable, properties of magnet material

CO5.Understand the characteristics of electromagnetic theory

CO6.Write down the characteristic of galvanometer

ELECTRICITY AND MAGNETISM: DSC 2

Unit-1

Vector Analysis: Review of vector algebra (Scalar and Vector product), Scalar and vector fields, gradient, divergence, Curl and their significance, Vector Integration, Line, surface and volume integrals of Vector fields, Gauss-divergence theorem and Stoke's theorem of vectors (statement only). **(07 Lectures)**

Electrostatics: Electrostatic Field, electric flux, Gauss's theorem of electrostatics and applications; 1) infinite line of charge and 2) plane charged sheet. Electric potential as line integral of electric field, potential due to a point charge, electric dipole, uniformly charged spherical shell and solid sphere. Calculation of electric field from potential.

Capacitance of an isolated spherical conductor. Parallel plate, spherical and cylindrical condenser. Energy per unit volume in electrostatic field.

Dielectric medium, Polarization, Displacement vector. Gauss's theorem in dielectrics. Parallel plate capacitor completely filled with dielectric.

Galvanometers: Construction, theory and working of Helmholtz galvanometer. **(15Lectures)**

Alternating current: R M S values, Response of LR, CR and LCR circuits to sinusoidal voltages (discussion using the j symbol), Series and parallel resonance, Half-power frequencies, bandwidth and Q-factor, Power in electrical circuits, power factor and Maximum power transfer theorem.

(08 Lectures)

Unit-2

Applications of ac circuits - ac bridges**;** Anderson's bridge and De-Sauty's bridge

(02 Lectures)

Magneto statics: Biot-Savart's law & its applications; long straight conductor, circular coil and solenoid carrying current. Divergence and curl of magnetic field. Magnetic vector potential. Ampere's circuital law.

Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. Brief introduction of dia-magnetic, para-magnetic and ferro-magnetic materials.

(10Lectures)

Electromagnetic Induction: Faraday's laws of electromagnetic induction, Lenz's law, self Inductance (L) and mutual inductance (M), L of single coil, M of two coils. Energy stored in magnetic field. **(06 Lectures)**

Electromagnetic Theory: Equation of continuity, Displacement current, Setting up of Maxwell's equations, wave equation in free space, Poynting vector, energy density in electromagnetic field, electromagnetic wave propagation through free space and isotropic dielectric medium, Transverse nature of electromagnetic waves, polarization. **(12 Lectures)**

Reference Books:

- D. C. Tayal, Electricity and Magnetism, 1988, Himalaya Publishing House.
- K. K. Tewari: Electricity and magnetism, S. Chand Co. Ltd., New Delhi, Reprint 2007.
- B. B. Laud: Electrodynamics, Wiley Eastern Limited, New Delhi.
- David. J. Griffiths: Introduction to Electrodynamics, 3rd edition, Prentice-Hall of India Private limited, New Delhi.
- BrijLal and N. Subramanian: Electricity and Magnetism, 19th edition-Ratan Prakashan Mandir, Educational and University Publishers, Agra.

- D.N. Vasudeva: Fundamentals of Magnetism and Electricity, 12th edition-S.Chand and Co. Ltd., New Delhi

PHYSICS LAB- DSC 2A LAB: ELECTRICITY AND MAGNETISM
(Minimum of eight is to be conducted)

1. To verify the Thevinin's theorem
2. Maximum Power Transfer Theorem
3. Black box – Identification of L,C & R
4. LCR series circuits – Determination of L & Q factor
5. LCR parallel circuits – Determination of L & Q factor
6. Anderson's Bridge – Determination of the self-inductance of the coil.
7. De-Sauty's bridge – Verification of laws of combination of capacitances, unknown capacitance.
8. B_H using Helmholtz double coil galvanometer
9. Maxwell's bridge-determination of mutual inductance
10. Low resistance-determination of the resistivity of the material.
11. Determination of capacitance by measuring impedance of RC circuit.
12. Determination of inductance by measuring impedance of RL circuit.
13. Measurement of Magnetic field strength B and its gradient in a Solenoid (Determine dB/dx).
14. To determine a Low Resistance by Carey Foster's Bridge.

Reference Books

- Advanced Practical Physics for students, B.L.Flint & H.T.Worsnop, 1971, Asia Publishing House.
- A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.
- Edition, reprinted 1985, Heinemann Educational Publishers

SEMESTER III

Course code: CMC29001/ CMC29002/ CMC29003/ CMC29004
Credits: Theory – 04, Practical – 02 **Theories: 60 Lectures**

COURSE OUTCOME:

After successful completion of the course, the student is able to

CO1.Specify in details with examples kinetic theory of gases

CO2.Specify in depth low temperature physics

CO3.Identify in detail with application thermal conductivity and theory of radiation

CO4.write down the classification and characteristics of laws of thermodynamics

CO5.Have a clear understanding about reversible and irreversible process

CO6.Understand the classification and characteristics of entropy and thermodynamic potential

THERMAL PHYSICS AND STATISTICAL MECHANICS: DSC 3

Unit-1

Laws of Thermodynamics: Thermodynamic description of system, Zeroth Law of thermodynamics and temperature. Applications of First Law; General Relation between C_P & C_V. Work Done during Isothermal and Adiabatic Processes. Compressibility & Expansion Coefficient. Reversible & irreversible processes; Carnot's theorem. Thermodynamic scale of temperature and its identity with perfect gas scale.

Entropy: The concept of entropy. Change of entropy in reversible and irreversible cycles. Entropy and non-available energy. Principle of increase of entropy; Clausius inequality. Second law of thermodynamics in terms of Entropy. Entropy of ideal gas, T-S diagram. Probability and entropy, Boltzmann relation. Concept of absolute zero and the third law of thermodynamics.

(15 Lectures)

Thermodynamic Potentials: Internal energy, Enthalpy, Helmholtz and Gibbs functions, Maxwell's thermodynamic relations & applications; Joule-Thompson Effect. Clausius-Clapeyron first Latent heat equation, effect of pressure on melting point of a solid, effect of pressure on boiling

point of a liquid, Expression for ($C_P - C_V$), C_P/C_V, TdS equations. **(08 Lectures)**

Kinetic Theory of Gases: Derivation of Maxwell's law of distribution of velocities and its experimental verification, Mean free path (Zeroth Order). Transport Phenomena; Viscosity, Conduction and Diffusion (for vertical case), Law of equipartition of energy (no derivation) and its applications to specific heat of gases; mono-atomic and diatomic gases. **(07 Lectures)**

Unit-2

Thermal conductivity: Equation of flow of heat through solid bar, determination of thermal conductivity of a bad conductor by Lee and Charlton method. **(03 Lectures)**

Theory of Radiation: Induced and spontaneous emission of radiation. Derivation of Planck's law of radiation using Einstein's A and B coefficients. Deduction of Rayleigh-Jeans law, Stefan's law and Wien's displacement law from Planck's law, Wien's formula. **(08 Lectures)**

Low temperature Physics: Ideal gas and real gas. Van-der Waals equation of state. Porous-plug experiment and its theory. Joule-Thomson expansion - expression for the temperature of inversion, inversion curve. Relation between Boyle temperature, temperature of inversion and critical temperature of a gas. Principle of regenerative cooling. Liquefaction of air by Linde's methods. Adiabatic demagnetization**.** **(07 Lectures)**

Statistical Mechanics: Probability concept, Phase space, Macrostate and Microstate, Entropy and Thermodynamic probability, Maxwell-Boltzmann law- distribution of velocity. Quantum statistics: Bose-Einstein, Maxwell-Boltzmann and Fermi-Dirac distribution law – electron gas-Bose-Einstein distribution law - photon gas - comparison of three statistics. **(12 Lectures)**

Reference Books:

- BrijLal, N. Subramanyam P.S. Hemne: Heat Thermodynamics and Statistical Physics, 1st edition. S Chand Publishing, 2007.
- S C Gupta: Thermodynamics, 1st edition, Pearson, 2005.
- C. L. Arora: Refresher Course in Physics Vol I, S Chand publishing, 2011.

- S. R. Shankara Narayana: Heat and Thermodynamics, 2nd edition, Sulthan Chand and Sons, 1990.
- A Treatise on Heat, Meghnad Saha, and B.N. Srivastava, 1969, Indian Press.
- Heat and Thermodynamics, M.W.Zemasky and R. Dittman, 1981, McGraw Hill

PHYSICS LAB-DSC 3A LAB: THERMAL PHYSICS AND STATISTICAL MECHANICS
(Minimum of eight is to be conducted)

1. Measurement of Planck's constant using black body radiation.
2. Verification of Stefan's-Boltzmann law.
3. To determine the coefficient of thermal conductivity of a bad conductor by Lee and Charlton's disc method.
4. Verification of distribution law using Monte-Carlo Method
5. To study the variation of thermo emf across two junctions of a thermocouple with temperature.
6. Specific heat of a liquid by cooling – graphical method
7. To determine Stefan's Constant
8. To determine Mechanical Equivalent of Heat, J, by Callender and Berne's constant flow method.
9. To record and analyze the cooling temperature of an hot object as a function of time using a thermocouple and suitable data acquisition system
10. To determine the temperature co-efficient of resistance by Platinum resistance thermometer.
11. To determine the coefficient of thermal conductivity of copper by Searle's Apparatus
12. To determine the Coefficient of Thermal Conductivity of Cu by Angstrom's Method.
13. To study the variation of thermo emf across two junctions of a thermocouple with temperature
14. To calibrate Resistance Temperature Device (RTD) using Null Method/Off-Balance Bridge

Reference Books:

- Advanced Practical Physics for students, B.L.Flint & H.T.Worsnop, 1971, Asia Publishing House.
- Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
- A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.
- A Laboratory Manual of Physics for Undergraduate Classes, D.P. Khandelwal, 1985, Vani Publication.

SEMESTER IV

Course code: CMD29001/ CMD29002/ CMD29003/ CMD29004
Credits: Theory – 04, Practical – 02 **Theories: 60 Lectures**

COURSE OUTCOME:

After the completion of the course, Students will be able to

CO1.Specify the classification and characteristics of Fourier theorem

CO2.Learn in detail with application, superposition of simple harmonic motion

CO3.Understand in detail with application of wave motion

CO4.Deliberate in detail with examples Sound, wave optics and transducers

CO5.Learn the details of Interference, diffraction and polarization

CO6.Learn in detail with application of acoustics

WAVES AND OPTICS: DSC 4

Unit-1

Analysis of Complex Waves: Fourier's Theorem - Application to saw tooth wave and square wave. **(03 Lectures)**

Superposition of simple harmonic motion:

Superposition of two simple harmonic motion; Lissajous' figures. Damped vibration; Equation for damped vibrations. Forced vibration; solution in exponential form, Resonance, Expression for amplitude and phase at resonance.

Superposition of two collinear harmonic oscillations: Linearity and Superposition Principle. (1) Oscillations having equal frequencies and (2) Oscillations having different frequencies (Beats). **(11Lectures)**

Wave Motion:

Progressive waves; Differential equation of wave motion; Relation between amplitude and intensity. Expression for velocity of progressive waves in a medium; Newton's formula, Laplace's correction.

Transverse waves on a string. Travelling and standing waves on a string. Normal Modes of a string.

Expression for frequency of vibration of a stretched string, harmonics. Group velocity, Phase velocity. Longitudinal vibrations in a rod; Kundt's tube experiment. **(10 Lectures)**

Sound: Intensity and loudness of sound - Decibels - Intensity levels - musical notes - musical scale. Acoustics of buildings: Reverberation and time of reverberation, Absorption coefficient, Sabine's formula, measurement of reverberation time. Acoustic aspects of halls and auditoria.

(06 Lectures)

Unit-2

Transducers: Types of transducers, dynamic microphone and loudspeaker - construction, working and their characteristics, Piezo electrical transducer. **(03 Lectures)**

Wave Optics: Electromagnetic nature of light. Definition and Properties of wave front. Huygens Principle. **(03 Lectures)**

Interference: Interference: Review of basic concepts, Coherent sources, conditions for constructive and destructive interference.

Coherent source by division of amplitude: Interference in Thin Films: – reflected and transmitted light, color of thin films, theory of air wedge, theory of Newton's rings; measurement of wavelength and refractive index.

Coherent source by division of division of wave front: Lloyd's Mirror and Fresnel's Biprism. Michelson's interferometer; Measurement of λ and $d\lambda$. **(11 Lectures)**

Diffraction: Fresnel and Fraunhoffer diffraction. Explanation of rectilinear propagation of light. Theory of the zone plate and comparison with convex lens. Fresnel diffraction at a straight edge. Fraunhoffer diffraction at a single slit. Transmission grating: theory for the case of normal incidence**.** **(06 Lectures)**

Polarization: Double refraction in uniaxial crystals. Huygens's theory. Positive and negative crystal. Principal refractive indices. Huygens's constructions of ordinary and extraordinary wave fronts in a uniaxial crystal, retarding plates. Production and analysis of linearly, circularly and elliptically polarized light. Optical activity, Fresnel's theory, Lorentz half shade polarimeter.

(07 Lectures)

Reference Books:

- Fundamentals of Optics, F A Jenkins and H E White, 1976, McGraw-Hill. Principles of Optics, B.K. Mathur, 1995, Gopal Printing
- Fundamentals of Optics, H.R. Gulati and D.R. Khanna, 1991, R. Chand Publication
- Brij lal and N Subramanyam: Waves and Oscillations, 2nd edition, Vikas publishing house Pvt. Ltd., New Delhi.
- S K Gupta, O P Varma: Waves and Oscillations, 3rd edition, R.Chand & Co., New Delhi.
- R.L. Saihgal, A Text Book of Sound, S.Chand & Company Ltd. New Delhi, Reprint 1990.

PHYSICS LAB-DSC 4A LAB: WAVES AND OPTICS
(Minimum of eight is to be conducted)

1. To study Lissajous Figures
2. To determine the Refractive Index of the Material of a given Prism using Sodium Light.
3. To determine wavelength of sodium light using Fresnel Biprism.
4. To determine wavelength of sodium light using Newton's Rings.
5. To determine wavelength of Sodium light using plane diffraction Grating
6. Air wedge – Determination of thickness of a thin paper/diameter of a thin wire.
7. Helmholtz resonator-determination of frequency of tuning fork.
8. Cauchy's constants using spectrometer
9. Polarization – Determination of unknown concentration of sugar solution by graphical method using a polarimeter.
10. Diffraction at a Straight wire -To determine the diameter of the Straight wire
11. To investigate the motion of coupled oscillators
12. To determine the Frequency of an Electrically Maintained Tuning Fork by Melde's Experiment and to verify λ^2 – T Law
13. Familiarization with Schuster`s focusing; determination of angle of prism
14. To measure the intensity using photo sensor and laser in diffraction patterns of single and double slits.

Reference Books:

- Advanced Practical Physics for students, B.L. Flint & H.T. Worsnop, 1971, Asia Publishing House.
- Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
- A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.

Discipline Specific Elective papers: Choose 1

SEMESTER V

Course code: CME29001/ CME29001/ CME29003/ CME29004
Credits: Theory – 04, Practical – 01 **Theories: 60 Lectures**

COURSE OUTCOME:

After the completion of the course, Students will be able to

CO1.Deliberate in detail with examples Digital Circuits

CO2.Specify the details of Operational amplifier

CO3.Learn the characteristics of sinusoidal oscillator

CO4.Identify in detail with application Instrumentation

CO5.Deliberate the classification and characteristics of gates

CO6.Identify in detail with application of semiconductor devices

DIGITAL AND ANALOG CIRCUITS AND INSTRUMENTATION: DSE 1A

Unit-1

Digital Circuits

Difference between Analog and Digital Circuits. Binary Numbers. Decimal to Binary and Binary to Decimal Conversion, AND, OR and NOT Gates (Realization using Diodes and Transistor). NAND and NOR Gates as Universal Gates. XOR and XNOR Gates. **(04 Lectures)**

De Morgan's Theorems. Boolean Laws. Simplification of Logic Circuit using Boolean algebra. Fundamental Products. Minterms and Maxterms. Conversion of a Truth Table into an Equivalent Logic Circuit by (1) Sum of Products Method and (2) Karnaugh Map. **(05 Lectures)**

Binary Addition. Binary Subtraction using 2's Complement Method).Half Adders and Full Adders and Subtractors, 4-bit binary Adder-Subtractor. **(04 Lectures)**

Semiconductor Devices and Amplifiers:

Semiconductor Diodes: p and n type semiconductors. Barrier Formation in PN Junction Diode. Qualitative Idea of Current Flow Mechanism in Forward and Reverse Biased Diode. PN junction and its characteristics. Static and Dynamic Resistance. Principle and structure of (1) LEDs (2) Photodiode (3) Solar Cell. **(05 Lectures)**

Bipolar Junction transistors*:* n-p-n and p-n-p Transistors. Characteristics of CB, CE and CC Configurations. Active, Cutoff, and Saturation Regions. Current gains α and β. Relations between α and β. Load Line analysis of Transistors. DC Load line and Q-point. Voltage Divider Bias Circuit for CE Amplifier. h-parameter Equivalent Circuit. Analysis of a single-stage CE amplifier using Hybrid Model. Input and Output Impedance. Current, Voltage and Power Gains. Class A, B, and C Amplifiers. Two stage RC coupled amplifier. **(12 Lectures)**

Unit-2

Operational Amplifiers (Black Box approach):

Characteristics of an Ideal and Practical Op-Amp (IC 741), Open-loop& Closed-loop Gain. CMRR, concept of Virtual ground. Applications of Op-Amps: (1) Inverting and Non-inverting Amplifiers (2) Adder (3) Subtractor (4) Differentiator (5) Integrator (6) Zero Crossing Detector

(13 Lectures)

Sinusoidal Oscillators: Barkhausen's Criterion for Self-sustained Oscillations. Determination of Frequency of RC Oscillator **(05Lectures)**

Instrumentations:

Introduction to CRO: Construction and Working of CRO Applications of CRO: (1) Study of Waveform, (2) Measurement of Voltage, Current, Frequency, and Phase Difference. **(03 Lectures)**

Power Supply: Half-wave Rectifiers. Centre-tapped and Bridge Full-wave Rectifiers Calculation of Ripple Factor and Rectification Efficiency, Basic idea about capacitor filter, Zener Diode and Voltage Regulation. **(06 Lectures)**

Timer IC: IC 555 Pin diagram and its application as Astable & Monostable Multivibrator.

(03 Lectures)

Reference Books:

- Integrated Electronics, J. Millman and C.C. Halkias, 1991, Tata Mc-Graw Hill.
- Electronic devices and circuits, S. Salivahanan and N. Suresh Kumar, 2012, Tata Mc-Graw Hill.
- Microelectronic Circuits, M.H. Rashid, 2nd Edn. 2011, Cengage Learning.
- Modern Electronic Instrumentation & Measurement Tech., Helfrick&Cooper,1990, PHI Learning
- Digital Principles & Applications, A.P. Malvino, D.P. Leach & Saha, 7th Ed.,2011, Tata McGraw Hill
- Microelectronic circuits, A.S. Sedra, K.C. Smith, A.N. Chandorkar, 2014, 6th Edn., Oxford University Press.
- Fundamentals of Digital Circuits, A. Anand Kumar, 2nd Edition, 2009, PHI Learning Pvt. Ltd.
- OP-AMP and Linear Digital Circuits, R.A. Gayakwad, 2000, PHI Learning Pvt. Ltd.

PRACTICALS - DSE LAB: DIGITAL AND ANALOG CIRCUITS AND INSTRUMENTS
(Minimum of eight is to be conducted)

1. To verify and design AND, OR, NOT and XOR gates using NAND gates.
2. Zener diode as a voltage regulator.
3. Half adder and Full adder
4. FET-characteristics
5. To study the characteristics of a Transistor in CE configuration.
6. To study the characteristics of a Transistor in CB configuration.
7. Phase shift oscillator
8. Op-amp has inverting and non-inverting amplifier
9. Wien Bridge Oscillator
10. Hartley oscillator
11. CE-amplifier and negative feedback amplifier
12. To minimize a given logic circuit.
13. To design an astable multivibrator of given specifications using 555 Timer.

14. To design a monostable multivibrator of given specifications using 555 Timer

Reference Books:

- Basic Electronics: A text lab manual, P.B. Zbar, A.P. Malvino, M.A. Miller, 1994, Mc-Graw Hill.
- Electronics: Fundamentals and Applications, J.D. Ryder, 2004, Prentice Hall.
- OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edition, 2000, Prentice Hall.
- Electronic Principle, Albert Malvino, 2008, Tata Mc-Graw Hill

SEMESTER V

Course code: CME29201/ CME29202/ CME29203/ CME29204
Credits: Theory – 04, Practical – 01 **Theories: 60 Lectures**

COURSE OUTCOME:

After the completion of the course, Students will be able to

CO1.Write down in detail with application of crystal structure

CO2.Write down the details of Elementary lattice dynamics

CO3.Deliberate in detail with examples Magnetic properties of matter

CO4.Identify the characteristics of elementary band theory

CO5.Learn the classification and characteristics of superconductivity

CO6.Understand the elastic properties of solids and lattice vibrations

SOLID STATE PHYSICS: DSE 1B

Unit-1

Crystal Structure: Solids: Amorphous and Crystalline Materials. Lattice Translation Vectors. Lattice with a Basis – Central and Non-Central Elements. Unit Cell. Miller Indices. Reciprocal Lattice. Types of Lattices. Brillouin Zones. Diffraction of X-rays by Crystals. Bragg's Law. Bragg spectrometer. Continuous x-ray spectra, Duane and Hunt limit. Characteristic x-ray spectra. Mosley law and its significance. **(10 Lectures)**

Elementary Lattice Dynamics: Lattice Vibrations and Phonons: Linear Monatomic and Diatomic Chains. Acoustical and Optical Phonons. Qualitative Description of the Phonon Spectrum in Solids. Dulong and Petit's Law, Einstein and Debye theories of specific heat of solids. **(09 Lectures)**

Magnetic Properties of Matter: Dia, Para, Ferri and Ferromagnetic Materials. Classical Langevin Theory of dia – and Paramagnetic Domains. Quantum Mechanical Treatment of Paramagnetism. Curie's law, Weiss's Theory of Ferromagnetism and Ferromagnetic Domains. Discussion of B-H Curve. Hysteresis and Energy Loss. **(11 Lectures)**

Unit-2

Electrical Properties of metals: Free electron theory, Quantum theory, Conductivity of metals on the basis of free electron theory- Ohm's law. **(04 Lectures)**

Dielectric Properties of Materials: Polarization. Local Electric Field at an Atom. Depolarization Field. Electric Susceptibility. Polarizability. Clausius Mosotti Equation. Classical Theory of Electric Polarizability. Normal and Anomalous Dispersion. Cauchy and Sellmeir relations. Langevin-Debye equation. Complex Dielectric Constant. Optical Phenomena. Application: Plasma Oscillations, Plasma Frequency, Plasmon's. **(10 Lectures)**

Elementary band theory: Kronig Penny model. Band Gaps. Conductors, Semiconductors and insulators. P and N type Semiconductors, carrier concentration in intrinsic semiconductor, Fermi energy, effect of temperature and concentration on Fermi energy, Conductivity of Semiconductors, mobility, Hall Effect, Hall coefficient. **(10 Lectures)**

Superconductivity: Experimental Results. Critical Temperature. Critical magnetic field. Meissner effect. Type I and type II Superconductors, London's Equation and Penetration Depth. Isotope effect.BCS theory, application of Superconductors.

(06 Lectures)

Reference Books:

- Introduction to Solid State Physics, Charles Kittel, 8th Ed., 2004, Wiley India Pvt. Ltd.
- Elements of Solid State Physics, J.P. Srivastava, 2nd Ed., 2006, Prentice-Hall of India
- Introduction to Solids, Leonid V. Azaroff, 2004, Tata Mc-Graw Hill
- Solid State Physics, Neil W. Ashcroft and N. David Mermin, 1976, Cengage Learning
- Solid State Physics, Rita John, 2014, McGraw Hill
- Solid-state Physics, H. Ibach and H Luth, 2009, Springer
- Elementary Solid State Physics, 1/e M. Ali Omar, 1999, Pearson India
- Solid State Physics, M.A. Wahab, 2011, Narosa Publications

PRACTICALS-DSE LAB: SOLID STATE PHYSICS

(Minimum of eight is to be conducted)

1. Determination of energy gap of a semiconductor using Meter Bridge.
2. Determination Fermi energy of metal(copper)
3. Study of powder X-ray photograph-the determination of inter planar distances.
4. Study of hall effect
5. To measure the Dielectric Constant of a given solid Materials
6. To determine value of Boltzmann constant using V-I characteristic of PN diode.
7. To determine value of Planck's constant using LEDs of at least 4 different colors.
8. Study of LDR characteristics.
9. Verification of Inverse square law for light Intensity using a Photo-diode.
10. To determine the refractive index of a dielectric layer using SPR
11. To study the PE Hysteresis loop of a Ferroelectric Crystal.
12. To measure the resistivity of a semiconductor (Ge) crystal with temperature by four-probe method (from room temperature to 150 ^{o}C) and to determine its band gap
13. To draw the BH curve of iron using a Solenoid and determine the energy loss from Hysteresis.
14. To determine the complex dielectric constant and plasma frequency of metal using Surface Plasmon resonance (SPR)

Reference Books

- Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House.
- Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
- A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Ed., 2011, Kitab Mahal, New Delhi
- Elements of Solid State Physics, J.P. Srivastava, 2nd Ed., 2006, Prentice-Hall of India

SEMESTER V

Course code: CME29601/CME29602/CME29603/CME29604
Credits: Theory – 04, Practical – 01 **Theories: 60 Lectures**

COURSE OUTCOME:

After successful completion of the course, the student is able to:

CO1.Learn in detail with examples calculus of functions of more than one variable

CO2.Specify the details of fourier series

CO3.Specify in depth integrals

CO4.Deliberate in detail with application of partial differential equations

CO5.Understand in depth complex analysis

CO6.Deliberate in detail with examples of beta and gamma function

MATHEMATICAL PHYSICS: DSE 1D

Unit-1

Calculus of functions of more than one variable: Partial derivatives, exact and inexact differentials. Integrating factor, with simple illustration. Constrained Maximization using Lagrange Multipliers. **(06 Lectures)**

Fourier series: Periodic functions. Orthogonality of sine and cosine functions, Dirichlet Conditions (Statement only). Expansion of periodic functions in a series of sine and cosine functions and determination of Fourier coefficients. Complex representation of Fourier series. Expansion of functions with arbitrary period. Expansion of non-periodic functions over an interval. Even and odd functions and their Fourier expansions. Application. Summing of Infinite Series. **(10 Lectures)**

Frobenius Method and Special Functions: Singular Points of Second Order Linear Differential Equations and their importance. Frobenius method and its applications to differential equations. Legendre, Bessel, Hermite and Laguerre Differential Equations. Properties of Legendre Polynomials: Rodrigues Formula, Orthogonality. Simple recurrence relations. **(14 Lectures)**

Unit-2

Some Special Integrals: Beta and Gamma Functions and Relation between them. Expression of Integrals in terms of Gamma Functions. Error Function (Probability Integral). **(06 Lectures)**

Partial Differential Equations: Solutions to partial differential equations, using separation of variables: Laplace's Equation in problems of rectangular, cylindrical and spherical symmetry.

(10 Lectures)

Complex Analysis: Brief Revision of Complex Numbers and their Graphical Representation. Euler's formula, De Moivre's theorem, Roots of Complex Numbers. Functions of Complex Variables. Analyticity and Cauchy-Riemann Conditions. Examples of analytic functions. Singular functions: poles and branch points, order of singularity, branch cuts. Integration of a function of a complex variable. Cauchy's Inequality. Cauchy's Integral formula.

(14 Lectures)

Reference Books:

- Mathematical Methods for Physicists: Arfken, Weber, 2005, Harris, Elsevier.
- Fourier analysis by M.R. Spiegel, 2004, Tata McGraw-Hill.
- Mathematics for Physicists, Susan M. Lea, 2004, Thomson Brooks/Cole.
- An Introduction to Ordinary Differential Equations, Earl A Coddington, 1961, PHI Learning.
- Differential Equations, George F. Simmons, 2006, Tata McGraw-Hill.
- Essential Mathematical Methods, K.F. Riley and M.P. Hobson, 2011, Cambridge University Press
- Partial Differential Equations for Scientists and Engineers, S.J. Farlow, 1993, Dover Publications.
- Mathematical methods for Scientists and Engineers, D.A. McQuarrie, 2003, Viva Books.

PRACTICALS -DSE LAB: MATHEMATICAL PHYSICS

The aim of this course is not just to teach computer programming and numerical analysis but to emphasize its role in solving problems in Physics.

- Highlights the use of computational methods to solve physical problems
- Use of computer language as a tool in solving physics problems (applications)
- The course will consist of lectures (both theory and practical) in the ComputerLab
- Evaluation done not on the programming but on the basis of formulating the problem
- Aim at teaching students to construct the computational problem to be solved
- Students can use anyone operating system Linux or Microsoft Windows

Topics Description with Applications	Introduction and Overview
Introduction and Overview	Computer architecture and organization, memory and Input/output devices
Basics of scientific computing	Binary and decimal arithmetic, Floating point numbers, algorithms, Sequence, Selection and Repetition, single and double precision arithmetic, underflow & overflow-emphasize the importance of making equations in terms of dimensionless variables, Iterative methods
Errors and error Analysis	Truncation and round off errors, Absolute and relative errors, Floating point computations.
Review of C & C++ Programming fundamentals	Introduction to Programming, constants, variables and data types, operators and Expressions, I/O statements, scanf and printf, c in and c out, Manipulators for data formatting, Control statements (decision making and looping statements) (*If-statement. If-else Statement. Nested if Structure. Else-if Statement. Ternary Operator. Goto Statement. Switch Statement. Unconditional and Conditional Looping. While-Loop. Do-While Loop. FOR Loop. Break and Continue Statements. Nested Loops*), Arrays (*1D&2D*) and strings, user defined functions, Structures and Unions, Idea of classes and objects
Programs: using C/C++ language	Sum & average of a list of numbers, largest of a given list of numbers and its location in the list, sorting of numbers in ascending-descending order, Binary search
Random number generation	Area of circle, area of square, volume of sphere, value of pi ($\boldsymbol{\pi}$)

Solution of Algebraic and Transcendental equations by Bisection, Newton Raphson and Secant methods	Solution of linear and quadratic equation, solving $\alpha = \tan\alpha; I = I_0\left(\frac{\sin\alpha}{\alpha}\right)^2$ in optics
Interpolation by Newton Gregory Forward and Backward difference formula, Error estimation of linear interpolation	Evaluation of trigonometric functions e.g. *sin θ, cos θ, tanθ, etc.*
Numerical differentiation (Forward and Backward difference formula) and Integration (Trapezoidal a n d Simpson rules), Monte Carlo method	Given Position with equidistant time data to calculate velocity and acceleration and vice-versa. Find the area of B-H Hysteresis loop
Solution of Ordinary Differential Equations (ODE) First order Differential equation Euler, modified Euler and Runge-Kutta (RK) second and fourth order methods	First order differential equation • Radioactive decay • Current in RC, LC circuits with DC source • Newton's law of cooling • Classical equations of motion Attempt following problems using RK 4 order method: • Solve the coupled differential equations $\frac{dx}{dt} = y + x - \frac{x^3}{3}; \frac{dy}{dx} = -x$ for four initial conditions x(0) = 0, y(0) = -1, -2, -3, -4. Plot x vs y for each of the four initial conditions on the same screen for $0 \le t \le 15$ The differential equation describing the motion of a Pendulum is $\frac{d^2\theta}{dt^2} = -\sin(\theta)$. The pendulum is released from rest at an angular displacement α, i. e. $\theta(0) = \alpha, and \theta^1(0) = 0.$ Solve the equation for α= 0.1, 0.5 and 1.0 and plot θ as a function of time in the range $0 \le t \le 8\Pi$. Also plot the analytic solution valid for small θsin(θ)=θ

Reference Books:

- Introduction to Numerical Analysis, S.S. Sastry, 5thEdn., 2012, PHI Learning Pvt. Ltd.
- Schaum's Outline of Programming with C++. J.Hubbard, 2000, McGraw-Hill Publications.
- Numerical Recipes in C++: The Art of Scientific Computing, W.H. Pressetal., 3rdEdn., 2007, Cambridge University Press.
- A first course in Numerical Methods, Uri M. Ascher and Chen Greif, 2012, PHI Learning
- Elementary Numerical Analysis, K.E. Atkinson, 3 r dEdn. , 2007, Wiley India Edition.
- Numerical Methods for Scientists and Engineers, R.W. Hamming, 1973, Courier Dover Pub.
- An Introduction to Computational Physics, T. Pang, 2ndEdn., 2006, Cambridge Univ. Press

Discipline Specific Elective papers: Choose 1

SEMESTER VI

Course code: CMF29001/ CMF29002/ CMF29003/ CMF29004
Credits: Theory – 04, Practical – 01 **Theories: 60 Lectures**

COURSE OUTCOME:

After successful completion of the course, the student is able to:

CO1.Understand in detail with examples planks quantum

CO2.Identify the classification and characteristics of Planck's quantum

CO3.Learn the classification and characteristics of fission and fusion reaction

CO4.Write down the characteristics of matter waves

CO5.Understand the classification and characteristics of radioactivity

CO6.Specify in depth Eigen values

ELEMENTS OF MODERN PHYSICS: DSE 1A

Unit-1

Planck's quantum, Planck's constant and light as a collection of photons; Photo-electric effect and Compton scattering. De Broglie wavelength and matter waves; Davisson-Germer experiment. **(08 Lectures)**

Problems with Rutherford model- instability of atoms and observation of discrete atomic spectra; Bohr's quantization rule and atomic stability; calculation of energy levels for hydrogen like atoms and their spectra. **(04 Lectures)**

Position measurement-gamma ray microscope thought experiment; wave-particle duality, Heisenberg uncertainty principle-impossibility of a particle following a trajectory; Estimating minimum energy of a confined particle using uncertainty principle; Energy-time uncertainty principle **(04 lectures)**

Two slit interference experiment with photons, atoms and particles; linear superposition principle as a consequence; Matter waves and wave amplitude; Schrodinger equation for non-relativistic particles; Momentum and Energy operators; stationary states; physical interpretation of wave function, probabilities and normalization; Probability and probability current densities in one dimension. **(10 Lectures)**

Fission and fusion - mass deficit, relativity and generation of energy; Fission - nature of fragments and emission of neutrons. Nuclear reactor: slow neutrons interacting with Uranium 235; Fusion and thermonuclear reactions. **(04 Lectures)**

Unit-2

One dimensional infinitely rigid box- energy eigenvalues and Eigen functions, normalization; Quantum dot as an example; Quantum mechanical scattering and tunnelling in one dimension - across a step potential and across a rectangular potential barrier. **(12 Lectures)**

Size and structure of atomic nucleus and its relation with atomic weight; Impossibility of an electron being in the nucleus as a consequence of the uncertainty principle. Nature of nuclear force, NZ graph, semi-empirical mass formula and binding energy. **(07 Lectures)**

Radioactivity: stability of nucleus; Law of radioactive decay; Mean life & half-life; Alpha decay; Beta decay - energy released, spectrum and Pauli's prediction of neutrino; gamma-ray emission. **(11 Lectures)**

Reference Books:

- Concepts of Modern Physics, Arthur Beiser, 2009, McGraw-Hill
- Modern Physics, John R. Taylor, Chris D. Zafiratos, Michael A.Dubson,2009, PHI Learning
- Six Ideas that Shaped Physics: Particle Behave like Waves, Thomas A. Moore, 2003, McGraw Hill
- Quantum Physics, Berkeley Physics Course Vol.4. E.H. Wichman, 2008, Tata McGraw-Hill

Co.

- Modern Physics, R.A. Serway, C.J. Moses, and C.A.Moyer, 2005, Cengage Learning
- Modern Physics, G. Kaur and G.R. Pickrell, 2014, McGraw Hill

PRACTICALS –DSE LAB: ELEMENTS OF MODERN PHYSICS
(Minimum of eight is to be conducted)

1. To determine value of Boltzmann constant using V-I characteristic of PN diode.
2. To determine work function of material of filament of directly heated vacuum diode.
3. To determine value of Planck's constant using LEDs of at least 4 different colors.
4. To determine the ionization potential of mercury.
5. To determine the wavelength of H-alpha emission line of Hydrogen atom.
6. To determine the absorption lines in the rotational spectrum of Iodine vapor. To study the diffraction patterns of single and double slits using laser source and measure its intensity variation using Photo sensor and compare with incoherent source – Na light.
7. Photo-electric effect: photo current versus intensity and wavelength of light; maximum energy of photo-electrons versus frequency of light
8. To determine the value of e/m by magnetic focusing.
9. To setup the Millikan oil drop apparatus and determine the charge of an electron.
10. To study the diffraction patterns of single and double slits using laser source and measure its intensity variation using Photo sensor and compare with incoherent source – Na light.
11. To determine work function of material of filament of directly heated vacuum diode.
12. To study the Divergence of laser
13. Spectral response of solar cell
14. Bridge rectifier with and without filters
15. Clipping and clamping circuits using diodes
16. Study of characteristics of GM tube and determination of operating voltage and plateau length using background radiation as source (without commercial source).
17. Study of counting statistics using background radiation using GM counter.
18. Study of radiation in various materials (e.g. KSO4 etc.). Investigation of possible radiation in different routine materials by operating GM at operating voltage.
19. Study of absorption of beta particles in Aluminum using GM counter.

20. Half life of k-40
21. To determine the ionization potential of xenon.
22. Cockcroft-Walton Voltage multiplier.
23. Determination of range of electron in aluminum using GM counter

References:

- Physics of Radiation Therapy: F M Khan Williams and Wilkins, Third edition (2003)
- Advanced Practical Physics for students, B.L. Flint & H.T. Worsnop, 1971, Asia Publishing House.
- Practical Applications of Radioactivity and Nuclear Radiations, G.C. Lowental and P.L. Airey, Cambridge University Press, U.K., 2001
- A. Martin and S.A. Harbisor, An Introduction to Radiation Protection, John Willey & Sons, Inc. New York, 1981.
- Advanced Practical Physics for students, B.L. Flint & H.T. Worsnop, 1971, Asia Publishing House.
- Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
- A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.

SEMESTER VI

Course code: CMF29201/ CMF29202/ CMF29203/ CMF29204
Credits: Theory – 05 **Theories: 75 Lectures**

COURSE OUTCOME:

After the completion of the course, Students will be able to

CO1.Write down in detail with application and properties of nuclei

CO2.Learn in detail with application and nuclear models

CO3.Understand in detail with examples radioactivity

CO4.Identify the details of particle physics

CO5.Write down the details of particle accelerators

CO6.Write down the details of detector for nuclear radiator

Nuclear & Particle Physics: DSE 1B

Unit-1

General Properties of Nuclei: Constituents of nucleus and their Intrinsic properties, quantitative facts about size, mass, charge density (matter energy), binding energy, average binding energy and its variation with mass number, main features of binding energy versus mass number curve, N/A plot, angular momentum, parity, magnetic moment, electric moments, nuclear excites states.

(10 Lectures)

Nuclear Models: Liquid drop model approach, semi empirical mass formula and binding energy, significance of various terms, condition of nuclear stability. Two nucleon separation energies, Fermi gas model (degenerate fermion gas, nuclear symmetry potential in Fermi gas), evidence for nuclear shell structure, nuclear magic numbers, basic assumption of shell model, concept of mean field, residual interaction, concept of nuclear force. **(12 Lectures)**

Nuclear Reactions: Types of Reactions, Conservation Laws, kinematics of reactions, Q-value, reaction rate, reaction cross section, Concept of compound and direct reaction, resonance reaction, Coulomb scattering (Rutherford scattering). **(08 Lectures)**

Unit-2

Radioactivity decay :(a) Alpha decay: basics of α-decay processes, theory of α-emission, Gamow factor, Geiger Nuttall law, α-decay spectroscopy. (b) beta-decay: energy kinematics for beta-decay, positron emission, electron capture, neutrino hypothesis. (c) Gamma decay: Gamma rays emission & kinematics, internal conversion.

(10 Lectures)

Interaction of Nuclear Radiation with matter: Energy loss due to ionization (Bethe-Block formula), energy loss of electrons, Cerenkov radiation, Gamma ray interaction through matter, photoelectric effect, Compton scattering, pair production, neutron interaction with matter.

(08 Lectures)

Detector for Nuclear Radiations: Gas detectors: estimation of electric field, mobility of particle, for ionization chamber and GM Counter. Basic principle of Scintillation. Detectors and construction of photo-multiplier tube (PMT). Semiconductor Detectors (Si & Ge) for charge particle and photon detection (concept of charge carrier and mobility)

(08 Lectures)

Particle Accelerators: Accelerator facility available in India: Van-de Graaff generator (Tandem accelerator), Linear accelerator, Cyclotron, Synchrotrons.

(04 Lectures)

Unit-3

Particle physics: Particle interactions; basic features, types of particles and its families. Symmetries and Conservation Laws: energy and momentum, angular momentum, parity, baryon number, Lepton number, Isospin, Strangeness and charm, concept of quark model, color quantum number and gluons. **(15 Lectures)**

Reference Books:

- Introductory nuclear Physics by Kenneth S. Krane (Wiley India Pvt. Ltd., 2008).
- Concepts of nuclear physics by Bernard L. Cohen. (Tata Mcgraw Hill, 1998).
- Introduction to the physics of nuclei & particles, R.A. Dunlap. (Thomson Asia, 2004)
- Introduction to Elementary Particles, D. Griffith, John Wiley & Sons
- Quarks and Leptons, F. Halzen and A.D. Martin, Wiley India, New Delhi
- Basic ideas and concepts in Nuclear Physics - An Introductory Approach by K. Heyde (IOP-

Institute of Physics Publishing, 2004).

- Radiation detection and measurement, G.F. Knoll (John Wiley & Sons, 2000).
- Theoretical Nuclear Physics, J.M. Blatt & V.F.Weisskopf (Dover Pub.Inc., 1991)

SEMESTER VI

Course code: CMF29401/CMF29402/CMF29403/CMF29404
Credits: Theory – 04, Practical – 01 **Theories: 60 Lectures**

COURSE OUTCOME:

After successful completion of the course, the student is able to:

CO1.Understand the classification and characteristics of time dependent Schrodinger equation

CO2.Understand in depth time independent Schrodinger equation

CO3.Understand the classification and characteristics of quantum theory of hydrogen like atoms

CO4.Specify the details of atoms in external magnetic field

CO5.Write down the characteristics of many electron atoms

QUANTUM MECHANICS: DSE 1C

Unit-1

Time dependent Schrodinger equation: Time dependent Schrodinger equation and dynamical evolution of a quantum state; Properties of Wave Function. Interpretation of Wave Function Probability and probability current densities in three dimensions; Conditions for Physical Acceptability of Wave Functions. Normalization. Linearity and Superposition Principles. Eigenvalues and Eigenfunctions. Position, momentum & Energy operators; commutator of position and momentum operators; Expectation values of position and momentum. Wave Function of a Free Particle. **(08 Lectures)**

Time independent Schrodinger equation-Hamiltonian, stationary states and energy eigenvalues; expansion of an arbitrary wavefunction as a linear combination of energy eigenfunctions; General solution of the time dependent Schrodinger equation in terms of linear combinations of stationary states; Application to the spread of Gaussian wavepacket for a free particle in one dimension; wave packets, Fourier transforms and momentum space wavefunction; Position-momentum uncertainty principle. **(10 Lectures)**

General discussion of bound states in an arbitrary potential- continuity of wave function, boundary condition and emergence of discrete energy levels; application to one-dimensional problem- square well potential; Quantum mechanics of simple harmonic oscillator-energy levels and energy eigenfunctions using Frobenius method. **(12 Lectures)**

Unit-2

Quantum theory of hydrogen-like atoms: time independent Schrodinger equation in spherical polar coordinates; separation of variables for the second order partial differential equation; angular momentum operator and quantum numbers; Radial wave functions from Frobenius method; Orbital angular momentum quantum numbers l and m; s, p, d,.. Shells (idea only) **(10 Lectures)**

Atoms in Electric and Magnetic Fields:- Electron Angular Momentum. Space Quantization. Electron Spin and Spin Angular Momentum. Larmor's Theorem. Spin Magnetic Moment. Stern-Gerlach Experiment. Zeeman Effect: Electron Magnetic Moment and Magnetic Energy, Gyromagnetic Ratio and Bohr Magneton. **(08 Lectures)**

Atoms in External Magnetic Fields:- Normal and Anomalous Zeeman Effect. **(02 Lectures)**

Many electron atoms:- Pauli's Exclusion Principle. Symmetric and Antisymmetric Wave Functions. Periodic table. Fine structure. Spin orbit coupling. Spectral Notations for Atomic States. Total Angular Momentum. Vector Model. Spin-orbit coupling in atoms-L-S and J-J couplings. **(10 Lectures)**

Reference Books:

- A Text book of Quantum Mechanics, P.M. Mathews & K. Venkatesan, 2nd Ed., 2010, McGraw Hill
- Quantum Mechanics, Robert Eisberg and Robert Resnick, 2ndEdn. 2002, Wiley.
- Quantum Mechanics, Leonard I. Schiff, 3rdEdn. 2010, Tata McGraw Hill.
- Quantum Mechanics, G. Aruldhas, 2ndEdn. 2002, PHI Learning of India.
- Quantum Mechanics, Bruce Cameron Reed, 2008, Jones and Bartlett Learning.
- Quantum Mechanics for Scientists & Engineers, D.A.B. Miller, 2008, Cambridge University Press
- Quantum Mechanics, Eugen Merzbacher, 2004, John Wiley and Sons, Inc.

- Introduction to Quantum Mechanics, David J. Griffith, 2nd Ed. 2005, Pearson Education
- Quantum Mechanics, Walter Greiner, 4thEdn., 2001, Springer

PRACTICAL-DSE LAB: QUANTUM MECHANICS

Use C/C++/Scilab for solving the following problems based on Quantum Mechanics Like

1. Solve the s-wave Schrodinger equation for the ground state and the first excited state of the hydrogen atom:

$$\frac{d^2y}{dr^2} = A(r)u(r), A(r) = \frac{2m}{\hbar^2}[V(r) - E] where V(r) = \frac{-e^2}{r}$$

   Here, m is the reduced mass of the electron. Obtain the energy Eigen values and plot the corresponding wave functions. Remember that the ground state energy of the hydrogen atom is ≈ -13.6 eV. Take e=3.795 $(eVÅ)^{1/2}$, ħc = 1973 (eVÅ) and m = 0.511x10^6eV/c^2

2. Solve the s-wave radial Schrodinger equation for an atom

$$\frac{d^2y}{dr^2} = A(r)u(r), A(r) = \frac{2m}{\hbar^2}[V(r) - E]$$

   Where m is the reduced mass of the system (which can be chosen to be the mass of an electron), for the screened coulomb potential

$$V(r) = \frac{-e^2}{r} e^{\frac{-r}{a}}$$

   Find the energy (in eV) of the ground state of the atom to an accuracy of three Significant digits. Also, plot the corresponding wave function. Take e = 3.795 $(eVÅ)^{1/2}$, m = 0.511x10^6eV/c^2 , and a = 3 Å, 5 Å, 7 Å. In these units ħc = 1973(eVÅ). The ground state energy is expected to be above -12 eV in all three cases.

3. Solve the s-wave radial Schrodinger equation for a particle of mass m:

$$\frac{d^2y}{dr^2} = A(r)u(r), A(r) = \frac{2m}{\hbar^2}[V(r) - E]$$

For the anharmonic oscillator potential

$$V(r) = \frac{1}{2}kr^2 + \frac{1}{3}br^3$$

for the ground state energy (in MeV) of the particle to an accuracy of three significant digits. Also, plot the corresponding wave function. Choose m = 940 MeV/c^2, k = 100 MeV fm^{-2}, b = 0, 10, 30 MeV fm^{-3} In these units, cħ = 197.3 MeV fm. The ground state energy I expected to lie between 90 and 110 MeV for all three cases.

4. Solve the s-wave radial Schrodinger equation for the vibrations of hydrogen molecule:

$$\frac{d^2y}{dr^2} = A(r)u(r), A(r) = \frac{2\mu}{\hbar^2}[V(r) - E]$$

where μ is the reduced mass of the two-atom system for the Morse potential

$$V(r) = D\left(e^{-2\alpha r^1} - e^{-\alpha r^1}\right), r^1 = \frac{r - r_0}{r}$$

Find the lowest vibrational energy (in MeV) of the molecule to an accuracy of three significant digits. Also plot the corresponding wave function. Take: m = 940x10^6eV/C^2, D = 0.755501 eV, α = 1.44, r_o = 0.131349 Å

Laboratory based experiments:

5. Study of Electron spin resonance- determine magnetic field as a function of the resonance frequency

6. Study of Zeeman effect: with external magnetic field; Hyperfine splitting

7. To study the quantum tunnelling effect with solid state device, e.g. tunnelling current in backward diode or tunnel diode.

Reference Books:

- Schaum's Outline of Programming with C++. J.Hubbard, 2000, McGraw-Hill Publications.
- Numerical Recipes in C: The Art of Scientific Computing, W.H.Press et al., 3rdEdn., 2007, Cambridge University Press.
- Elementary Numerical Analysis, K.E.Atkinson, 3 r dEdn. , 2007, Wiley India Edition.

- A Guide to MATLAB, B.R. Hunt, R.L. Lipsman, J.M. Rosenberg, 2014, 3rd Edn., Cambridge University Press
- Simulation of ODE/PDE Models with MATLAB®, OCTAVE and SCILAB:
- Scientific and Engineering Applications: A. Vande Wouwer, P. Saucez, C. V. Fernández.2014 Springer ISBN: 978-3319067896
- Scilab by example: M. Affouf2012ISBN: 978-1479203444
- Scilab (A Free Software to Matlab): H. Ramchandran, A.S. Nair. 2011 S. Chand and Company, New Delhi ISBN: 978-8121939706
- Scilab Image Processing: Lambert M. Surhone. 2010Betascript Publishing ISBN: 978-6133459274A
- Quantum Mechanics, Leonard I. Schiff, 3rdEdn. 2010, Tata McGraw Hill.
- Quantum Mechanics, Bruce Cameron Reed, 2008, Jones and Bartlett Learning.

Skill Enhancement Course (SEC) (Credit: 02 each)

SEMESTER V

Course code: CME69001/ CME69002/ CME69003/ CME69004
Credits: Theory – 02 **Theories: 30 Lectures**

COURSE OUTCOME:

After the completion of the course, Students will be able to

CO1.Understand the characteristics of fossil fuel

CO2.Learn in detail with application of wind energy

CO3.Specify in detail with application of ocean energy and hydro energy

CO4.Identify the characteristics of geothermal energy

CO5.Deliberate the characteristics of electromagnetic energy

CO6.Deliberate the characteristics of piezoelectric energy harvesting

RENEWABLE ENERGY AND ENERGY HARVESTING: SEC 1A

Fossil fuels and Alternate Sources of energy: Fossil fuels and Nuclear Energy, their limitation, need of renewable energy, non-conventional energy sources. An overview of developments in Offshore Wind Energy, Tidal Energy, Wave energy systems, Ocean Thermal Energy Conversion, solar energy, biomass, biochemical conversion, biogas generation, geothermal energy tidal energy, Hydroelectricity. **(03 Lectures)**

Solar energy: Solar energy, its importance, storage of solar energy, solar pond, non convective solar pond, applications of solar pond and solar energy, solar water heater, flat plate collector, solar distillation, solar cooker, solar green houses, solar cell, absorption air conditioning. Need and characteristics of photovoltaic (PV) systems, PV models and equivalent circuits, and sun tracking systems. **(06 Lectures)**

Wind Energy harvesting: Fundamentals of Wind energy, Wind Turbines and different electrical machines in wind turbines, Power electronic interfaces, and grid interconnection topologies. **(03 Lectures)**

Ocean Energy: Ocean Energy Potential against Wind and Solar, Wave Characteristics and Statistics, Wave Energy Devices. **(03 Lectures)**

Tide characteristics and Statistics, Tide Energy Technologies, Ocean Thermal Energy, Osmotic Power, Ocean Bio-mass. **(02 Lectures)**

Geothermal Energy: Geothermal Resources, Geothermal Technologies. **(02 Lectures)**

Hydro Energy: Hydropower resources, hydropower technologies, environmental impact of hydro power sources. **(02 Lectures)**

Piezoelectric Energy harvesting: Introduction, Physics and characteristics of piezoelectric effect, materials and mathematical description of piezoelectricity, Piezoelectric parameters and modeling piezoelectric generators, Piezoelectric energy harvesting applications, Human power **(04 Lectures)**

Electromagnetic Energy Harvesting: Linear generators, physics mathematical models, recent applications **(02 Lectures)**

Carbon captured technologies, cell, batteries, power consumption **(02 Lectures)**

Environmental issues and Renewable sources of energy, sustainability. **(01 Lecture)**

Demonstrations and Experiments

1. Demonstration of Training modules on solar energy, wind energy, etc.
2. Conversion of vibration to voltage using piezoelectric materials
3. Conversion of thermal energy into voltage using thermoelectric modules.

Reference Books:

- Non-conventional energy sources - G.D Rai - Khanna Publishers, New Delhi
- Solar energy - M P Agarwal - S Chand and Co. Ltd.
- Solar energy - Suhas P Sukhative Tata McGraw - Hill Publishing Company Ltd.
- Godfrey Boyle, "Renewable Energy, Power for a sustainable future", 2004, Oxford University Press, in association with The Open University.
- Dr. P Jayakumar, Solar Energy: Resource Assesment Handbook, 2009
- J.Balfour, M.Shaw and S. Jarosek, Photovoltaics, Lawrence J Goodrich (USA).
- http://en.wikipedia.org/wiki/Renewable_energy

SEMESTER V

Course code: CME69201/ CME69202/ CME69203/ CME69204
Credits: Theory – 02 **Theories: 30 Lectures**

COURSE OUTCOME:

After the completion of the course, Students will be able to

CO1.Deliberate the details of photons

CO2.Understand the classification and characteristics of Atomic and nuclear physics

CO3.Write down the classification and characteristics of nuclear techniques

CO4.Write down the characteristics of radiation safety management

CO5.Identify in detail with application of radiation detection

RADIATION SAFETY: SEC 2A

Basics of Atomic and Nuclear Physics: Basic concept of atomic structure; X rays characteristic and production; concept of bremsstrahlung and auger electron, The composition of nucleus and its properties, mass number, isotopes of element, spin, binding energy, stable and unstable isotopes, law of radioactive decay, Mean life and half life, basic concept of alpha, beta and gamma decay, concept of cross section and kinematics of nuclear reactions, types of nuclear reaction, Fusion, fission. **(06 Lectures)**

Interaction of Radiation with matter: Types of Radiation: Alpha, Beta, Gamma and Neutron and their sources, sealed and unsealed sources, **Interaction of Photons** – Photoelectric effect, Compton Scattering, Pair Production, Linear and Mass Attenuation Coefficients, **Interaction of Charged Particles:** Heavy charged particles - Beth-Bloch Formula, Scaling laws, Mass Stopping Power, Range, Straggling, Channeling and Cherenkov radiation. Beta Particles- Collision and Radiation loss (Bremsstrahlung), **Interaction of Neutrons**- Collision, slowing down and Moderation. **(07 Lectures)**

Radiation detection and monitoring devices: Radiation Quantities and Units: Basic idea of different units of activity, KERMA, exposure, absorbed dose, equivalent dose, effective dose,

collective equivalent dose, Annual Limit of Intake (ALI) and derived Air Concentration (DAC). **Radiation detection:** Basic concept and working principle of gas detectors (Ionization Chambers, Proportional Counter, Multi-Wire Proportional Counters (MWPC) and Gieger Muller Counter), Scintillation Detectors (Inorganic and Organic Scintillators), Solid States Detectors and Neutron Detectors, Thermo luminescent Dosimetry. **(07 Lectures)**

Radiation safety management: Biological effects of ionizing radiation, Operational limits and basics of radiation hazards evaluation and control: radiation protection standards, International Commission on Radiological Protection (ICRP) principles, justification, optimization, limitation, introduction of safety and risk management of radiation. Nuclear waste and disposal management. Brief idea about Accelerator driven Sub-critical system (ADS) for waste management. **(05 Lectures)**

Application of nuclear techniques: Application in medical science (e.g., MRI, PET, Projection Imaging Gamma Camera, radiation therapy), Archaeology, Art, Crime detection, Mining and oil. *Industrial Uses:* Tracing, Gauging, Material Modification, Sterization, Food preservation.

(05 Lectures)

Experiments:

1. Study the background radiation levels using Radiation meter

Characteristics of Geiger Muller (GM) Counter:

2) Study of characteristics of GM tube and determination of operating voltage and plateau length using background radiation as source (without commercial source).

3) Study of counting statistics using background radiation using GM counter.

4) Study of radiation in various materials (e.g. KSO4 etc.). Investigation of possible radiation in different routine materials by operating GM at operating voltage.

5) Study of absorption of beta particles in Aluminum using GM counter.

6) Detection of α particles using reference source & determining its half life using spark counter

7) Gamma spectrum of Gas Light mantle (Source of Thorium)

Reference Books:

1. W.E. Burcham and M. Jobes – Nuclear and Particle Physics – Longman (1995)

2. G.F.Knoll, Radiation detection and measurements

3. Thermoluninescense Dosimetry, Mcknlay, A.F., Bristol, Adam Hilger (Medical Physics Handbook 5)

4. W.J. Meredith and J.B. Massey, "Fundamental Physics of Radiology". John Wright and Sons, UK, 1989.

5. J.R. Greening, "Fundamentals of Radiation Dosimetry", Medical Physics Hand Book Series, No.6, Adam Hilger Ltd., Bristol 1981.

6. Practical Applications of Radioactivity and Nuclear Radiations, G.C. Lowental and P.L. Airey, Cambridge University Press, U.K., 2001

7. W.R. Hendee, "Medical Radiation Physics", Year Book – Medical Publishers Inc. London, 1981

SEMESTER V

Course code: CME69401/ CME69402/ CME69403/ CME69404
Credits: Theory – 02 **Theories: 30 Lectures**

COURSE OUTCOME:

After completion of the course the student is able to

CO1.Deliberate in details with examples basic of measurement

CO2.Specify in depth electronic voltmeter

CO3.Understand in depth Cathode ray oscilloscope

CO4.Specify the characteristics of Impedance Bridge

CO5.Specify the classification and characteristics of digital multimetre

CO6.Identify the characteristics of signal generator

BASIC INSTRUMENTATION SKILLS: SEC 1C

Basic of Measurement: Instruments accuracy, precision, sensitivity, resolution range etc. Errors in measurements and loading effects. **Multimeter:** Principles of measurement of dc voltage and dc current, ac voltage, ac current and resistance. Specifications of a multimeter and their significance.

(04 Lectures)

Electronic Voltmeter: Advantage over conventional multimeter for voltage measurement with respect to input impedance and sensitivity. Principles of voltage, measurement (block diagram only). Specifications of an electronic Voltmeter/Multimeter and their significance. **AC millivoltmeter:** Type of AC millivoltmeters: Amplifier- rectifier, and rectifier- amplifier. Block diagram ac millivoltmeter**,** specifications and their significance. **(04 Lectures)**

Cathode Ray **Oscilloscope:** Block diagram of basic CRO. Construction of CRT, Electron gun, electrostatic focusing and acceleration (Explanation only– nonmathematical treatment), brief discussion on screen phosphor, visual persistence & chemical composition. Time base operation, synchronization. Front panel controls. Specifications of a CRO and their significance.

(06 Lectures)

Use of CRO for the measurement of voltage (dc and ac frequency, time period. Special features of dual trace, introduction to digital oscilloscope, probes. Digital storage Oscilloscope: Block diagram and principle of working. **(03 Lectures)**

Signal Generators and Analysis Instruments: Block diagram, explanation and specifications of low frequency signal generators. pulse generator, and function generator. Brief idea for testing, specifications. Distortion factor meter, wave analysis. **(04 Lectures)**

Impedance Bridges & Q-Meters: Block diagram of bridge. working principles of basic (balancing type) RLC bridge. Specifications of RLC bridge. Block diagram & working principles of a Q-Meter. Digital LCR bridges. **(03 Lectures)**

Digital Instruments: Principle and working of digital meters. Comparison of analog & digital instruments. Characteristics of a digital meter. Working principles of digital voltmeter.

(03 Lectures)

Digital Multimeter: Block diagram and working of a digital multimeter. Working principle of time interval, frequency and period measurement using universal counter/frequency counter, time- base stability, accuracy and resolution. **(03 Lectures)**

The test of lab skills will be of the following test items:

1. Use of an oscilloscope.
2. CRO as a versatile measuring device.
3. Circuit tracing of Laboratory electronic equipment,
4. Use of Digital multimeter/VTVM for measuring voltages
5. Circuit tracing of Laboratory electronic equipment,
6. Winding a coil / transformer.
7. Study the layout of receiver circuit.
8. Trouble shooting a circuit
9. Balancing of bridges

Laboratory Exercises:

1. To observe the loading effect of a multimeter while measuring voltage across a low resistance and high resistance.
2. To observe the limitations of a multimeter for measuring high frequency voltage and currents.
3. To measure Q of a coil and its dependence on frequency, using a Q- meter.
4. Measurement of voltage, frequency, time period and phase angle using CRO.
5. Measurement of time period, frequency, average period using universal counter/frequency counter.
6. Measurement of rise, fall and delay times using a CRO.
7. Measurement of distortion of a RF signal generator using distortion factor meter.
8. Measurement of R, L and C using a LCR bridge/ universal bridge.

Open Ended Experiments:

1. Using a Dual Trace Oscilloscope
2. Converting the range of a given measuring instrument (voltmeter, ammeter)

Reference Books:

- A text book in Electrical Technology - B L Theraja - S Chand and Co.
- Performance and design of AC machines - M G Say ELBS Edn.
- Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
- Logic circuit design, Shimon P. Vingron, 2012, Springer.
- Digital Electronics, Subrata Ghoshal, 2012, Cengage Learning.
- Electronic Devices and circuits, S. Salivahanan & N. S.Kumar, 3rd Ed., 2012, Tata Mc-Graw Hill
- Electronic circuits: Handbook of design and applications, U.Tietze, Ch.Schenk, 2008, Springer Electronic Devices, 7/e Thomas L. Floyd, 2008, Pearson India

SEMESTER V

Course code: CME70601/ CME70602/ CME70603/ CME70604
Credits: Theory – 02 **Theories: 30 Lectures**

COURSE OUTCOME:

After the completion of the course, Students will be able to

CO1.Specify the details of sources and detector

CO2.Deliberate the classification and characteristics of experiments on lasers

CO3.Specify the details of experiments on semiconductor sources

CO4.Write down in details with examples Fourier optics

CO5.Specify the classification and characteristics of photonic and holography

CO6.Specify the characteristics of photonic

APPLIED OPTICS: SEC 1I

(i) Sources and Detectors **(09 Lectures)**

Lasers, Spontaneous and stimulated emissions, Theory of laser action, Einstein's coefficients, Light amplification, Characterization of laser beam, He-Ne laser, Semiconductor lasers.

Experiments on Lasers:

a. Determination of the grating radial spacing of the Compact Disc (CD) by reflection using He-Ne or solid state laser.

b. To find the width of the wire or width of the slit using diffraction pattern Obtained by a He-Ne or solid state laser.

c. To find the polarization angle of laser light using polarizer and analyzer

d. Thermal expansion of quartz using laser

Experiments on Semiconductor Sources and Detectors:

a. V-I characteristics of LED

b. Study the characteristics of solid state laser

c. Study the characteristics of LDR

d. Photovoltaic Cell

e. Characteristics of IR sensor

(ii) Fourier Optics **(06 Lectures)**

Concept of Spatial frequency filtering, Fourier transforming property of a thin lens

Experiments on Fourier Optics:

a. Fourier optic and image processing

1. Optical image addition/subtraction
2. Optical image differentiation
3. Fourier optical filtering
4. Construction of an optical 4f system

b. Fourier Transform Spectroscopy

Fourier Transform Spectroscopy (FTS) is a powerful method for measuring emission and absorption spectra, with wide application in atmospheric remote sensing, NMR spectrometry and forensic science.

Experiment:

To study the interference pattern from a Michelson interferometer as a function of mirror separation in the interferometer. The resulting interferogram is the Fourier transform of the power spectrum of the source. Analysis of experimental interferograms allows one to determine the transmission characteristics of several interference filters. Computer simulation can also be done.

(iii) Holography **(06 Lectures)**

Basic principle and theory: coherence, resolution, Types of holograms, white light reflection hologram, application of holography in microscopy, interferometry, and character recognition

Experiments on Holography and interferometry:

1. Recording and reconstructing holograms
2. Constructing a Michelson interferometer or a Fabry Perot interferometer
3. Measuring the refractive index of air

4. Constructing a Sagnac interferometer

5. Constructing a Mach-Zehnder interferometer

6. White light Hologram

(iv) Photonics: Fibre Optics **(09 Lectures)**

Optical fibers and their properties, Principal of light propagation through a fibre, The numerical aperture, Attenuation in optical fibre and attenuation limit, Single mode and multimode fibres, Fibre optic sensors: Fibre Bragg Grating

Experiments on Photonics: Fibre Optics

a. To measure the numerical aperture of an optical fibre

b. To study the variation of the bending loss in a multimode fibre

c. To determine the mode field diameter (MFD) of fundamental mode in a

Single-mode fibre by measurements of its far field Gaussian pattern

d. To measure the near field intensity profile of a fibre and study its refractive

Index profile

e. To determine the power loss at a splice between two multimode fibre

Reference Books:

- Fundamental of optics, F. A. Jenkins & H. E. White, 1981, Tata McGraw hill.
- LASERS: Fundamentals & applications, K.Thyagrajan & A.K.Ghatak, 2010, Tata McGraw Hill
- Fibre optics through experiments,M.R.Shenoy, S.K.Khijwania, et.al. 2009, Viva Books
- Nonlinear Optics, Robert W. Boyd, (Chapter-I), 2008, Elsevier.
- Optics, Karl Dieter Moller, Learning by computing with model examples, 2007, Springer.
- Optical Systems and Processes, Joseph Shamir, 2009, PHI Learning Pvt. Ltd.
- Optoelectronic Devices and Systems, S.C. Gupta, 2005, PHI Learning Pvt. Ltd.
- Optical Physics, A.Lipson, S.G.Lipson, H.Lipson, 4th Edn., 1996, Cambridge Univ. Press

The marks distribution for the final practical examination is as follows:

Formula/Formulae with explanation of symbols	**05 marks**
Diagram/Circuit diagram and tabular column	**08 marks**
Experimental setup+ taking readings	**18 marks**
Accuracy of readings	**05 marks**
Graph and Calculations	**10 marks**
Final result and units	**04 marks**
Viva	**10 marks**
Record	**10 marks**
Total for the practical examination	**70 marks**

Question Paper Pattern for DSC and DSE theory papers of 04 credits

From the academic year 2017-2018 onwards

Time: 3 hours **Max. Marks: 70**

Part A:

I. Answer all the questions (Multiple choice questions) **1 x 4 = 4 marks**

(One question should be selected from 15 lectures)

Part B:

II. Answer any seven questions. **2 x 7 =14 marks**

Ten questions should be set

(At least two questions should be selected from 15 lectures)

Part C:

III. Answer all the questions. **4 x 10 = 40 marks**

(Two questions should be set out of fifteen lectures of internal choice of ten marks each)

Part D:

IV. Answer any three out of four questions **4 x 3 = 12 marks**

(One problem should be selected from 15 lecturers)

Question Paper Pattern for DSE theory papers of 05 credits

From the academic year 2017-2018 0nwards

Time: 3 hours **Max. Marks: 70**

Part A:

I. Answer all the questions (Multiple choice questions) **1 x 5 = 5 marks**

(One question should be selected from 15 lectures)

Part B:

II. Answer any five questions. **2 x 5 =10 marks**

Eight questions should be set

(At least two questions should be selected from 15 lectures)

Part C:

III. Answer the following questions. **8 x 5 = 40 marks**

(Two questions should be set out of fifteen lectures of internal choice of eight marks each)

Part D:

IV. Answer any three out of five questions **5 x 3 = 15 marks**

(One problem should be selected from 15 lecturers)

Question Paper Pattern for SEC theory paper of 02 credits

Time: 2 hours **Max. Marks: 50**

Part A:

I. Ten Questions out of twelve. **2 x 10 = 20 marks**

(Five questions from15 lectures.)

Part B:

II. Answer all the questions **10 x 03 = 30 marks**

(Two questions should be set out of ten lectures of internal choice of ten marks each)

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE
(AUTONOMOUS)
B.N. ROAD, MYSURU-570025

DEPARTMENT OF POLITICAL SCIENCE

Revised Syllabus for Undergraduate (UG)
CBCS Scheme - 2017-18

Scheme of Study

Paper No	Sem	Paper Code	Course	Teaching Hours Per week	L T P	Credit	I.A Marks	Theory Exam	Total Marks
1	I	Core - 1 DLA26012	Introduction to Political Theory	5+1	5-1-0	6	30	70	100
2	II	Core - II DLB26012	Indian Government and Politics	5+1	5-1-0	6	30	70	100
3	III	Core - III DLC26012	Comparative Government and Politics	5+1	5-1-0	6	30	70	100
4	IV	Core - IV DLD26012	International Relations	5+1	5-1-0	6	30	70	100
	*DSE- Discipline Specific Elective-One of the following								
5	V	DSE – 1A DLE26012	Legislative Support	5+1	5-1-0	6	30	70	100
6	V	DSE – 2 DLE26212	Public Opinion and Survey Research	5+1	5-1-0	6	30	70	100
	*DSE- Discipline Specific Elective-One of the following								
7	VI	DSE – 1B DLF26012	Democratic awareness with Legal Literacy	5+1	5-1-0	6	30	70	100
8	VI	DSE – 2 DLF26212	Conflict and Peace Building	5+1	5-1-0	6	30	70	100
	*SEC – Skill Enhancement Course								
9	V	SEC -1 DLE26412	Theme in comparative political Theory	4	3-1-0	4	30	70	100
10	V	SEC-1 DLE26612	Democracy and Governance	4	3-1-0	4	30	70	100
11	VI	SEC – 2 DLF26412	Administration and public policy	4	3-1-0	4	30	70	100
12	VI	SEC-2 DLF26612	Understanding Globalization	4	3-1	4	30	70	100
13		AECC	Indian constitution	4	4	4	30	70	100

Generic Elective

Sl. No	Semester	Course Code	Title of the paper	Total credits	
				Theory	Tutorials
1	V	DLE26812	Reading Gandhi	05	01
2	VI	DLF26812	Reading Gandhi	05	01

Scheme of Assessment

Year	SEM	COURSE CODE	TITLE OF THE PAPER	CONTINUOUS ASSESSMENT				MAX. MARKS			DURATION OF EXAM
				C1		C2		C3	TH	IA	TH
				TH	AS	TH	SE				
I	I	DLA26012	Introduction to Political Theory	10	5	10	5	70	70	30	3h
	II	DLB26012	Indian Government and Politics	10	5	10	5	70	70	30	3h
II	III	DLC26012	Comparative Government and Politics	10	5	10	5	70	70	30	3h
	IV	DLD26012	International Relations	10	5	10	5	70	70	30	3h
III	V	DLE26012	Legislative Support	10	5	10	5	70	70	30	3h
		DLE26212	public opinion and survey research	10	5	10	5	70	70	30	
		DLE26412	Theme in comparative political theory	10	5	10	5	70	70	30	
		DLE26612	Democracy and Governance	10	5	10	5	70	70	30	
	VI	DLF26012	Democratic awareness with Legal Literacy	10	5	10	5	70	70	30	3h
		DLF26212	Conflict and peace building	10	5	10	5	70	70	30	
		DLF26412	Administration and public policy concept &theories	10	5	10	5	70	70	30	
		DLF26612	Understanding Globalization	10	5	10	5	70	70	30	
BA, B.Com, BSc, BCA, BBA, B. Voc	I.II.V.VI	DLB130112 DNB13001 CMF29402 DCF21001 BDF29001 FPC/SDC550	Indian Constitution	10	5	10	5	70	70	30	3h

TEMPLATE

Sem	Core			DSE			SEC	
	No. of Courses	**Credits**	**Total Hours**	**No. of Courses**	**Credits**	**Total Hours**	**No. of Courses**	**Credits**
I	1	6	75+15	-	-	-	-	-
II	1	6	75+15	-	-	-	-	-
III	1	6	75+15	-	-	-	-	-
IV	1	6	75+15	-	-	-	-	-
V	-	-	-	1	6	75+15	1	4
VI	-	-	-	1	6	75+15	1	4

Programme Outcome

After completing the graduation in BA HP) the students are able to:

PO1. Critically recognize the social, political, economic and cultural aspects of History.
PO2. Demonstrate thinking skills by analysing, synthesizing, and evaluating historical information from multiple sources.
PO3. Extract evidence from primary sources by analysing and evaluating them in relation to their cultural and historical context.
PO4. Develop an informed familiarity with multiple cultures.
PO5. Emerge as a multifaceted personality who is self-dependent.
PO6. Spread the messages of equality, nationality, social harmony and other human values.
PO7. Comprehend the basic structures and processes of government systems and/or theoretical underpinnings.
PO8. Analyse political problems, arguments, information, and/or theories.
P09.Apply methods appropriate for accumulating and interpreting data applicable to the discipline of political science.
PO10. Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes

Programme Specific Outcomes

On Completion of BA (HP) students will:

PSO1. Exerts it's Influence on life and destiny of human beings

PSO2. Act as a stepping stone for one's success in competitive examinations

PSO3. Create appropriate and efficient Historians, Political Leaders, administrators and State's man

PSO4. Educate about patriotism toleration and National Integration

DLA26012

Course outcome
I – Semester

Political Science I: Introduction to Political Theory

Course Outcome:

On completion of the Course, students will:

CO1 Learn in depth meaning and nature of political theory

CO2 Deliberate in details with examples differences between politics and political theory

CO3 Understand the characteristics of elements of state

CO4 Specify the details of civil society

CO5 Understand the classification and characteristics of rights

CO6 Specify the classification and characteristics of democracy

I Introduction to Political Theory and Politics

a. Politics – Meaning, Nature and Importance
b. Political Theory – Meaning, Nature and Importance
c. Differences between Politics and Political Theory
d. Decline of Politics

II. State – Citizenship – Civil Society

a. State – Elements Theories, Historical, Social Contract Marxist
b. Citizenship – Concepts, Kinds, Methods of accruing and Loosing Citizenship
c. Civil Society – Meaning Role and Importance
d. Significance of State Intervention in Family Life

III. Basic Concepts – I

a. Liberty – Meaning, Types, Importance and Limitations
b. Equality – Meaning, Types, Importance, Limitations
c. Justice - Meaning, Types, Importance, Limitations

IV. Basic Concepts – II

a. Gender - Meaning, Types, Importance, Limitations
b. Rights - Meaning, Types, Importance, Limitations

V. Democracy

a. Democracy – Meaning, Nature, Principles & Forms
b. Contemporary debates on democracy
c. Democracy and Economic Growth
d. Essentials & Hindrances

References:

Bharagava,R and Acharya-political theory
Acharya,a-Equality
R.G.Gettle-Principles of political science
B.K.Ghokhale-AStudy of political theory
Appadori-Substance of politics

DLB26012

II Semester

Political Science II: Indian Government and Politics

Course Outcome:

On completion of the Course, students will:

CO1 Identify the characteristics of Indian politics

CO2 Understand the characteristics of Indian constitution

CO3 Understand in details with application, if applicable, federalism

CO4 Identify the classification and characteristics of power structure in India

CO5 Identify the details of party system in India

Unit I

a. Indian Politics: Nature of the State in India

b. Approaches to Indian Politics:

(1) Liberal (2) Marxist and Gandhian

c. Federalism in India – Federal features, unitary features, challenges to Indian Federalism

Unit II

a. Basic features of Indian Constitution

b. Debates on Fundamental Rights

c. Directive Principles of State Policy, Planned Economy & Neo Liberalism (NITI Ayoga)

Unit III

a. Parliament

b. Prime Minister & Council Ministers

c. Supreme Court of India

Unit IV

a. Power Structure in India

b. Caste, Class, Patriarchy

c. Religion and Politics, Secularism and Communism

d. Social movements, Peasants, Environmental, Women's Movement

Unit V

a. Features of Political Party System in India
b. Organization and Functions – INC, BJP
c. Role Regional Parties and National Parties

Reference:

1. Abbas, H, Kumar R & Alam – Indian Government and Politics
2. Chandhoke N - Contemporary India
3. Chakravarthy B - Indian Government and Politics
4. Singh - Indian Politics

DLC26012

III Semester

Political Science III: Comparative Government & Politics

Course Outcome:

On completion of the Course, students will:

CO1 Specify the details of comparative governments

CO2 Understand the details of classification of political systems

CO3 Understand the classification and characteristics of electoral systems

CO4 Learn the classification and characteristics of contemporary debates on state

CO5 Understand in details with application, if applicable, contemporary debates

Unit I. Comparative Politics

a. Nature, Scope, Methods
b. Authoritarian and Democratic Regimes

II. Classifications of Political Systems

a. Parliamentary and Presidential : UK & USA
b. Federal & Unitary : Canada and China

III. Electoral Systems

a. First Past and Post
b. Proportional representation
c. Mixed Systems

IV. Party Systems

a. Single Party System
b. Bi-party System
c. Multi-party System

V. Contemporary Debates on State

a. State – Centric Security to Human Centric Security
b. State in the Context of globalization

Reference:

1. Baraj & Pennington m – comparative politics
2. Caramani – Comparative Politics
3. Hague Rand Harrop. M – The Political executive in comparative government and politics
4. Evans, Jocelyn A J Government and Politics

DLD26012

IV Semester
Political Science IV: Introduction to International Relations

Course Outcome:

On completion of the Course, students will:

CO1 Identify the classification and characteristics of approaches of international relations

CO2 Specify the classification and characteristics of cold war

CO3 Specify in depth India and her neighbours relationship

CO4 Learn the details of relations of India with great powers

CO5 Write down the characteristics of India's foreign policy

I. Introduction:

a. Meaning Scope & Importance of INR
b. Approaches – Realism, Neo-Realism, Neo Liberalism
c. Structural Approaches
d. Feminist Perspective

II. Cold War & Post Cold War Era

a. Meaning & Origin of Cold War
b. First Cold War, Rise and Fall of Détente
c. Second Cold War: Collapse of USSR
d. Emerging Centres of Power Today

III. India's Foreign Policy

a. Basic Determinants and Features
b. Non-alignment policy
c. India: An emerging power

IV. India & Her neighbours

a. India & Pakistan
b. India & China
c. India & Bangladesh

V. India & Great Powers

a. India & US
b. India & Russia
c. India & Japan

Reference:

1. R.J. and Tervis R – Concepts and Contemporary Issues

2. Smith M – Perspective on World Politics
3. Basu, Rumki – International Politics

DLE26012

V- SEMESTER
Discipline Specific Elective (DSE1A)
Legislative support

Course Outcome:

On completion of the Course, students will:

CO1 Understand in depth legislative support
CO2 Write down the details of legislative process
CO3 Write down the details of legislative committees
CO4 Learn in details with examples legislative committees
CO5 Identify in details with application, if applicable, budget process

Unit I

Power and functions of people's representative at different tiers of governance, Members of parliament, state legislative Assemblies, functionaries of rural and urban local self government from Zillaparishads/Municipal corporation to panchayat

Unit II

Supporting the legislative process: How a bill becomes a Law, Role of the Standing Committee in reviewing a Bill, Legislative Consultations, amendments to a Bill, the framing of Rules and Regulations.

Unit III

Supporting the legislative committees: types of committees, role of committees in reviewing government finances, policy, programmes and legislation

Unit IV

Reading the budget document: Overview of Budget Process, Role of Parliament in reviewing the Union Budget, Examination of Demands for Grants of Ministers, Working of Ministries.

Reference:

Madhavan, M R & N Wahi financing of election campaigns
Vanka, S primer on MPLADS centre for policy research
Karla, H Public engagement with the legislative process
Agerwalo.P and T V Somanathan, "Public Policy Making in India: Issues and Remedies," Feb, 2005
Debroy, bibek, "Why we Need Law Reform"

DLE26212

V- SEMESTER
Discipline Specific Elective (DSE2)
PUBLIC OPINION AND SURVEY RESEARCH

Course Outcome:
On completion of the Course, students will:

CO1 Deliberate the details of public opinion and survey research
CO2 Understand the details of measuring public opinion
CO3 Understand in details with examples quantitative data
CO4 Write down the classification and characteristics of interpreting polls

Unit I: Introduction to the Course

Definition and characteristics of public opinion, conceptions and characteristics, debates about its role in a democratic political system, uses for opinion poll

Unit II: Measuring Public Opinion with Surveys: Representation and sampling

a. What is sampling? Why do we need to sample? Sample design
b. Sampling error and non-response
c. Types of sampling: Non random sampling (quota, purposive and snowball sampling); random sampling: simple and stratified

Unit III: Survey Research

a. Interviewing: Interview techniques pitfalls, different types of and forms of interview
b. Questionnaire: Question wording; fairness and clarity

Unit IV: Quantitative Data Analysis

a. Introduction to quantitative data analysis
b. Basic concepts: correlational research, causation and prediction, descriptive and inferential Statistics

Unit V: Interpreting Polls

Prediction in polling research: possibilities and pitfalls
Politics of interpreting polling

Reference:

R. Karandikar, C. Pyne and Y Yadav, (2002)' Predicting the 1998 Indian Parliamentary Elections', Electoral Studies, Vol. 21, pp.69-89
K. Warren, (2001), Chapter2', in In Defense of Public Opinion Polling, Boulder: Westview Press, pp. 45-80
D. Rowntree (2000) Statistics Without Tears: an introduction for Non athematicians, Harmondworth: Penguin

DLE26412

V Semester
Skill Enhancement Course (SEC1A)
Themes on Comparative Political Theory

Course Outcome:

On completion of the Course, students will:

CO1 Understand in details with application, if applicable, democracy and governance

CO2 Understand in details with application, if applicable, Indian political thought

CO3 Specify in depth Indian political thought

CO4 Identify the classification and characteristics of western political thought

CO5 Understand in details with examples western political thought

CO6 Understand in depth local government

CO7 Learn the details of regulatory institutions

CO8 Identify the classification and characteristics of lobbying institutions

Unit I

a. Distinctive features of Indian political thought
b. Kautilya on State
c. Tilak and Gandhi on Swaraj

Unit II

a. Ambedkar and Lohia on Social Justice
b. Nehru and Jayaprakash Narayan on Democracy
c. Pandita Ramabai on Patriarchy

Unit III

a. Distinctive features of western political thought
b. Aristotle on citizenship
c. John Locks on Rights

Unit IV

a. J.J. Rousseous on Inequality
b. J.S. Mill on liberty and democracy
c. Marx and Bakunin on state

Reference:

1. Dallmayr F – Comparative Political Theory
2. Sparks, Oh and Isaacs s – Political Theory its in context
3. Zelliot E – Political Thought in Modern India

DLE26612

V Semester
Skill Enhancement Course (SEC2)
Democracy and Governance

Course Outcome:

On completion of the Course, students will:

CO1 Understand in details with application, if applicable, democracy and governance

CO2 Identify the classification and characteristics of lobbying institutions

CO3 Understand in depth local government

CO4 Learn the details of regulatory institutions

I. Governance in India

a. Indian Model of Democracy
b. Relation between Indian Parliament and Indian Executive
c. Reason for the decline of Indian Parliament
d. Judicial activism and PIL
e. Political communication: Nature forms & Importance

II. Regulatory Institutions

a. SEBI
b. TRAI
c. Competition Commission of India

III. Lobbying Institutions

a. Chamber of Commerce and Industries
b. Trade Unions
c. Farmers associations

IV. Local Government

a. 73rd and 74th Amendments
b. Rural & Urban local governments in India

Reference:

Agarwasl B. Environmental Management
Jagdish Bhagwathi : India in Transition

DLF26012

VI SEMESTER
Discipline Specific Elective (DSE)-1B:

Democratic Awareness with Legal Literacy

Course Outcome:

On completion of the Course, students will:

CO1 Identify in depth democratic awareness with legal literacy

CO2 Learn in details with examples system of course

CO3 Write down in details with application, if applicable, constitutional rights and there enforcement

CO4 Understand in details with examples criminal jurisdiction

CO5 Specify in details with examples personal laws in India

Unit I

a. Outline of the Legal systems in India
b. System of courts/tribunals and their jurisdiction in India – criminal and civil courts, writ jurisdiction, specialized courts such as juvenile courts, Mahila courts and tribunals
c. Role of the police and executive in criminal law administration
d. Alternate dispute mechanisms such as lok adults, non – formal mechanisms.

Unit II

a. Brief understanding of the laws applicable in India
b. Constitution – fundamental rights, fundamental duties, other constitutional rights and their manner of enforcement with emphasis on public interest litigation and the expansion of certain rights under Article 21 of the Constitution.
c. Laws relating to criminal jurisdiction – provision relating to filing an FIR, arrest, bail search and seizure and some understanding of the questions of evidence and procedure in Cr. P.C. and related laws, important justice, prevention of atrocities on Scheduled Castes and Scheduled Tribes
d. Concepts like Burden of Proof, Presumption of Innocence, Principles of Natural Justice, Fair comment under Contempt laws
e. Personal laws in India, Pluralism and Democracy
f. Laws relating to contract, property and tenancy laws.
g. Laws relating to dowry, sexual harassment and violence against women
h. Laws relating to consumer rights
i. Laws relating to cyber crimes
j. Anti-terrorist laws: implications for security and human rights
k. Practical application: Visit to either a (1) court or (2) a legal aid centre set up by the Legal Services Authority an NGO or (3) a lokadalat, and to interview a litigant or person being counselled, Preparation of a case history

Unit III

Access to courts and enforcement of rights

a. Critical Understanding of the Functioning of the Legal System
b. Legal Services Authorities Act and Right to Legal Aid, ADR Systems
c. Practical Application:
   What to do if you are arrested; if you are a consumer with a grievance; if you are a victim of sexual harassment; domestic violence, child abuse, caste, ethnic and religious discrimination; filling a public interest litigation. How can you challenge administrative orders that violate rights, judicial and administrative remedies
d. Using a hypothetical case of (for example) child abuse or sexual harassment or any other violation of a right, preparation of an FIR or writing a complaint addressed to the appropriate authority

Reference:

Creating Legal Awareness, edited by Kamala Sankaran and Ujjwal Singh (Delhi: OUP, 2007)

Legal literacy: available amongst interdisciplinary courses on Institute of Life Long Learning (Delhi University) Virtual Learning Portal namely vle,du.ac.in

Multiple Action Research Group, Our Laws Vols 1-10, Delhi

S.K. Agarwala, Public Interest Litigation in India, K.M. Munshi Memorial Lecture,

S.P. Sathe, Towards Gender Justice, Research Centre for Womens' Studies, SNDT Women's University, Bombay, 1993

Sagade, Jaga, Law of Maintenance: An Empirical Study, ILS Law College, Pune 1996

Parmanand Singh, 'Access to Justice and the Indian Supreme Court', 10 & 11 Delhi Law Review 156, 1981-82

DLF26212

VI SEMESTER
Discipline Specific Elective (DSE2)
CONFLICT AND PEACE BUILDING

Course Outcome:

On completion of the Course, students will:

CO1 Understand the characteristics of Conflict and Peace Building
CO2 Learn in details with examples dimensions of conflicts
CO3 Identify the classification and characteristics of sites of conflict
CO4 Identify in details with examples skills of conflict

Unit I – Concepts

a. Understanding Conflict
b. Conflict Management, Conflict Resolution and Conflict Transformation
c. Peace Building

Unit II – Dimensions of Conflicts

a. Ideology
b. Economic / Resource Sharing Conflicts
c. Socio-Cultural Conflicts (Ethnic, Religious, Gender-based)

Unit III – Sites of Conflict

a. Local
b. Sub-National
c. International

Unit IV – Conflict Responses: Skills and Techniques

a. Negotiations: Trust Building
b. Mediation: Skill Building; Active Listening
c. Tract I, Track II & Multi Track Diplomacy
d. Gandhian Methods

Reference:

Ramsbotham, T. Woodhouse and H Miall, (2011) ‘Understanding Contemporary Conflict’, in Contemporary Conflict Resolution, (Third Edition), Cambridge
Doucet, (1996) Thinking About Conflict, Resource Pack For Conflict Transformation: International Alert
C. Webel and J. Galtung (eds.), (2007) the Handbook fo Peace and Conflict Studies, London Routledge
S. Mason and M. Siegfried, (2010) Debriefing Mediators to Learn Their Experiences, Washington D.C: United States Institute of Peace
Online Resources Conflict Resolution in Popular Art and Culture:
H. Burgess and G. Burgess, (2010) Conducting Tract II, Washington D.C: United States Institute of Peace.

DLF26412

VI Semester
Skill Enhancement Course (SEC2B):
Administration & Public Policy Concept & Theories

Course Outcome:

On completion of the Course, students will:

CO1 Learn in depth Administration and Public Policy
CO2 Specify the details of administrative theories
CO3 Learn the classification and characteristics of administrative theories
CO4 Deliberate the details of public policy
CO5 Deliberate in details with examples public policy in India
CO6 Identify the characteristics of public policy in India

Unit I Public Administration

a. Meaning, Scope and Significance
b. Public & Private Administration
c. Approaches to Public Administration

Unit II Administrative Theories

a. Classical Theory & Human Relations Theory
b. Scientific Theory
c. Rational decision making theory

Unit III Public Policy

a. Concept, Theories & Relevance
b. Formulationof Public Policy
c. Implementation of Public Policy
d. Evolutionof Public Policy

Unit IV Major Public Policies in India

a. Educational Policy
b. Defense Policy
c. Reservation Policy
d. Nuclear Policy

Reference:

1. Awasthi A and Maheshwari - Public Administration
2. BasuRumki, Public Administration - Concepts and Theories
3. Henry N - Public Administration and Public Affairs
4. Mouzelis N P - The Ideal type of Bureaucracy
5. Mooney - The Principles of Organization
6. Esman M T - Politics & Development Administration

DLF26612

VI Semester
Skill Enhancement Course (SEC2):
Understanding Globalization

Course Outcome:

On completion of the Course, students will:

CO1 Write down in depth globalization

CO2 Deliberate the characteristics of world actress of globalization

CO3 Understand in details with application, if applicable, contemporary issues of world in globalization

CO4 Understand in details with examples dimensions of terrorism

I. Introduction to Globalization

a. Meaning, Nature and Importance
b. Origin and Growth of Globalization
c. Effects of Globalization
d. Dimensions of Globalization – Eco, Pol. Techno, Cultural

II. Contemporary World Actors

a. The U.N
b. W.T.O
c. Group 77 Countries

III. Contemporary World Issues

a. Environmental – Global Warming, Bio-diversity, Resource Scarcity
b. Eco – Poverty, Equality
c. Social – Ethnic, Immigration

IV. Transnational Terrorism

a. Meaning, Nature
b. Dimensions – Religions, Eco. Political – Cultural
c. Responses & Measures

Reference:

Lechner, F.J. and Boli, J. (eds.) (2004) The Globalization Reader, 2nd Edition, Oxford: Blackwell
Bavlies, J and Smith, S (eds.) (2011) The Globalization of World Politics.
Taylor, P. and Grom, A.J.R. (eds. (2000) The United Nations at the Millennium, London: Continuum pp. 1-20
Sauvant, K. (1981) Group of 77: Evolution, Structure and Organisation, New York: Oceana Publications.
Roberts J.M. (1999) The Penguin History of the 20th Century, London: Penguin
Smith, M., Little, R. and Shackleton, M (eds.) (1981) Perspectives on World Politics. London: Croom Helm

Generic Elective: Reading Gandhi

Course Outcome:

On completion of the Course, students will:

CO1 Understand in details with examples Gandhi's views on women
CO2 Deliberate in depth Gandhi and hind swaraj
CO3 Learn the details of Gandhi's views on nationalism
CO4 Understand the details of Gandhi's views on communal unity
CO5 Specify the details of reading Gandhi

Unit I:

Gandhi in his own Words: A Close reading of Hind Swaraj

Unit II:

Commentaries on Hind Swaraj and Gandhian though:

a. Introduction, M.K. Gandhi, Hind Swaraj and other writings ed. A.J. Parel (1997)
b. B. Parekh, Gandhi (1997), chs. 4 ("Satyagraha") and 5 (:The critique of modernity")
c. D. Hardiman, Gandhi in his time and ours (2003), ch. 4 ("An alternative modernity")

Unit III:

Gandhi and Modern India

a. Nationalism
b. Communal Unity
c. Women's Question
d. Untouchability

DLB13011/ DNB13001/CMF29402
DCF21001/BDF29001/FPC/SDC550

Indian Constitution
Ability enhancement compulsory course (AECC)
(BA, B.Com, BSc, BCA, BBA, B. Voc)

Course Outcome:

On completion of the Course, students will:

CO1 specify in details with application, if applicable, right to information act
CO2 Deliberate in details of preamble of Indian constitution
CO3 Deliberate the details with examples fundamental rights
CO4 Understand the classification and characteristics of union government of India
CO5 Understand the details of supreme court of India
CO6 specify the details of state government of India

Unit-I

a. Meaning and Importance of Constitution
b. Preamble of the Indian Constitution
c. Salient features of Indian Constitution

Unit II

a. Fundamental Rights
b. Fundamental Duties
c. Directive Principles of State Policy

Unit III

a. President – Election methods, Powers and Functions
b. Vice President
c. The Role of the Prime Minister
d. The Parliament – Structure, Power and Functions (Lok Sabha and Rajya Sabha)

Unit IV

a. The Role of Governor in the Administration of State
b. Powers and Functions of the Chief Minister
c. Composition, Powers and Functions of both the Houses of State Legislature

Unit V

a. Supreme Court – Organization and Jurisdiction
b. High Court – Organization and Jurisdiction
c. Public Interest Litigation
d. Right to Information Act

Reference:

M V Pylee	-	An Introduction to the Constitution of India
D D Basu	-	An Introduction to the Constitution of India
H B Mallikarjuna Swamy	-	Constitution of India

Department of Political Science
Model Question Paper for BA Student under CBCS

Time: 3 Hours **Marks: 70**

<u>PART – A</u>

Note: Answer any four questions each question carries Ten marks 4 x 10 = 40

1. _
2. _
3. _
4. _
5. _
6. _
7. _

<u>PART – B</u>

Note: Answer any Two questions each question carries Fifteen Marks 2 x 15 = 30

8. _
9. _
10. _

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE

(Autonomous)

B N ROAD, MYSURU- 570 025

DEPARTMENT OF SANSKRIT

Syllabus

CHOICE BASED CREDIT SYSTEM

For B.A/B.Sc PROGRAMME

2017-18

Scheme of study and Assessment pattern for BSc

		Course	Title	Hours / Week		Credits	Maximum Marks			Exam Duration	Total
							IA		Exam		
				L	T/ P	L:T:P	C1	C2			Marks
I Year	I SEM	CMA09001 CMA 09002 CMA 09003 CMA 09004 CMA 09005 CMA 09006 CMA 09007 CMA 09008	Selection of anthology Sanskrit prose	3	1	3:1:0	15	15	70	3 Hours	100
	II SEM	CMB09001 CMB 09002 CMB 09003 CMB 09004 CMB 09005 CMB 09006 CMB 09007 CMB 09008	Sanskrit poetry	3	1	3:1:0	15	15	70	3 Hours	100
II Year	III SEM	CMC09001 CMC 09002 CMC 09003 CMC 09004 CMC 09005 CMC 09006 CMC 09007 CMC 09008	Sanskrit drama1.Abhijnana shakunthale of kalidasa	3	1	3:1:0	15	15	70	3 Hours	100
	IV SEM	CMD09001 CMD09002 CMD09003 CMD09004 CMD09005 CMD09006 CMD09007 CMD09008	Champu kavyamChampu ramayane Ayodhyakanda	3	1	3:1:0	15	15	70	3 Hours	100

Programme: B.Sc (PCM/PMCs/PMCm/PME/CZBt/BMBt/BBM/CBZ)

Scheme of study and Assessment pattern for B.A

Programme: BA (EG/HP/KG/HE/JE)

		Course	Title	Hours / Week		Credits	Maximum Marks			Exam Duration	Total
							IA		Exam		
				L	T/ P	L:T:P	C1	C2			Marks
I Year	I SEM	DLA09001 DLA09002 DLA09003 DLA09004 DLA09005	Selection of anthology Sanskrit prose	3	1	3:1:0	15	15	70	3 Hours	100
	II SEM	DLB09001 DLB09002 DLB09003 DLB09004 DLB09005	Sanskrit poetry	3	1	3:1:0	15	15	70	3 Hours	100
II Year	III SEM	DLC09001 DLC09002 DLC09003 DLC09004 DLC09005	Sanskrit drama1.Abhijnana shakunthale of kalidasa	3	1	3:1:0	15	15	70	3 Hours	100
		DLC310	Bhasha samvardhane	2	0	2:0:0	15	15	70	3 Hours	100
	IV SEM	DLD09001 DLD09002 DLD09003 DLD09004 DLD09005	Champu kavyamChampu ramayane Ayodhyakanda	3	1	3:1:0	15	15	70	3 Hours	100

Programme Outcome for BA & B.Sc

PO1. To realize the human values.

PO2. To create the sense of social service.

PO3. Responsible and dutiful citizen.

PO4. To enhance the critical temper and creative ability.

Programme Specific Outcome for BA & B.Sc

PSO1. To develop the speaking skill.

PSO2. Clarity in Language.

PSO3. Usage of appropriate words.

BA/BSC

I SEMESTER

Selection of anthology Sanskrit prose

Credit (L: T: P = 3: 1: 0)

Course Outcome

CO1. Identify the characteristics of tathavamasi
CO2. Deliberate the classification and characteristics of tathavamasi
CO3. Deliberate in details with examples chandrapedavidyabyasa
CO4. Learn the classification and characteristics of chandrapeedavidyabyasa
CO5. Deliberate in details with application, if applicable, mahatmabudha
CO6. Specify in depth varthamanayugsyamahapuroshomahathmagandhigi

1. Tathvamsi
2. Chandrapeeda vidhyyabhayyasa
3. Vyapadeshenamahatam
4. Mahathma Buddha
5. Varthamana yugasyya mahapurusho mahatma Gandhi

GRAMMAR

1. Sandhi prakarana – Swara sandhi
2. Shabdhaha –Ajanta pullinga, Stree linga, Napumsaka linga
3. Samasaha – Tathpurusha, Karmadhareyaha
4. Karakani
5. Bhashantaram – Unseen Passage

Reference Books

1 Banas Kadambari – Editor by M.R. Kale
2 Raghavamsha Translation by Vidvan H.V. Nagaraj Rao
3 Samskrita Gadya Padya Sangrah by Dr. M. shivkumarswamy, Bangalore
4 Kavya Taranga 18 (Anthology of Sanskrit Prose) Published by Prasaranga University of Mysore

BA/BSC

II SEMESTER

Sanskrit poetry

Credit (L: T: P = 3: 1: 0)

Course Outcome

CO1. Deliberate the classification and characteristics of selected poems of raguvamsha of kalidasa

CO2. Write down in details with examples selected poems of raguvamsha of kalidasa

CO3. Deliberate the characteristics of selected poems of raguvamsha of kalidasa

CO4. Deliberate in depth selested poems of raguvamsha of kalidasa

CO5. Write down the classification and characteristics of selected slokas of sidaratha manparivarthanm

CO6. Specify the classification and characteristics of selected slokas of sidaratha manparivarthanm

CO7. Specify the characteristics of selected slokas of sidaratha manparivarthanm

CO8. Understand in details with application, if applicable, selected vachanas of basaveshwara

CO9. Learn in depth selected vachanas of basaveshwara

CO10. Specify the classification and characteristics of selected sloks of katopanisht

CO11. Understand the classification and characteristics of selected sloks of katopanisht

CO12. Understand the characteristics of selected sloks of katopanisht

CO13. Understand in details with application, if applicable, selected vachanas of basaveshwara

CO14. Deliberate the classification and characteristics of selected vachanas of basaveshwara

1. Raguvamsha of kalidasa – Ist Canto 1-30 sloakas
2. Siddarthamanaparivarthananm – Ashwaghosha – IIIrd Canto 1-20 sloakas
3. Basaveshwara vachanani – 1 – 15 Vachanas
4. Yamanachiketayoh – Samvada in katopanishath – Prathama valli- 28 sloakas

GRAMMAR

1. Sandhi prakarana – Vyanjana sandhi
2. Shabdhaha –Sarvanama
3. Samasaha – Bahurvrihi, Avyaeebhava samasa
4. Kriyapadani – Lat, Lung, Lrut, Lot, Vidhiling(Parsmipadi)
5. Krudannta avyyanee – Tavanta, Lebannta, Tumunannta
6. Translation – Unseen passage

Reference Books

1 Samskruta Kavya by K. Krishnamurthy, Mysore University, Mysore
2 Raghu vamsha Dr Nagarajarao
3 Samskrutha kavyatharanga 15 Prasaranga Mysuru

BA/B.Sc

III SEMESTER

Sanskrit drama1.Abhijnana shakunthale of kalidasa

Credit (L: T: P = 3: 1: 0)

Course Outcome

CO1 Write down the characteristics of Abignanna shakuntalm of kalidasa 1-4acts

CO2 Identify the details of Abignanna shakuntalm of kalidasa 1-4acts

Part - 1

Drama –Abhijnana shakuntalam of Kalidasa 1 – 4 Acts

Date, Place and works of Mahakavi Kalidasa

Part – II

Grammar

1. Halantha shabdhah – Rajan, Athma, Maruth, Bhavath
2. Kriya padani - Lat, Lung, Lrut, Lot, Vidhiling(Atamanepadi)
3. Samasaha – Davndva, Divigu
4. Alankaraha – Upama, Swabhvokthi, Artantaranyyasa, Drustantha
5. Vakayya doshannpariharata
6. Translation – Seen passage

Reference Books

1 Abijnanna Sankunthala Edited by M.R. Kale

2 Sanskrita Drama by A.B. kith – published by Motilal Banarasidass, New Delhi.

3 Abijanna sakunthala Prof.K.T. Pandurangi

4 Samskritha Nataka Prof.A.R. Krishna Shastri

5 Kannada Abijnanna Sakunthala by Ganapathi Moleyara

DLC310

III SEMESTER

AECC(Only for III Sem B.com)
Bhasha samvardhana

Credit (L: T: P = 2:0: 0)

Course OutCome

CO1 Learn in details with examples padagalu

CO2 Deliberate the details of Vakyarachane

CO3 Understand in details with application, if applicable, Varadirachane

CO4 Deliberate the details of Sankshepakaranam

CO5 Deliberate the classification and characteristics of Sambhashanakaushalam

CO6 Learn in details with examples Bhashantharam

CO7 Write down in depth Patralekanam prabhedani

CO8 Identify the characteristics of Prathamika vyakarnam

CO9 Identify the characteristics of Geethagayanam

1. Lekhana kowshala
2. Bhasha prayoga, Shudha-Ashudha vyyathyyasa
3. Vakhyya rachana
4. Varadhi rachana
5. Samkshepa karanam
6. Bhashantaram
7. Pathralekhanam, Types of letter
8. Viramatham, Avedana pathram
9. Adesha pathram, Anugata pathram, Sambhashana kowshalam, Geeta gayanam

Reference

1. Samskrutha kavya –Dr. K Krishna Murthy
2. Samskrutha vanijayam- Prasaranga Mysuru University

BA/BSc

IV SEMESTER

Champu kavyam Champu ramayane Ayodhyakanda

Credit (L: T: P = 3: 1: 0)

Course Outcome

CO1Specify the characteristics of Ayodyakanada of champu ramayanam of bhoja

CO2 Write down the classification and characteristics of Ayodyakanada of champu ramayanam of bhoja

CO3Write down in depth Ayodyakanada of champu ramayanam of bhoja

CO4Understand in depth Ayodyakanada of champu ramayanam of bhoja

PART - 1

1. Champukavyam – Ayodhyakanda of champu Ramayana
2. Kavikaya parichyaha

PART - 2

GRAMMAR

1. Alankaraha – Roopaka, Anannvyaha, Slesha, Uthpreksha
2. Vakyya rachana –Sentence formation
3. Channdassu – Indravajra, Upendravajra, Anustup, Vasanta tilaka
4. Prayoga parivarthanam
5. Bhashantaram – Seen/ Un seen passage

Reference Books

1 Champu Ramayanam Edited by pandith S. Rangachar Sanskrita Sahithya Sadhana, mysore-4

2 Samskrutha Vanijyam Edited by Dr. G. Marulasiddaiah published by Prasaranga University of Mysore

3 Chandraloka Vrutharanthnakara Translation by Prof.B.Rajashekaraiah, Published by Prof.M.Mallanna Mallikachala Prakashana, Mysore

4 Arthashastra of Kautilya

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE (Autonomous),

OOTY ROAD, Mysore

SANSKRIT (CBCS) 2017-18

B.Sc (PCM/PMCs/PMCm/PME/CZBt/BMBt/BBM/CBZ)

Pattern of question paper

1.	Essay type questions	1×8= 08
2.	Essay type question 1 Out of 2	1×8= 08
3.	Short notes 2 out of 4	2×4= 08
4.	Translate and explain- 2 out of 4	2×5= 10
5.	Annotations -3 out of 5	3×3= 09
6.	Sanskrit questions -2 out of 4	2×4= 08
7.	Sanskrit questions -5 out of 7	1×5= 05
8.	Grammar - 7	12
9.	Translation _ Seen passage	07

Total = 70

C1 – 15 Marks

C2 – 15 Marks

C3 - 70 Marks

Total =100 marks

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE (Autonomous),

OOTY ROAD, Mysore

SANSKRIT (CBCS) 2017-18

B.A (EG/HP/KG/HE/JE)

Pattern of question paper

1.	Essay type questions	1×8= 08
2.	Essay type question 1 Out of 2	1×8= 08
3.	Short notes 2 out of 4	2×4= 08
4.	Translate and explain- 2 out of 4	2×5= 10
5.	Annotations -3 out of 5	3×3= 09
6.	Sanskrit questions -2 out of 4	2×4= 08
7.	Sanskrit questions -5 out of 7	1×5= 05
8.	Grammar - 7	12
9.	Translation _ Seen passage	07
		—— ——
	Total	**= 70**

C1 – 15 Marks

C2 – 15 Marks

C3 - 70 Marks

Total =100 marks

SANSKRIT (CBCS) 2017-18

AECC-B.A (EG/HP/KG/HE/JE) III SEM

Pattern of question paper **2hrs**

1.one out of two questions	1X10=10
2.two out of four	2X5=10
3.two out of three	2X5=10
4.translate kannada to Sanskrit	1X5=5
5.One third of its length suggest suitable title	1X10=10
6 correct the sentence	1X5=5
Total	50

C1 – 10 Marks
C2 – 10 Marks
C3 - 50 Marks
Total =70 marks

		Course	Title	Hours / Week		Credits	Maximum Marks			Exam Duration	Total
							IA		Exam		
				L	T/ P	L:T:P	C1	C2			Marks
I Year	I SEM	DNA09001 BDA09001 DCA09001	Selection of anthology Sanskrit prose	3	1	3:1:0	15	15	70	3 Hours	100
	II SEM	DNB09001 BDB09001 DCB09001	Sanskrit poetry	3	1	3:1:0	15	15	70	3 Hours	100
II Year	III	DNC09001 BDC09001 DCC09001	Sanskrit drama1. Swapnavasavadatham	3	1	3:1:0	15	15	70	3 Hours	100
	BCOM	DNC310	Bhasha Samvardhana	2	0	2:0:0	15	15	70	3 Hours	100
	IV SEM	DND09001 BDD09001 DCD09001	Samskrutha vaanijyam	3	1	3:1:0	15	15	70	3 Hours	100

Scheme of study and Assessment pattern for BCOM/BBA/BCA

Programme Outcome for B.COM/BBA/BCA

PO1. inherit our ancient culture ,social ,political amd economical knowledge

PO2. to understand trade and commerce as reflected in koutilyas Arthashastra and shukraneethi

PO3. write letter ,writing essays and regional language

PO4. understand moral values

PO5. understand life in a better way

PO6. have a good relation get a good job

PO7. serve society

Program Specific Outcome for B.COM/BBA/BCA

PSO1:Learn concentrate on studies by chanting Vedic shlokas and manthras

PSO2:Understand Vedic economics and policies

PSO3:Sanskrit is best suitable computer and is the mother of all languages

B.COM/BBA/BCA

I SEMESTER

Selection of anthology Sanskrit prose

Credit (L: T: P = 3: 1: 0)

Course Outcome

CO1 Specify in details with application, if applicable, Thatvamasi

CO2 Specify in details with application, if applicable, Learn in depth tathavamasi

CO3 Deliberate in details with application, if applicable, Deliberate in details with examples tathavamasi

CO4 Specify in details with application, if applicable, Understand in details with application, if applicable, tathavamasi

CO5 Identify the classification and characteristics of Deliberate in details with examples chandrapedavidyabyasa

CO6 Identify in details with examples Specify in depth chandrapedavidyabyasa

CO7 Understand in details with examples Deliberate in depth chandrapedavidyabyasa

CO8 Identify the details of Deliberate the details of vyapadwshenamahatha

CO9 Specify the classification and characteristics of Deliberate the details of vyapadwshenamahath

CO10 Learn the characteristics of Specify the classification and characteristics of mahatmabudha

CO11 Understand the details of Deliberate in details with application, if applicable, mahatmabudha

CO12 Identify in details with examples Identify in details with examples varthamanayugsyamahapuroshomahathmagandhigi

CO13 Identify in details with examples Deliberate the characteristics of grammer(sandi prakaranna-swara sandhi)

CO14 Specify in depth Write down the details of grammer(sandi prakaranna-swara sandhi)

CO15 Identify in details with examples Understand in details with examples shabdas-thrishulingesh

1. Rajaarshi vrutham in Kowtilya's Arthashastram
2. Tytriyopanishath – Shikshavalli
3. Sukanassupadeshasaraha in Bana's Kadambari
4. Kashi teerthayatravarnanam – In anthology of Prose
5. Digarthaha kasttasamshreyaha in Panchatanntram

GRAMMER

1. Sandhi prakarana – Swara sandhi (Achh sandi)
2. Shabdhaha –Ajanta pullinga, Stree linga, Napumsaka linga
3. Samasaha – Tathpurusha, Karmadhareyaha
4. Krudanta avyyahani – Tavanta, Tumulnanta, Lybantha
5. Bhashantaram – Unseen Passage

Reference Books

3 Banas Kadambari – Editor by M.R. Kale

4 Raghavamsha Translation by Vidvan H.V. Nagaraj Rao

3 Samskrita Gadya Padya Sangrah by Dr. M. shivkumarswamy, Bangalore

4 Kavya Taranga 18 (Anthology of Sanskrit Prose) Published by Prasaranga University of Mysore

B.COM/BBA/BCA

II SEMESTER

Sanskrit poetry

Credit (L: T: P = 3: 1: 0)

Course Outcome

CO1 Understand the details of rajarashivrutham in koutilya's arthashatram
CO2 Specify the characteristics of rajarashivrutham in koutilya's arthashatram
CO3 Identify the classification and characteristics of rajarashivrutham in koutilya's arthashatram
CO4 Learn the classification and characteristics of lya's arthashatram
CO5 Specify in depth Shiskhavalli in Thithriya upnishathu
CO6 Learn the details of Shukunasopadesha in Banas kadmnabri
CO7 Understand in depth Shukunasopadesha in Banas kadmnabri
CO8 Understand the details of khashi theerthta yathra varnanum
CO9 Identify the details of khashi theerthta yathra varnanum
CO10 Learn the classification and characteristics of Degrthaha kastha samshraah in panchathanthram
CO13 Learn the details of selected sloks of Basvandhalahri of Gowrisankarawamy
CO15 Learn the classification and characteristics of selected vachana of Sarvanjana
CO14 Write down the characteristics of Selected slokas of Meghadutha by Kalidasa
CO12 Write down the details of Selected slokas of Meghadutha by Kalidasa
CO16 Deliberate the classification and characteristics of selected vachana of Sarvanjana
CO15 Write down in depth selected sloks of Basvandhalahri of Gowrisankarawamy
CO17 Deliberate the characteristics of selected vachana of Shubshithani
CO18 Specify the characteristics of selected vachana of Shubshithani

PART – I

1. Meghaduta of kalidasa – poorva megha **1-30 sloakas**
2. Basavanandalahari of his holiness Sri Gowrishankara swamiji –**1-15 sloakas**
3. Sarvagnya vachanani – **1 – 15 stanzas selected from Purushothama Sarvgnya vachanani**
4. Subhashitani - **1 – 10 stanzas (Anthology of Poetry)**

GRAMMER

1. Vyanjana sandhi – Schuthva, Stuthva, Jasthva, Anunasika
2. Shabdhaha –Rajan, Maruth, Athman, Bhavath
3. Kriyapadani - Lat, Lung, Lrut, Lot, Vidhiling(Parsmipadi)
4. Prayoga parivartanam
5. Samasaha – Avyayi bhava, Bahurvihi
6. Translation – Unseen passage

Reference Books

1 Samskruta Kavya by K. Krishnamurthy, Mysore University,Mysore

B.COM/BBA/BCA

III SEMESTER

Sanskrit drama1. Swapnavasavadatham

Credit (L: T: P = 3: 1: 0)

Course Outcome

CO1 Write down in details with examples swapnavasavdattam of bhasa

CO2 Learn in details with examples swapnavasavdattam of bhasa

CO3 Specify in details with examples swapnavasavdattam of bhasa

CO4 Write down in details with examples swapnavasavdattam of bhasa

Part - 1

Drama –Swapnavasavadattam of Mahakavi Bhasa

Date, Place and works of Mahakavi Bhasa

Part – II

Grammar

1. Sarvanama shabdhah – Tadh, Atadh, Yath, Kim, Trishulingeshu, Asmadh, Yushmadh
2. Kriya padani - Lat, Lung, Lrut, Lot, Vidhiling(Atamanepadi)
3. Samasaha – Davndva, Divigu
4. Alankaraha – Upama, Swabhvokthi, Artantaranyyasa, Drustantha

Reference Books

1. Swapnavasavadhatham
2. Sanskrita Drama by A.B. kith – published by Motilal Banarasidass, New Delhi.
3. Abijanna sakunthala Prof.K.T. Pandurangi
4. Samskritha Nataka Prof.A.R. Krishna Shastri
5. Kannada Abijnanna Sakunthala by Ganapathi Moleyara

DNC310

III SEMESTER

AECC(Only for III Sem B.com)
Bhasha samvardhana

Credit (L: T: P = 2:0: 0)

Course OutCome

CO1 Learn in details with examples padagalu

CO2 Deliberate the details of Vakyarachane

CO3 Understand in details with application, if applicable, Varadirachane

CO4 Deliberate the details of Sankshepakaranam

CO5 Deliberate the classification and characteristics of Sambhashanakaushalam

CO6 Learn in details with examples Bhashantharam

CO7 Write down in depth Patralekanam prabhedani

CO8 Identify the characteristics of Prathamika vyakarnam

CO9 Identify the characteristics of Geethagayanam

10. Lekhana kowshala
11. Bhasha prayoga, Shudha-Ashudha vyyathyyasa
12. Vakhyya rachana
13. Varadhi rachana

14. Samkshepa karanam
15. Bhashantaram
16. Pathralekhanam, Types of letter
17. Viramatham, Avedana pathram
18. Adesha pathram, Anugata pathram, Sambhashana kowshalam, Geeta gayanam

Reference

3. Samskrutha kavya –Dr. K Krishna Murthy
4. Samskrutha vanijayam- Prasaranga Mysuru University

B.COM/BBA/BCA

IV SEMESTER

Samskrutha vaanijyam

Credit (L: T: P = 3: 1: 0)

Course Outcome

CO1 Understand the characteristics of bussiness sanskrit

CO2 Learn the details of bussiness Sanskrit
CO3 Learn in depth bussiness Sanskrit
CO4 Specify in depth bussiness Sanskrit
CO5 Learn in details with application, if applicable, arthashatra of kutilya
CO6 Write down the characteristics of arthashatra of kutilya
CO7 Identify the characteristics of arthashatra of kutilya
CO8 Deliberate the details of arthashatra of kutilya
CO9 Specify in details with examples arthashatra of kutilya vinayadikarna
CO10 Understand the details of arthashatra of kutilya vinayadikarna
CO11 Identify in depth arthashatra of kutilya vinayadikarna
CO12 Specify the classification and characteristics of arthashatra of kutilya vinayadikarna

PART – 1

1. Strayisthapana, Vartha dandaneeti, Indriya jaya in vinayadhikaranam – Arthashastra of Kowtilya
2. Samskruta vanijayam – Importance of Commerical education
3. Patralekhanam, Personal, official, Public and Business letters
4. Prabhanda lekhanam in Sanskrit
5. Samshkeshepa karanam
6. General essays in regional language
7. Translation from Kannada to Sanskrit

Reference

1. Samskrutha kavya –Dr. K Krishna Murthy
2. Samskrutha vanijayam- Prasaranga Mysuru University
3. Prabhanda pallava Dr s Jaganath
4. Koutilya's arthashastram shyama shatri ORI Mysur

SANSKRIT (CBCS) 2017-18

B.COM/BBA/BCA(I SEM - III SEM)

Pattern of question paper

1. Sanskrit one marks questions	1×10=10
2. Essay type questions – 2 out of 4	2×7= 14
3. Short notes– 2 out of 4	2×5= 10
4. Annotations -3 out of 5	3×3= 09
5. Sanskrit questions -2 out of 4	2×5= 10
6. Grammar	12
7. Seen passage	05
Total	**= 70**

C1 – 15 Marks
C2 – 15 Marks
C3 - 70 Marks
Total =100 marks

SANSKRIT (CBCS) 2017-18

B.COM/BBA/BCA(IV SEM)

Pattern of question paper

1. One Essay type question out of 2 in vinayadhikaranam in Kowtilya of Arthashastram 1×10=10
2. Short notes 2 out of 4 2×5= 10
3. Drafting of personal letter 1×8= 08
4. Applications for suitable job 1×8= 08
5. Sanskrit Essays - 1×10=10
6. Essays in Regional language 1×8= 08
7. Essay writing 1×10= 10
8. Translation _ Seen passage 06

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Total = 70

C1 – 15 Marks
C2 – 15 Marks
C3 - 70 Marks
Total =100 marks

SANSKRIT (CBCS) 2017-18
AECC-B.COM III SEM

Pattern of question paper **2hrs**

1.one out of two questions	1X10=10
2.two out of four	2X5=10
3.two out of three	2X5=10
4.translate kannada to Sanskrit	1X5=5
5.One third of its length suggest suitable title	1X10=10
6 correct the sentence	1X5=5
Total	50

C1 – 10 Marks
C2 – 10 Marks
C3 - 50 Marks
Total =70 marks

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE

(Autonomous)

B N ROAD, MYSURU- 570 025

DEPARTMENT OF ZOOLOGY

Syllabus

CHOICE BASED CREDIT SYSTEM

For B.Sc programmes

Chemistry, Botany, Zoology

Chemistry, Zoology, Biotechnology

2017-18

Year	Sem	Course	Title of the Paper	Paper code	Credits	Percentage			Maximum Marks						Exam Duration	
					L:T:P	Th	Pr	IA	Th	Pr	IA-1		IA-2		Th	Pr
											Th	Pr	Th	Pr		
I BSc	I	DSC	Theory-Animal Diversity Practical- Animal Diversity	CMA30005	4:0:2	50	20	30	70	70	10	05	10	05	3H	3H
	II	DSC	Theory -Comparative Anatomy and Developmental Biology of Vertebrates Practical- Comparative Anatomy and Developmental Biology of Vertebrates	CMB30005	4:0:2	50	20	30	70	70	10	05	10	05	3H	3H
II BSc	III	DSC	Theory-Physiology and Biochemistry Practical- Physiology and Biochemistry	CMC30005	4:0:2	50	20	30	70	70	10	05	10	05	3H	3H
	IV	DSC	Theory-Genetics and Evolutionary Biology Practical- Genetics and Evolutionary Biology	CMD30005	4:0:2	50	20	30	70	70	10	05	10	05	3H	3H
III BSc	V	DSE-7A	Theory-Applied Zoology Practical- Applied Zoology	CME30005	4:0:1	50	20	30	70	70	10	05	10	05	3H	3H
		DSE-7B	Theory-Insect,Vector and Diseases Practical- Insect,Vector and Diseases	CME30205	4:0:1	50	20	30	70	70	10	05	10	05	3H	3H
	VI	DSE-7A	Theory-Aquatic Biology Practical- Aquatic Biology	CMF30005	4:0:1	50	20	30	70	70	10	05	10	05	3H	3H
		DSE-7B	Theory-Immunology Practical- Immunology	CMF30205	4:0:1	50	20	30	70	70	10	05	10	05	3H	3H
	VII	SEC	Theory-Medical Diagonistics	CME30405	2:0:0	70	-	30	50	-	10	05	10	05	2H	-

Programme - CZBt

Scheme of Study

Programme - CBZ

Scheme of Study

Year	Sem	Course	Title of the Paper	Paper code	Credits	Percentage			Maximum Marks						Exam Duration	
					L:T:P	Th	Pr	IA	Th	Pr	IA-1		IA-2		Th	Pr
											Th	Pr	Th	Pr		
I BSc	I	DSC	Theory-AnimalDiversity Practical- Animal Diversity	CMA30008	4:0:2	50	20	30	70	70	10	05	10	05	3H	3H
	II	DSC	Theory -Comparative Anatomy and Developmental Biology of Vertebrates Practical- Comparative Anatomy and Developmental Biology of Vertebrates	CMB30008	4:0:2	50	20	30	70	70	10	05	10	05	3H	3H
II BSc	III	DSC	Theory-Physiology and Biochemistry Practical- Physiology and Biochemistry	CMC30008	4:0:2	50	20	30	70	70	10	05	10	05	3H	3H
	IV	DSC	Theory-Genetics and Evolutionary Biology Practical- Genetics and Evolutionary Biology	CMD30008	4:0:2	50	20	30	70	70	10	05	10	05	3H	3H
III BSc	V	DSE-7A	Theory-Applied Zoology Practical- Applied Zoology	CME30008	4:0:1	50	20	30	70	70	10	05	10	05	3H	3H
		DSE-7B	Theory-Insect,Vector and Diseases Practical- Insect,Vector and Diseases	CME30208	4:0:1	50	20	30	70	70	10	05	10	05	3H	3H
	VI	DSE-7A	Theory-Aquatic Biology Practical- Aquatic Biology	CMF30008	4:0:1	50	20	30	70	70	10	05	10	05	3H	3H
		DSE-7B	Theory-Immunology Practical- Immunology	CMF30208	4:0:1	50	20	30	70	70	10	05	10	05	3H	3H
	VII	SEC	Theory-Medical Diagonistics	CME30608	2:0:0	70	-	30	50	-	10	05	10	05	2H	-

Programme Outcome for Bachelor of Science in Chemistry, Zoology, Biotechnology:

After completing the graduation in the Bachelor of Science the students are able to:

PO1. Demonstrate the ability to justify, explain, and/or approach the concept both in written and oral forms

PO2. Demonstrate the ability to present clear, logical and succinct arguments

PO3. Develop state-of-the-art laboratory skills and professional communication skills.

PO4. Apply the scientific method to design, execute, and analyze an experiment.

PO5. Appreciate the central role of chemistry in the society and use this as a basis for ethical behaviour in issues facing chemists/drugs.

PO6. Understand Chemistry as an integral part for addressing social, economic, and environmental problems.

PO7. Identify the major groups of organisms with an emphasis on animals and plants.

PO8. Compare and contrast the characteristics of animals that differentiate themselves from other living and non-living creatures.

PO9. Give specific examples of physiological adaptations.

PO10. Design and develop solution to Biotechnology problems keeping in mind the safety measures for environment and society.

PO11. Support Biotechnology research activity with strong technical background knowledge.

Programme Specific Outcome

After completing the graduation in Chemistry, Zoology, Biotechnology the students are able to:

PSO1. Find jobs at all level of chemical, pharmaceutical, food products and life oriented material Industries

PSO2. Apply appropriate techniques for the qualitative and quantitative analysis of chemicals in laboratories and in industries.

PSO3. Recognize the relationship between different structures and functions at different levels.

PSO4. Characterize the biological, chemical and physical features of environments that Animals inhabit.

PSO5. Demonstrate effectively the applications of biochemical and biological sciences.

PSO6. Know and apply appropriate tools and techniques in biotechnological manipulation

PSO7. Understand his or her responsibilities in biotechnological practices.

Programme Outcome for Bachelor of Science in Chemistry, Botany, Zoology:

After completing the graduation in the Bachelor of Science the students are able to:

PO1. Demonstrate the ability to justify, explain, and/or approach the concept

PO2. Demonstrate the ability to present clear, logical and succinct arguments

PO3. Develop state-of-the-art laboratory skills and professional communication skills.

PO4. Apply the scientific method to design, execute, and analyze an experiment.

PO5. Appreciate the role and use of chemistry for ethical issues facing chemists/drugs.

PO6. Identify the taxonomic position of plants using required principles and methods.

PO7. Understand the impact of the plant diversity in societal and environmental context.

PO8. Use interdisciplinary approaches with quantitative skills to work on biological problems.

PO9. Understand Chemistry as an integral part for addressing social, economic, and environmental problems.

PO10. Identify the major groups of organisms with an emphasis on animals and plants.

Programme Specific Outcome

Bachelor of Science in Chemistry, Botany, Zoology

After completing the graduation in the Bachelor of Science the students are able to:

PSO1. Find jobs at all level of chemical, pharmaceutical, food products, life oriented material industries

PSO2. Apply appropriate techniques for the qualitative and quantitative analysis of chemicals in laboratories and in industries.

PSO3. Explicate ecological interconnectedness of life

PSO4. Analyze the avenues and remedies for burning environmental issues

PSO5. Recognize the relationship between different structures and functions at different levels.

PSO6. Characterize the biological, chemical and physical features of environment of animals inhabits.

CMA30008/ CMA30005

I SEMESTER
CORE COURSE I
ANIMAL DIVERSITY

Theory **Credits -4(60 hrs)**

Course outcome

After completion of the course the student is able to:

CO1. Identify in depth chordata
CO2. Write down the characteristics of chordata
CO3. Identify in details with examples chordata
CO4. Deliberate in details with examples non chordata
CO5. Learn the classification and characteristics of non chordata
CO6. Write down the details of non chordate

Unit I **15 hrs**

Introduction to Biodiversity

Phylum Protozoa: General characters and classification up to classes; Locomotory organelles and locomotion in Protozoa.

Phylum Porifera

General characters and classification upto classes; Canal System in poriferans

Phylum Cnidaria

General characters and classification upto classes; Polymorphism in Physalia.

Phylum Platyhelminthes

General characters and classification upto classes; parasitic adaptations (morphological and physiological)

Phylum Nemathelminthes

General characters and classification upto classes; transmission, pathogenicity and preventive measures of Ascaris.

UnitII **15 hrs**

Phylum Annelida

General characters and classification upto classes; Metamerism in Annelida and external morphology of Leech

Phylum Arthropoda

General characters and classification upto classes; Metamorphosis in Insects and economic importance insects

Phylum Mollusca

General characters and classification upto classes; Torsion in gastropods, pearl formation

Phylum Echinodermata

General characters and classification upto classes; Water-vascular system in Asteroidea

Unit III **15 hrs**

Protochordates

General features and Phylogeny of Protochordata

Agnatha
General features of Agnatha and classification of cyclostomes upto classes
Pisces
General features and Classification upto orders; Osmoregulation in Fishes
Amphibia
General features and Classification upto orders; Parental care in Amphibia
Reptiles
General features and Classification upto orders; Poisonous and non-poisonous snakes, biting mechanism in snakes, types of venom.

Unit IV **15 hrs**
Aves
General features and Classification upto orders; Flightless birds and their distribution, major types of beaks. Kinds of migration in birds
Mammals
Classification up to orders; Origin of mammals, Distribution of prototheria and metatheria with example
Dentition in mammals.structure of teeth and their types. Adaptive radiation in mammals.

Reference:

1. Alexander R.M. 1975 – The chordate – Cambridge – University Press, London
2. Barnes, R.D. 1974, Invertebrate Zoology – III edition by W.B. Saunders Co., Philadelphia.
3. Barrington, E.J.W., 1976, Invertebrate structure and function by Thomas Delson & Sons Ltd., London.
4. Chandler A.C. An Introduction to Parasitology, John Willy & Co.,
5. Earthworm Cinderella of Organic Farming-Radha D. Kale
6. Economic Zoology. - Shukla and Upadhya.
7. Ekambarnatha Ayyar – Invertebrate – Volumes
8. Hyman, L.H. 1940. The Invertebrates Vol. l, 2.
9. Jordan and Verma P.S. Invertebrate Zoology
10. Jordan E.L. Verma P.S. – Chordate Zoology.
11. Kingsley J.S. 1962. Outlines of comparative anatomy of Vertebrates. Central Book Depot, Allahabad
12. Kotpal R.L. Chordata.
13. Kotpal R.L. Invertebrates.
14. Parker. J.J. Haswell, W.A. 1961 Text Book of Zoology vol. 1, 2nd edition. By Macmillan Co., London.
15. Sandhu G.S, Harshvardhan Bhaskar, Text book on Invertebrate Zoology, Campus Books International, 2002, 2005 – Vol 1 and 2
16. Simpson G.C. Principles of Taxonomy

PRACTICAL –I

ANIMAL DIVERSITY

1. **PROTOZOA-** Culture preparation and observation of different protozoans. Paramecium, Euglena, Amoeba,
2. **PORIFERA-**Sycon, Hyalonema, , Gemmule, Monaxon spicules.,
3. **COELETERATA**-Obelia, Physalia, Aurelia, Ephyra larva, Metridium
4. **HELMINTHES**-Taenia solium, Planaria, Fasciola, Ascaris male and female,
5. **ANNELIDA:** Pheretima-Mounting of setae , Nereis, Leech

   Onychophora: Peripatus
6. **ARTHROPODA**- Palaemon, Palamnaeus, Scolopendra, Spirostreptus
7. **MOLLUSCA**- Chiton, Unio, Sepia, Octopus.
8. **ECHINODERMATA**- Asteropecten, Ophiothrix, Holothuria, Antedon, Pedicellariae of Seaurchin.
9. **PROTOCHORDATA**- Balanoglossus, Herdmania, Myxine, Ammocoetes larva.
10. **PISCES-** Pristis, Torpedo, Labeo, Exocoetus
11. **AMPHIBIA**- Salamandra, Bufo, Hyla.
12. **REPTILES**- Chamaeleon, Draco, Vipera, Naja, Chelone, Bungarus, Enhydrina.
13. **AVES AND MAMMALS-** Bat, Loris, Guinea pig, Koel, Kite, Duck.
14. Study of animal dissection through digi frog software.
15. Preparation of animal album containing photographs, cut outs, with appropriate write up the above mentioned taxa. Different taxa/topics may be given to different sets of students.**(Invertebrates-05, Vertebrates-05)**

    Note: Charts, Photographs and models can be shown.

SCHEME OF EXAMINATION

Duration: 3 hrs. **Max. Marks: 70** Marks

1. Identify and comment on A to E (5 X 4) 20Marks

   (Porifera to Echinodermata)

2. Identify and comment on F to I (5 X 4) 20Marks
(Protochordates to Mammals)
3. Mounting of protozoan cultures 05 Marks
4. Identification of poisonous and non-poisonous snakes 05 Marks
5. Submission of Animal album 10 Marks
6. Class Records 10 Marks

SCHEME OF VALUATION FOR PRACTICAL- I

1. Identification-01, Classification-01,Diagram –0 1,Salient features–01
2. Identification-1, Classification-1,Diagram – 1,Salient features -1
3. Procedure-1,Labelled diagram-2, Slide preparation – 2
4. Identification-1, Classification-1,Diagram – 1,Salient features– 2

CMB30008/ CMB30005

II SEMESTER
CORE COURSE II
COMPARATIVE ANATOMY AND DEVELOPMENTAL BIOLOGY OF VERTEBRATES

Theory **Credits -4(60 hrs)**

Course outcome

After completion of the course the student is able to:

CO1. Learn in details with examples anatomy of vertebrate
CO2. Write down in details with examples comparative anatomy
CO3. Deliberate the details of comparative anatomy
CO4. Identify in details with application of developmental biology

CO5. Learn in depth developmental biology

CO6. Deliberate in details with examples developmental biology

Unit I **15 hrs**

Integumentary System

Integument and its modifications in the chordates- epidermal derivatives and dermal derivatives- with reference to glands and digital tips. Comparison of integument in Vertebrate series- Pisces (Shark), Amphibia (Frog), Reptiles (Lizard), Aves (Pigeon) and Mammals (Rabbit).Evolution of visceral arches.

Digestive System

Comparative account of the digestive glands in different Vertebrates.
Comparative account of the alimentary canal in Vertebrate series

Respiratory System

Evolutionary trends in the respiratory system with reference to modification of gills, lungs, air sacs and swim bladder.

Unit II **15 hrs**

Circulatory System

Evolution of heart and aortic arches in vertebrates

Urinogenital System

Succession of kidney, Evolution of urinogenital ducts in vertebrates

Nervous System

Comparative account of brain of Shark, Frog, Lizard, Pigeon and Rabbit.

Sense Organs

Types of receptors in Vertebrates
Trace the development of membranous labyrinth in Pisces and Amphibians.
Evolution of ear ossicles in the Mammals.

Unit III 15 hrs

Early Embryonic Development

Gametogenesis: Spermatogenesis and oogenesis w.r.t. mammals, vitellogenesis in birds

Fertilization: external (amphibians), internal (mammals), monospermy and polyspermy; Early development of frog and humans (structure of mature egg and its membranes, patterns of cleavage, fate map, up to formation of gastrula); types of morphogenetic movements; Fate of germ layers; Neurulation in frog embryo.

Foetal membranes: Development, structure and functions of amnion, chorion, yolk sac and allantoises.

Unit IV 15 hrs

Late Embryonic Development

Structure of mature spermatozoon, Graafian follicle, Human menstrual cycle.

Ovulation, fertilization, morula, blastocyst, implantation and placentation.

Placenta: Histological and morphological classification of mammalian placenta with examples.

Modern trends in human reproduction : Invitro fertilization ,cloning, sperm and egg banks, sexually transmitted diseases(AIDS, syphilis and gonorrhea).

Reference:

1. Balinsky, B.I. (2008). An introduction to Embryology, International Thomson Computer
2. Carlson, Bruce M (1996). Patten's Foundations of Embryology, McGraw Hill, Inc
3. Gilbert, S. F. (2006). Developmental Biology, VIII Edition, Sinauer Associates, Inc.,
4. Hildebrand, M and Gaslow G.E. Analysis of Vertebrate Structure, John Wiley and Sons
5. Kent, G.C. and Carr R.K. (2000). Comparative Anatomy of the Vertebrates. IX Edition.The McGraw-Hill Companies.
6. Kardong, K.V. (2005) Vertebrates' Comparative Anatomy, Function and
7. Evolution. IV Edition. McGraw-Hill Higher Education
8. Walter, H.E. and Sayles, L.P; Biology of Vertebrates, Khosla Publishing House.Publishers, Sunderland, Massachusetts, USA.Press.
9. Young J.Z. 1950 - Life of Vertebrates – Oxford University Press, London.

PRACTICAL –II
COMPARATIVE ANATOMY AND DEVELOPMENTAL BIOLOGY OF VERTEBRATES

1. Skeleton of [Pigeon] and [Rabbit].
2. Carapace and plastron of turtle /tortoise
3. Mammalian skulls: Herbivorous (Rabbit/ Horse) and Carnivorous (Dog/Cat)
4. Skull of Frog, Pigeon
5. Vertebrae of Frog (Atlas, Pro, Amphi and Acoelous), Pigeon (Heterocoelous Vertebra, Synsacrum) Rabbit (Atlas, Axis, Thoracic vertebrae)
6. Pectoral and Pelvic girdles of Frog, Pigeon and Rabbit.
7. Fore and hind limb skeletons of Frog, pigeon and Rabbit.
8. Study of development of hen's egg – Window technique
9. Frog - cleavage stages, Blastula, gastrula, neurula stage (whole mount)
10. Chick embryo stages-18hrs, 24hrs, 36 hrs, 48hrs. (whole mount and sections)
11. Study of Vertebrate embryos-Human and Pig
12. Study of the different types of placenta- Sheep, Rat placenta(section)
13. Identification of various family planning devices
14. Study of skeletal system through software
15. Repetition

SCHEME OF EXAMINATION

Duration: 3 hrs. **Max.Marks:70** Marks

1. Identify and comment on A to E (5 X 4) (1 to 6 experiment)	20Marks
2 .Identify and comment on F to H (5 X 4) (8 to 10 experiments)	20Marks
3 . Window technique	08 Marks
4. Identify and comment on I & J (11&12)	06 Marks
5. Identify and comment on K & L(13)	06 Marks
6. Class Records	10 Marks

SCHEME OF VALUATION FOR PRACTICAL -II

1. Identification – 1, Classification-1,Diagram – 1,Salient features–1
2. Identification – 1, Classification-1,Diagram – 1,Salient features -1
3. Procedure-3, Diagram – 1,Preparation – 4
4. Identification – 1, Diagram – 1, Salient features– 1
5. Identification – 1, Diagram – 1, Salient features–1

CMC30008/ CMC30005

III SEMESTER
CORE COURSE III
PHYSIOLOGY AND BIOCHEMISTRY

Theory **Credits -4(60 hrs)**

Course outcome

After completion of the course the student is able to:

CO1. Specify in depth physiology

CO2. Learn in details with examples physiology

CO3. Learn the classification and characteristics of biochemistry

CO4. Learn the characteristics of biochemistry

.

Unit I **15 hrs**

Nerve and muscle

Structure of a neuron, types of neuron, axonic conduction and synaptic transmission of nerve impulse, neurotransmitters

Ultra-structure of skeletal muscle, sliding filament theory. Chemical composition of muscle.

Digestion

Physiology of digestion in the alimentary canal; Absorption of carbohydrates, proteins, lipids, mechanical process in digestion

Unit II **15 hrs**

Respiration

Pulmonary ventilation, respiratory volumes and capacities, Transport of Oxygen and carbon dioxide in blood: Respiratory pigments (Haemoglobin, Haemocyanin, Haemoerythrin and chlorocruorin)

Excretion

Structure of nephron, Mechanism of Urine formation, Counter-current Mechanism

Cardiovascular system

Composition of blood, Structure of Heart, Origin and conduction of the cardiac impulse, Cardiac cycle.

Unit III **15 hrs**

Reproduction and Endocrine Glands

Physiology of male reproduction: hormonal control of spermatogenesis; Physiology of female reproduction: hormonal control of menstrual cycle Structure and function of pituitary, thyroid, pancreas and adrenal

Carbohydrate: Structure and classification

Protein: Structure and classification

Lipid: Structure and classification

Unit IV **15 hrs**

CarbohydrateMetabolism

Glycolysis, Krebs Cycle, Pentose phosphate pathway, Gluconeogenesis, Glycogen metabolism, Review of electron transport chain

Protein metabolism : Transamination, Deamination and Urea Cycle

Lipid Metabolism: Biosynthesis and β oxidation of palmitic acid

Vitamins: Definition and classification, (fat soluble and water soluble vitamins) physiological role and disorders.

Reference:

1. Berg, J.M., Tymoczko, J.L.and Stryer, L. (2006) Biochemistry.VI Edition. W.H freeman and CO.
2. Guyton, A.C.and Hall, J.E (2011) Text book of medical physiology.XII Edition,Harcourt Asia Pvt.Ltd/W.B.Saunders Company.
3. Harper's lustrated Biochemistry. XXVIII Edition. Lange Medical Book/Mc Mraw3Hill
4. Jayaraman J .1981. Laboratory Manual in Biochemistry Wiley Eastern Ltd.,
5. Lehninger A.L:Nelson D. Land Co., M.M. 2nd edition 1993. Principles of Biochemistry, CBS Publishers, New Delhi
6. Murray,R.K.,Granner,D.K.,Mayes,P.Aand Rodwell, V.W.(2009)
7. Tortora, G.J.and Derrickson, B.H. (2009). Principles of Anatomy and Physiology, XII Edition, john Wiley &Sons, Inc
8. Nelson.D.L. Cox, m.m.Lehninger, A.L (2009).Principles of Biochemistry.IV Edition.W.H Freeman and Co.
9. Widmaier,E.P.,Raff H.andStrang,K.T.(2008) Vander's Human physiology XI Edition. McGraw Hill

PRACTICAL –III
PHYSIOLOGY AND BIOCHEMISTRY

1. Qualitative test for carbohydrate test-Molisch's test, Iodine test, Fehling's test and picric acid test.

2. Qualitative test for proteins- Biuret test, Ninhydrin test, Millon's test and Xanthoproteic test.

3. Qualitative test for lipids-Acrolein Test, Leiberman-Burchard test, Salkowasky test

4. Identification of vitamins presents in the food materials with their physiological role

5. Salivary amylase activity on starch.

6. Dehydrogenase activity in milk.

7. Preparation of hematin crystals.

8. Blood typing –ABO type and Rh factors.

9. Detection of nitrogenous wastes – Ammonia (Nessler's test), Urea (Urease test), Uric acid (Follin's U test).

10. Study of permanent histological sections of mammalian pituitary, thyroid, parathyroid.

11. Study of permanent histological sections of mammalian Pancreas, adrenal gland, testis and ovary.

12. Study of permanent slides of liver, lung and kidney.

13. Study of permanent slides of spinal cord, bone marrow and T.S of cartilage.

14. **Field Study:** Visit to a Pathology lab / Hospital to know about different techniques of biochemical analysis and submission of the report.

15. Repetition.

SCHEME OF PRACTICAL EXAMINATION:

Duration: 3 hrs **Max. Marks: 70**

1. Biochemistry experiments by lots (1 to 3) 10 Marks
2. Physiology experiments by lots (5 to 9) 10Marks
3. Identify and comment the slide A, B, C & D (10 to 13) 20Marks
4. Identify the vitamin present in the food material and comment on their physiological role and disorders. 10 Marks
5. Report 10 Marks
6. Practical records 10 Marks

SCHEME OF VALUATION FOR PRACTICAL III

1. Procedure - 04, Experiment- 04, Result - 02
2. Procedure - 04, Experiment- 04, Result - 02
3. Identification -01, Classification-01, Diagram –01, Salient features– 02
4. Identification -01, Sources-01, Physiological role –01, Deficiency disease – 02

=

034. Identification - 01 mark, Comment - 02 marks,

= **03**

****

CMD30008/ CMD30005

IV SEMESTER
CORE COURSE IV
GENETICS AND EVOLUTIONARY BIOLOGY

Theory **Credits -4(60 hrs)**

Course outcome

After completion of the course the student is able to:

CO1. Learn in depth genetics
CO2. Identify the detail of evolution
CO3. Understand in depth evolution
CO4. Identify in details with application, if applicable, genetics

Unit I **15 hrs**

Introduction to Genetics

History of genetics mono and dihybrid crosses, Mendel's law.

Mendelian Genetics and its Extension

Principles of Inheritance, Chromosome theory of inheritance, Incomplete dominance and codominance.

Multiple alleles, Lethal alleles, Epistasis, Pleiotropy.Extra-chromosomal inheritance-Maternal inheritance-shell coiling in Limnaea. Cytoplasmic inheritance- Kappa particle in Paramecium

Sex Determination

Chromosomal basis of sex determination in animals. Non-disjunction. Genic balance theory. Klinefelter and Turners syndromes. Environmental and hormonal effects on determination of sex.

Unit II **15 hrs**

Linkage, Crossing Over and Chromosomal Mapping

Linkage and crossing over: Linkage in Drosophila, linkage in man; Significance of crossing over. Genetic maps of chromosomes. Construction of chromosome map.

Sex linked inheritance: Drosophila- Red and white color inheritance

Man- Haemophilia and color blindness, Y-linked genes.

Mutations: Chromosomal Mutations: Deletion, Duplication, Inversion, Translocation, Aneuploidy and Polyploidy; Gene mutations: Induced mutations Spontaneous mutations, Reverse mutations, Suppressor mutations.

Unit III **15 hrs**

Introduction to Evolutionary Theories

Concept of organic evolution. Lamarckism, Darwinism, Neo-Darwinism-Industrialmelanism(Natural selection).

Evidences of Evolution

Indirect evidences - comparative morphology & anatomy, connecting links. Homology, vestigial organs, Physiology and biochemistry – enzyme, hormones,

serology, and amino acid sequence analysis, excretory product analysis, cytology, genetics and embryology.

Direct evidences from palaeontology – Nature, types of fossils. Geological time scale mentioning dominant groups in each period

Unit IV **15 hrs**

ADAPTATIONS AND SPECIATION:

Adaptations: Aquatic adaptations: Primary (Shark) and secondary (Turtle) Volant adaptations: Active (Insect, Bird and Bat) and passive flights (Exocoetes, Rhacophorus and Draco) Arboreal adaptations – Chameleon, Loris, Desert adaptations–Phrynosoma, Camel, Coloration and mimicry. **Ethology-** Definition, innate – taxes, reflexes, instincts and motivation, learned behaviour – habituation, imprinting, conditioned reflexes and insight learning. **Adaptive radiation** – examples, micro and macro evolution – examples.

Speciation- Isolation types, nature of speciation – allopatric and sympatric, reproductive isolating mechanisms with examples.

Trends in Human evolution- Australopithecus, Paranthropus, Kenyanthropus and *Homo erectus*, *Homo sapiens*.

Reference:

1. Barton.N.H. Briggs, D.E.G., Eisen, J.A., Goldstein, D.B.and N.H. (2007).
2. Campbell, N.A.and Reece J.B. (2011) Biology.IX Edition, Pearson, Benjamin, Cumming.
3. Douglas,J.Futuyma91997)Evolutionary Biology.Sinauer Associates Evolution. Cold Spring, Harbour Laboratory Press.
4. Gardner, E.J.Simmons, M.J., Snustad, D.P (2008).Principles of Genetics.
5. Hall,B.K. and Hallgrimsson, B.(2008) Evolution.IV Edition,Jones and Bartlett
6. Klug,W.S.,Cumming,M.R., Spencer,C.A.(2012).Concepts of Genetics Organic Evolution by Veer Bala Rastogi
7. Principles of Genetics by Robert.H.Tamarin, Tata McGraw-Hill pub. Publishers
8. Ridiey, M. (2004) Evolution.III Edition. Blackwell Publishing
9. Russell, P.J. (2009) Genetics-A Molecular Approach.III Edition. Benjamin
10. Snustad, D.P., Simmons, M.J (2009). Principles of Genetics Edition.
11. Stebbins G.L. (1970) The process of organic evolution, Prentice Hall Publ.
12. Strickberger, M.W, (1995) Genetics, Mac Millan Co.VIII Edition. Wiley India X Edition. Benjamin Cummings.

PRACTICAL –IV
GENETICS AND EVOLUTIONARY BIOLOGY

1. Genetic problems- Monohybrid and Dihybrid cross.

2. Complementary genes: flower color in sweet pea.
   Supplementary genes: Comb patterns in Fowls.

3. Epistatic genes: Plumage colors in Fowls and Multiple genes: Skin color in man.

4. Multiple alleles: ABO blood group in human. And Sex linked inheritance: Drosophila and human.

5. Study of Human Karyotypes (normal) and abnormal- (Turner, Klinefelter, Down's and Cri-du-chat syndrome (abnormal).

6. General morphology of *Drosophila melanogaster* (male and female).

7. Mounting of sex comb and wing of Drosophila

8. Identification of mutants of white eye, bar eye, sepia eye, vestigial wing and ebony body of Drosophila

9. Preparation of media and maintenance and breading of Drosophila – (Demonstration)

10. Study of homology – vertebrate forelimbs and analogy-wing of bird & limb skeleton from suitable specimens/ pictures.

11. Study of aquatic adaptations: Shark & Turtle.
    Study of arboreal adaptations: Chameleon, Loris.

12. Study of Volant adaptations : Exocoetus Fish, Bat, Pigeon, Draco.

13. Submission of report on-
    a. Evolution of Horse
    b. Evolution of Camel
    c. Evolution of Elephant
    d. Evolution of Man
14. Experiment on genetic drift-Sampling error and population size.

15. Repetition.

SCHEME OF EXAMINATION

DURATION: 3 HOURS **MAX.MARKS:70**

1. Genetics problem any 3 15marks
2. Identify with reasons A (Wild male & Female *Drosophila melanogaster*) B&C (Drosophila mutant) 09 marks
3. Identify and comment-Human Karyotypes(normal and abnormal). 08 marks
4. Mounting of wing/ sex comb of Drosophila. 03marks
5. Identify and comment- Homologous or Analogous organs. 03marks
6. Identify and comment on adaptation in D, E and F. 12 marks
7. Submission of report. 10 marks
8. Class record. 10 marks

SCHEME OF VALUATION FOR PRACTICAL IV

1. Genetic Problems
2. Identification-01, Reasons-0 2
3. Identification -01, Reasons -03
4. Procedure-01, Mounting-02
5. Identification-01,Comment-03
6. Identification – 01, Diagram – 01, Salient features–02

CME30008/ CME30005

V SEMESTER
DISCIPLINE SPECIFIC ELECTIVE COURSE
APPLIED ZOOLOGY

Theory **Credits -4(60 hrs)**

Course outcome

After completion of the course the student is able to:

CO1. Understand the detail of communicable deseases
CO2. Understand the classification and characteristics of medical zoology
CO3. Learn the characteristics of applied zoology
CO4. Understand in detail with examples applied zoology
CO5. Know about the importance of insects in forensic science and medicine.

Unit I **15 hrs**

Introduction to Host-parasite Relationship

Host, Definitive host, Intermediate host, Parasitism, Symbiosis, Commensalism, Reservoir, Zoonosis

Epidemiology of Diseases

Transmission, Prevention and control of diseases: Tuberculosis, typhoid

Rickettsiae and Spirochaetes

Brief account of *Rickettsia prowazekii*, *Borrelia recurrentis* and *Treponema pallidum*

Unit II **15 hrs**

Parasitic Protozoa

Life history and pathogenicity of *Entamoeba histolytica*, *Plasmodium vivax* and *Trypanosoma gambiense*

Parasitic Helminthes

Life history and pathogenicity of *Ancylostoma duodenale* and *Wuchereria bancrofti*

Unit III **15 hrs**

Insects of Economic Importance

Biology, Control and damage caused by *Helicoverpa armigera, Pyrilla perpusilla* and *Papilio demoleus*, *Callosobruchus chinensis*, *Sitophilus oryzae* and *Tribolium castaneum*

Insects of Medical Importance

Medical importance and control of *Pediculus humanus corporis*, Anopheles, Culex, Aedes, *Xenopsylla cheopis*

Unit IV **15 hrs**

Animal Husbandry

Preservation and artificial insemination in cattle; Induction of early puberty and Synchronization of estrus in cattle

Poultry Farming

Principles of poultry breeding, Management of breeding stock and broilers, processing and preservation of eggs

Fish Technology

Genetic improvements in aquaculture industry; Induced breeding and transportation of fish seed.

Life cycle of *Bombyx mori*. Structure of silk gland and secretion of silk

PRACTICAL –7A
APPLIED ZOOLOGY

1. Study of *Plasmodium vivax, Entamoeba histolytica, Trypanosoma gambiense,* and *Wuchereria bancrofti* and their life stages through permanent slides/photomicrographs or specimens.
2. Study of arthropod vectors associated with human diseases: Pediculus, Culex,

Anopheles, Aedes and Xenopsylla.

3. Study of insect damage to different plant parts/stored grains through damaged products/ photographs.
4. Identifying feature and economic importance of *Helicoverpa (Heliothis) armigera*, *Papilio demoleus*
5. Plastination techniques by using some insects.
6. Maintenance of freshwater aquarium
7. Collection and mounting of Ants.
8. Animal associations: - Mutualism – Termites and Trichonympha.
9. Commensalism – Echenies and shark
   Protocooperation – Hermit crab and Sea anemone.
10. Predation – Snake and Frog. Parasitism – Head louse, Bed bug, Mosquito, Ticks, mites.
11. Identification of mulberry and non mulberry silkworms. Identification different larvae of silk worm- Using specimens / pictures
12. Identification of food fishes of Karnataka
13. Field visits to a Vermiculture / Sericulture / fisheries / apiculture / poultry / dairy farm- submission of any 3 Reports
14. Repetition

Reference:

1. Arora, D. R and Arora, B. (2001). Medical Parasitology. II Edition. CBS Publications
2. Atwal, A.S. (1986). Agricultural Pests of India and South East Asia, Kalyani CBCS Undergraduate Program in Zoology
4. Dennis, H. (2009). Agricultural Entomology. Timber Press (OR).
5. Dunham R.A. (2004). Aquaculture and Fisheries Biotechnology Genetic Approaches.CABI publications, U.K.
6. Hafez, E. S. E. (1962). Reproduction in Farm Animals. Lea & Fabiger Publisher
7. Kumar and Corton. Pathological Basis of Diseases.
8. Park, K. (2007). Preventive and Social Medicine. XVI Edition. B.B Publishers.
9. Pedigo, L.P. (2002). Entomology and Pest Management, Prentice Hall. Publishers.

Scheme of Practical Examination

Duration: 3 Hours **Max Marks: 70**

1. Identification of parasites (any six) 24 Marks
   (3 from Unit I and II, 3 from Unit III and IV)
2. Identify and comment upon animal association A & B 10 Marks
3. Identification of mulberry and non mulberry silkworms 06 Marks
4. Identification of food fishes of Karnataka 06 Marks

5. Identification different larvae of silk worm- 04 Marks
   Using specimens / pictures
6. Report submission 10 Marks
7. Class record. 10 Marks

SCHEME OF VALUATION FOR PRACTICAL -7A

1. Identification –01, Classification-01,Diagram – 01, Salient features–01
2. Identification – 01,Diagram – 02,Salient features -02
3. Identification –01, Diagram – 01, Salient features– 01
4. Identification – 01, Diagram – 01, Salient features– 01
5. Identification – 01, Diagram – 01, Salient features–02

CME30208/ CME30205

V SEMESTER ZOOLOGY
DISCIPLINE SPECIFIC ELECTIVE COURSE
INSECT, VECTORS AND DISEASES

Theory **Credits -4(60 hrs)**

Course outcome

After completion of the course the student is able to:

CO1.Learn in detail of insect, vector diseases
CO2. Identify in detail with examples insect, vector diseases
CO3. Deliberate the detail of insect ,vector diseases
CO4. Learn in depth Insect, vectors and diseases

Unit I **15 hrs**

Introduction to Insects

General Features of Insects, Morphological features, Head – Eyes, Types of antennae, Mouth parts w.r.t. feeding habits

Concept of Vectors : Brief introduction of Carrier and Vectors (mechanical and biological vector),

Reservoirs, Host-vector relationship, Vectorial capacity, Adaptations as vectors, Host Specificity

Insects as Vectors

Classification of insects up to orders, detailed features of orders with insects as vectors – Diptera, Siphonaptera, Siphunculata, Hemiptera

Unit II **15 hrs**

Dipteran as Disease Vectors

Dipterans as important insect vectors – Mosquitoes, Sand fly, Houseflies;

Study of mosquito-borne diseases – Malaria, Dengue, Chikungunya, Viral encephalitis, Filariasis; Control of mosquitoes

Study of sand fly-borne diseases – Visceral Leishmaniasis, Cutaneous Leishmaniasis, Phlebotomus fever; Control of Sand fly

Study of house fly as important mechanical vector, Myiasis, Control of house fly

Unit III **15 hrs**

Siphonaptera as Disease Vectors

Fleas as important insect vectors; Host-specificity, Study of Flea-borne diseases – Plague, Typhus fever; Control of fleas

Siphunculata as Disease Vectors

Human louse (Head, Body and Pubic louse) as important insect vectors; Study of louse-borne diseases –Typhus fever, Relapsing fever, Trench fever, Vagabond's disease, Phthiriasis; Control of human louse

Unit VI **15 hrs**

Hempitera as Disease Vectors

Bugs as insect vectors; Blood-sucking bugs; Chagas disease, Bed bugs as mechanical vectors, Control and prevention measures

PRACTICAL –7B
INSECT VECTORS AND DISEASES

1. Study of different kinds of mouth parts of insects.
2. Study of following insect vectors through permanent slides/ photographs:

   Aedes, Culex, Anopheles, Pediculus humanus capitis,
3. Pediculus humanuscorporis, Phithirus pubis, Xenopsylla cheopis,

   Cimex lectularius'.
4. Phlebotomus argentipes, Musca domestica, through permanent slides/

   Photographs.
6. Study of different diseases transmitted by above insect vectors.

7.Submission of a project report on any one of the insect vectors and disease transmitted

Reference:

1. Imms, A.D. (1977). *A General Text Book of Entomology*. Chapman & Hall, UK
2.Chapman, R.F. (1998). *The Insects: Structure and Function.* IV Edition, Cambridge University Press, UK
3. Pedigo L.P. (2002). *Entomology and Pest Management.* Prentice Hall Publication
4. Mathews, G. (2011). *Integrated Vector Management: Controlling Vectors of Malaria and Other Insect Vector Borne Diseases*. Wiley-Blackwell

CMF30008/ CMF30005

VI SEMESTER ZOOLOGY
DISCIPLINE SPECIFIC ELECTIVE COURSE
AQUATIC BIOLOGY

Theory **Credits -4(60 hrs)**

Course outcome

After completion of the course the student is able to:

CO1. Learn in detail with examples aquatic biology
CO2. Write down in detail with examples aquatic biology
CO3. Identify the classification and characteristics of aquatic biology
CO4. Identify in depth aquatic biology
.

UNIT I **15 hrs**

Aquatic Biomes

Brief introduction of the aquatic biomes: Freshwater ecosystem (lakes, wetlands, Streams and rivers), estuaries, intertidal zones, oceanic pelagic zone, marine Benthic zone and coral reefs.
Hydrosphere – (Water) Physical and chemical properties.

UNIT II **15 hrs**

Freshwater Biology

Lakes: Origin and classification, Lake as an Ecosystem, Lake morphometry, Physico–chemical Characteristics: Light, Temperature, Thermal stratification, Dissolved Solids, Carbonate, Bicarbonates, Phosphates and Nitrates, Turbidity; dissolved gases (Oxygen, Carbon dioxide). Nutrient Cycles in Lakes-Nitrogen, Sulphur and Phosphorous. **Ecosystems:** Concept, types and structure of ecosystem. **Fresh water ecosystem:** Physico-chemical nature of fresh water. The pond as an ecosystem – abiotic components, producers and consumers, interaction between components

UNIT III **15 hrs**

Marine Biology

Salinity and density of Sea water, Continental shelf, Adaptations of deep sea organisms, Coral reefs, Sea weeds.
Streams: Different stages of stream development, Physico-chemical environment, Adaptation of hill-stream fishes.

UNIT IV **15 hrs**

Management of Aquatic Resources

Causes of pollution: Agricultural, Industrial, Sewage, Thermal and Oil spills, Eutrophication, Management and conservation (legislations), Sewage treatment, Water quality assessment- BOD and COD.

Reference:

1. B. Das, (2012). Parasitology, Books & Allied Pvt. Ltd-II

2. S. Bhattacharya (2011). Environmental toxicology, Books & Allied Pvt. Ltd
3. S. Bhattacharya (2011). Environmental toxicology, Books & Allied Pvt. Ltd
4. T. K. Saha. (2012). Ecology and Environmental Biology. Books & Allied Pvt.

PRACTICAL –7A

AQUATIC BIOLOGY

1. Identify the important macrophytes, phytoplanktons and zooplanktons present in a lake ecosystem.
2. Estimation of dissolved oxygen in different water samples.
3. Estimation of dissolved carbon dioxide in different water samples.
4. Estimation of chlorides in different water samples.
5. Estimation of hardness in different water samples.
6. Estimation of pH, using pH-meter, pH paper.
7. Study of pond ecosystem.
8. Study of aquarium ecosystem.
9. Morphometric measurement of locally available freshwater fish and marine water fish.
10. Identification of fish based on their morphology.
11. Identification of muscles and prawn.
12. Fish by products.
13. A Project Report on a visit to a Sewage treatment plant/Marine bioreserve/ Fisheries Institutes.
14. Repetition.

Scheme of Practical Examination

Duration 3 Hours Max Marks: 70 Marks

1.	Estimation of any 2 parameters – by lots	10Marks
2.	Estimation of any 2 parameters – by lots	10Marks
3.	Morphometric measurement of freshwater fish and marine water fish.	10Marks
4.	Identification of fish based on their morphology.	08 Marks
5.	Identification of muscles and prawn.	08 Marks
6.	Fish by products	04 Marks
7.	Report	10 Marks
8.	Record	10 Marks

SCHEME OF VALUATION FOR PRACTICAL -7A

1. Procedure - 04, Experiment- 04, Result - 02

2. Procedure - 04, Experiment- 04, Result - 02,

3. Procedure - 04, Experiment- 04 , Result - 02,

4.Identification -01, Classification-01,Diagram –01,Salient features– 02

5. Identification -01, Sources-01, Physiological role –01, Deficiency disease – 01

6.Identification -01, Comment.

CMF30208/ CMF30205

VI SEMESTER ZOOLOGY
DISCIPLINE SPECIFIC ELECTIVE COURSE

IMMUNOLOGY

Theory **Credits -4(60 hrs)**

Course outcome

After completion of the course the student is able to:

CO1. Deliberate in details with application, if applicable immunology
CO2. Learn in details with examples immunology
CO3.Identify in details with examples immunology
CO4.Identify the characteristics of immunology
CO5. Deliberate in depth immunology
.

Unit I: **Overview of the Immune System** **15Hrs**
Introduction to basic concepts in immunology, components of immune system, principles
of innate and adaptive immune system
Cells and Organs of the Immune System
Haematopoeisis, Cells of immune system and organs (primary and secondary lymphoid
organs) of the immune system
Antigens: Basic properties of antigens, B and T cell epitopes, haptens and adjuvants

Unit II: Antibodies **15Hrs**
Structure, classes and function of antibodies, monoclonal antibodies, antigen antibody interactions as tools for research and diagnosis
Vaccines
General introduction to vaccines, Various types of vaccines

Unit III: Working of the immune system **15Hrs**
Structure and functions of MHC, exogenous and endogenous pathways of antigen presentation and processing, Basic properties and functions of cytokines, Complement system: Components and pathways.

Unit IV: **Immune system in health and disease** **15Hrs**
Gell and Coombs' classification and brief description of various types of hypersensitivities, Introduction to concepts of autoimmunity and immunodeficiency,

PRACTICAL-7B

IMMUNOLOGY

1. Demonstration of lymphoid organs.

2. Histological study of spleen, thymus and lymph nodes through slides/ photographs

3. Preparation of stained blood film to study various types of blood cells.

4. Ouchterlony's double immuno-diffusion method.

5. ABO blood group determination.

6. Cell counting and viability test from splenocytes of farm bred animals/cell lines.

7. Demonstration of
a) ELISA
b) Immunoelectrophoresis

Reference:

1. Kindt, T. J., Goldsby, R.A., Osborne, B. A. and Kuby, J (2006). *Immunology*, VI Edition. W.H. Freeman and Company.

2, David, M., Jonathan, B., David, R. B. and Ivan R. (2006). *Immunology,* VII Edition, Mosby, Elsevier Publication.

3. Abbas, K. Abul and Lechtman H. Andrew (2003.) *Cellular and Molecular Immunology.* V Edition. Saunders Publication.

CME30608/CME30405

SKILL ENHANCEMENT COURSE
MEDICAL DIAGNOSTICS

Theory **Credits -2(30 hrs)**

Course outcome

After completion of the course the student is able to:

CO1. Write down the characteristics of medical diagnostics
CO2. Write down in depth medical diagnostics
CO3. Specify the details of non infectious diseases

Unit I **10 hrs**

Introduction to Medical Diagnostics and its Importance

Diagnostics Methods Used for Analysis of Blood

Blood composition, Preparation of blood smear and Differential Leucocyte Count (D.L.C) using Leishman's stain, Platelet count using haemocytometer, Erythrocyte Sedimentary Rate (E.S.R), Packed Cell Volume (P.C.V.)

Unit II **10 hrs**

Non-infectious Diseases

Causes, types, symptoms, complications, diagnosis and prevention of Diabetes (Type I and Type II), Hypertension (Primary and secondary), Testing of blood glucose using Glucometer/Kit

Infectious Diseases

Causes, types, symptoms, diagnosis and prevention of Tuberculosis and Hepatitis

Unit III: **10 hrs**

Diagnostic Methods Used for Urine Analysis

Urine Analysis: Physical characteristics; Abnormal constituents

Tumours

Types (Benign/Malignant), Detection and metastasis; Medical imaging: X-Ray of Bone
fracture, PET, MRI and CT Scan (using photographs).

Reference:

1. Asis. Das. (2012). Medical Physiology, Books & Allied Pvt. Ltd
2. Cheesbrough M., A Laboratory Manual for Rural Tropical Hospitals, A Basis forTraining Courses.
3. Godkar P.B. and Godkar D.P. Textbook of Medical Laboratory Technology, II Edition, Bhalani Publishing House.
4. Guyton A.C. and Hall J.E. Textbook of Medical Physiology, Saunders
5. Park, K. (2007), and Social Medicine, B.B. Publishers.
6. Prakash, G. (2012), Lab Manual on Blood Analysis and Medical Diagnostics, S.Chand and Co.

B.Sc. Examinations

Zoology Question Paper pattern

I to VI semesters

Duration: 03 Hours **Maximum Marks: 70**

I . Answer any Five of the following **1X 5 = 05**

1.
2.
3.
4.
5.
6.

II. Write short note on any Five of the following **3X 5 = 15**

7.
8.
9.
10.
11.
12.

III. Write Explanatory note on any Four of the following **5X 4 = 20**

13.
14.
15.
16.
17.

IV. Write an essay on any Three of the following **10X 3=30**

18.
19.
20.
21.
22.

B.Sc, Examinations (SEC)

Zoology Question Paper

Duration: 02 Hours **Maximum Marks: 50**

I. Answer all Five of the following **1X 5 = 05**

1.
2.
3.
4.
5.

II. Write short note on any Five of the following **3X 5 = 15**

6.
7.
8.
9.
10.
11.

III. Write Explanatory note on any Four of the following **5X 4 = 20**

13.
14.
15.
16.
17.

IV. Write an essay on any one of the following **10X1 = 10**

18.
19.

JSS COLLEGE OF ARTS, COMMERCE & SCIENCE

(An Autonomous College of University of Mysore)

Re-accredited by NAAC with 'A' grade

OOTY ROAD, MYSORE-570 025, KARNATAKA

SYLLABUS

Programme: B. Voc. (Software Development)

B.Voc. (SD) Scheme:

Year	Sem	Course Code	Title	L:T:P	Theory Hours	Tutorial Hours	Practical Hours	Total Hours	Total Credits
1 Year	Sem 1	SDA 020	Communication Language Kannada	3:0:0	45	0	0	45	3
		SDA 510	Basic Mathematics	3:0:0	45	0	0	45	3
		SDA 520	C Programming	2:0:1	30	0	15	45	3
		SDA 530	Digital Electronics	2:0:1	30	0	15	45	3
	Sem 2	SDB 510	Discrete Mathematics	3:0:0	45	0	0	45	3
		SDB 540	Communication Language English	3:0:0	45	0	0	45	3
		SDB 520	Algorithms & Data Structure	2:0:1	30	0	15	45	3
		SDB 550	Microcontroller & Embedded System	2:0:1	30	0	15	45	3
									24
2 Year		SDC 510	Advanced calculus	3:0:0	45	0	0	45	3
		SDC 520	Differential equation	3:0:0	45	0	0	45	3
		SDC 530	Software Architecture and SDLC & Process	2:0:1	30	0	15	45	3
		SDC 550	Indian Constitution	3:0:0	45	0	0	45	3
	Sem 4	SDD 510	Numerical Analysis & Statistics	3:0:0	45	0	0	45	3
		SDD 520	Operation Research	3:0:0	45	0	0	45	3
		SDD 530	Software Modeling & Software Quality Assurance	2:0:1	30	0	15	45	3
		SDD560	Environmental Studies	3:0:0	45	0	0	45	3
									24
3 Year	Sem 5	SDE 510	Project Management	2:0:2	30	0	30	60	4
		SDE 520	Configuration Management	3:0:1	45	0	15	60	4
		SDE 530	Human Computer Interaction	3:0:1	45	0	15	60	4
	Sem 6	SDF 510	Operating System	3:0:1	45	0	15	60	4
		SDF 550	Database Design	3:0:1	45	0	15	60	4
		SDF 520	CN & Security Fundamentals	3:0:1	45	0	15	60	4
									24

Scheme of Assessment:

Semester-I:

Sl. no	Course Code	Course Name	Credits		Marks					Hours Per Week		
			L:T:P	Total	Th	C1	C2	Pr	Total	T	P	Total
1	SDA 020	Communication Language Kannada	3:0:0	03	70	15	15	-	100	03	-	03
2	SDA 510	Basic Mathematics	3:0:0	03	70	15	15	-	100	03	-	03
3	SDA 520	C Programming	2:0:1	03	70	15	15	70	170	02	01	03
4	SDA 530	Digital Electronics	2:0:1	03	70	15	15	70	170	02	01	03

Semester-II:

Sl. no	Course Code	Course Name	Credits		Marks					Hours Per Week		
			L:T:P	Total	Th	C1	C2	Pr	Total	T	P	Total
1	SDB 540	Communication Language English	3:0:0	03	70	15	15	-	100	03	-	03
2	SDB 510	Discrete Mathematics	3:0:0	03	70	15	15	-	100	03	-	03
3	SDB 520	Algorithms & Data Structure	2:0:1	03	70	15	15	70	170	02	01	03
4	SDB 550	Microcontroller &Embedded System	2:0:1	03	70	15	15	70	170	02	01	03

Semester-III:

Sl. no	Course Code	Course Name	Credits		Marks					Hours Per Week		
			L:T:P	Total	Th	C1	C2	P	Total	T	P	Total
1	SDC 510	Advanced Calculus	4:0:0	04	70	15	15	-	100	04	-	04
2	SDC 520	Differential Equation	2:0:0	02	70	15	15	-	100	02	-	02
3	SDC 530	Software Architecture and SDLC & Process	2:0:1	03	70	15	15	70	170	02	01	03
4	SDC 550	Indian Constitution	3:0:0	03	70	15	15	-	100	03	-	03

Semester-IV:

Sl. no	Course Code	Course Name	Credits		Marks					Hours Per Week		
			L:T:P	Total	Th	C1	C2	P	Total	T	P	Total
1	SDD 510	Numerical Analysis & Statistics	4:0:0	04	70	15	15	-	100	04	-	04
2	SDD 520	Operation Research	2:0:0	02	70	15	15	-	100	02	-	02
3	SDD 530	Software Modelling & QA	2:0:1	03	70	15	15	70	170	02	01	03
4	SDD560	Environmental Science	3:0:0	03	70	15	15	-	100	03	-	03

Semester-V:

Sl. no	Course Code	Course Name	Credits		Marks					Hours Per Week		
			L:T:P	Total	Th	C1	C2	P	Total	T	P	Total
1	SDE 510	Project Management	2:0:2	04	70	15	15	70	170	02	02	04
2	SDE 520	Configuration Management	3:0:1	04	70	15	15	70	170	03	01	04
3	SDE 530	Human Computer Interaction	3:0:1	04	70	15	15	70	170	03	01	04

Semester-VI:

Sl. no	Course Code	Course Name	Credits		Marks					Hours Per Week		
			L:T:P	Total	Th	C1	C2	P	Total	T	P	Total
1	SDF 510	Operating System	3:0:1	04	70	15	15	70	170	03	01	04
2	SDF 550	Database Design	3:0:1	04	70	15	15	70	170	03	01	04
3	SDF 520	Computer Networks & Security Fundamentals	3:0:1	04	70	15	15	70	170	03	01	04

Program Outcome:

After completing the graduation in Software Development, the students are able to:

PO1. Contribute to the design of software products and applications

PO2. Develop software code to specification

PO3. Provide data/information in standard formats

PO4. Develop their knowledge, skills and competence

PO5. Create documents for Knowledge Sharing

PO6. Develop media content and graphic designs for software products and applications

PO7. Appreciate the engineering nature of software development

PO8. Describe key activities in software development and the role of modelling

PO9. Explain key concepts in software development such as risk and quality

PO10. Explain the basics of an object-oriented approach to software development

Program Specific Outcome:

After completing the graduation in Software Development, the students are able to:

PSO1. Apply standard Software Engineering practices and strategies in real-time software project development

PSO2. Acquaint with the contemporary trends in industrial/research settings and thereby innovate novel solutions to existing problems

PSO3. Understand, analyze and develop computer programs of varying complexity

PSO4. Apply standard Software Engineering practices and strategies in software project development

PSO5.Acquaint with the contemporary issues, latest trends in technological development

PSO6. Develop software code to specification

PSO7. Manage their work to meet requirements

PSO8. Develop their skills and competence

General Component Syllabus

SDA 020

SEMESTER I

Communication Language Kannada

Credits: 3 (45 hours)

(3 Hours of Theory per week)

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Course Outcome:

After completion of the course, the students are able to:

CO1. Deliberate in depth Putta Vidhave

CO2. Learn the details of Rangoli

CO3. Specify in depth Mumbai Jathaka

CO4. Learn in details with examples Mahiti Tantradnyan

CO5. Understand in details with examples Mudanambikegala Bedinali

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SDA 510

BASIC MATHEMATICS

Credits: 3 (45 Hours)

(3 Hours of Theory per week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Learn in depth Polynomials

CO2. Write down the details of Cardon's Method

CO3. Identify the details of Pair of straight lines

CO4. Deliberate in details with examples Circle

CO5. Specify in details with examples Radian Measure

CO6. Learn in depth Complex Numbers

Unit 1: Algebra1 **15 Hours**

- Theory of Equations: Polynomials – Relations between the roots and coefficients – Symmetric functions –Synthetic division-Descartes' rule of signs –Cubic equations- Cardon's method.

Unit 2: Analytical Geometry –I **15 Hours**

- Two dimensional coordinate geometry – straight line (Revision), Pair of straight lines – standard results and simple problems.
- Circle: Equations of circles, Tangent and normal, radical axis and radical centers.
- Conic: Parabola – Ellipse- Hyperbola (Equations in standard form and problems)

Unit 3: Trigonometry **15 Hours**

- Radian measure-Trigonometric ratios –Trigonometric functions of compound angle, multiple angles and half angles-Inverse trigonometric functions-complex numbers.

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Reference:

1. Algebra –Natarajan
2. Algebra – Hardy and Wright
3. Algebra –Shanthi Narayan
4. Algebra -Manicavachagam Pillay
5. Elements of Analytical Solid geometry – Shanti Narayan
6. Elements of Analytical Solid geometry –S.L.Loney
7. Differential Calculus –Shanthi Narayan
8. Trigonometry –S.L.Loney

SDA 520

C PROGRAMMING

Credits: 3 (45 Hours)

(2 Hours of Theory and 1 Hour of Practical per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Specify in details with examples Problem Design
CO2. Learn in details with examples Algorithms
CO3. Deliberate the details of Data Definition Structure
CO4. Learn the details of Control Structures
CO5. Learn the details of Functions
CO6. Identify in details with examples Abstract Data Types

Unit 1 **15 Hours**

Problem Solving Technique: Problem definition, Problem analysis, Problem Design, Algorithms, Flow charts, Coding, Debugging, Program documentation, Program maintenance and Basic programming construct

Data Definition Structure: Types, constants, variables, keywords and identifiers.

Operators and Expressions: Arithmetic, Relational, Logical, operator precedence rules; input and output statement and Assignment statement

Unit 2 **15 Hours**

Control Structures: Sequential, Selection (one way, two way), looping (while, do while, for), combinations

Functions: Definition and passing (function depth look), Prototypes: parameter definition and passing (scope: local and global variables)

Data Structures: One and Two dimensional arrays

Abstract data types: Records (Structure definition statement); Strings: Use of main operations, string functions (concatenates string copy and compare etc).

Reference:

- Programming with ANSI C by: E. Balaguruswamy
- Let us C - Yashwanth kanetkar
- Computer concepts and C programming by - P. B. Kotur

Practicals

(1 Hour per week X 15 Weeks = 15 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

SDA 530

DIGITAL ELECTRONICS

Credits: 3 (45 Hours)

(2 Hours of Theory and 1 Hour of Practical per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Learn in detail with application, logic gates

CO2. Learn the classification and characteristics of combinational digital circuits

CO3. Deliberate the classification and characteristics of sequential digital circuits

CO4. Learn in details with application, flip flop

Unit 1 **15 Hours**

Representation of Information: Number system, integer and floating point representation, character codes (ASCII, EBCDIC)

Number Systems: Introduction to decimal, binary and hexadecimal number systems. Inter-conversion of decimal, binary and hex numbers

Binary Arithmetic and codes: Addition, multiplication and division in binary systems. Subtraction in binary systems –one's and two's complement methods. Subtraction of binary numbers by one`s and two`s complement methods. Concept of signed and unsigned numbers

Alphanumeric codes- ASCII and EBCDIC, concept of parity, error detection and correction

Logic Gates: Logic values and variables, positive and negative logic, AND, OR, NOT, NAND, NOR, AND, XOR gates, symbols and truth table. Definition of universal gates, NAND & NOR gates as universal gates

Boolean algebra: Laws of Boolean algebra. Principle of duality. DeMorgan's theorems. Simplification of Boolean expressions. Boolean expression for logic circuits and vice versa SOP and POS notations. Canonical Expressions. Conversion from SOP to POS form and vice versa. Reduction of Boolean expressions (three/ four variables with don't care conditions) using Karnaugh maps

Unit 2 **15 Hours**

Combinational Circuits: Half Adder, Full Adder, Half subtractor, Full subtractor, Encoders (Decimal to BCD) and decoders (BCD to Decimal), 4 X 1 Multiplexer and 1 X 4 demultiplexer - symbol and truth table

Sequential Circuits: RS flip flop, D flip flop. JK flip flop. Race around condition & T flip-flops. Shift registers –SISO, SIPO, PISO, PIPO registers. Brief explanation with Block diagrams. Counter - Synchronous and Asynchronous - Binary ripple counter and modulo counter

Semiconductor Memories: Idea of different types of Semiconductor memories (RAM, ROM, PROM, EPROM, EEPROM), process of data storage and retrieval, organization of memory, concept of PLA and PAL

Basic Building Blocks: ALU: arithmetic and logic unit operations, organization of control units, memory: types and organization, peripheral devices: I/O devices (video terminals and printers) and controllers, storage devices (tapes and disks), Programmed and interrupt control mechanism, I/O controllers, and bus bandwidths

Reference:

- Digital Electronic – Introduction to Theory & Practice by Gothmann
- Modern Digital Electronic (3rd Ed.) by Jain.
- Digital Principles & applications (6th Ed.) by Leech, Malvino and Saha.
- Digital Electronic by Thomas Floyd.
- The 8086 / 8088 Family Design, Programming & Interfacing by John Uffenbeck.
- 8086 Microprocessors Programming & Interfacing by Duglos V Hall.
- Intel Microprocessors Architecture, Programming & Interfacing (6th Ed.) by Barry B Bery.

Practicals

(1Hour per week X 15 Weeks = 15 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

SDB 540

SEMESTER II

COMMUNICATIVE LANGUAGE ENGLISH

Credits: 3 (45 Hours)

(3 Hours of Theory per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Deliberate in details with examples Voice
CO2. Specify in details with examples Articles
CO3. Learn in depth Speech
CO4. Deliberate the details of Writing Skills
CO5. Learn in depth Speaking Skills

Module – 1 Grammar

		Marks	Hrs/ Week
1.	Subject and Verb Agreement	5	6
2.	Voice	5	5
3.	Articles	5	3
4.	Speech	5	6
5.	Question tag	5	5
6.	Framing of Questions	5	3+2=05

Module – 2 Writing Skills

1.	Letter Writing Letter of Application/Letter of Grievances/Resume Preparation	10	4
2.	Comprehension	10	3
3.	Essay Writing	10	3

Module – 3 Speaking Skills

1.	Greeting		
2.	Requesting		
3.	Enquiring		
4.	Explaining	10	03+2=05
5.	Reporting		
6.	Permission		
7.	Thanking		
		70	**45**

SDB 510

DISCRETE MATHEMATICS

Credits: 3 (45 Hours)

(3 Hours of Theory per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Understand the details of Matrices and Determinants

CO2. Learn the details of Hamilton Theorem

CO3. Understand in details with examples Graph Theory

CO4. Understand the details of Calculus

CO5. Identify in details with examples Definite and Indefinite Integrals

Unit 1: Matrices and Determinants **15 Hours**

Algebra of Matrices and determinants –Elementary row operations- Rank of a matrix – Linear dependence of row and column vectors- System of Homogeneous linear equations-System of non homogeneous linear equations-Characteristic equations –Eigen values and Eigen vectors-Cayley –Hamilton theorem-Inverse of a matrix

Unit 2: Basics of graph theory **15 Hours**

Definition-paths-matrix representation of graphs –planar graphs-non planar graphs-Coloring of graphs-chromatic number of graphs-Independent number

Unit 3: Calculus **15 Hours**

Limits–Derivatives-Rules of differentiation-problems-differentiation of implicit Parametric and inverse functions-logarithmic differentiation and derivatives of second order Indefinite and definite integrals-simple problems

Reference:

1) Discrete Mathematics – Hari Kishan and Shiv Rajpundir
2) Matrices – Frank Ayers, Schaum publishing company
3) Text book of Matrices – Shanti Narayan and P k Mittal
4) Differential Calculus – Shanti Narayan
5) Differential Calculus and Integral Calculus – Piskunov
6) F.Harary – Graph Theory, Addition Wesley Reading Mass, 1969
7) Calculus – Volumes I & II.

SDB 520

ALGORITHMS AND DATA STRUCTURES

Credits: 3 (45 Hours)

(2 Hours of Theory and 1 Hour of Practical per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Deliberate in details with examples Algorithms and Data Structures
CO2. Learn in depth Arrays
CO3. Learn in details with examples Binary Search Trees
CO4. Deliberate the characteristics of Heaps
CO5. Specify the characteristics of Sorting Algorithms
CO6. Learn the details of Shortest Path

Unit 1: **15 Hours**

Algorithms and Data Structures: Asymptotic and Algorithm Analysis, Properties of data, Asymptotic Analysis, Algorithm Analysis.

Abstract Lists and Implementations: Linked lists and arrays, Stacks, Queues, De-queues.

Abstract Sorted Lists and Implementations: General trees, binary (including binary and complete trees), N-array trees and tree traversals, Abstract Sorted Lists, Binary search trees, Balanced search trees, AVL trees, B-Trees.

Unit 2: **15 Hours**

Abstract Priority Queues: Heaps.

Abstract Sets/Maps: Chained Hash Tables, Linear Probing, Double Hashing.

Sorting Algorithms: Insertion and bubble sort, Heap, merge and quick sort, Bucket and radix sort

Graph and Direct Acyclic Graph Algorithms: Topological sort, Minimum spanning trees and shortest path.

Reference:

- Digital Electronic – Introduction to Theory & Practice by Gothmann
- Modern Digital Electronic (3rd Ed.) by Jain

Practicals

(1 Hour per week X 15 Weeks = 15 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

SDB 550

INTRODUCTION TO MICROCONTROLLERS AND EMBEDDED SYSTEMS

Credits: 3 (45 Hours)

(2 Hours of Theory and 1 Hour of Practical per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Understand the architecture of 8051 microcontroller
CO2. Write down the instruction set and simple programs of 8051 microcontroller
CO3. Learn the details of 8051 microcontrollers
CO4. Specify the characteristics of embedded system

Unit 1: Microcontrollers 15 Hours

Microcontroller 8051 - Introduction, block diagram of microprocessor, block diagram of microcontroller, comparison between microprocessor & microcontroller, Architecture of 8051 and pin out diagram of 8051.

Addressing modes - Data moves, Types of addressing modes - register addressing, immediate addressing, direct addressing, indirect addressing mode.

Instructions set - Data transfer instructions, arithmetic instructions, jump and call instructions.

PIC microcontroller - Core feature and over view of series.

Unit 2: Embedded Systems 15 Hours

Introduction to Embedded Systems - Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

Hardware Side - introduction, The Core Level, Representing Information, Understanding Numbers, Addresses, Instructions, Registers. An Instruction Set View, Embedded Systems- A Register View, Register View of a Microprocessor

The Hardware Side: Storage Elements and Finite-State Machines - Theoretical model.

Reference:

- Microcontroller – K J Ayala.
- Introduction to Embedded Systems - Shibu K.V, McGraw Hill.
- Microcontroller – Mazadi.

Practicals

(1 Hour per week X 15 Weeks = 15 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

SDC 510

SEMESTER III

ADVANCED CALCULUS

Credits: 3 (45 Hours)

(3 Hours of Theory per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Learn in depth Sequences

CO2. Specify the details of Series

CO3. Understand in details with examples Rolle's Theorem

CO4. Deliberate in details with examples Taylor's Theorem

CO5. Identify the details of Partial derivatives

Unit 1: Sequences and Series: 15 Hours

Sequences-Bounded and monotonic sequences-convergent, divergent and oscillatory sequences- standard results and simple problems

Infinite series-nth partial sum- geometric series-convergence of $\sum \frac{1}{n^p}$- comparison test and ratio test-simple problems-alternating series

Unit 2: Calculus 15 Hours

Mean value theorems-Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorems (Statements and Geometrical interpretations)-Taylor's theorem – Maclaurin's expansion (Statement) and problems.

Unit 3: Partial derivatives 15 Hours

Limit and continuity of functions of two and three variables, Partial differentiation, Change of variables, Partial derivation and differentiability of real-valued functions of two and three variables, Euler's theorem on homogeneous functions. Taylor's theorem for functions of two and three variables - Jacobians

Reference:

1. A First Course in Real Analysis – Asharani Singhal.
2. Real Analysis – S.C. Malik.
3. Principles of Mathematical Analysis – Shanthinarayan
4. Calculus ,Volume -1 and Volume -2

SDC 520

DIFFERENTIAL EQUATIONS

Credits: 3 (45 Hours)

(3 Hours of Theory per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Specify in details with examples linear differential equations
CO2. Write down in details with examples nonlinear differential equations
CO3. Understand in details with examples Homogeneous linear differential equations
CO4. Learn the details of Non homogeneous linear differential equations
CO5. Specify the details of Partial differential equations

Unit 1: Linear and nonlinear differential equations 15 Hours

Elimination of arbitrary constant-solutions of linear differential equations - separation of variables –Homogeneous equations-exact equations- equations of the form $\frac{dy}{dx} + Py = Q$- Integrating factor, Equations solvable for x, y, p. Clairaut's form and singular solutions

Unit 2: Homogeneous and non homogeneous linear differential equations 15 Hours

Homogeneous Linear differential equations with constant coefficients.-non homogeneous linear differential equations –inverse differential operators-Cauchy's homogeneous linear differential equations- Second order linear differential equations-variation of parameters and exact equations.

Unit 3: Partial differential equations 15 Hours

Total differential equations-simultaneous equations- partial differential equations-Lagranges form of linear partial differential equations-charpit's method.

Reference:

1. A short course in differential equations – Rainville and Bedient
2. Advanced Engineering Mathematics – Kreyszig
3. Higher Engineering Mathematics – Grewal
4. Laplace Transform –Murry R Speigel
5. Applications of Differential equations –Martin Brown

SDC 530

SOFTWARE ARCHITECTURE AND SDLC& PROCESSES

Credits: 3 (45 Hours)

(2 Hours of Theory and 1 Hour of Practical per week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Specify in depth Software Process
CO2. Deliberate in details with examples SDLC
CO3. Learn in depth Data Modeling
CO4. Understand the details of UML and ER Models
CO5. Specify the details of Loose Coupling

Unit 1: **15 Hours**

SDLC & Processes: Software Process, Software Development Life Cycle, Object-Oriented Concepts: connections between design and implementation, Software Testing, Object-Oriented Architecture and Design, Requirements analysis, Safety Critical Software.

Unit 2: **15 Hours**

Software Architecture: Introduction to enterprise software architecture, the role of middleware, Cloud computing = SaaS + Utility Computing, Data Modeling, UML and E-R models. XML, Schemas, XML Schemas, Data Processing. Strategies for data processing, introduction to XQuery. JSON and JAXB, Domain-Driven Architecture. Domain-driven, design (DDD), Object-relational mapping (ORM), Service-oriented Architecture (SOA), Standardized service contract, Loose coupling, Service abstraction, Service-oriented Architecture (SOA),

Reference:

1. Designing Software Architectures: A Practical Approach (SEI Series in Software Engineering) 1st Edition, Kindle Edition by Humberto Cervantes
2. Just Enough Requirements and Sdlc: Requirements Documentation, Waterfall, and Agile Paperback – Import, 10 Mar 2017 by Ed Crook shanks

Practicals

(1 Hour per week X 15 Weeks = 15 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

SDC 550

INDIAN CONSTITUTION

Credits: 3 (45 Hours)

(3 Hours of Theory per week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Learn the details of Features of Indian Constitution
CO2. Understand the details of Fundamentals Rights
CO3. Identify the details of Role of Prime Minister
CO4. Learn the details of Power and Functions of Lok Sabha
CO5. Specify the details of Power and Functions of Chief Minister

Unit 1 **08 Hours**

a) Preamble of the Indian Constitution
b) Salient features of Indian Constitution

Unit 2 **10 Hours**

a) Fundamental Rights
b) Fundamental Duties
c) Directive principles of State Policy

Unit 3 **14 Hours**

a) President – Election Method, Powers and Functions
b) The Role of the Prime Minister
c) The Parliament – Structure, Power and Functions(Lok Sabha and Rajya Sabha)
d) Supreme Court – Organization and Jurisdiction

Unit 4 **13 Hours**

a) The Role of Governor in the Administration of State
b) Powers and Functions of the Chief Minister
c) Composition , Powers and Functions of both the Houses of State Legislature
d) High Court – Organization and Jurisdiction

Reference:

1. M.V. Pylee, "An Introduction to Constitution of India", Vikas Publishing, 2002.
2. Brij Kishore Sharma, "Introduction to the Constitution of India", PHI Learning Pvt. Ltd., New Delhi, 2011.
3. Latest Publications of Indian Institute of Human Rights, New Delhi.

SDD 510

SEMESTER IV
NUMERICAL ANALYSIS AND STATISTICS

Credits: 3 (45 Hours)

(3 Hours of Theory per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Understand the details of Bisection Method

CO2. Identify in details with examples Range Kutta IV Order Method

CO3. Learn the details of Finite differences

CO4. Understand in depth Numerical Integration

CO5. Identify in details with examples Linear programming

Unit 1: Numerical techniques **15 Hours**

Numerical solutions of algebraic equations-Bisection method -Newton Raphson method, Regula Falsi method -iteration method-Euler method, Range kutta IV order methods

Unit 2: Finite differences and Numerical integration **15 Hours**

Finite differences-Interpolation-Newton Gregory forward interpolation formula-Lagranges interpolation formula-Numerical integration: Trapezoidal rule, Simpson's $1/3^{rd}$ and $3/8^{th}$ rule Weddle's rule.

Unit 3: Linear programming **15 Hours**

Linear programming –Requirements for a linear programming problem, Examples on the Applications of linear programming, Formulation of a linear programming, Standardization, Solving LPP by Graphical Method, Simplex Method (up to two variables)

Reference:

1. Numerical methods: S.S. Sastry.
2. Probability and statistics for engineers and Scientists – Ronald E .Walpole and Raymond H Mayers.
3. Mathematical Statistics - John Freund (Prentice Hall India PVT .Ltd)

SDD 520

OPERATION RESEARCH

Credits: 3 (45 Hours)

(3 Hours of Theory per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Understand the details of Different phases of operation research
CO2. Deliberate in depth Simplex method
CO3. Identify in depth Duality theorems
CO4. Understand the details of Sequencing problems
CO5. Learn in depth Transportation model problems
CO6. Understand the details of Assignment problems

Unit 1: **15 Hours**

Definition of the term Operation Research -Different phases of operation research Advantages and limitations of O.R. Linear programming –Requirements for a linear programming problem , Examples on the Applications of linear programming ,Formulation of a linear programming , Standardization , Solving LPP by Graphical Method ,Simplex Method (up to two variables)

Unit 2: **15 Hours**

Big M method revised simplex method, Dual simplex method, Duality theorems.
Sequencing problems: Processing 'n' jobs through two machines –Travelling salesman problems as an application of sequencing

Unit 3: **15 Hours**

Transportation Model problems – Formulating, Solution –North West Corner Rule, Least Cost method, Row Minima method, Column minima method and Vogel's approximation.
Assignment problem: formulating, method of finding initial basic feasible solution to Assignment problem using Hungarian method.

Reference:

1. 'Operation Research' by Kanthiswarup, Guptha, Manmohan – Sultan chand and sons Educational publishers, New Delhi,1996
2. 'Operation Research' by H. A.Taha Prentice Hall of India Ltd 1998
3. 'Operation Research' by S .D Sharma Kedarnath Ramnath and co (publishers)1997

SDD 530

SOFTWARE MODELING AND SOFTWARE QUALITY ASSURANCE

Credits: 3 (45 Hours)

(2 Hours of Theory and 1 Hour of Practical per week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Deliberate in details with examples Classes and Relationships
CO2. Specify the details of State diagrams
CO3. Identify in details with examples Events
CO4. Deliberate in details with examples Software quality assurance
CO5. Understand the details of Software quality assurance

Unit 1: **15 Hours**

Software Modeling: What is Modeling?, Classes, Relationships, Common Mechanisms, Diagrams, Class Diagrams, Advanced Relationships, Instances, Object Diagrams, Use Cases, Interaction/Activity Diagrams, Events, State Machines, Time, Space, State Diagrams and Events

Unit 2: **15 Hours**

Software Quality Assurance: Software Quality, Quality Assurance, Testing Concepts and Issues, Testing Activities, Testing Techniques. Other Techniques, Defect Prevention/Process Improvement, Inspection, Refactoring, CRC, Software Reliability Engineering, Quality Models and Measurements

Reference:

1. Modeling for Software Quality Assurance (English, Paperback, Srivyshnavi Pagadala)
2. Modeling for Software Quality Assurance Paperback – Import, 16 Nov 2013 by Srivyshnavi Pagadala

Practicals

(1 Hour per week X 15 Weeks = 15 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

SDD560

ENVIRONMENTAL STUDIES

Credits: 3 (45 Hours)

(3 Hours of Theory per week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Deliberate the details of Components of environment
CO2. Specify the details of Ecology and Ecosystems
CO3. Identify in details with examples Natural resources
CO4. Learn the details of Biodiversity
CO5. Specify in details with examples Environmental pollution
CO6. Identify the details of Environmental issues and policies

Unit 1: Environment and natural systems **4 Hours**

- Introduction to Environment and Environmental Studies
- Definition and Components of Environment, Relationship between the different components of Environment
- Man and Environment relationship
- Impact of technology on Environment, Environmental Degradation
- Multidisciplinary nature of the Environment studies
- Its scope and importance in the present day Education System

Unit 2: Ecology and Ecosystems **5 Hours**

- Introduction: Ecology- Objectives and Classification
- Concept of an ecosystem- structure and functions of ecosystem
- Components of ecosystem- Producers, Consumers, Decomposers
- Bio-Geo- Chemical Cycles- Hydrologic Cycle, Carbon cycle, Energy Flow in Ecosystem, Food Chains, Food webs, Ecological Pyramids
- Major Ecosystems: Forest Ecosystem, Grassland Ecosystem, Desert Ecosystem, Aquatic Ecosystem, Estuarine Ecosystem**.**

Unit 3: Natural Resources **6 Hours**

Renewable and Non-renewable resources, exploitation and conservation,

- Water resources: Surface and Ground water sources, Indian and Global scenario.
- Land as a resource, land use change and land degradation
- Forest resources: Definition and Classification of Forests
  Ecological and Economic importance and benefits of forest, Indian scenario
  Deforestation: causes and effects, case studies remedial measures
- Food resources: Sources of food, Global and Indian food demand scenario
  Limits of food production, Environmental effects of Agriculture
- Energy resources: Renewable and non renewable energy sources, use of alternate energy sources, growing energy needs, case studies
- Mineral resources: Definition and Classification of minerals, mining issues
  Case studies
- Role of individual in conservation of natural resources.

Unit 4: Biodiversity and its Conservation 7 Hours

- Biodiversity: Definition, Levels of biological diversity: genetic, species and ecosystem diversity
- Bio geographic zones of India
- Hot spots of biodiversity
- Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational values
- Biodiversity patterns
- India as a mega-biodiversity nation
- Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions.
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit 5: Environmental pollution 6 Hours

- Types of Environmental Pollution:
- Water Pollution: Introduction – Water Quality Standards, Sources of Water Pollution: Industrial Agricultural, Municipal; Classification of water pollutants, Effects of water pollutants, Eutrophication.
- Marine pollution: Causes, effects and control.
- Air Pollution: Composition of air, Structure of atmosphere, Ambient Air Quality Standards, Classification of air pollutants, Sources of common air pollutants like PM, SO2, NOX, Natural & Anthropogenic Sources, Effects of common air pollutants
- Soil Pollution: causes, effects and control.
- Noise Pollution: Introduction, Sound and Noise, Noise measurements, Causes and Effects
- Thermal Pollution: Causes, effects and control.
- Nuclear hazards and human health risks.
- Solid waste management: Control measures of urban and industrial waste.
- Role of individual in the prevention of pollution, Pollution case studies.

Unit 6: Sustainable development and Environmental issues and Policies 7 Hours

- Sustainable development: Meaning, changes in resource utilization.
- Water conservation: watershed management and Rain water harvesting.
- Environmental issues: Climate change, global warming, acid rain, ozone layer depletion.
- Disaster management: floods, drought, earthquake, cyclones and landslides.
- Wasteland reclamation.
- Environment Protection Act: Air, Water, Wildlife (Prevention and Control of Pollution)
- Forest Conservation Act.
- Issues involved in enforcement of environmental legislation.
- Environment: rights and duties**.**

Unit 7: Human Population and the Environment **5 Hours**

- Population growth, Explosion, demographic variation among nations.
- Family welfare Program.
- Environment, human health and welfare; infectious and lifestyle diseases in contemporary world.
- Value Education: Environmental ethics.
- HIV/AIDS
- Women and Child welfare.
- Role of information technology in Environment and human health

Unit 8: Field visit **5 Hours**

- Field work Visit to an area to document environmental assets river/ forest/ grassland/ hill/ mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural.
- Visit to the solid waste treatment plant and water treatment plant.
- Video: The one degree (Equal to 5 lectures)

Reference:

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha Second edition, 2013 Publisher: Universities Press (India) Private Ltd, Hyderabad.
2. Basics of Environmental Studies by Prof Dr N S Varandani,2013 Publisher: LAP – Lambert Academic Publishing, Germany.
3. Environmental Studies by Anindita Basak, 2009 Publisher: Drling Kindersley (India) Pvt. Ltd Pearson
4. Textbook of Environmental Studies by Deeksha Dave & S S Kateva, Cengage Publishers.
5. Environmental Sciences by Daniel B Botkin & Edward A Keller Publisher: John Wiley & Sons.
6. Environmental Studies by R. Rajagopalan, Oxford University Press
7. Environmental Studies by Benny Joseph, TMH publishers
8. Environmental Studies by Dr. Suresh K Dhameja, 2007 Published by: S K Kataria & Sons New Delhi
9. Basics of Environmental Studies by U K Khare, 2011 Published by Tata McGraw Hill.
10. Environmental Studies by N. Arumugam & V.Kumaresan, Sara's publication.

SDE 510

SEMESTER V

PROJECT MANAGEMENT

Credits: 4 (60 Hours)

(2 Hour of Theory and 2 Hours of Practical per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Understand in depth Project plan
CO2. Identify the details of User controlled scheduling
CO3. Deliberate the details of Adding tasks
CO4. Understand in details with examples Adding work resources
CO5. Learn the details of Calendar

Unit 1: **15 Hours**

Creating a Project Plan
User-Controlled Scheduling
Adding Tasks
Resolving Common Scheduling Issues

Unit 2: **15 Hours**

Adding Work Resources
Adding Material and Cost Resources
Defining a Calendar
Viewing and Tracking Project Information Gantt Charts

Reference:

1. Project Management for Dummies, 5ed Paperback – 2017 by Stanley E. Portny
2. Project Management 3rd Edition (English, Paperback, Maylor)

Practicals

(2 Hours per week X 15 Weeks = 30 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

SDE 520

CONFIGURATION MANAGEMENT

Credits: 4 (60 Hours)

(3 Hour of Theory and1 Hour of Practical per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Specify in depth Configuration management

CO2. Understand the details of Configuration management planning

CO3. Deliberate the details of Configuration control

CO4. Learn in details with examples Configuration status accounting

CO5. Identify the details of Configuration audits

Unit 1: **15 Hours**

DEFINING CONFIGURATION MANAGEMENT: CM principles and standards, the recent growth of CM

CM PLANNING: Program phasing and milestones, Creating the CM organization, Defining CM system requirements, CM job classifications

CONFIGURATION IDENTIFICATION: First tasks of CM, Configurations & Baselines, Requirements traceability, Item identification and numbering

Unit 2: **15 Hours**

ENGINEERING RELEASE: Control of technical data, the document control process, Development vs. formal release

CONFIGURATION CONTROL: Defining a closed-loop process, Change classifications, Review boards and CCBs, Processing changes and RDWs

INTRODUCTION TO SOFTWARE CONFIGURATION MANAGEMENT: Specific software CM tasks, SEI evaluation criteria

Unit 3: **15 Hours**

CONFIGURATION STATUS ACCOUNTING: Defining CSA tasks and tailoring, Status accounting elements, Understanding the impact

CM PLANS: CMP preparation techniques, Software CMPs, Assessments and Plans

General procedures and work flow

CONFIGURATION AUDITS: Internal and informal audits, developing the audit plan, The Functional and Physical Audits

Reference:

1. Jessica Keyes, Software Configuration Management, Auerbach Publications, 2004
2. Anne Hass , Configuration Management Principles and Practice, Addison Wesley, 2002

Practicals

(1 Hour per week X 15 Weeks = 15 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

SDE 530

HUMAN COMPUTER INTERACTION

Credits: 4 (60 Hours)

(3 Hours of Theory and 1 Hour of Practical per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Learn the details of Introduction of human computer interface

CO2. Understand the details of Human consideration in screen design

CO3. Identify in details with examples Windows

CO4. Deliberate in depth Multimedia and coloring

CO5. Specify in details with examples Hypermedia

Unit 1: 20 Hours

Introduction-Importance-Human-Computer interface-characteristics of graphics interface-Direct manipulation graphical system - web user interface-popularity-characteristic & principles. User interface design process- obstacles-usability-human characteristics in design - Human interaction speed-business functions-requirement analysis-Direct-Indirect methods-basic business functions-Design standards-system timings - Human consideration in screen design - structures of menus - functions of menus-contents of menu-formatting -phrasing the menu - selecting menu choice-navigating menus-graphical menus.

Unit 2: 13 Hours

Windows-Characteristics-components-presentation-styles-types-managements-organizations-operations-web systems-device-based controls: characteristics-Screen -based controls: operate control - text boxes-selection control-combination control-custom control-presentation control.

Unit 3: 12 Hours

Text for web pages - effective feedback-guidance & assistance-Internationalization-accesssibility-Icons-Image-Multimedia –coloring, Windows layout-test: prototypes - kinds of tests - retest - Information search - visualization - Hypermedia - www - Software tools.

Reference:

1. Human-Computer Interaction, 3e Paperback – 2004 by Dix
2. Human Computer Interaction Paperback – 2014 by Meena K
3. Human-Computer Interaction Third Edition Paperback – Import, 24 Aug 2018 by Gerardus Blokdyk

Practicals

(1 Hour per week X 15 Weeks = 15 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

SDF 510

SEMESTER VI

OPERATING SYSTEM

Credits: 4 (60 Hours)

(3 Hours of Theory and 1 Hour of Practical per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Identify the Characteristics of operating system
CO2. Deliberate in depth Scheduling algorithms
CO3. Learn in depth Semaphores
CO4. Specify the details of Message passing
CO5. Understand the details of Deadlock
CO6. Identify in details with examples File organisation

Unit 1: **15 Hours**

Overview of operating systems, functionalities and characteristics of OS
Hardware concepts related to OS, CPU states, I/O channels, memory hierarchy and microprogramming
The concept of a process, operations on processes, process states, concurrent processes, process control block, process context
UNIX process control and management, PCB, signals, forks and pipes
Interrupt processing, operating system organisation, OS kernel FLIH and dispatcher.
Job and processor scheduling, scheduling algorithms, process hierarchies.
Problems of concurrent processes, critical sections, mutual exclusion, synchronisation, deadlock.

Unit 2: **15 Hours**

Mutual exclusion, process co-operation, producer and consumer processes.
Semaphores: definition, init, wait, signal operations.
Use of semaphores to implement mutex, process synchronisation etc., implementation of semaphores, Critical regions, Conditional Critical Regions, Monitors, Ada Tasks
Interprocess Communication (IPC), Message Passing, Direct and Indirect

Unit 3: **15 Hours**

Deadlock: prevention, detection, avoidance, banker's algorithm.
Memory organisation and management, storage allocation
Virtual memory concepts, paging and segmentation, address mapping.
Virtual storage management, page replacement strategies
File organisation: blocking and buffering, file descriptor, directory structure, File and Directory structures, blocks and fragments, directory tree, inodes, file descriptors, UNIX file structure.

Reference:

1. D.M Dhamdhere: Operating systems - A concept based Approach, 3rd Edition, Tata McGraw- Hill, 2012.
2. P.C.P. Bhatt: Introduction to Operating Systems Concepts and Practice, 3rd Edition, PHI, 2010.
3. Harvey M Deital: Operating systems, 3rd Edition, Pearson Education, 2011.

Practicals

(1 Hour per week X 15 Weeks = 15 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

SDF 550

DATABASE DESIGN

Credits: 4 (60 Hours)

(3 Hours of Theory and 1 Hour of Practical per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Understand the details of Database terminology and information types
CO2. Specify in depth Database planning and designing
CO3. Learn the details of Cloud computing
CO4. Specify the details of Sets and normalization
CO5. Specify in depth Report writing
CO6. Understand in details with examples Customer service management

Unit 1 **15 Hours**

Database Basics
Introduction to Devise Digital Storage
Database Terminology & Database Information Types
Microsoft Excel versus Microsoft Access
Database Planning
Database Objects – Creating Fields and Tables
Planning and Designing a Database

Unit 2 **15 Hours**

Introduction to Cloud Computing
Database Relationships
Designing for the Business Case
Introduction to Data Security & Data Archives
Managing the Database
Database Relationship Development
Introduction to Visual Data Analytics
Introduction to Sets & Normalization
Database Extractions

Unit 3 **15 Hours**

Database Queries and Basic SQL
Emergence of Social Media Databases
Database Distribution
Report Writing
Introduction to Customer Service Management
Computing Databases
Database Inputs
Form Development

Reference:

1. Korth, Slberchatz, Sudarshan:"Database System Concepts", 6th Edition, McGraw – Hill
2. Elmasri and Navathe: "Fundamentals of Database Systems", 5thEdition, PEARSON Education.
3. Peter Rob and Carlos Coronel: "Database Systems Design, Implementation and Management", Thomson Learning, 5th Edition.

Practicals

(1 Hour per week X 15 Weeks = 15 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

SDF 520

COMPUTER NETWORKS & SECURITY FUNDAMENTALS

Credits: 4 (60 Hours)

(3 Hours of Theory and 1 Hour of Practical per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Deliberate the details of OSI model
CO2. Learn the details of Switches
CO3. Understand the details of Protocols and services
CO4. Identify in depth Security
CO5. Learn in depth Encryption
CO6. Specify the details of E-mail and server protection

Unit 1 **15 Hours**

COMPUTER NETWORKS
Network Infrastructure - Internet, intranet, and extranet.
Understand the OSI model.
TCP/IP
Local area networks (LANs), Wide area networks (WANs).
Network topologies and access methods
Network Hardware - switches.

Unit 2 **15 Hours**

Routers, media types
Protocols and Services
Understand IPv4 & IPv6.
Addressing names resolution & networking services.
SECURITY
Understanding Security Layers Principles, Physical, Wireless, Internet & Operating System Security

Unit 3 **15 Hours**

User authentication, permissions, password, audit policies, encryption, malware,
Network Security & dedicated firewalls.
Network Access Protection (NAP), network isolation, Protocol security, client, e-mail & server protection

Reference:

1. Fundamentals of Computer Networks Kindle Edition by SUDAKSHINA KUNDU
2. Introduction to Computer and Network Security Hardcover – 21 Aug 2013 by Richard R. Brooks

Practicals

(1 Hour per week X 15 Weeks = 15 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

QUESTION PAPER SCHEME

JSS MAHAVIDYAPEETHA
JSS College of Arts, Commerce & Science
(Autonomous)
Ooty Road, Mysore - 570 025
Title of the paper with code

Time: 3 Hours **Max Marks: 70**

Part – A

I Answer any five Questions (out of six) 2x5=10

a)

b)

c)

d)

e)

f)

Part – B

Answer any two questions from each main

II a) 2x5=10

b)

c)

III a) 2x5=10

b)

c)

IV a) 2x5=10

b)

c)

Part – C

Answer any one question from each main

V	a)		1x10=10
	Or		
	b)		
VI	a)		1x10=10
	Or		
	b)		
VII	a)		1x10=10
	Or		
	b)		

Question numbers V, VI and VII internal split-up (5+5, 7+3, 2+8 etc.)

QUESTION PAPER SCHEME

TIME: 3 Hrs **MAX MARKS: 70**

Instructions to Students: All sections are compulsory.

SECTION A

I Fill in the blanks with correct form of verbs 5 X 1 = 05

a)
b)
c)
d)
e)

II Change the voice of the following sentences 5 X 1 = 05

a)
b)
c)
d)
e)

III Fill in the blanks with suitable article 5 X 1 = 05

a)
b)
c)
d)
e)

IV Change the speech of the following 5 X 1 = 05

a)
b)
c)
d)
e)

V Add question tag to the following 5 X 1 = 05

a)
b)
c)
d)
e)

VI Frame questions so as to get the underlined words as answers 5 X 1 = 05

a)
b)
c)
d)
e)

SECTION B

VII 10 X 1 = 10

1. Write a letter of application
   Or
2. Prepare a Resume.

VIII Read the following essay carefully and answer the questions. 10 X 1 = 10

a)
b)
c)
d)
e)

IX Write an essay on one of the following: 10 X 1 = 10

a)
b)
c)

X Answer the following (Dialogue writing) 5 X 2 = 10

1)
2)

QUESTION PAPER PATTERN

Section A

Q1: Six questions of two marks each .Five questions to be answered $5 \times 2 = 10$

1.
2.
3.
4.
5.
6.

Section B

Answer any four questions from each main. Each main carries 20 marks 3 X 20 = 60

Q2: Five sub questions of 5 marks each from unit 1

Q3: Five sub questions of 5 marks each from unit 2

Q4: Five sub questions of 5 marks each from unit 3

Skill Component Syllabus

Model Curriculum

JUNIOR SOFTWARE DEVELOPER

JUNIOR SOFTWARE DEVELOPER

SECTOR:	**IT-ITeS**
SUB-SECTOR:	**IT Services**
OCCUPATION:	**Application Development**
REFERENCE ID:	**SSC/Q0508, version 1.0**
NSQF LEVEL:	**4**

IT - ITeS SSC NASSCOM

N·S·D·C National Skill Development Corporation
Transforming the skill landscape

Table of Contents

Junior Software Developer

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of **Junior Software Developer** in the **IT-ITeS** Sector/Industry and aims at building the following key competencies in the learner.

Program Name	**Junior Software Developer**		
Qualification Pack Name & Reference ID.	Junior Software Developer SSC/Q0508, version 1.0		
Version No.	1.0	**Version Update Date**	31/12/2015
Pre-requisites to Training	10th Standard		
Training Outcomes	**After completing this programme, participants will be able to:** • assist in performing software construction and software testing entry-level tasks in the IT Services industry • manage work to meet requirements • maintain a healthy, safe and secure working environment		

The Course encompasses all six National Occupational Standards (NOS) of **Junior Software Developer SSC/Q0508** Qualification Pack issued by **IT-ITeS Sector Skills Council NASSCOM**.

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
1	Basics of IT	05:00	15:00	Candidates will be able to: • Demonstrate basic computer and internet literacy including operating a computer, describing its major components and how they work, using Windows and Linux OS, operating a browser, searching the internet, managing mails and using social internet media.	SSC/N0506	Refer to Unique Equipment Required section
2	Problem Solving and Program Design	30:00	60:00	Candidates will be able to: • Demonstrate aptitude for analysing information and making logical conclusions.	SSC/N0506	Refer to Unique Equipment Required section

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
				• Demonstrate knowledge of the foundational mathematical concepts in computing.		
3	Basic Algorithms and Application Development	30:00	60:00	Candidates will be able to: • Design algorithms to solve problems and convert them into code using the appropriate programming language constructs. • Read and execute a test case and record the outcome in the appropriate template. • Communicate effectively with appropriate people w.r.t. assigned roles in simple English – both oral and written.	SSC/N0506	Refer to Unique Equipment Required section
4	Self and work Management	30:00	70:00	Candidates will be able to: • Establish and agree work requirements with appropriate people • Keep immediate work area clean and tidy • Utilize time effectively • Use resources correctly and efficiently • Treat confidential information correctly • Work in line with organization's policies and procedures • Work within the limits of job role • Obtain guidance from appropriate people, where necessary • Ensure work meets the agreed requirements	SSC/N9001	Refer to Unique Equipment Required section
5	Team Work and Communication	12:00	38:00	Candidates will be able to: • Obtain guidance from appropriate people to agree the analysis to be performed on the data • Obtain advice and guidance from appropriate people on issues with data analysis	SSC/N9002	Refer to Unique Equipment Required Section

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
				outside their area of competence or • Review the results of their analysis with appropriate people • Undertake modifications to your analysis based on inputs from appropriate people • Communicate with colleagues clearly, concisely and accurately • Work with colleagues to integrate their work effectively with them • Pass on essential information to colleagues in line with organizational requirements • Work in ways that show respect for colleagues • Carry out commitments they have made to colleagues • Let colleagues know in good time if they cannot carry out your commitments, explaining the reasons • Identify any problems they have working with colleagues and take the initiative to solve these problems • Follow the organization's policies and procedures for working with colleagues		
6	Managing Health and Safety	12:00	38:00	Candidates will be able to: • Comply with organization's current health, safety and security policies and procedures • Report any identified breaches in health, safety, and security policies and procedures to the designated person • Identify and correct any hazards that can deal with	SSC/N9003	Refer to Unique Equipment Required section

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
				safely, competently and within the limits of authority • Report any hazards that one is not competent to deal with to the relevant person in line with organizational procedures and warn other people who may be affected • Follow their organization's emergency procedures promptly, calmly, and efficiently • Identify and recommend opportunities for improving health, safety, and security to the designated person • Complete any health and safety records legibly and accurately		
7	Data and Information Management	15:00	35:00	Candidates will be able to: • Establish and agree with appropriate people the data/information they need to provide, the formats in which you need to provide it, and when they need to provide it • Obtain the data/information from reliable sources • Check that the data/information is accurate, complete and up-to-date • Obtain advice or guidance from appropriate people where there are problems with the data/information • Carry out rule-based analysis of the data/information, if required • Insert the data/information into the agreed formats • Check the accuracy of work, involving colleagues where required • Report any unresolved anomalies in the	SSC/N9004	Refer to Unique Equipment Required Section

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
				data/information to appropriate people • Provide complete, accurate and up-to-date data/information to the appropriate people in the required formats on time		
8	Learning and Self Development	05:00	20:00	Candidates will be able to: • Obtain advice and guidance from appropriate people to develop your knowledge, skills and competence • Identify accurately the knowledge and skills they need for your job role • Identify accurately their current level of knowledge, skills and competence and any learning and development needs • Agree with appropriate people a plan of learning and development activities to address their learning needs • Undertake learning and development activities in line with their plan • Apply new knowledge and skills in the workplace, under supervision • Obtain feedback from appropriate people on their knowledge and skills and how effectively you apply them • Review their knowledge, skills and competence regularly and take appropriate action	SSC/N9005	Refer to Unique Equipment Required Section
	Total Duration:	**114:00**	**286:00**	**Unique Equipment Required:** Training room should be fully furnished with the following equipment / tools / accessories. Additional / specific resources, wherever applicable (e.g. Hardware, software) are indicated in the main text corresponding to relevant learning outcome.		

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
				For Domain NOS, For NOS SSC/N0506 – HTML, C++ / Java, IDE General: • Comfortable seats with adequate lighting, controlled temperature and acoustics for training and learning • White Board, Markers and Eraser • Projector with screen • Flip chart with markers • Faculty's PC/Laptop with latest configuration and internet connection • Supporting software / applications for projecting audio, video, recording, • Presentation Tools to support learning activities: • Intranet • Email • IMs • Learning management system e.g. Moodle, Blackboard to enable blended learning • Microphone / voice system for lecture and class activities • Handy Camera • Stationery kit – Staples, Glue, Chart Paper, Sketch Pens, Paint Box, Scale, A4 Sheets • For IT Lab sessions: Computer Lab with 1:1 PC : trainee ratio and having internet connection, MS Office / Open office, Browser, Outlook / Any other Email Client and chat tools. • Assessment and Test Tools for day to day online Tests and Assessments • For team discussions: Adequate seating arrangement in full / half circle format for one or more teams as per planned team composition. • Reading Resources: Access to relevant sample documents and learning forums to enable self-study before and after each training session.		

Grand Total Course Duration: **400 Hours 0 Minutes**

*(This Syllabus/Curriculum has been approved by **IT-ITeS Sector Skills Council NASSCOM**.)*

Notes from IT-ITeS Sector Skills Council NASSCOM

1. This document outlines the broad scope of coverage. This should be linked with OBF and training delivery plan. OBF (Outcome based framework) reflects the pedagogy used to ensure an expected outcome. Training delivery plan focuses on the sequence of delivery.
2. Though many NOSs have some seemingly common outcomes, notably core/generic, professional and technical skills, it is imperative to understand the contextual difference between them. For example, writing skills required to document program structure and code (in SSC/N0506) are different from the writing skills required to prepare a time plan (in SSC/N9001). Training providers are advised to,
    a. Embed such skills development in the learning pedagogy for each expected outcome
    b. Prepare a detailed session plan for training delivery with focus on sequence and duration of training
    c. Run a diagnostic test to assess prior learning of students and help trainers / students identify the need for gap training, optimal duration and suitable training methodology. Accordingly, more introductory level sessions may be included in guided or self-paced mode of learning. E.g. adding some sessions on Functional English or Use of Internet and MS Office.

Annexure1: Assessment Criteria

Assessment Criteria for Junior Software Developer	
Job Role	**Junior Software Developer**
Qualification Pack	**SSC/Q0508**
Sector Skill Council	**IT-ITeS**

Sr. No.	Guidelines for Assessment
1	Criteria for assessment for each Qualification Pack (QP) will be created by the Sector Skill Council (SSC). Each performance criteria (PC) will be assigned Theory and Skill/Practical marks proportional to its importance in NOS.
2	The assessment will be conducted online through assessment providers authorised by SSC.
3	Format of questions will include a variety of styles suitable to the PC being tested such as multiple choice questions, fill in the blanks, situational judgment test, simulation and programming test.
4	To pass a QP, a trainee should pass each individual NOS. Standard passing criteria for each NOS is 70%.
5	For latest details on the assessment criteria, please visit www.sscnasscom.com.

				MARKS ALLOCATION	
ASSESSMENT OUTCOME (NOS CODE AND DESCRIPTION)	**Assessment criteria** (PC)	**Total Marks**	**Out Of**	**Theory**	**Skills Practical**
1.SSC/N0506 (Deal remotely with customer queries - Domestic)	PC1. greet customers and verify details, following your organization's procedures	**120**	12.5	2.5	10
	PC2. read carefully, summarize, and obtain **customer** confirmation of, your understanding of queries		12.5	2.5	10
	PC3. express your concern for any difficulties caused and your commitment to resolving queries		15	0	15
	PC4. record and categorize queries accurately using your organization's query management tool		5	0	5
	PC5. refer queries outside your area of competence or authority promptly to appropriate people		2.5	0	2.5
	PC6. access your organization's knowledge base for solutions to queries, where available		2.5	0	2.5
	PC7. resolve queries within your area of competence or authority in line with organizational guidelines and service level agreements (SLAs)		15	0	15
	PC8. obtain advice and guidance from appropriate people, where necessary		2.5	0	2.5
	PC9. obtain confirmation from **c**ustomers that queries have been resolved to satisfaction		10	0	10

	PC10. record the resolution of queries accurately using your organization's query management tool		35	15	20
	PC11. comply with relevant standards, policies, procedures and guidelines when dealing remotely with customer queries		7.5	0	7.5
		NOS Total	**120**	**20**	**100**
2.SSC/N9001 (Manage your work to meet requirements)	PC1. establish and agree your work requirements with appropriate people	**40**	10	5	5
	PC2. keep your immediate work area clean and tidy		5	0	5
	PC3. utilize your time effectively		5	5	0
	PC4. use resources correctly and efficiently		5	2.5	2.5
	PC5. treat confidential information correctly		5	0	5
	PC6. work in line with your organization's policies and procedures		2.5	0	2.5
	PC7. work within the limits of your job role		2.5	0	2.5
	PC8. obtain guidance from appropriate people, where necessary		2.5	0	2.5
	PC9. ensure your work meets the agreed requirements		2.5	0	2.5
		NOS Total	**40**	**12.5**	**27.5**
3.SSC/N9003 (Maintain a healthy, safe and secure working environment)	PC1. comply with your organization's current health, safety and security policies and procedures	**40**	10	5	5
	PC2. report any identified breaches in health, safety, and security policies and procedures to the designated person		5	0	5
	PC3. identify and correct any hazards that you can deal with safely, competently and within the limits of your authority		10	5	5
	PC4. report any hazards that you are not competent to deal with to the relevant person in line with organizational procedures and warn other people who may be affected		5	0	5
	PC5. follow your organization's emergency procedures promptly, calmly, and efficiently		5	0	5
	PC6. identify and recommend opportunities for improving health, safety, and security to the designated person		2.5	0	2.5
	PC7. complete any health and safety records legibly and accurately		2.5	0	2.5
		NOS Total	**40**	**10**	**30**

Annexure2: Trainer Prerequisites for Job role: Junior Software Developer mapped to Qualification Pack: SSC/Q0508

Sr. No.	Area	Details
1	**Job Description**	To deliver accredited training service, mapping to the curriculum detailed above, in accordance with the Qualification Pack SSC/Q0508.
2	**Personal Attributes**	Aptitude for conducting training, and pre/ post work to ensure competent, employable candidates at the end of the training. Strong communication skills, interpersonal skills, ability to work as part of a team; a passion for quality and for developing others; well-organised and focused, eager to learn and keep oneself updated with the latest in this field.
3	**Minimum Educational Qualifications**	Minimum 12th Standard; Preferred Master's degree in any discipline
4a	**Domain Certification**	Minimum accepted score in SSC Assessment is 90% per NOS being taught in QP SSC/Q0508. Additional certification in customer orientation, dealing with difficult customers, written communication etc. will be an added advantage.
4b	**Platform Certification**	Recommended that the Trainer is certified for the Job Role: "Trainer" mapped to the Qualification Pack: "SSC/Q1402". Minimum accepted score is 70% per NOS.
5	**Experience**	Field experience: Minimum 2 years' experience in the same domain Training experience: 1 year preferred

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

IT - ITeS SSC
NASSCOM

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Model Curriculum

WEB DEVELOPER

WEB DEVELOPER

SECTOR: **IT-ITeS**
SUB-SECTOR: **IT Services**
OCCUPATION: **Application Development**
REFERENCE ID: **SSC/Q0503, version 1.0**
NSQF LEVEL: **5**

IT - ITeS SSC NASSCOM

N·S·D·C National Skill Development Corporation
Transforming the skill landscape

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Web Developer

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of **Web Developer** in the **IT-ITeS** Sector/Industry and aims at building the following key competencies in the learner.

Program Name	**Web Developer**		
Qualification Pack Name & Reference ID.	Web Developer SSC/Q0503, version 1.0		
Version No.	1.0	**Version Update Date**	31/12/2015
Pre-requisites to Training	Graduate degree/ diploma in web design/ media design or any other related field		
Training Outcomes	**After completing this programme, participants will be able to:** • Contribute to the design of software products and applications • Develop media content and graphic designs for software products and Applications • Manage their work to meet requirements • Work effectively with colleagues • Maintain a healthy, safe and secure working environment • Provide data/information in standard formats • Develop their knowledge, skills and competence		

The Course encompasses all seven National Occupational Standards (NOS) of **Web Developer SSC/Q0503** Qualification Pack issued by **IT-ITeS Sector Skills Council NASSCOM**.

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
1	Programming for the Web	20:00	30:00	Candidates will be able to: • Design basic programming structures to implement functionality in line with requirements defined in BRS/URS, SRS and HLD	SSC/N0501	Refer to Unique Equipment Required Section
2	Analysis and Design of Web based Applications	20:00	30:00	Candidates will be able to: • Check their understanding of the Business Requirements Specification (BRS)/User	SSC/N0501	Refer to Unique Equipment Required Section

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
				Requirements Specification (URS) with appropriate people • Check their understanding of the Software Requirements Specification (SRS) with appropriate people • Check their understanding of High Level Design (HLD) with appropriate people • Review their designs with appropriate people • Analyse inputs from appropriate people to identify, resolve and record design defects and inform future designs • Document their designs using standard templates and tools • Comply with their organization's policies, procedures and guidelines when contributing to the design of software products and applications		
3	Media Content and Graphics Design	20:00	80:00	Candidates will be able to: • Check their understanding of the Business Requirements Specification (BRS), Software Requirements Specification (SRS), High Level Design (HLD) and Low Level Design (LLD) with appropriate people • Access reusable components, media and graphical packages and tools from their organization's knowledge base	SSC/N0503	Refer to Unique Equipment Required Section

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
				• Convert requirements into media content and graphic designs, leveraging reusable components where available • Review media content and graphic designs with appropriate people and analyze their feedback • Record any defects and corrective actions taken to inform future work • Rework media content and graphic designs, incorporating feedback • Submit media content timely and graphic designs for approval by appropriate people • Update their organization's knowledge base with their experiences of the media content and graphic designs developed • Comply with their organization's policies, procedures and guidelines when developing media content and graphic designs for software products and applications		
4	Self and work Management	12:00	38:00	Candidates will be able to: • Establish and agree their work requirements with appropriate people • Keep their immediate work area clean and tidy • utilize their time effectively	SSC/N9001	Refer to Unique Equipment Required Section

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
				• Use resources correctly and efficiently • Treat confidential information correctly • Work in line with organization's policies and procedures • Work within the limits of their job role • Obtain guidance from appropriate people, where necessary • Ensure their work meets the agreed requirements		
5	Team Work and Communication	12:00	38:00	Candidates will be able to: • Communicate with colleagues clearly, concisely and accurately • Work with colleagues to integrate their work effectively with them • Pass on essential information to colleagues in line with organizational requirements • Work in ways that show respect for colleagues • carry out commitments they have made to colleagues • Let colleagues know in good time if they cannot carry out their commitments, explaining the reasons • Identify any problems they have working with colleagues and take the initiative to solve these problems • Follow the organization's policies and procedures for working with colleagues	SSC/N9002	Refer to Unique Equipment Required Section

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
6	Managing Health and Safety	05:00	20:00	Candidates will be able to: • Comply with their organization's current health, safety and security policies and procedures • Report any identified breaches in health, safety, and security policies and procedures to the designated person • Identify and correct any hazards that they can deal with safely, competently and within the limits of their authority • Report any hazards that they are not competent to deal with to the relevant person in line with organizational procedures and warn other people who may be affected • Follow their organization's emergency procedures promptly, calmly, and efficiently • Identify and recommend opportunities for improving health, safety, and security to the designated person • Complete any health and safety	SSC/ N 9003	
7	Data and Information Management	15:00	35:00	Candidates will be able to: • Establish and agree with appropriate people the data/information they need to provide, the formats in which they need to provide it, and when they need to provide it	SSC/N9004	Refer to Unique Equipment Required Section

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
				• Obtain the data/information from reliable sources • Check that the data/information is accurate, complete and up-to-date • Obtain advice or guidance from appropriate people where there are problems with the data/information • Carry out rule-based analysis of the data/information, if required • Insert the data/information into the agreed formats • Check the accuracy of their work, involving colleagues where required • Report any unresolved anomalies in the data/information to appropriate people • Provide complete, accurate and up-to-date data/information to the appropriate people in the required formats on time		
8	Learning and Self Development	5:00	20:00	Candidates will be able to: • Obtain advice and guidance from appropriate people to develop their knowledge, skills and competence • Identify accurately the knowledge and skills they need for their job role • Identify accurately their current level of knowledge, skills and	SSC/N9005	Refer to Unique Equipment Required Section

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
				competence and any learning and development needs • Agree with appropriate people a plan of learning and development activities to address their learning needs • Undertake learning and development activities in line with their plan • Apply their new knowledge and skills in the workplace, under supervision • Obtain feedback from appropriate people on their knowledge and skills and how effectively they apply them • Review their knowledge, skills and competence regularly and take appropriate action		
	Total Duration:	**109:00**	**291:00**	**Unique Equipment Required**: Training room should be fully furnished with the following equipment / tools / accessories. Additional / specific resources, wherever applicable (e.g. Hardware, software) are indicated in the main text corresponding to relevant learning outcome. For Domain NOSs: • NOS SSC/N0501: HTML5, Javascript, CSS, SQL, Web Builder, Word Press, Joomla and modelling tools such as Visio, UML • NOS SSC/N0503: HTML5, CSS, Flash, Photoshop, Windows media player, Eclipse, XAMPP General: • Comfortable seats with adequate lighting, controlled temperature and acoustics for training and learning		

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required

				• White Board, Markers and Eraser
				• Projector with screen
				• Flip chart with markers
				• Faculty's PC/Laptop with latest configuration and internet connection
				• Supporting software / applications for projecting audio, video, recording,
				• Presentation Tools to support learning activities:
				  ○ Intranet
				  ○ Email
				  ○ IMs
				  ○ Learning management system e.g. Moodle, Blackboard to enable blended learning
				• Microphone / voice system for lecture and class activities
				• Handy Camera
				• Stationery kit – Staples, Glue, Chart Paper, Sketch Pens, Paint Box, Scale, A4 Sheets
				• For IT Lab sessions: Computer Lab with 1:1 PC:trainee ratio and having internet connection, MS Office / Open office, Browser, Outlook/ other Email Clients
				• Assessment and Test Tools for day to day online Tests and Assessments
				• For team discussions: Adequate seating arrangement in full / half circle format for one or more teams as per planned team composition.
				• Reading Resources: Access to relevant sample documents and learning forums to enable self-study before and after each training session.		

Grand Total Course Duration: **400 Hours 0 Minutes**

*(This Syllabus/Curriculum has been approved by **IT-ITeS Sector Skills Council NASSCOM**.)*

Notes from IT-ITeS Sector Skills Council

1. This document outlines the broad scope of coverage. This should be linked with OBF and training delivery plan. OBF (Outcome based framework) reflects the pedagogy used to ensure an expected outcome. Training delivery plan focuses on the sequence of delivery.
2. Though many NOSs have some seemingly common outcomes, notably core/generic, professional and technical skills, it is imperative to understand the contextual difference between them. For example, writing skills required write design specifications (in SSC/N0501) are different from the writing skills required to prepare a time plan (in SSC/N9001). Training providers are advised to,
    a. Embed such skills development in the learning pedagogy for each expected outcome
    b. Prepare a detailed session plan for training delivery with focus on sequence and duration of training
    c. Run a diagnostic test to assess prior learning of students and help trainers / students identify the need for gap training, optimal duration, and suitable training methodology. Accordingly, more introductory level sessions may be included in guided or self-paced mode of learning. E.g. adding some sessions on Functional English or Use of Internet and MS Office.

Annexure 1: Assessment Criteria

Assessment Criteria for Web Developer	
Job Role	**Web Developer**
Qualification Pack	**SSC/Q0503**
Sector Skill Council	**IT-ITeS**

Sr. No.	Guidelines for Assessment
1	Criteria for assessment for each Qualification Pack (QP) will be created by the Sector Skill Council (SSC). Each performance criteria (PC) will be assigned Theory and Skill/Practical marks proportional to its importance in NOS.
2	The assessment will be conducted online through assessment providers authorised by SSC.
3	Format of questions will include a variety of styles suitable to the PC being tested such as multiple choice questions, fill in the blanks, situational judgment test, simulation and programming test.
4	To pass a QP, a trainee should pass each individual NOS. Standard passing criteria for each NOS is 70%.
5	For latest details on the assessment criteria, please visit www.sscnasscom.com.

				MARKS ALLOCATION	
ASSESSMENT OUTCOME (NOS CODE AND DESCRIPTION)	**ASSESSMENT CRITERIA** (PC)	**TOTAL MARKS**	**OUT OF**	**THEORY**	**SKILLS PRACTICAL**
1. SSC/N0501 (Contribute to the design of software products and applications)	PC1. check their understanding of the Business Requirements Specification (BRS)/User Requirements Specification (URS) with appropriate people	**100**	10	10	0
	PC2. check their understanding of the Software Requirements Specification (SRS) with appropriate people		10	10	0
	PC3. check their understanding of High Level Design (HLD) with appropriate people		10	10	0
	PC4. design basic programming structures to implement functionality in line with requirements defined in BRS/URS, SRS and HLD		30	0	30
	PC5. review their designs with appropriate people		5	5	0
	PC6. analyze inputs from appropriate people to identify, resolve and record design defects and inform future designs		15	5	10
	PC7. document their designs using standard templates and tools		10	0	10
	PC8. comply with their organization's policies, procedures and guidelines when contributing to the design of software products and applications		10	0	10
		Total	100	40	60
2. SSC/N0503 (Develop media	PC1. check their understanding of the Business Requirements Specification (BRS), Software	**100**	10	10	0

content and graphic designs for software products and Applications)	Requirements Specification (SRS), High Level Design (HLD) and Low Level Design (LLD) with appropriate people				
	PC2. access reusable components, media and graphical packages and tools from their organization's knowledge base		10	0	10
	PC3. convert requirements into media content and graphic designs, leveraging reusable components where available		20	0	20
	PC4. review media content and graphic designs with appropriate people and analyze their feedback		10	5	5
	PC5. record any defects and corrective actions taken to inform future work		10	0	10
	PC6. rework media content and graphic designs, incorporating feedback		10	5	5
	PC7. submit media content and graphic designs for approval by appropriate people		10	0	10
	PC8. update their organization's knowledge base with their experiences of the media content and graphic designs developed		10	0	10
	PC9. comply with their organization's policies, procedures and guidelines when developing media content and graphic designs for software products and applications		10	0	10
		Total	100	20	80
3.SSC/N9001 (Manage their work to meet requirements)	PC1. establish and agree their work requirements with appropriate people		7.5	0	7.5
	PC2. keep their immediate work area clean and tidy		15	7.5	7.5
	PC3. utilize their time effectively		15	7.5	7.5
	PC4. use resources correctly and efficiently		15	7.5	7.5
	PC5. treat confidential information correctly	**100**	7.5	0	7.5
	PC6. work in line with their organization's policies and procedures		15	0	15
	PC7. work within the limits of their job role		7.5	0	7.5
	PC8. obtain guidance from appropriate people, where necessary		7.5	0	7.5
	PC9. ensure their work meets the agreed requirements		10	0	10
		Total	100	22.5	77.5
4.SSC/N9002 (Work effectively with colleagues)	PC1. communicate with colleagues clearly, concisely and accurately	**100**	20	0	20
	PC2. work with colleagues to integrate their work effectively with theirs		10	0	10

	PC3. pass on essential information to colleagues in line with organizational requirements		10	10	0
	PC4. work in ways that show respect for colleagues		20	0	20
	PC5. carry out commitments you have made to colleagues		10	0	10
	PC6. let colleagues know in good time if you cannot carry out their commitments, explaining the reasons		10	10	0
	PC7. identify any problems you have working with colleagues and take the initiative to solve these problems		10	0	10
	PC8. follow the organization's policies and procedures for working with colleagues		10	0	10
		Total	100	20	80
5.SSC/N9003 (Maintain a healthy, safe and secure working environment)	PC1. comply with their organization's current health, safety and security policies and procedures	**100**	20	10	10
	PC2. report any identified breaches in health, safety, and security policies and procedures to the designated person		10	0	10
	PC3. identify and correct any hazards that you can deal with safely, competently and within the limits of their authority		20	10	10
	PC4. report any hazards that you are not competent to deal with to the relevant person in line with organizational procedures and warn other people who may be affected		10	0	10
	PC5. follow their organization's emergency procedures promptly, calmly, and efficiently		20	10	10
	PC6. identify and recommend opportunities for improving health, safety, and security to the designated person		10	0	10
	PC7. complete any health and safety records legibly and accurately		10	0	10
		Total	100	30	70
6.SSC/N9004 (Provide data/information in standard formats)	PC1. establish and agree with appropriate people the data/information you need to provide, the formats in which you need to provide it, and when you need to provide it	**100**	15	15	0
	PC2. obtain the data/information from reliable sources		15	0	15
	PC3. check that the data/information is accurate, complete and up-to-date		15	5	10
	PC4. obtain advice or guidance from appropriate people where there are problems with the data/information		5	5	0
	PC5. carry out rule-based analysis of the data/information, if required		20	0	20

	PC6. insert the data/information into the agreed formats		10	0	10
	PC7. check the accuracy of their work, involving colleagues where required		10	0	10
	PC8. report any unresolved anomalies in the data/information to appropriate people		5	5	0
	PC9. provide complete, accurate and up-to-date data/information to the appropriate people in the required formats on time		5	0	5
		Total	100	30	70
7.SSC/N9005 (Develop their knowledge, skills and competence)	PC1. obtain advice and guidance from appropriate people to develop their knowledge, skills and competence		20	7	13
	PC2. identify accurately the knowledge and skills you need for their job role		14	7	7
	PC3. identify accurately their current level of knowledge, skills and competence and any learning and development needs		14	0	14
	PC4. agree with appropriate people a plan of learning and development activities to address their learning needs	**100**	7	0	7
	PC5. undertake learning and development activities in line with their plan		12	0	12
	PC6. apply their new knowledge and skills in the workplace, under supervision		12	0	12
	PC7. obtain feedback from appropriate people on their knowledge and skills and how effectively you apply them		7	0	7
	PC8. review their knowledge, skills and competence regularly and take appropriate action		14	7	7
		Total	100	21	79

Annexure 2: Trainer Prerequisites for Job role: Web Developer mapped to Qualification Pack: SSC/Q0503

Sr. No.	Area	Details
1	**Job Description**	To deliver accredited training service, mapping to the curriculum detailed above, in accordance with the Qualification Pack SSC/Q0503.
2	**Personal Attributes**	Aptitude for conducting training, and pre/ post work to ensure competent, employable candidates at the end of the training. Strong communication skills, interpersonal skills, ability to work as part of a team; a passion for quality and for developing others; well-organised and focused, eager to learn and keep oneself updated with the latest in this field.
3	**Minimum Educational Qualifications**	Minimum Graduate degree/ diploma in web design/ media design or any other related field; Preferred Master's Degree in Media Design
4a	**Domain Certification**	Minimum accepted score in SSC Assessment is 90% per NOS being taught in QP SSC/Q0503. Certification in relevant software competencies: Software Development Certifications in C++, Embedded, C#, C, Java etc., is an added advantage.
4b	**Platform Certification**	Recommended that the Trainer is certified for the Job Role: "Trainer" mapped to the Qualification Pack: "SSC/1402". Minimum accepted score is 70%.
5	**Experience**	Field experience: Minimum 2 years' experience in the same domain Training experience: 1 year preferred

Certificate

CURRICULUM COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

IT-ITES SECTOR SKILLS COUNCIL NASSCOM

for the

MODEL CURRICULUM

Complying to National Occupational Standards of
Job Role/ Qualification Pack: 'Web Developer' QP No. 'SSC/Q0503 NSQF Level 5'

Date of issuance: December 31st, 2015

Valid up to*: December 31st, 2016

* Valid up to the next review date of the Qualification Pack

Authorised Signatory
Lakshmi Narayan
(Chairman, IT-ITeS Sector Skills Council NASSCOM)

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Model Curriculum

Software Developer

SECTOR: IT-ITES
SUB-SECTOR: IT SERVICES
OCCUPATION: DATA SCIENTISTS
REF. ID: SSC/Q0401, VERSION 1.0
NSQF LEVEL: 7

Skill India

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Certificate

CURRICULUM COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

IT-ITES SECTOR SKILLS COUNCIL NASSCOM

for the

MODEL CURRICULUM

Complying to National Occupational Standards of
Job Role/ Qualification Pack: '**Software Developer**' QP No. '**SSC/Q0501 NSQF Level 7**'

Date of issuance: December 31st, 2015

Valid up to*: December 31st, 2018

* Valid up to the next review date of the Qualification Pack

Authorised Signatory
Lakshmi Narayan
(Chairman, IT-ITeS Sector Skills Council NASSCOM)

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Software Developer

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of **Software Developer** in the **IT-ITeS** Sector/Industry and aims at building the following key competencies in the learner.

Program Name	**Software Developer**		
Qualification Pack Name & Reference ID.	Software Developer SSC/Q0501, version 1.0		
Version No.	1.0	**Version Update Date**	31/12/2015
Pre-requisites to Training	BSc (Stat, Math, Physics, Chemistry, Geology) or BE/ BTech		
Training Outcomes	**After completing this programme, participants will be able to:** • Contribute to the design of software products and applications • Develop software code to specification • Manage their work to meet requirements • Work effectively with colleagues • Maintain a healthy, safe and secure working environment • Provide data/information in standard formats • Develop their knowledge, skills and competence		

The Course encompasses all seven National Occupational Standards (NOS) of Software Developer SSC/Q0501 Qualification Pack issued by IT-ITeS Sector Skills Council NASSCOM.

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1	**Programming and Algorithms** **Theory Duration** (hh:mm) 20:00 **Practical Duration** (hh:mm) 30:00 **Corresponding NOS Code** SSC/N0501	Candidates will be able to: • Design basic programming structures to implement functionality in line with requirements defined in BRS/URS, SRS and HLD	Refer to Unique Equipment Required Section
2	**Analysis and Design of Software Applications** **Theory Duration** (hh:mm) 20:00 **Practical Duration** (hh:mm) 30:00 **Corresponding NOS Code** SSC/N0501	Candidates will be able to: • Check their understanding of the Business Requirements Specification (BRS)/User Requirements Specification (URS) with appropriate people • Check their understanding of the Software Requirements Specification (SRS) with appropriate people • Check their understanding of High Level Design (HLD) with appropriate people • Review their designs with appropriate people • Analyse inputs from appropriate people to identify, resolve and record design defects and inform future designs • Document designs using standard templates and tools • Comply with organization's policies, procedures and guidelines when contributing to the design of software products and applications	Refer to Unique Equipment Required Section
3	**Application Development** **Theory Duration** (hh:mm) 20:00 **Practical Duration** (hh:mm) 80:00 **Corresponding NOS Code** SSC/N0502	Candidates will be able to: • Check their understanding of the Business Requirements Specification (BRS), Software Requirements Specification (SRS), High Level Design (HLD) and Low Level Design (LLD) with appropriate people • Access reusable components, code generation tools and unit testing tools from their organization's knowledge base • Convert technical specifications into code to meet the requirements, leveraging reusable components, where available • Create appropriate unit test cases (UTCs) • Review codes and UTCs with appropriate people • Execute UTCs and document results • Rework the code and UTCs to fix identified defects	Refer to Unique Equipment Required Section

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		• Analyse inputs from appropriate people to inform future designs • Record corrective actions for identified defects to inform future designs • Submit tested code timely for approval by appropriate people • Update their organization's knowledge base with their experiences of the code developed • Comply with their organization's policies, procedures and guidelines when developing software code to specification	
4	**Self and work Management** **Theory Duration** (hh:mm) 12:00 **Practical Duration** (hh:mm) 38:00 **Corresponding NOS Code** SSC/N9001	Candidates will be able to: • Establish and agree their work requirements with appropriate people • Keep their immediate work area clean and tidy • utilize their time effectively • Use resources correctly and efficiently • Treat confidential information correctly • Work in line with organization's policies and procedures • Work within the limits of their job role • Obtain guidance from appropriate people, where necessary • Ensure their work meets the agreed requirements	Refer to Unique Equipment Required Section
5	**Team Work and Communication** **Theory Duration** (hh:mm) 12:00 **Practical Duration** (hh:mm) 38:00 **Corresponding NOS Code** SSC/N9002	Candidates will be able to: • Communicate with colleagues clearly, concisely and accurately • Work with colleagues to integrate their work effectively with them • Pass on essential information to colleagues in line with organizational requirements • Work in ways that show respect for colleagues • carry out commitments they have made to colleagues • Let colleagues know in good time if they cannot carry out their commitments, explaining the reasons • Identify any problems they have working with colleagues and take the initiative to solve these problems • Follow the organization's policies and procedures for working with colleagues	Refer to Unique Equipment Required Section
6	**Managing Health and Safety** **Theory Duration** (hh:mm) 05:00	Candidates will be able to: • Comply with their organization's current health, safety and security policies and procedures • Report any identified breaches in health, safety, and security policies and procedures to the designated person • Identify and correct any hazards that they can deal	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Practical Duration (hh:mm) 20:00 **Corresponding NOS Code** SSC/ N 9003	with safely, competently and within the limits of their authority • Report any hazards that they are not competent to deal with to the relevant person in line with organizational procedures and warn other people who may be affected • Follow their organization's emergency procedures promptly, calmly, and efficiently • Identify and recommend opportunities for improving health, safety, and security to the designated person • Complete any health and safety	
7	**Data and Information Management** **Theory Duration** (hh:mm) 15:00 **Practical Duration** (hh:mm) 35:00 **Corresponding NOS Code** SSC/N9004	Candidates will be able to: • Establish and agree with appropriate people the data/information they need to provide, the formats in which they need to provide it, and when they need to provide it • Obtain the data/information from reliable sources • Check that the data/information is accurate, complete and up-to-date • Obtain advice or guidance from appropriate people where there are problems with the data/information • Carry out rule-based analysis of the data/information, if required • Insert the data/information into the agreed formats • Check the accuracy of their work, involving colleagues where required • Report any unresolved anomalies in the data/information to appropriate people • Provide complete, accurate and up-to-date data/information to the appropriate people in the required formats on time	Refer to Unique Equipment Required Section
8	**Learning and Self Development** **Theory Duration** (hh:mm) 05:00 **Practical Duration** (hh:mm) 20:00 **Corresponding NOS Code** **SSC/N9005**	Candidates will be able to: • Obtain advice and guidance from appropriate people to develop their knowledge, skills and competence • Identify accurately the knowledge and skills they need for their job role • Identify accurately their current level of knowledge, skills and competence and any learning and development needs • Agree with appropriate people a plan of learning and development activities to address their learning needs • Undertake learning and development activities in line with their plan • Apply their new knowledge and skills in the workplace, under supervision • Obtain feedback from appropriate people on their	Refer to Unique Equipment Required Section

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		knowledge and skills and how effectively they apply them • Review their knowledge, skills and competence regularly and take appropriate action	
	Total Duration **Theory Duration** **109:00** **Practical Duration** **291:00**	**Unique Equipment Required:** Training room should be fully furnished with the following equipment / tools / accessories. Additional / specific resources, wherever applicable (e.g. Hardware, software) are indicated in the main text corresponding to relevant learning outcome. **For Domain NOSs:** • For NOS SSC/N0501: C/C++, UML tools such as Rational suite • For NOS SSC/N0502: JDK / Eclipse General: • Comfortable seats with adequate lighting, controlled temperature and acoustics for training and learning • White Board, Markers and Eraser • Projector with screen • Flip chart with markers • Faculty's PC/Laptop with latest configuration and internet connection • Supporting software / applications for projecting audio, video, recording, • **Presentation Tools to support learning activities:** o Intranet o Email o IMs o Learning management system e.g. Moodle, Blackboard to enable blended learning • Microphone / voice system for lecture and class activities • Handy Camera • Stationery kit – Staples, Glue, Chart Paper, Sketch Pens, Paint Box, Scale, A4 Sheets • For IT Lab sessions: Computer Lab with 1:1 PC: trainee ratio and having internet connection, MS Office / Open office, Browser, Outlook/ other Email Clients • Assessment and Test Tools for day to day online Tests and Assessments • For team discussions: Adequate seating arrangement in full / half circle format for one or more teams as per planned team composition. • Reading Resources: Access to relevant sample documents and learning forums to enable self-study before and after each training session.	

Grand Total Course Duration: 400 Hours 0 Minutes
(This Syllabus/Curriculum has been approved by IT-ITeS Sector Skills Council NASSCOM.)

Notes from IT-ITeS Sector Skills Council

1. This document outlines the broad scope of coverage. This should be linked with OBF and training delivery plan.OBF (Outcome based framework) reflects the pedagogy used to ensure an expected outcome. Training delivery plan focuses on the sequence of delivery.

2. Though many NOSs have some seemingly common outcomes, notably core/generic, professional and technical skills, it is imperative to understand the contextual difference between them. For example, writing skills required to communicate results of testing (in SSC/N0501) are different from the writing skills required to prepare a time plan (in SSC/N9001). Training providers are advised to,

    a. Embed such skills development in the learning pedagogy for each expected outcome
    b. Prepare a detailed session plan for training delivery with focus on sequence and duration of training
    c. Run a diagnostic test to assess prior learning of students and help trainers / students identify the need for gap training, optimal duration, and suitable training methodology. Accordingly, more introductory level sessions may be included in guided or self-paced mode of learning. E.g. adding some sessions on Functional English or Use of Internet and MS Office.

Trainer Prerequisites for Job role: Software Developer mapped to Qualification Pack: SSC/Q0501

Sr. No.	Area	Details
1	**Job Description**	To deliver accredited training service, mapping to the curriculum detailed above, in accordance with the Qualification Pack SSC/Q0501.
2	**Personal Attributes**	Aptitude for conducting training, and pre/ post work to ensure competent, employable candidates at the end of the training. Strong communication skills, interpersonal skills, ability to work as part of a team; a passion for quality and for developing others; well-organised and focused, eager to learn and keep oneself updated with the latest in this field.
3	**Minimum Educational Qualifications**	Minimum Bachelor's Degree in Computer Science or any related field; Preferred Master's Degree in Computer Science
4a	**Domain Certification**	Minimum accepted score in SSC Assessment is 90% per NOS being taught in QP SSC/Q0501. Certification in relevant software competencies: Software Development Certifications in C++, Embedded, C#, C, Java etc., is an added advantage.
4b	**Platform Certification**	Recommended that the Trainer is certified for the Job Role: "Trainer" mapped to the Qualification Pack: "SSC/Q1402". Minimum accepted score is 70%.
5	**Experience**	Field experience: Minimum 2 years' experience in the same domain Training experience: 1 year preferred

Annexure: Assessment Criteria

Assessment Criteria for Software Developer	
Job Role	Software Developer
Qualification Pack	SSC/Q0501
Sector Skill Council	IT-ITeS

Sr. No.	Guidelines for Assessment
1	Criteria for assessment for each Qualification Pack (QP) will be created by the Sector Skill Council (SSC). Each performance criteria (PC) will be assigned Theory and Skill/Practical marks proportional to its importance in NOS.
2	The assessment will be conducted online through assessment providers authorised by SSC.
3	Format of questions will include a variety of styles suitable to the PC being tested such as multiple choice questions, fill in the blanks, situational judgment test, simulation and programming test.
4	To pass a QP, a trainee should pass each individual NOS. Standard passing criteria for each NOS is 70%.
5	For latest details on the assessment criteria, please visit www.sscnasscom.com.

				MARKS ALLOCATION	
ASSESSMENT OUTCOME (NOS CODE AND DESCRIPTION)	ASSESSMENT CRITERIA (PC)	TOTAL MARKS	OUT OF	THEORY	SKILLS PRACTICAL
1.SSC/N0501 (CONTRIBUTE TO THE DESIGN OF SOFTWARE PRODUCTS AND APPLICATIONS)	PC1. check their understanding of the Business Requirements Specification (BRS)/User Requirements Specification (URS) with appropriate people	**100**	10	10	0
	PC2. check their understanding of the Software Requirements Specification (SRS) with appropriate people		10	10	0
	PC3. check their understanding of High Level Design (HLD) with appropriate people		10	10	0
	PC4. design basic programming structures to implement functionality in line with requirements defined in BRS/URS, SRS and HLD		30	0	30
	PC5. review their designs with appropriate people		5	5	0
	PC6. analyze inputs from appropriate people to identify, resolve and record design defects and inform future designs		15	0	15
	PC7. document their designs using standard templates and tools		10	0	10
	PC8. comply with their organization's policies, procedures and guidelines when contributing to the design of software products and applications		10	0	10
		Total	100	35	65
2.SSC/N0502 (DEVELOP SOFTWARE CODE TO SPECIFICATION)	PC1. check their understanding of the Business Requirements Specification (BRS), Software Requirements Specification (SRS), High Level Design (HLD) and Low Level Design (LLD) with appropriate people	**100**	5	5	0
	PC2. access reusable components, code generation tools and unit testing tools from their organization's knowledge base		5	0	5
	PC3. convert technical specifications into code to meet the requirements, leveraging reusable components, where available		30	0	30
	PC4. create appropriate unit test cases (UTCs)		10	0	10
	PC5. review codes and UTCs with appropriate people		5	5	0
	PC6. execute UTCs and document results		5	0	5
	PC7. rework the code and UTCs to fix identified defects		10	0	10
	PC8. analyze inputs from appropriate people to inform future designs		5	5	0
	PC9. record corrective actions for identified defects to inform future designs		10	0	10
			5	5	0

				MARKS ALLOCATION	
ASSESSMENT OUTCOME (NOS CODE AND DESCRIPTION)	ASSESSMENT CRITERIA (PC)	TOTAL MARKS	OUT OF	THEORY	SKILLS PRACTICAL
	PC10. submit tested code for approval by appropriate people				
	PC11. update their organization's knowledge base with their experiences of the code developed		5	0	5
	PC12. comply with their organization's policies, procedures and guidelines when developing software code to specification		5	0	5
		Total	100	20	80
3.NOS/N9001 (MANAGE THEIR WORK TO MEET REQUIREMENTS)	PC1. establish and agree their work requirements with appropriate people	**100**	6.25	0	6.25
	PC2. keep their immediate work area clean and tidy		12.5	6.25	6.25
	PC3. utilize their time effectively		12.5	6.25	6.25
	PC4. use **resources** correctly and efficiently		18.75	6.25	12.5
	PC5. treat confidential information correctly		6.25	0	6.25
	PC6. work in line with their organization's policies and procedures		12.5	0	12.5
	PC7. work within the limits of their job role		6.25	0	6.25
	PC8. obtain guidance from appropriate people, where necessary		6.25	0	6.25
	PC9. ensure their work meets the agreed requirements		18.75	6.25	12.5
		Total	**100**	**25**	**75**
4.SSC/N9002 (WORK EFFECTIVELY WITH COLLEAGUES)	PC1. communicate with colleagues clearly, concisely and accurately	**100**	20	0	20
	PC2. work with colleagues to integrate their work effectively with theirs		10	0	10
	PC3. pass on essential information to colleagues in line with organizational requirements		10	10	0
	PC4. work in ways that show respect for colleagues		20	0	20
	PC5. carry out commitments you have made to colleagues		10	0	10
	PC6. let colleagues know in good time if you cannot carry out their commitments, explaining the reasons		10	10	0
	PC7. identify any problems you have working with colleagues and take the initiative to solve these problems		10	0	10
	PC8. follow the organization's policies and procedures for working with colleagues		10	0	10
		Total	**100**	**20**	**80**
5.SSC/N9003 (MAINTAIN A	PC1. comply with their organization's current health, safety and security policies and procedures	**100**	20	10	10

				MARKS ALLOCATION	
ASSESSMENT OUTCOME (NOS CODE AND DESCRIPTION)	ASSESSMENT CRITERIA (PC)	TOTAL MARKS	OUT OF	THEORY	SKILLS PRACTICAL
HEALTHY, SAFE AND SECURE WORKING ENVIRONMENT)	PC2. report any identified breaches in health, safety, and security policies and procedures to the designated person		10	0	10
	PC3. identify and correct any hazards that you can deal with safely, competently and within the limits of their authority		20	10	10
	PC4. report any hazards that you are not competent to deal with to the relevant person in line with organizational procedures and warn other people who may be affected		10	0	10
	PC5. follow their organization's emergency procedures promptly, calmly, and efficiently		20	10	10
	PC6. identify and recommend opportunities for improving health, safety, and security to the designated person		10	0	10
	PC7. complete any health and safety records legibly and accurately		10	0	10
		Total	**100**	**30**	**70**
6.SSC/N9004 (PROVIDE DATA/INFORMATION IN STANDARD FORMATS)	PC1. establish and agree with appropriate people the data/information you need to provide, the formats in which you need to provide it, and when you need to provide it	**100**	12.5	12.5	0
	PC2. obtain the data/information from reliable sources		12.5	0	12.5
	PC3. check that the data/information is accurate, complete and up-to-date		12.5	6.25	6.25
	PC4. obtain advice or guidance from appropriate people where there are problems with the data/information		6.25	0	6.25
	PC5. carry out rule-based analysis of the data/information, if required		25	0	25
	PC6. insert the data/information into the agreed formats		12.5	0	12.5
	PC7. check the accuracy of their work, involving colleagues where required		6.25	0	6.25
	PC8. report any unresolved anomalies in the data/information to appropriate people		6.25	6.25	0
	PC9. provide complete, accurate and up-to-date data/information to the appropriate people in the required formats on time		6.25	0	6.25
		Total	**100**	**25**	**75**
7.SSC/N9005 (DEVELOP THEIR KNOWLEDGE, SKILLS AND COMPETENCE)	PC1. obtain advice and guidance from appropriate people to develop their knowledge, skills and competence	**100**	10	0	10
	PC2. identify accurately the knowledge and skills you need for their job role		10	0	10
	PC3. identify accurately their current level of		20	10	10

				MARKS ALLOCATION	
ASSESSMENT OUTCOME (NOS CODE AND DESCRIPTION)	ASSESSMENT CRITERIA (PC)	TOTAL MARKS	OUT OF	THEORY	SKILLS PRACTICAL
	knowledge, skills and competence and any learning and development needs				
	PC4. agree with appropriate people a plan of learning and development activities to address their learning needs		10	0	10
	PC5. undertake learning and development activities in line with their plan		20	10	10
	PC6. apply their new knowledge and skills in the workplace, under supervision		10	0	10
	PC7. obtain feedback from appropriate people on their knowledge and skills and how effectively you apply them		10	0	10
	PC8. review their knowledge, skills and competence regularly and take appropriate action		10	0	10
		Total	**100**	**20**	**80**

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National
Skill Development
Corporation
Transforming the skill landscape

IT-ITeS Sector Skill Council
4E-Vandana Building (4th Floor) 11, Tolstoy Marg, New Delhi-110001

Model Curriculum

User Interface (UI) Developer

User Interface (UI) Developer

SECTOR: **IT-ITeS**
SUB-SECTOR: **IT Services**
OCCUPATION: **Application Development**
REFERENCE ID: **SSC/Q0502**
NSQF LEVEL: **7**

IT - ITeS SSC NASSCOM

N·S·D·C National Skill Development Corporation
Transforming the skill landscape

Format: ModCur_2015_1_0

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User Interface (UI) Developer

Curriculum / Syllabus

This program is aimed at training candidates for the job of a **User Interface (UI) Developer** in the **IT-ITeS** Sector/Industry and aims at building the following key competencies amongst the learner.

Program Name	**User Interface (UI) Developer**		
Qualification Pack Name & Reference ID.	User Interface (UI) Developer SSC/Q0502		
Version No.	1.0	**Version Update Date**	31/01/2015
Pre-requisites to Training	Bachelor's Degree in Science/Technology/Computers or any graduate course		
Training Outcomes	**After completing this programme, participants will be able to:** • Contribute to the design of software products and applications • Develop software code to specification • Develop media content and graphic designs for software products and applications • Manage your work to meet requirements • Work effectively with colleagues • Maintain a healthy, safe and secure working environment • Provide data/information in standard formats • Develop your knowledge, skills and competence		

This course encompasses all Eight National Occupational Standards (NOS) of **User Interface (UI) Developer** Qualification Pack issued by **IT-ITeS Sector Skills Council NASSCOM**.

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
1.	Contribute to the design of software products and applications	17:00	33:00	Candidates will be able to: • check your understanding of the Business Requirements Specification (BRS)/User Requirements Specification (URS) with appropriate people • check your understanding of the Software Requirements Specification (SRS) with appropriate people • check your understanding of High Level Design (HLD) with appropriate people • design basic programming structures to implement functionality in line with requirements defined in BRS/URS, SRS and HLD • review your designs with appropriate people	SSC/N0501	Refer to Unique Equipment Required

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
				• analyze inputs from appropriate people to identify, resolve and record design defects and inform future designs • document your designs using standard templates and tools • comply with your organization's policies, procedures and guidelines when contributing to the design of software products and applications		
2.	Develop software code to specification	20:00	80:00	Candidates will be able to: • check your understanding of the Business Requirements Specification (BRS), Software Requirements Specification (SRS), High Level Design (HLD) and Low Level Design (LLD) with appropriate people • access reusable components, code generation tools and unit testing tools from your organization's knowledge base • convert technical specifications into code to meet the requirements, leveraging reusable components, where available • create appropriate unit test cases (UTCs) • review codes and UTCs with appropriate people • execute UTCs and document results • rework the code and UTCs to fix identified defects • analyze inputs from appropriate people to inform future designs • record corrective actions for identified defects to inform future designs • submit tested code for approval by appropriate people • update your organization's knowledge base with your experiences of the code developed • comply with your organization's policies, procedures and guidelines when developing software code to specification	SSC/N0502	

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
3.	Develop media content and graphic designs for software products and applications	12:00	38:00	Candidates will be able to: • check your understanding of the Business Requirements Specification (BRS), Software Requirements Specification (SRS), High Level Design (HLD) and Low Level Design (LLD) with appropriate people • access reusable components, media and graphical packages and tools from your organization's knowledge base • convert requirements into media content and graphic designs, leveraging reusable components where available • review media content and graphic designs with appropriate people and analyze their feedback • record any defects and corrective actions taken to inform future work • rework media content and graphic designs, incorporating feedback • submit media content and graphic designs for approval by appropriate people • update your organization's knowledge base with your experiences of the media content and graphic designs developed • comply with your organization's policies, procedures and guidelines when developing media content and graphic designs for software products and applications	SSC/N0503	
4.	Manage your work to meet requirements	12:00	38:00	Candidates will be able to: • establish and agree your work requirements with appropriate people • keep your immediate work area clean and tidy • utilize your time effectively • use resources correctly and efficiently • treat confidential information correctly • work in line with your organization's policies and procedures • work within the limits of your job role • obtain guidance from appropriate people, where necessary • ensure your work meets the agreed requirements	SSC/N9001	

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
5.	Work effectively with colleagues	10:00	40:00	Candidates will be able to: • communicate with colleagues clearly, concisely and accurately • work with colleagues to integrate your work effectively with theirs • pass on essential information to colleagues in line with organizational requirements • work in ways that show respect for colleagues • carry out commitments you have made to colleagues • let colleagues know in good time if you cannot carry out your commitments, explaining the reasons • identify any problems you have working with colleagues and take the initiative to solve these problems • follow the organization's policies and procedures for working with colleagues	SSC/N9002	
6.	Maintain a healthy, safe and secure working environment	7:00	18:00	Candidates will be able to: • comply with your organization's current health, safety and security policies and procedures • report any identified breaches in health, safety, and security policies and procedures to the designated person • identify and correct any hazards that you can deal with safely, competently and within the limits of your authority • report any hazards that you are not competent to deal with to the relevant person in line with organizational procedures and warn other people who may be affected • follow your organization's emergency procedures promptly, calmly, and efficiently • identify and recommend opportunities for improving health, safety, and security to the designated person	SSC/N9003	

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
				• complete any health and safety records legibly and accurately		
7.	Provide data/information in standard formats	12:00	38:00	Candidates will be able to: • establish and agree with appropriate people the data/information you need to provide, the formats in which you need to provide it, and when you need to provide it • obtain the data/information from reliable sources • check that the data/information is accurate, complete and up-to-date • obtain advice or guidance from appropriate people where there are problems with the data/information • carry out rule-based analysis of the data/information, if required • insert the data/information into the agreed formats • check the accuracy of your work, involving colleagues where required • report any unresolved anomalies in the data/information to appropriate people • provide complete, accurate and up-to-date data/information to the appropriate people in the required formats on time	SSC/N9004	
8.	Develop your knowledge, skills and competence	5:00	20:00	Candidates will be able to: • obtain advice and guidance from appropriate people to develop your knowledge, skills and competence • identify accurately the knowledge and skills you need for your job role • identify accurately your current level of knowledge, skills and competence and any learning and development needs • agree with appropriate people a plan of learning and development activities to address your learning needs • undertake learning and development activities in line with your plan • apply your new knowledge and skills in the workplace, under supervision • obtain feedback from appropriate people on your knowledge and skills and how effectively you apply them	SSC/N9005	

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
				• review your knowledge, skills and competence regularly and take appropriate action		

	Total Duration:	**95:00**	**305:00**	**Unique Equipment Required:**
				Training room should be fully furnished with the following equipment / tools / accessories. Additional / specific resources, wherever applicable (e.g. Hardware, software) are indicated in the main text corresponding to relevant learning outcome.
				
				Domain NOS requirements
				• Visio, UML, freeminds, mockingbird
				• HTML 5, CSS, Java Script and SQL
				• IDEs such as Web Builder, Word Press, Joomla
				• Wordpress, psdGraphics etc.
				• HTML, CSS, Flash, Photoshop, Windows media player, Eclipse, XAMPP
				
				Common requirements
				• Comfortable seats with adequate lighting, controlled temperature and acoustics for training and learning
				• White Board, Markers and Eraser
				• Projector with screen
				• Flip chart with markers
				• Faculty's PC/Laptop with latest configuration and internet connection
				• Supporting software / applications for projecting audio, video, recording,
				• Presentation Tools to support learning activities:
				  ○ Intranet
				  ○ Email
				  ○ IMs
				  ○ Learning management system e.g. Moodle, Blackboard to enable blended learning
				• Microphone / voice system for lecture and class activities
				• Handy Camera
				• Stationery kit – Staples, Glue, Chart Paper, Sketch Pens, Paint Box, Scale, A4 Sheets
				• For IT Lab sessions: Computer Lab with 1:1 PC:trainee ratio and having internet connection, MS Office / Open office, Browser, Outlook / Any other Email Client and chat tools.
				• Assessment and Test Tools for day to day online Tests and Assessments
				• For team discussions: Adequate seating arrangement in full / half circle format for one or more teams as per planned team composition.		

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
				• Reading Resources: Access to relevant sample documents and learning forums to enable self-study before and after each training session.		

Grand Total Course Duration: **400 Hours 0 Minutes**

*(This syllabus/ curriculum has been approved **IT-ITeS Sector Skills Council NASSCOM**.)*

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2. Though many NOSs have some seemingly common outcomes, notably core/generic, professional and technical skills, it is imperative to understand the contextual difference between them. Training providers are advised to,
   a. Embed such skills development in the learning pedagogy for each expected outcome
   b. Prepare a detailed session plan for training delivery with focus on sequence and duration of training
3. Run a diagnostic test to assess prior learning of students and help trainers / students identify the need for gap training and suitable training methodology. Accordingly, more introductory level sessions may be included in guided or self-paced mode of learning. E.g. adding some sessions on Functional English or Use of Internet and MS Office.

Annexure1: Assessment Criteria

Assessment Criteria for <QP Name>	
Job Role	**User Interface (UI) Developer**
Qualification Pack	**SSC/Q0502**
Sector Skill Council	**IT-ITeS**

Sr. No.	Guidelines for Assessment
1	Criteria for assessment for each Qualification Pack (QP) will be created by the Sector Skill Council (SSC). Each performance criteria (PC) will be assigned Theory and Skill/Practical marks proportional to its importance in NOS.
2	The assessment will be conducted online through assessment providers authorised by SSC.
3	Format of questions will include a variety of styles suitable to the PC being tested such as multiple choice questions, fill in the blanks, situational judgment test, simulation and programming test.
4	To pass a QP, a trainee should pass each individual NOS. Standard passing criteria for each NOS is 70%.
5	For latest details on the assessment criteria, please visit www.sscnasscom.com.

Assessable Outcomes	Assessment criteria for the outcome	Total Mark	Out of	Theory	Skills Practical
1. SSC/N0501 (Contribute to the design of software products and applications)	PC1. check your understanding of the Business Requirements Specification (BRS)/User Requirements Specification (URS) with appropriate people	**100**	10	10	0
	PC2. check your understanding of the Software Requirements Specification (SRS) with appropriate people		10	10	0
	PC3. check your understanding of High Level Design (HLD) with appropriate people		10	10	0
	PC4. design basic programming structures to implement functionality in line with requirements defined in BRS/URS, SRS and HLD		30	0	30
	PC5. review your designs with appropriate people		5	5	0
	PC6. analyze inputs from appropriate people to identify, resolve and record design defects and inform future designs		15	0	15
	PC7. document your designs using standard templates and tools		10	0	10
	PC8. comply with your organization's policies, procedures and guidelines when contributing to the design of software products and applications		10	0	10
		Total	100	35	65
2. SSC/N0502 (Develop software code to specification)	PC1. check your understanding of the Business Requirements Specification (BRS), Software Requirements Specification (SRS), High Level Design (HLD) and Low Level Design (LLD) with appropriate people	**100**	5	5	0
	PC2. access reusable components, code generation tools and unit testing tools from your organization's knowledge base		10	0	10

Assessable Outcomes	Assessment criteria for the outcome	Total Mark	Out of	Theory	Skills Practical
	PC3. convert technical specifications into code to meet the requirements, leveraging reusable components, where available		10	0	10
	PC4. create appropriate unit test cases (UTCs)		10	0	10
	PC5. review codes and UTCs with appropriate people		5	5	0
	PC6. execute UTCs and document results		10	0	10
	PC7. rework the code and UTCs to fix identified defects		10	0	10
	PC8. analyze inputs from appropriate people to inform future designs		5	5	0
	PC9. record corrective actions for identified defects to inform future designs		10	0	10
	PC10. submit tested code for approval by appropriate people		5	5	0
	PC11. update your organization's knowledge base with your experiences of the code developed		10	0	10
	PC12. comply with your organization's policies, procedures and guidelines when developing software code to specification		10	0	10
		Total	100	20	80
3. SSC/N0503 (Develop media content and graphic designs for software products and Applications)	PC1. check your understanding of the Business Requirements Specification (BRS), Software Requirements Specification (SRS), High Level Design (HLD) and Low Level Design (LLD) with appropriate people	**100**	10	10	0
	PC2. access reusable components, media and graphical packages and tools from your organization's knowledge base		10	0	10
	PC3. convert requirements into media content and graphic designs, leveraging reusable components where available		25	0	25
	PC4. review media content and graphic designs with appropriate people and analyze their feedback		10	10	0
	PC5. record any defects and corrective actions taken to inform future work		10	0	10
	PC6. rework media content and graphic designs, incorporating feedback		10	0	10
	PC7. submit media content and graphic designs for approval by appropriate people		5	5	0
	PC8. update your organization's knowledge base with your experiences of the media content and graphic designs developed		10	0	10
	PC9. comply with your organization's policies, procedures and guidelines when developing media content and graphic designs for software products and applications		10	0	10
		Total	100	25	75
4.SSC/N9001 (Manage your work to meet requirements)	PC1. establish and agree your **work requirements** with **appropriate people**	**100**	6.25	0	6.25
	PC2. keep your immediate work area clean and tidy		12.5	6.25	6.25
	PC3. utilize your time effectively		12.5	6.25	6.25
	PC4. use **resources** correctly and efficiently		18.75	6.25	12.5

Assessable Outcomes	Assessment criteria for the outcome	Total Mark	Out of	Theory	Skills Practical
	PC5. treat confidential information correctly		6.25	0	6.25
	PC6. work in line with your organization's policies and procedures		12.5	0	12.5
	PC7. work within the limits of your job role		6.25	0	6.25
	PC8. obtain guidance from **appropriate people**, where necessary		6.25	0	6.25
	PC9. ensure your work meets the agreed requirements		18.75	6.25	12.5
		Total	**100**	**25**	**75**
5.SSC/N9002 (Work effectively with colleagues)	PC1. communicate with colleagues clearly, concisely and accurately	**100**	20	0	20
	PC2. work with colleagues to integrate your work effectively with theirs		10	0	10
	PC3. pass on essential information to colleagues in line with organizational requirements		10	10	0
	PC4. work in ways that show respect for colleagues		20	0	20
	PC5. carry out commitments you have made to colleagues		10	0	10
	PC6. let colleagues know in good time if you cannot carry out your commitments, explaining the reasons		10	10	0
	PC7. identify any problems you have working with colleagues and take the initiative to solve these problems		10	0	10
	PC8. follow the organization's policies and procedures for working with colleagues		10	0	10
		Total	**100**	**20**	**80**
6.SSC/N9003 (Maintain a healthy, safe and secure working environment)	PC1. comply with your organization's current health, safety and security policies and procedures	**100**	20	10	10
	PC2. report any identified breaches in health, safety, and security policies and procedures to the designated person		10	0	10
	PC3. identify and correct any hazards that you can deal with safely, competently and within the limits of your authority		20	10	10
	PC4. report any hazards that you are not competent to deal with to the relevant person in line with organizational procedures and warn other people who may be affected		10	0	10
	PC5. follow your organization's **emergency procedures** promptly, calmly, and efficiently		20	10	10
	PC6. identify and recommend opportunities for improving health, safety, and security to the designated person		10	0	10
	PC7. complete any health and safety records legibly and accurately		10	0	10
		Total	**100**	**30**	**70**
	PC1. establish and agree with appropriate people the data/information you need to provide, the formats	**100**	12.5	12.5	0

Assessable Outcomes	Assessment criteria for the outcome	Total Mark	Out of	Theory	Skills Practical
7.SSC/N9004 (Provide data/information in standard formats)	in which you need to provide it, and when you need to provide it				
	PC2. obtain the data/information from reliable sources		12.5	0	12.5
	PC3. check that the data/information is accurate, complete and up-to-date		12.5	6.25	6.25
	PC4. obtain advice or guidance from appropriate people where there are problems with the data/information		6.25	0	6.25
	PC5. carry out rule-based analysis of the data/information, if required		25	0	25
	PC6. insert the data/information into the agreed formats		12.5	0	12.5
	PC7. check the accuracy of your work, involving colleagues where required		6.25	0	6.25
	PC8. report any unresolved anomalies in the data/information to appropriate people		6.25	6.25	0
	PC9. provide complete, accurate and up-to-date data/information to the appropriate people in the required formats on time		6.25	0	6.25
		Total	**100**	**25**	**75**
8.SSC/N9005 (Develop your knowledge, skills and competence)	PC1. obtain advice and guidance from appropriate people to develop your knowledge, skills and competence	**100**	10	0	10
	PC2. identify accurately the knowledge and skills you need for your job role		10	0	10
	PC3. identify accurately your current level of knowledge, skills and competence and any learning and development needs		20	10	10
	PC4. agree with appropriate people a plan of learning and development activities to address your learning needs		10	0	10
	PC5. undertake learning and development activities in line with your plan		20	10	10
	PC6. apply your new knowledge and skills in the workplace, under supervision		10	0	10
	PC7. obtain feedback from appropriate people on your knowledge and skills and how effectively you apply them		10	0	10
	PC8. review your knowledge, skills and competence regularly and take appropriate action		10	0	10
		Total	**100**	**20**	**80**

Annexure2: Trainer Prerequisites for Job role: User Interface (UI) Developer mapped to Qualification Pack: SSC/Q0502

Sr. No.	Area	Details
1	**Job Description**	To deliver accredited training service, mapping to the curriculum detailed above, in accordance with the Qualification Pack SSC/Q0502.
2	**Personal Attributes**	Aptitude to conduct training, and pre/ post work to ensure competent, employable candidates at the end of the training. Strong communication skills, interpersonal skills, ability to work as part of a team; a passion for quality and for developing others; well-organised and focused, eager to learn and keep oneself updated with the latest in the mentioned field. The individual should be result oriented. The individual should also be able to demonstrate skills for communication, creative and logical thinking.
3	**Minimum Educational Qualifications**	Bachelor's Degree in Science/Technology/Computers or any graduate course
4a	**Domain Certification**	Minimum accepted score in SSC Assessment is 90% per NOS being taught in SSC/Q0502. Additional certification in computers/technology/ animation/graphics
4b	**Platform Certification**	Recommended that the Trainer is certified for the Job Role: "Trainer" mapped to the Qualification Pack: "SSC/Q1402". Minimum accepted score is 70% per NOS.
5	**Experience**	Field experience: Minimum 2 years' experience in the same domain Training experience: 1 year preferred

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JSS COLLEGE OF ARTS COMMERCE & SCIENCE

(Autonomous)

B.N Road, Mysuru – 25

DEPARTMENT OF COMMERCE AND MANAGEMENT

Syllabus

CHOICE BASED CREDIT SYSYTEM

BBA Programme

2017-18

Scheme of Study for BBA under CBCS Scheme implemented from 2017-18

YEAR	SEM	COURSE CODE	TITLE OF THE PAPER	NO. OF CREDITS			LECTURE/PRACTICAL HOURS /WEEK			TOTAL TEACHING HOUIRS		
				L (Hrs)	T (Hrs)	PRA (Hrs)	L (Hrs)	T (Hrs)	PRA (Hrs)	L (Hrs)	T (Hrs)	PRA (Hrs)
I	I	BDA21011	ENTREPRENEURSHIP DEVELOPMENT	3	1	0	3	1	0	48	16	0
		BDA22011	FINANCIAL ACCOUNTING AND ANALYSIS	4	1	1	4	1	2	64	16	32
		BDA23011	BUSINESS DECISIONS	5	1	0	5	1	0	80	16	0
	II	BDB23011	ORGANISATIONAL BEHAVIOUR	3	1	0	3	1	0	48	16	0
		BDB21011	STATISTICS FOR BUSINESS	5	1	0	5	1	0	80	16	0
		BDB22011	COST AND MANAGEMENT ACCOUNTING	5	1	0	5	1	0	80	16	0
II	III	BDC21011	INCOME TAX	4	1	1	4	1	2	64	16	32
		BDC22011	CORPORATE FINANCE	5	1	0	5	1	0	80	16	0
	IV	BDD22001	FINANCIAL MARKETS AND INSTITUTIONS	5	1	0	5	1	0	80	16	0
		BDD23001	QUANTITATIVE TECHNIQUES	5	1	0	5	1	0	80	16	0
		BDD21001	COMPUTER APPLICATIONS IN BUSINESS	2	0	2	2	0	4	32	0	64
III	V	BDE21001	INVESTMENT ANALYSIS AND PORTFOLIE MANAGEMENT	5	1	0	5	1	0	80	16	0
		BDE22001	GST AND CUSTOMS DUTY	5	1	0	5	1	0	80	16	0
			ELECTIVE -1 (ANY ONE FROM THE LIST **DSE** GROUP)	LIST GIVEN BELOW								
			ELECTIVE -2 (ANY ONE FROM THE LIST **DSE** GROUP)	LIST GIVEN BELOW								
	VI	BDF21001	CORPORATE RESTRUCTURING	5	1	0	5	1	0	80	16	0
		BDF22001	INTERNATIONAL FINANCIAL INSTITUTIONS	5	1	0	5	1	0	80	16	0
			ELECTIVE -3 (ANY ONE FROM THE LIST **DSE** GROUP)	LIST GIVEN BELOW								
			ELECTIVE – 4 (ANY ONE FROM THE LIST **DSE** GROUP)	LIST GIVEN BELOW								

LIST OF COURSES IN DSE GROUP

YEAR	SEM	COURSE CODE	TITLE OF THE PAPER	NO. OF CREDITS			LECTURE/PRACTICAL HOURS /WEEK			TOTAL TEACHING HOUIRS		
				L (Hrs)	T (Hrs)	PRA (Hrs)	L (Hrs)	T (Hrs)	PRA (Hrs)	L (Hrs)	T (Hrs)	PRA (Hrs)
III	V	BDE23001	INVESTMENT BANKING AND FINANCIAL SERVICES	5	1	0	5	1	0	80	16	0
		BDE24001	CORPORATE ANALYSIS AND VALUATION	5	1	0	5	1	0	80	16	0
		BDE25001	RESEARCH METHODOLOGY	5	1	0	5	1	0	80	16	0
		BDE26001	INTERNATIONAL TRADE BLOCKS & MULTILATERAL AGENCIES	5	1	0	5	1	0	80	16	0
		BDE27001	HUMAN RESOURCE MANAGEMENT	5	1	0	5	1	0	80	16	0

	VI	BDF23001	STRATEGIC CORPORATE FINANCE	5	1	0	5	1	0	80	16	0
		BDF24001	MANAGEMENT OF FINANCIAL INSTITUTIONS	5	1	0	5	1	0	80	16	0
		BDF25001	FINANCIAL DERIVATIVES	5	1	0	5	1	0	80	16	0
		BDF26001	RESEARCH SOFTWAR PACKAGE	2	0	2	2	0	4	32	0	64
		BDF27001	COMPUTERISED ACCOUNTING SYSTEM	4	0	2	4	0	4	64	0	64
		BDF28001	PROJECT WORK	1	1	4	1	1	8	16	16	128

Proposed Scheme of Assessment for BBA under CBCS Scheme to be implemented from 2017-18

Year	SEM	COURSE CODE	TITLE OF THE PAPER	CONTINUOUS ASSESSMENT					MAX MARKS			PERCENTAGE			DURATION OF EXAM	
				C1		C2		C3								
				T	SDR	T	VIVA		TH	PR	IA	TH	PR	IA	TH	PR
I	I	BDA21011	ENTREPRENEURSHIP DEVELOPMENT	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		BDA22011	FINANCIAL ACCOUNTING AND ANALYSIS	**10**	**05**	**10**	**05**	**70**	70	70	30	**50**	**20**	**30**	**3h**	**2h**
		BDA23011	BUSINESS DECISIONS	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
	II	BDB23011	ORGANISATIONAL BEHAVIOUR	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		BDB21011	STATISTICS FOR BUSINESS	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		BDB22011	COST AND MANAGEMENT ACCOUNTING	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
II	III	BDC21011	INCOME TAX	**10**	**05**	**10**	**05**	**70**	70	70	30	**50**	**20**	**30**	**3h**	**2h**
		BDC22011	CORPORATE FINANCE	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
	IV	BDD22001	FINANCIAL MARKETS AND INSTITUTIONS	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		BDD23001	QUANTITATIVE TECHNIQUES	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		BDD21001	COMPUTER APPLICATIONS IN BUSINESS	**10**	**05**	**10**	**05**	**70**	50	70	30	**35**	**35**	**30**	**3h**	**2h**
III	V	BDE21001	INVESTMENT ANALYSIS AND PORTFOLIE MANAGEMENT	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		BDE22001	GST AND CUSTOMS DUTY	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
			ELECTIVE -1 (ANY ONE FROM THE LIST **DSE** GROUP)	**LIST GIVEN BELOW**												
			ELECTIVE -2 (ANY ONE FROM THE LIST **DSE** GROUP)	**LIST GIVEN BELOW**												
	VI	BDF21001	CORPORATE RESTRUCTURING	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		BDF22001	INTERNATIONAL FINANCIAL INSTITUTIONS	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
			ELECTIVE -3 (ANY ONE FROM THE LIST **DSE** GROUP)	**LIST GIVEN BELOW**												
			ELECTIVE – 4 (ANY ONE FROM THE LIST **DSE** GROUP)	**LIST GIVEN BELOW**												

LIST OF COURSES IN DSE GROUP

Year	SEM	COURSE CODE	TITLE OF THE PAPER	CONTINUOUS ASSESSMENT					MAX MARKS			PERCENTAGE			DURATION OF EXAM	
				C1		C2		C3								
				T	SDR	T	VIVA		TH	PR	IA	TH	PR	IA	TH	PR
III	V	BDE23001	INVESTMENT BANKING AND FINANCIAL SERVICES	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		BDE24001	CORPORATE ANALYSIS AND VALUATION	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		BDE25001	RESEARCH METHODOLOGY	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		BDE26001	INTERNATIONAL TRADE BLOCKS & MULTILATERAL AGENCIES	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		BDE27001	HUMAN RESOURCE MANAGEMENT	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
	VI	BDF23001	STRATEGIC CORPORATE FINANCE	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		BDF24001	MANAGEMENT OF FINANCIAL INSTITUTIONS	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		BDF25001	FINANCIAL DERIVATIVES	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		BDF26001	RESEARCH SOFTWAR PACKAGE	**10**	**05**	**10**	**05**	**70**	50	70	30	**35**	**35**	**30**	**2h**	**2h**
		BDF27001	COMPUTERISED ACCOUNTING SYSTEM	**10**	**05**	**10**	**05**	**70**	70	70	30	**50**	**20**	**30**	**3h**	**3h**
		BDF28001	PROJECT WORK	**-**	**-**	**-**	**-**	**-**	-	70	30	**-**	**70**	**30**	**-**	**-**

SCHEME OF VALUATION FOR PRACTICAL EXAMINATION

- A candidate appearing for the first time should submit a duly signed and certified practical record
- Practical record has to be valued for ***FIVE m*arks** by examiners at the time of examination
- ***FIVE marks*** for conducting viva-voce.
- Computer Lab exams are conducted for 70 marks for each candidates

EVALUATION OF PROJECT WORK:

Sl No	Component	Marks
1	Proposal of Project Work	15
2	PPT Presentation	15
TOTAL		**30**

Sl No	Component	Marks
1	Evaluation of Project by Internal and External Exainors	50
2	Viva Voce	20
	TOTAL	**70**

DEPARTMENT OF COMMERCE

Discipline Specific Course

Sl. No	Sem	Course Code	Title of the paper	Total credits		
				L	T	P
1	I	BDA22011	FINANCIAL ACCOUNTINGAND ANALYSIS	4	1	1
2		BDA23011	BUSINESS DECISIONS	5	1	0
3	II	BDB21011	STATISTICS FOR BUSINESS	5	1	0
4		BDB22011	COST AND MANAGEMENT ACCOUNTING	5	1	0
5	III	BDC21011	INCOME TAX	4	1	1
6		BDC22011	CORPORATE FINANCE	5	1	0
7	IV	BDC22001	FINANCIAL MARKETS AND INSTITUTIONS	5	1	0
8		BDC23001	QUANTITATIVE TECHNIQUES	5	1	0
9	V	BDE21001	INVESTMENT ANALYSIS AND PORTFOLIE MANAGEMENT	5	1	0
10		BDE22001	GST AND CUSTOMS DUTY	5	1	0
11	VI	BDF21001	CORPORATE RESTRUCTURING	5	1	0
12		BDF22001	INTERNATIONAL FINANCIAL INSTITUTIONS	5	1	0

Generic Elective

Sl. No	Sem	Course Code	Title of the paper	Total credits		
				L	T	P
1	I	BDA21011	ENTREPRENEURSHIP DEVELOPMENT	3	1	0
2	II	BDB23011	ORGANISATIONAL BEHAVIOUR	3	1	0

Skill Enhancement Course

Sl. No	Sem	Course Code	Title of the paper	Total credits		
				L	T	P
1	IV	BDD21011	COMPUTER APPLICATON IN BUSINESS	2	0	2

Discipline Specific Elective

Sl. No	Sem	Course Code	Title of the paper	Total credits		
				L	T	P
1	V	BDE23001	INVESTMENT BANKING AND FINANCIAL	5	1	0

			SERVICES			
2		BDE24001	CORPORATE ANALYSIS AND VALUATION	5	1	0
3		BDE25001	RESEARCH METHODOLOGY	5	1	0
4		BDE26001	INTERNATIONAL TRADE BLOCKS & MULTILATERAL AGENCIES	5	1	0
5		BDE27001	HUMAN RESOURCE MANAGEMENT	5	1	0
6	VI	BDF23001	STRATEGIC CORPORATE FINANCE	5	1	0
7		BDF24001	MANAGEMENT OF FINANCIAL INSTITUTIONS	5	1	0
8		BDF25001	FINANCIAL DERIVATIVES	5	1	0
9		BDF26001	RESEARCH SOFTWAR PACKAGE	2	0	2
10		BDF27001	COMPUTERISED ACCOUNTING SYSTEM	4	0	2
11		BDF28001	PROJECT WORK	1	1	4

Programme code: BBA11

Programme Outcome:

This program could provide well trained dynamic personnel and professionals for

PO1: Industries and Multinational companies

PO2: Banking Sectors and Insurance Companies

PO3: Financing and Leasing Companies

PO4: Transport Agencies and Warehousing

PO5: Stock Markets and Foreign Trade,

This program could provide well trained professionals to practice and work as

PO6: Chartered accountants, advocates, cost accountants and company secretaries

PO7: Financial Analysts, Tax consultants, Tax Practitioners and Investment consultants

PO8: Financial and management accountants

PO9: Marketing Manager, Store manager, Purchase Manager and Sales Manager

PO10: Human Resources Manager, Counsellor

PO11: Retail Manager, Middle men and Customer relation manager

PO12: Decision Maker

PO13: Stock broker

PO14: Official receiver and Liquidator,

PO15: Market researcher, supply chain manger and Franchisee

PO16: Administrator of the different types of Business and Non-business organizations

Programme Specific Outcomes

The students at the end of the BBA programme can become a

PSO1: Business Entrepreneur
PSO2: Business Administrator
PSO3: Financial, Cost and Management Accountant
PSO4: Business Researcher
PSO5: Bank Manager
PSO6: Personal Secretary
PSO7: Project Manager

PSO8: Legal adviser
PSO9: Stock Broker

BDA22011

SEMESTER I

FINANCIAL ACCOUNTING AND ANALYSIS – DSC 1

(Credits: Lecture – 04, Tutorial – 01, Practical – 01)

Lectures: 64 Hrs
Tutorials: 16 Hrs
Practical: 32 Hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Learn the characteristics of financial accountant and able to work as financial accountant

CO2: Learn the classification and characteristics and apply the principles of accounting in preparation of financial statements

CO3: Understand in details with application and generate financial statement using accounting software

CO4: Understand in details with examples become a financial analyst

CO5: Identify the characteristics of financial analyst and able to become financial analyst

Unit 1: **Introduction to Financial Accounting**:
Accounting as an Information System, Importance and Scope, Limitations; Users of accounting information, Concepts, Principles and Conventions. Generally Accepted Accounting Principles; The Accounting Equation; Nature of Accounts, Types of books (Primary and Secondary) and Rules of Debit and Credit; Recording Transactions in Journal; Preparation of Ledger Accounts; Opening and Closing Entries; Preparation of Trial Balance.

Unit 2: **Preparation of Financial Statements**:
Trading Account, Profit & Loss Account and Balance Sheet, Adjustment Entries, Understanding contents of financial statements of a joint stock company as per the Companies Act 2013; Understanding the contents of annual report of a company.

Unit 3: **Indian Accounting Standards (Ind-AS)**:
Concept, benefits, procedure for issuing Ind-AS in India, salient features of Ind-AS issued by ICAI; International Financial Reporting Standards(IFRS): Main features, uses and objectives of IFRS, IFRS issued by IASB and concept of harmonization and convergence, obstacle in harmonization and convergence, suggestions for increased convergence and harmonization.

Unit 4: Computerised Accounting Systems:26 Practical Lab
Computerised Accounting Systems: Computerized Accounts by using any popular accounting software: Creating a Company; Configure and Features settings; Creating Accounting Ledgers and Groups; Creating Stock Items and Groups; Vouchers Entry; Generating Reports – Cash Book, Ledger Accounts, Trial Balance, Profit and Loss Account, Balance Sheet, Funds Flow Statement, Cash Flow Statement. Selecting and shutting a Company; Backup and Restore data of a Company.

Unit 5: **Financial Statement Analysis:**
Objective of financial statement analysis, sources of information; Techniques of financial statement analysis: Horizontal analysis, Vertical analysis and Ratio Analysis; Financial Ratios: Meaning and Usefulness of Financial Ratios. Analysis of ratios from the perspective

of Stakeholders like Investors, Lenders, and Short-term Creditors. Liquidity Ratios, Solvency Ratios, Profitability Ratios, and Turnover Ratios; Limitation of ratios.

Reference:

1. Monga, J.R., Financial Accounting: Concepts and Applications, Mayur Paperbacks
2. Tulsian, P.C., Financial Accounting, Pearson
3. Maheshwari, S.N. &Maheshwari, S.K. , Financial Accounting for B. Com., CA, CS, & ICWA (Foundation) Courses, Vikas Publishing House Pvt. Ltd.
4. Ghosh, T.P., Financial Accounting for Managers, Taxmann Allied Services (P) Ltd.
5. Balwani, Nitin, Accounting and Finance for Managers

6. Gupta, Ambrish: Financial Accounting for Management
7. Bhattacharyya, Asish K., Financial Accounting for Business Managers 8. Jain, S.P. &Narang, K.L., Advanced Accountancy.
8. Charles T. Horngren, Gart L. Sundem, John A. Elliot and Donna R. Philbrick, Introduction to Financial Accounting, Pearson.

Note: Latest edition of the text books should be used.

BDA23011

SEMESTER I

BUSINESS DECISIONS – DSC 2

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80 Hrs
Tutorials: 16 Hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Identify in detail the cost and income effect on business

CO2: Learn in depth the decision making areas and able to make appropriate business decisions

CO3: Understand in details with examples Analyse the behaviour of consumer

CO4: Learn in detail the characteristics of forecast and able to forecast the demand for products

CO5: Understand and analyse business problems and able to solve them

Unit 1: **Market Dynamics**:
Individual demand, market demand, individual supply, market supply, market equilibrium; Elasticity of demand and supply: Price elasticity of demand, income elasticity of demand, cross price elasticity of demand, elasticity of supply; Theory of consumer behaviour: cardinal utility theory, ordinal utility theory(indifference curves, budget line, consumer choice, price effect, substitution effect, income effect for normal, inferior and Giffen goods), revealed preference theory.

Unit 2: **Producer and optimal production choice:**
Optimizing behaviour in short run (geometry of product curves, law of diminishing margin productivity, three stages of production),optimizing behaviour in long run (isoquants, iso-cost line, optimal combination of resources) Costs and scale: traditional theory of cost (short run and long run, geometry of cost curves, envelope curves), modern theory of cost (short run and long run), economies of scale, economies of scope.

Unit 3: **Theory of firm and market organization**:
Perfect competition (basic features, short run equilibrium of firm/industry, long run equilibrium of firm/industry, effect of changes in demand, cost and imposition of taxes) ; monopoly (basic features, short run equilibrium, long run equilibrium, effect of changes in demand, cost and imposition of taxes, comparison with perfect competition, welfare cost of monopoly), price discrimination, multi plant monopoly; monopolistic competition (basic features, demand and cost, short run equilibrium, long run equilibrium, excess capacity) ; oligopoly (Cournot's model, kinked demand curve model,
dominant price leadership model, prisoner's dilemma

Unit 4: **Factor Market**:

Demand for a factor by a firm under marginal productivity theory (perfect competition in the product market, monopoly in the product market), market demand for a factor, supply of labour, market supply of labour, factor market equilibrium.

Reference:

1. Dominick Salvatore (2009). Principles of Microeconomics(5th ed.) Oxford University Press
2. Lipsey and Chrystal. (2008). Economics.(11th ed.) Oxford University Press
3. Koutosyannis (1979). Modern Micro Economics. Palgrave Macmillan
4. Pindyck, Rubinfeld and Mehta. (2009). Micro Economics. (7th ed.). Pearson.

Note: Latest edition of the text books should be used.

BDA21011

SEMESTER I

ENTREPRENEURSHIP DEVELOPMNET - GE 1

(Credits: Lecture – 03, Tutorial – 01, Practical – 0) Lectures: 48 Hrs
Tutorials: 16 Hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Learn in depth qualities of an entrepreneur and able to become an entrepreneur

CO2: Write down the details of financial schemes offered by banks and government agencies and able to access them easily

CO3: Learn the details of mobilisation of resources

CO4: Learn in depth the characteristics of customer and able to identify the customer

Unit 1: Entrepreneurial Development Perspective:

Concept of entrepreneurship development and their dynamics. Importance of skill, knowledge and motivation in ED. Entrepreneurial Competition, generation of business, ideas and final selection of an activity. Market survey report and business plan preparation. Pooling of resources, forms enterprise ownership and their details.

Unit 2: Enterprise Management

Logistics and launching formalities, probable pitfalls, managing money, men, machinery, material and marketing. Support organization, entrepreneurial growth, following the law of the land and social obligation. Managing organisation for innovation and creativity. Importance of leadership, business ethics and business skills on good team building

Unit 3: Running A Family Business :

Concept, structure and kinds of family firms. Understanding its reputation and brand. Enhancing the knowledge and skill. Managing family and shareholders relationship. Managing leadership succession and understanding the group dynamics, encouraging family women into business. Identifying the changed customer needs and encouraging growth and change in the family business.

Unit 4: Social Entrepreneurship:

Introduction, Role and Characteristics of Social Entrepreneurs, Starting of a Non-profits Organization innovatively through local resources in a social context, sustainability, Business Strategies and Scaling up.

Unit 5: Role Of Government And Financial Institutions

Role of Central and State Government in promoting entrepreneurship. Types of schemes, loans, incentives, grants and subsidies. Different types of financial institutions, role of commercial banks, types of loans for MSMEs schemes, appraisal, sanctions, repayment.

Reference:

1. Entrepreneurship – Tata MC Graw hill
2. Entrepreneurship and Small Business – New Jersey: Palgrave
3. Creativity and Entrepreneurship – Jhon Kao
4. Corporate Creativity Tata MC Graw hill
5. Innovative Entrepreneurship – Practice and Principles – Drucker P.F.

Note: Latest edition of the text books should be used.

BDB23011

SEMESTER II

ORGANISATIONAL BEHAVIOUR - GE 2

(Credits: Lecture – 03, Tutorial – 01, Practical – 0) Lectures: 48 Hrs
Tutorials: 16 Hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Understand in detail behaviour of employees and able to manage them efficiently

CO2: Identify in details employees performance and able to motivate for effective performance

CO3: Learn in depth and analyse the behaviour of employees

CO4: Understand in details key positions in an organisation and able to occupy them

CO5: Learn in details with examples frame policies and strategies in organisation

Unit 1: Introduction to Organisational Behaviour:
Organisation- Concept, features and types. Organisational Behaviour – concept, meaning, scope, characteristics and role. Evolution, challenges and opportunities for O.B.

Unit 2: Personality:
Personality – Meaning, characteristics and determinants. Theories – Psychoanalytical Theory. Erikson stages, CheisArgyeis's immateriality – Maturity Theory, Traits Theory and Self theory. Personality traits.

Unit 3: Perception, Attitude and Learning:
Perception – concept, nature, process and factors influencing perceptual set.
Attitudes – Meaning, definition, nature, components and sources.
Learning – concept, nature, theories of learning, principles and determinants of learning

Unit 4: Groups and Teams:
Groups – Definitions, types, reasons for group formation. Groups Dynamics – Definition and features. Teams – Meaning , Groups v/s Teams, features, importance and types.

Reference:

1. Koontz & Heinz Weihrich: Essential of management McGraw Hill (1999)
2. Kaul, Vijay kumar, Management- Text & Cases, Vikas Publishing, New Delhi, 2015
3.Stoner&Wankel:Management
4. Stephen P. Robbins and Mary Coulter:Management, Pearson
5. Y.K. Bhushan: Fundamentals of Business Organisation& Management X Edition
6. Richard L. Daft, Principles Of Management, CengageLearning,India
7. Robbins Stephen P. :OrganisationalBehaviour, Pearson Education, 12th Edition

Note: Latest edition of the text books should be used.

BDB21011

SEMESTER II

STATISTICS FOR BUSINESS - DSC 3

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80 Hrs
Tutorials: 16 Hrs

Course Outcome:

On successful completion of this course the students can:
CO1: Learn in details with examples Measures of Central tendency
CO2: Understand the classification and characteristics of Measures of dispersion
CO3: Learn in detail the correlation and determine the relation between two variables
CO4: Understand in depth regression and able to find unknown variable value based on known variable value
CO5: Learn the characteristics and components of time series analysis and able fit a trend line

Unit 1: **Measures of Central Value:**
Meaning, Need for measuring central value. Characteristics of an ideal measure of central value. Types of averages - mean, median, mode, harmonic mean and geometric mean. Merits, Limitations and Suitability of averages. Relationship between averages. Measures of Dispersion: Meaning and Significance. Absolute and Relative measures of dispersion - Range, Quartile Deviation, Mean Deviation, Standard Deviation, Moments, Skewness.

Unit 2: **Correlation Analysis:**
Meaning and significance. Types of correlation. Methods of studying simple correlation - Karl Pearson's coefficient of correlation, Spearman's Rank correlation coefficient.
Regression Analysis: Meaning and significance, Regression vs. Correlation. Linear Regression, Regression lines (X on Y and Y on X) and Standard error of estimate.

Unit 3:Analysis of Time Series and Probability
Analysis of Time Series: Meaning and significance. Utility, Components of time series, Models (Additive and Multiplicative), Measurement of trend: Method of least squares, parabolic trend and logarithmic trend.
Probability: Meaning and need. Theorems of addition and multiplication. Conditional probability. Bayes' theorem, Random Variable- discrete and continuous. Probability Distribution: Meaning, characteristics (Expectation and variance) of Binomial, Poisson, and Normal distribution. s

Unit 4:Introduction to testing of Hypothesis:
Concept; Level of Significance; Process of testing; Test of hypothesis concerning Mean; Test of hypothesis concerning Proportion. Z -test, t – test for single mean and difference of means and ANNOVA – one way and two way.

Reference:

1. S.P. Gupta (S.P.) : Statistical Methods, Sultan Chand & Sons, 34th Edition

2. Richard Levin & David Rubin : Statistics for management, Prentice Hall
3. M. Wilson – Business Statistics
4. Sancheti&Kapoor – Business Statistics
5. C.B. Gupta - Business Statistics
6.Tulsian - Business Statistics

Note: Latest edition of the text books should be used.

BDB22011 **SEMESTER II**

COST AND MANAGEMENT ACCOUNTING - DSC 4

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80 Hrs
Tutorials: 16 Hrs

Course Outcome:

On successful completion of this course the students can:

CO 1: Understand in depth budgetary control system and able to prepare different types of budgets

CO 2: Understand in detail the techniques of costing and able to become cost accountant

CO 3: Learn in detail the classification of cost and able to prepare cost sheet, tender and quotation

CO 4: Learn in depth variance analysis and able to determine Material, Labour and overhead variance

CO5: Learn in detail marginal costing techniques and able to determine BEP, desired profit

Unit 1: Cost concepts:
Meaning, Scope, Objectives, and Importance of Cost Accounting, Cost, Costing, Cost Control, and Cost Reduction. Elements of Cost, Components of total Cost, Cost sheet.
Classification of costs: Fixed, Variable, Semi-variable, and Step costs; Product, and Period costs; Direct, and Indirect costs; Relevant, and Irrelevant costs; Shut-down, and Sunk costs; Controllable, and Uncontrollable costs; Avoidable, and Unavoidable costs; Imputed / Hypothetical costs; Out-of-pocket costs; Opportunity costs; Expired, and Unexpired costs; Conversion cost. Cost Ascertainment: Cost Unit, Cost Center, Profit Center, Cost Allocation and Cost apportionment; Cost Reduction and Cost Control.

Unit 2: **Cost-Volume-Profit Analysis**:
Contribution, PV Ratio, Breakeven-point, Margin of safety, cost break-even-point, cash break-even-point, Composite break-even-point, Key Factor, Break-even Analysis. Relevant Costs and Decision Making: Pricing, Product Profitability, Make or Buy, Exploring new markets, Shut down or continue.
Process costing: Process losses and wastage, Abnormal effectives.

Unit 3: **Budgets and Budgetary Control**:
Meaning, Types of Budgets (sales, production, purchase raw material consumption, cash budget). Steps in Budgetary Control, Fixed and Flexible Budgeting, Responsibility Accounting.

Unit 4: **Standard Costing and Variance Analysis**:
Material, Labour & Overhead variances.

Reference:

1. Maheshwari, S.N., and Mittal, S.N. Cost Accounting: Theory and Problems**,** Shree Mahavir Book Depot (Publishers), Delhi.

2. M.N.Arora, Management Accounting, Theory, Problems and Solutions, Himalaya Publishing House
3. Horngren, C.T., Foster, G, and Datar, S.M**.,** Cost Accounting: A Managerial Emphasis**,** Prentice Hall of India Pvt. Ltd., New Delhi.
4. Henke, E.O., and Spoede, C.W., Cost Accounting: Managerial Use of Accounting Data,PWS-KENT Publishing Company, Boston.

Note: Latest edition of the text books should be used.

BDC21011

SEMESTER III

INCOME TAX - DSC 5

(Credits: Lecture – 04, Tutorial – 01, Practical – 01)

Lectures: 64 Hrs
Tutorials: 16 Hrs
Practical: 32 Hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Learn in depth the procedure of online filing and able to file online income tax returns

CO2: Understand in depth Income Tax Act of 1961 and can become tax consultant practitioner

CO3: Deliberate in detail with examples and appear before IT tribunal on behalf of clients

CO4: Learn in detail different sections Under IT Act to reduce tax liability

CO5: Identify the different heads of income and able to compute tax liability

Unit 1: **Basic concepts**:
Income, agricultural income, person, asessee, assessment year, previous year, gross total income, total income, maximum marginal rate of tax. Residential status of persons and its effect on tax incidence .Exempted income under section 10(in relation to individuals).

Unit 2: **Computation of income under the heads**:
Salaries, Income from house property

Unit 3: **Computation of income under the heads**:
Profits and gains of business & profession, Capital gain, Income from other sources.

Unit 4: **Computation Total Income and Tax Liability**
Deductions under Chapter VI-A- Computation of total income and tax liability of individuals. Preparation of return of income manually and through software. Provision & Procedures of Compulsory online filing of returns for specified assesses.

Reference:

1. Dr.VinodkSinghania and Dr.MonicaSinghania; Students guide to income tax, Taxman Publications.
2. GirishAhuja and Ravi Gupta; Systematic Approach to Income Tax: Bharat Law House.
3. Mahesh Chandra, D.C Shukla; Income Tax Law and Practice: Pragati Publications.
4. S.P Goyal; Direct tax planning: SahityaBhawan
5. Finance Act for relevant Assessment Year
6. CBDT Circulars
7. Latest court judgements

Note: Latest edition of the text books should be used.

BDC22011

SEMESTER III

CORPORATE FINANCE - DSC 6

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80 Hrs
Tutorials: 16 Hrs

Course Outcome:

On successful completion of this course the students can:
CO1: Learn in details financial management and become financial adviser
CO2: Understand and analyse the interrelationship between finance and corporate
CO3: Learn in depth working capital management and able to estimate the working capital requirements
CO4: Understand in detail the various approaches to capital structure theories and able to design capital structure
CO5: Understand in depth long term investment decisions

Unit 1:Nature of Financial Management:
Finance and related disciplines; Scope of Financial Management; Profit Maximization, Wealth Maximization - Traditional and Modern Approach; Functions of finance – Finance Decision, Investment Decision, Dividend Decision; Objectives of Financial Management; Organisation of finance function; Concept of Time Value of Money: present value, future value, and annuity.

Unit 2: **Long-term investment decisions**:
Capital Budgeting - Principles and Techniques; Nature and meaning of capital budgeting; Estimation of relevant cash flows and terminal value; Evaluation techniques - Accounting Rate of Return, Net Present Value, Internal Rate of Return, Net Terminal Value, Profitability Index Method. Concept and Measurement of Cost of Capital: Explicit and Implicit costs; Measurement of cost of capital; Cost of debt; Cost of perpetual debt; Cost of Equity Share; Cost of Preference Share; Cost of Retained Earning; Computation of over-all cost of capital based on Historical and Market weights.

Unit 3: **Capital Structure**:
Approaches to Capital Structure Theories - Net Income approach, Net Operating Income approach, Modigliani-Miller (MM) approach, Dividend Policy Decision - Dividend and Capital; Irrelevance of dividends: General, MM hypothesis.
Leverage Analysis: Operating and Financial Leverage; EBIT -EPS analysis; Combined leverage.

Unit 4: **Working Capital Management**:
Management of Cash - Preparation of Cash Budgets (Receipts and Payment Method only); Cash management technique (Lock box, concentration banking), Receivables Management – Objectives; Credit Policy, Cash Discount, Debtors Outstanding and Ageing Analysis; Costs - Collection Cost, Capital Cost, Default Cost, Delinquency Cost, Inventory Management (Briefly) - ABC Analysis; Minimum Level; Maximum Level; Reorder Level; Safety Stock; EOQ (Basic Model), Determination of Working Capital.

Reference:

1. M.Y. Khan & P.K. Jain , Financial Management, Tata McGraw Hill Pubilshlng Co. Ltd.
2. Rustogi , Financial Management
3. I.M. Pandey , Financial Management
4. L.J. Gitman& C.J. Zutter, Managerial Finance.R.A. Brealey, S.C. Myers, F. Allen& P. Mohanty, Principles of Corporate Finance.
5. J.V. Horne & J.M. Wachowicz, Fundamentals of Financial Management.

Note: Latest edition of the text books should be used.

BDD22001

SEMESTER IV

FINANCIAL MARKETS AND INSTITUTIONS - DSC 7

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80 Hrs
Tutorials: 16 Hrs

Course Outcome:

On successful completion of this course the students can;
CO1: Understand in details transaction in stock exchange and able to become inter-mediator
CO2: Learn in depth the classification and characteristics of financial markets and institutions and able to set up his own institution
CO3: Understand in detail characteristics of financial market and able to participate in financial market
CO4: Identify the government policies for investment and able apply them

Unit 1: **Indian Financial System**:
Indian Financial System – Meaning - Overview – needs – objectives, major reforms – issues in financial reforms –future agenda –role of RBI- Banking Companies Regulation Act 1949, services, Retail banking – Payment Banks. Corporate universal Banking system – CBS – RTG'S – MBFC – Internet banking.

Unit 2: **Financial Markets in India**:
Role and Importance of Financial Markets, Types of Financial Markets: Money Market; Capital Market; Factors affecting Financial Markets, Linkages Between Economy and Financial Markets, Integration of Indian Financial Markets with Global Financial Markets, Primary & secondary market, Currency Market, Debt Market- role and functions of these markets.

Unit 3: Primary Market:
Primary Market for Corporate Securities in India: Issue of Corporate Securities: Public Issue through Prospectus, Green shoe option, Offer for sale, Private Placement, Rights Issue, On-Line IPO, Book Building of Shares, Disinvestment of PSU, Employees Stock Options, Preferential Issue of Shares, Venture Capital, Private Equity Firms, Performance of Primary Market in India, Corporate Listings : Listing and Delisting of Corporate Stocks.

Unit 4: **Secondary Market in India**:
Introduction to Stock Markets, Regional and Modern Stock Exchanges, International Stock Exchanges, Raising of funds in International Markets: ADRs and GDRs, FCCB and Euro Issues; Indian Stock Indices and their construction, maintenance, adjustment for corporate actions (rights, bonus and stock split;) on index with numerical, free float v/s full float methodology, Classification of Securities to be included in the Index, Bulls and Bears in Stock Markets, Factors influencing the movement of stock markets, indicators of maturity of stock markets, Major Instruments traded in stock markets: Equity Shares, Debentures, Myths attached to Investing in Stock Markets.

Unit 5: Trading of Securities:
Trading of securities on a stock exchange; Selection of broker, capital and margin requirements of a broker, MTM and VAR Margins, kinds of brokers, opening of an account to trade in securities, DEMAT System, placing an order for purchase/sale of shares, margin trading and margin adjustment, contract note and settlement of contracts, Algorithmic trading, Demutualization of Securities, NSE and BSE: Sensex & Nifty -Settlement mechanism at BSE & NSE..

Unit 6: **Money & Debt Markets**:
Money Markets & Debt Markets in India: Money Market - Meaning, role and participants in money markets, Segments of money markets, Call Money Markets, Repos and reverse Repo concepts, Treasury Bill Markets, Market for Commercial Paper, Commercial Bills and Certificate of Deposit. Role of STCI and DFHI in money market, Secondary market for government securities. Over subscription and devolvement of Government Securities, Government securities issued by State Governments, Municipal Bonds.

Reference:

1. Saunders , Anthony & Cornett , Marcia Millon (2007). Financial Markets and Institutions (3rd ed.). Tata McGraw Hill
2. Khan, M Y. (2010). Financial Services (5th ed.). McGraw Hill Higher Education
3. Shahani, Rakesh(2011). Financial Markets in India : A Research Initiative. Anamica Publications
4. Goel, Sandeep. (2012). Financial services.PHI.
5. Gurusamy,S. (2010). Financial Services.TMH.

Note: Latest edition of the text books should be used

BDD23001

SEMESTER IV

QUANTITATIVE TECHNIQUES - DSC 8

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80 Hrs
Tutorials: 16 Hrs

Course Outcome:

After the completion this course the students are able to:

CO1: Understand in depth about OR techniques and solve the business problems
CO2: Learn in detail to convert the business problem into mathematical for optimum utilization of scare resources
CO3: Understand the details of elementary transportation and able to solve business problems
CO4: Learn in depth about Network analysis and able to construct network diagram
CO5: Learn the details of Decision Theory

Unit 1: **Linear Programming**:
Formulation of L.P. Problems, Graphical Solutions, Two Variables, introduction of slack variables and additional variables – Duality concept, formulation of LPP Model using slack and additional variables.

Unit 2: **Elementary Transportation**:
Formulation of Transport Problem, Solution by N.W. Corner Rule, Least Cost method, Vogel's Approximation Method (VAM), Modified Distribution Method. (Special cases: Multiple Solutions, Maximization case, unbalanced case, prohibited routes) Elementary Assignment: Hungarian Method, (Special cases: Multiple Solutions,
Maximization case, unbalanced case, Restrictions on assignment.)

Unit 3: **Network Analysis**:
Construction of the Network diagram, Critical Path- float and slack analysis (Total float, free float, independent float), PERT, Project Time Crashing.

Unit 4: **Decision Theory**:
Pay off Table, Opportunity Loss Table, Expected Monetary Value, Expected Opportunity Loss, Expected Value of Perfect Information and Sample Information Markov Chains: Predicting Future Market Shares, Equilibrium Conditions (Questions based on Markov analysis) Limiting probabilities, Chapman Kolmogrov equation.
Introduction to Game Theory: Pay off Matrix- Two person Zero-Sum game, pure strategy, Saddle point; Dominance Rule, Mixed strategy, Reduction of m x n game and solution of 2x2, 2 x s, and r x 2 cases by Graphical and Algebraic methods; Introduction to Simulation: Monte Carlo Simulation

Reference:

1. N. D. Vohra, Quantitative Management, Tata McGraw Hill
2. P. K. Gupta, Man Mohan, KantiSwarup, Operations Research, Sultan Chand
3. V. K. Kapoor, Operations Research, Sultan Chand & Sons
4. J. K. Sharma,Operations Research Theory & Applications, Macmillan India Limited.

Note: Latest edition of the text books should be used.

BDD21001

SEMESTER IV

COMPUTER APPLICATIONS IN BUSINESS – SEC - 2

(Credits: Lecture – 02, Tutorial – 0, Practical – 2) Lectures: 32 Hrs
Practical: 64 Hrs

Course Outcome:

On successful completion of this course the students are able to:

CO1: Learn in depth and create business documents by using MS Word and Excel

CO2: Learn in details with application of PowerPoint and present of business information through PPTs

CO3: Write down the characteristics of BPOs and KPOs and able to work in BPOs and KPOs

CO4: Learn the classification and characteristics of chart and graphs using computers

CO5: Identify the characteristics of projects and develop projects using computer

Unit 1: Word Processing 3 Lectures, Practical Lab 6

Introduction to word Processing, Word processing concepts, Use of Templates, Working with word document: Creating and Editing Text, Find and replace text, Formatting, spell check, Autocorrect, Autotext; Bullets and numbering, Tabs, Paragraph Formatting, Indent, Page Formatting, Header and footer, Tables: Inserting/Drawing, filling and formatting a table; OLE concepts (Object Linking and Embedding) Inserting Pictures and Video; Mail Merge: including linking with Database; Printing documents

Creating Business Documents using the above facilities

Unit 2: Presentation Graphics 3 Lectures, Practical Lab 6

Presentation-Basic concepts, Creating/Editing slides, Formatting slides, Inserting drawings, Charts, Tables, Images, Symbols. Embedding media and animation. Preparing and presenting a slide show..

Creating Business Presentations using above facilities

Unit 3: Spreadsheets and its Business Applications10 Lectures, Practical Lab 20

Spreadsheet concepts, Managing worksheets; Formatting, Entering data, Editing, and Printing a worksheet; Handling operators in formula, Project involving multiple spreadsheets, Organizing Charts and graphs

Generally used Spreadsheet functions**:** Mathematical, Statistical, Financial, Logical, Date and Time, Lookup and reference, Database, and Text functions.

Unit 4: Creating Business Spreadsheet 10 Lectures, Practical Lab 20

Creating spreadsheet in the area of**:** Loan and Lease statement; Ratio Analysis; Payroll Processing and statements; Capital Budgeting; Depreciation Accounting; Graphical representation of data; Frequency distribution and its statistical parameters; Correlation and Regression.

Note:

1. The General Purpose Software referred in this course will be notified by the University Departments every three years. If the specific features, referred in the detailed course

above, is not available in that software, to that extent it will be deemed to have been modified.

2. Teaching arrangement need to be made in the computer Lab

Reference:
The suggested readings and guidelines shall be notified by the university department at least once in three years based on the selected software

BDE21001

SEMESTER V

INVESEMENT ANALYSIS & PORTFOLIO MANAGEMENT – DSC 9

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80 Hrs

Tutorials: 16 Hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Learn in depth various financial models to analyse risk and return

CO2: Understand in depth share valuation

CO3: Identify and use different models for portfolio analysis

CO4: Learn in depth capital asset pricing model

Unit 1: **Basics of risk and return**:
Concept of returns, application of standard deviation, coefficient of variation, beta, alpha. Bonds : present value of a bond, yield to maturity, yield to call, yield to put, systematic risk, price risk, interest rate risk, default risk. Yield curve and theories regarding shape of yield curve. Unsystematic risk and non-risk factors that influence yields. Duration and modified duration, immunization of a bond portfolio. Fundamental analysis: EIC framework; Economic analysis: Leading lagging & coincident macro-economic indicators, Expected direction of movement of stock prices with macroeconomic variables in the Indian context; Industry analysis: stages of life cycle, Porter's five forces model, SWOT analysis, financial analysis of an industry; Company analysis.

Unit 2: **Share valuation**:
Dividend discount models- no growth, constant growth, two stage growth model, multiple stages; Relative valuation models using P/E ratio, book value to market value. Technical analysis: meaning, assumptions, difference between technical and fundamental analysis; Price indicators- Dow theory, advances and declines, new highs and lows- circuit filters. Volume indicators- Dow Theory, small investor volumes. Other indicators- futures, institutional activity, Trends: resistance, support, consolidation, momentum- Charts: line chart, bar chart, candle chart, point & figure chart. Patterns: head &shoulders, triangle, rectangle, flag, cup & saucer, double topped, double bottomed, Indicators: moving averages. Efficient market hypothesis; Concept of efficiency: Random walk, Three forms of EMH and implications for investment decisions. (No numerical in EMH and technical analysis)

Unit 3: **Portfolio analysis**:
Portfolio risk and return, Markowitz portfolio model: risk and return for 2 and 3 asset portfolios, concept of efficient frontier & optimum portfolio. Market Model: concept of beta systematic and unsystematic risk. Investor risk and return preferences: Indifference curves and the efficient frontier, and anticipated inflation. Asset allocation: Asset allocation pyramid, investor life cycle approach, Portfolio management services: Passive – Index funds, systematic investment plans. Active – market timing, style investing.

Unit 4: **Capital Asset Pricing Model (CAPM):**
Efficient frontier with a combination of risky and risk free assets. Assumptions of single period classical CAPM model. Characteristic line, Capital Market Line, Security market Line. Expected return, required return, overvalued and undervalued assets. Mutual Funds :Introduction, calculation of Net Asset Value (NAV) of a Fund, classification of

mutual fund schemes by structure and objective, advantages and disadvantages of investing through mutual funds. Performance Evaluation using Sharpe's Treynor's and Jensen's measures and Fama's Decomposition.

Reference:

1. Fischer, D.E. & Jordan, R.J. : Security Analysis & Portfolio Management ; PearsonEducation.
2. PrasannaChandra : Investment Analysis and Portfolio Management ;Tata Mcgraw HillEducation Private Limited

Note: Latest edition of the text books should be used

BDE22001

SEMESTER V

GST AND CUSTOMS DUTY – DSC 10

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80 Hrs
Tutorials: 16 Hrs

Course Outcome:

On successful completion of this course the students are able to:

CO1: Learn in depth the provisions of GST to handle TDS and POS online and off line more efficiently

CO2: Learn the details of computation of GST

CO3: Learn in detail the steps to be followed to determine the assessable value and customs duty

CO4: Understand the details of technology of GST and flow of return filing under GST

CO5: Learn in details and gain knowledge to practice as GST Consultant

Unit 1: **Introduction to GST**- Indirect tax Structure in India, Constitutional requirements, GST Council, Issues in Indirect Tax, Rationale for Transition to GST. GST- Meaning, Definition of GST - Structure of GST -Types of GST- Features of GST, Benefits of GST. Difficulties in implementation of GST.

GST Compliance requirement definitions of Dealer, Manufacturer and Trader. Registration under GST-Persons liable for registration, compulsory registration, Procedure for Registration, Rejection of application for registration, cancellation of Registration,

Unit 2: a) **GST Definitions** - Aggregate Turnover, Agriculturist, Business, Credit note and Debit note, Exempt Supplies, Input, Input service, Input Service Distributor, Intra-state supply of Goods, Job work, Invoice. Composition Levy, Mixed Supply, outward supply, Person, Turnover in State

b) **Levy and Collection of Tax**: Introduction, Supply- meaning and scope of supply, treatment of mixed and composite supply, Liability of tax payable person, Rate and value of tax, transactions without considerations, list of transactions for supply of goods and services and list of transactions for non-supply of goods and services, Reverse charge mechanism,.

Unit 3: **Time of supply and Value of taxable supply**

Time of Supply Introduction, time of supply-forward charge, reverse charge, residuary, special charges Time of supply of service- forward charge, reverse charge, Vouchers, Residuary, Special charges. Problems on determination of time of supply.

Value of taxable Supply-conditions, inclusions, Consideration not wholly in money, Supply between two related persons, Supply through agent, cost based value, Residual valuation, specific supplies, Service of pure agent. Problems on determination of value of supply.

Unit 4 : **Input tax credit and Returns**

Input tax credit- Meaning, conditions for taking credit, ineligible input tax credit, availability of credit in special circumstances, Input tax credit and change in constitution of registered person, Taking input tax credit in respect of inputs and capital goods sent for job work, Manner of Distribution of Credit by Input Service Distributor (ISD)

Returns-Furnishing details of outward supplies and inward supplies, a brief introduction to GST forms-1 to 8, Steps for filing forms, Levy of late fee.

Unit 5: **Customs Act 1962**

Meaning-Notified Goods-Specified goods-Prohibition of Importation and Exportation under section 11-Types of Customs duty. Computation of Assessable Value and Customs duty.

Suggested Readings:

1. GST and Customs Duty - Singhania

BDE23001

SEMESTER V
INVESTMENT BANKING & FINANCIAL SERVICES- DSE

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80 Hrs
Tutorials: 16 Hrs

Course Outcome:

On successful completion of this course the students are able to:

CO1: Learn the characteristics of Investment banking in India

CO2: Learn the details of Public Issue

CO3: Understand the details of types of leasing

CO4: Understand in detail the feature of Hire Purchase

CO5: Understand the classification and characteristics of Insurance

CO6: Learn in detail the history and evolution of venture Capital

CO7: Learn the details of Securitization

Unit 1: Introduction:
An Overview of Indian Financial System, Investment Banking in India, Recent Developments and Challenges ahead, Institutional structure and Functions of Investment /Merchant Banking; SEBI guidelines for Merchant Bankers, Registration, obligations and responsibilities of Lead Managers, Regulations regarding Continuance of association of lead manager with an issue

Unit 2: Issue Management:
Public Issue: classification of companies, eligibility, issue pricing, promoter's contribution, minimum public offer, prospectus, allotment, preferential allotment, private placement, Book Building process, designing and pricing, Green Shoe Option; RightIssue: promoter's contribution, minimum subscription, advertisements, contents of offer document, Bought out Deals, Post issue work & obligations, Investor protection, Broker, subbroker and underwriters

Unit 3: Leasing and Hire Purchase :
Concepts of leasing, types of leasing – financial & operating lease, direct lease and sales & lease back, advantages and limitations of leasing, Lease rental determination; Finance lease evaluation problems (only Lessee's angle), Hire Purchase interest & Installment, difference between Hire Purchase & Leasing, Choice criteria between Leasing and Hire Purchase mathematics of HP, Factoring, forfaiting and its arrangement, Housing Finance : Meaning and rise of housing finance in India, Fixing the amount of loan, repricing of a loan, floating vs. fixed rate, Practical problems on housing finance.

Unit 4: Venture Capital, **Insurance, Credit ratings and Securitization:**
Concept, history and evolution of VC, the venture investment process, various steps in venture financing, incubation financing.
Insurance: Concept, classification, principles of insurance, IRDA and different regulatory norms, operation of General Insurance, Health Insurance, Life Insurance.

Credit Ratings: Introduction, types of credit rating, advantages and disadvantages of credit ratings, Credit rating agencies and their methodology, International credit rating practices.
Securitization: Concept, securitization as a funding mechanism, Traditional and nontraditional mortgages, Graduated-payment mortgages (GPMs), Pledged-Account Mortgages(PAMs), Centralized Mortgage obligations (CMOs), Securitization of non mortgage assets, Securitization in India

Reference:

1. M.Y.Khan,-Financial Services‘ – Tata McGraw –Hill, 3 rd Edition, 2005.
2. Machiraju - Indian Financial System _- Vikas Publishing House, 2 nd Edition, 2002.
3. J.C.Verma - A Manual of Merchant Banking _, Bharath Publishing House, New Delhi,2001.
4. K.Sriram - Hand Book of Leasing, Hire Purchase & Factoring‘, ICFAI, Hyderabad, 1992.
Note: Latest edition of the text books should be used

BDE24001

SEMESTER V
CORPORATE ANALYSIS AND VALUATION- DSE

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80 Hrs
Tutorials: 16 Hrs

Course Outcome:

On successful completion of this course the students are able to:

CO1: Learn the details of Analysis of Corporate Financial Statements

CO2: Understand the details of various methods of valuation

CO3: Learn in details with application of Discounted Cash flow valuation method

CO4: Learn the classification of estimating discount rates

CO5: Understand in depth Relative valuation

CO6: Identify the details of Impact of inflation on valuation

Unit 1: Analysis of Corporate Financial Statements:
Income statements and Balance sheets through ratio analysis and analyzing the Chairman's statement, Directors' report, management discussion & analysis, report on corporate governance, auditor's report to evaluate the financial soundness of the company. Understanding financial statements of manufacturing and service organisations. Common size analysis and relevant ratios.

Unit 2: Introduction to Valuation:
Value and price, Balance sheet-based methods, Income statement-based methods, Multiples, Goodwill-based methods. Cash flow discounting-based methods. Deciding the appropriate cash flow for discounting. The free cash flow to the firm, free cash flow to equity. Forecasting Cash flows: simple model for forecasting income and cash flows. Earnings, Tax effect, Reinvestment needs, dividend.

Unit 3: **Discounted Cash flow Valuation**:
Valuation of a company with no growth, constant growth, variable growth and infinite life. Estimating discount rates-cost of equity, cost of debt, tax shield, weighted average cost of capital. The estimation of equity risk premium, calculation of beta, instability of beta, adjusted beta, levered and unleveredbeta, bottoms up beta.

Unit 4: **Relative Valuation:**
standard multiples, comparable companies, potential pitfalls; estimating multiples using regression. Valuation of brands and intellectual capital. Interest rates and company valuation. Impact of inflation on valuation. Reconciling relative and discounted cash flow valuation. Case studies in valuation.

Reference:

1. Foster, George Financial Statement Analysis, 2nd ed., Pearson Education Pvt Ltd
2. Damodaran, A. (2008). Damodaran on Valuation, Security Analysis for investment and CorporateFinance (2nd ed.). Wiley India Pvt. Ltd.
3. Chandra, P. (2011).Corporate Valuation and Value Creation, (1st ed). TMH
4. Pablo Fernandez, Valuation and Common Sense, free download from ssrn.

Note: Latest edition of the text books should be used

BDE25001

SEMESTER V

RESEARCH METHODOLOGY-DSE

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80 Hrs
Tutorials: 16 Hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Understand in details with application of research methodology and become a good researcher

CO2: Learn the characteristics and classification of research Design

CO3: Understand in details with examples Sources of Data Collection

CO4: Learn the characteristics of sampling techniques

CO5: Understand in details with application of methods of analysis

CO6: Understand the details of research report

Unit 1: Business Research:
Meaning - Nature and Scope of Business Research – Role of Business Research in decision making. Applications of Business Research; The Research process – Steps in the research process; the research proposal; Problem Formulation: Management decision problem vs. Business Research problem. Research Design: Exploratory, Descriptive & Causal.

Unit 2: Primary Data Collection:
Survey v/s Observations. Random sample collection methods. Comparison of self-administered, telephone, mail, emails techniques. Qualitative Research
Tools: Depth Interviews focus groups and projective techniques.

Unit 3:Measurement& Scaling:
Primary scales of Measurement-Nominal, Ordinal, and Interval &Ratio. Scaling techniques paired comparison, rank order, constant sum, semantic differential, itemized ratings, Likert Scale; Questionnaire-form & design. Sampling: Sampling techniques, determination of sample size using statistical techniques, Cronbach's Alpha test for reliability(using software).

Unit 4: Data and the Methods of Analysis:
Analysis of Variance (ANOVA) One-Way & Two-Way, Chi square test (goodness of Fit).Multivariate Data Analysis: Factor Analysis (Principal Component Analysis), Discriminant Analysis. Above statistical test also to be explained using statistical software package. Report writing: Contents of a Research Report, Plagiarism in Business Research – Meaning and effects - Plagiarism detection software

Refercnce:
1. Zikmund, W.G., Babin, B.J., Carr, J.C. & Griffin, M. (2013). Business Research Methods (9th ed.). Cengage Learning.
2. Johnson, R.A. &Wichern, D.W. (1997) Business Statistics-Decision Making with Data (1st ed.). John Wiley & Sons.
3. Cooper, D.R. & Schindler, P.S. (2008) Business Research Methods (10th ed.). McGraw Hill Education.

4..Chawla, D, &Sondhi,N. (2011) Research Methodology Concepts and Cases (1st ed.). Vikas Publishing House
5. Malhotra, N & Dash. S (2010) Marketing Research An Applied Orientation (6th ed.). Pearson, Prentice Hall of India.

Note: Latest edition of the text books should be use

BDE26001

SEMESTER V

INTERNATIONAL TRADE BLOCKS AND MULTILATERAL AGENCIES- DSE

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80 Hrs
Tutorials: 16 Hrs

Course Outcome:

On successful completion of this course the students can:

CO 1: Learn the details of Economic theory on international trade

CO2: Understand the characteristics of domestic, foreign, global environment and analyse their impact on international business decision

CO3: Understand the details of regional integration and trade blocks

CO4: Understand the characteristics and types of international investment

CO5: Identify the impact of reform on competitiveness of the Indian firms

CO6: Understand in depth economic institutions

Unit 1: **Review of Economic Theory on International Trade**:
Basis for international trade; gains from trade; distributional issues, policy instruments and their impact, political economy. Importance, nature and scope of international relation, modes of entry into international business, internationalization process and managerial implications; Domestic, foreign and global environments and their impact on international business decision; Growing concern for green trades.

Unit 2:**International economic & trading environment**:
Regional integration and trade blocks, regionalism v/s. multilateralism, European union, integration of developing countries -BRICS, ASEAN, SAARC, SAFTA, NAFTA, G-20; World trade in goods and services -Major trends and developments; World trade and protectionism - Tariff and non-tariff barriers ; Counter trade, UNCTAD, WTO, GATT, GATS, TRIM, TRIPS; India's role in facilitating trade relations under BRICS, SAARC, SAFTA, ASEAN and to WTO.

Unit 3: **International investment**:
Types and significance of foreign investments, factors affecting international investment, growth and dispersion of FDI, Cross border mergers and acquisition, foreign investment in India-Impact of reforms on competitiveness of the Indian Firms, EURO/ADR issues, ECBs; current economic crises in US/Europe/Asia and its impact on economic growth in India.

Unit 4: **Economic institutions**:
International Monetary Funds (IMF), World Bank (IBRD,IDA, IFC), Asian Development Bank, BRICS Development Bank, Bilateral funding arrangements with special reference to Japan International Cooperation Agencies (JICA),agencies of USA; Case studies on Bilateral financing arrangements of Indian projects like Delhi Metro, Dedicated Freight corridor, Nuclear Power Plant etc.

Reference:

1. Hill, W. L. Charles and Jain, A.K. (2008). International Business (6th ed.). India: McGrawHill.
2. Fernando, A.C. (2011) .Corporate Governance: Principles, Policies and Practices. India: Pearson Education.
3. Roger, Bennet (1999). International Business, Financial Times. London: Pitman Publishing.
4. Sharan, Vyuptakesh (2003). International Business (2nd ed.). India: Pearson Education.
5. Krueger, Anne O. (2002). Economic Policy Reforms and the Indian Economy.OUP.

Note: Latest edition of the text books should be used

BDE27001

SEMESTER V

HUMAN RESOURCE MANAGEMENT- DSE

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80 Hrs

Tutorials: 16 Hrs

Course Outcome:

On successful completion of this course the students are able to:

CO1: Understand in depth the techniques to manage Human Resources at work place and able to occupy a position of H R Manager

CO2: Deliberate the methods and techniques of training to train the Human Resources and create assets for the organisation

CO3: Understand in depth the methods of recruitment

CO4:Understand the basis and purpose of promotion

CO5: Learn the details of transfer

Unit 1: Human Resource Management

Meaning, Definition – objectives, Importance , Functions and process. HR policies, HR Manager- Duties and responsibilities – Recent trends in HRM

Unit 2: Human Resource Planning, Recruitment and Selection

Meaning – Importance of Human Resource Planning – Benefits of Human Resource Planning. Recruitment – Meaning – methods of recruitment. Selection – meaning – steps in selection process. Interview – meaning and types. Induction – Meaning, objectives and purposes.

Unit 3: Training and Development

Training – Need for training, benefits of training, identification of training needs and methods of training. Training v/s development, methods of development. Career Development.

Unit 4: Performance Appraisal and Compensation

Performance Appraisal – Meaning and Definition, objectives, methods, uses and limitation. Compensation – meaning and objectives. Fringe benefits.

Unit 5: Promotion and Transfers

Meaning and Definition of Promotion – purpose of promotion, basis of promotion, meaning of transfer, reasons for transfer, types of transfer, promotion v/s transfer.

Reference:

1. Gary Dessler. *A Framework* for *Human Resource Management*.Pearson Education.
2. DeCenzo, D.A. and S.P. Robbins, *Personnel/Human Resource Management*, Pearson Education.
3. Bohlendar and Snell, *Principles of Human Resource Management,* Cengage Learning
4. Ivancevich, John M. *Human Resource Management*. McGraw Hill.
5. Wreather and Davis. *Human Resource Management*.Pearson Education.
6. Robert L. Mathis and John H. Jackson.*Human Resource Management*.Cengage Learning.
7. TN Chhabra, *Human Resource Management,* DhanpatRai& Co., Delhi

8. BiswajeetPatttanayak, *Human Resource Management, PHI Learning*
9. NeeruKapoor*, Human Resource Management,* Taxmann Publication

Note: Latest edition of text books may be used.

BDF21001 **SEMESTER VI**

CORPORATE RESTRUCTURING – DSC 11

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80 Hrs
Tutorials: 16 Hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Understand in detail the problems faced in joint ventures

CO2: Learn the types and structure of joint venture

CO3: Understand in detail the theories of Mergers and Acquisitions

CO4: Learn the details of legal frame work for mergers and acquisitions

CO5: Understand the methods and factors affecting Valuation

CO6: Understand the details of Post merger evaluation and its impact on shareholders' wealth

Unit 1: **Joint Ventures**:
Concept & Meaning of Joint Ventures, Need & Types of Joint Ventures, Structures & Problems faced in Joint Ventures, Joint Ventures and Strategic Alliance. Some relevant case study of successful and failed joined ventures.

Unit 2: **Mergers and Acquisitions**:
Introduction to mergers, types of mergers, theories of mergers & acquisitions; Cross-border mergers and acquisitions, issues and challenges in cross border M&A. Analysis of Post-Merger Performance. Demerger, types of demerger, reverse merger, buyback of shares, leverage buy-out strategy, merger strategy - growth, synergy, operating synergy, financial synergy, diversification. Takeover and its types, takeover strategy, takeover bids, legal framework for mergers and acquisitions, leverages and buyouts; Hostile tender offers and various anti-takeover strategies.

Unit 3: **Deal Valuation and Evaluation**:
Factors affecting valuation basics, methods of valuation, cash flow approaches, Economic Value Added (EVA), sensitivity analysis, valuation under takeover regulation, valuation for slump sale, cost-benefit analysis and swap ratio determination.

Unit 4: Post-Merger Evaluation:
Financial Evaluation of Mergers & Acquisitions, Impact on shareholders' Wealth; Methods of payment and financing options in mergers & acquisitions, financing decision, Merger, Acquisition and Competition law 2002, SEBI (Securities & Exchange Board of India) Takeover Code 2011 and criteria for negotiating friendly takeover.

Reference:

1. Weston, Fred; Chung, Kwang S. &Siu, Jon A.: Takeovers, Restructuring and Corporate Governance, (2nd ed.). Pearson Education
2. Gupta, Manju (2010): Contemporary Issues in Mergers and Acquisitions. Himalaya Publishing
3. Sundarsanam (2006); Creating Value from Mergers and Acquisitions, (1st ed.) Pearson Education
4. Ramanujan. S. (1999); Mergers: The New Dimensions for Corporate Restructuring, McGraw Hill

5. Narayankar, Ravi, (2013): Merger and Acquisitions Corporate Restructuring, Strategy and Practices, (2nd ed.). International Book House Pvt. Ltd.

Note: Latest edition of the text books should be used

BDF22001

SEMESTER VI

INTERNATIONAL FINANCIAL INSTITUTIONS – DSC 12

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80 Hrs
Tutorials: 16 Hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Learn the details of IFIS and their implications on business

CO2: Understand the characteristics of world bank

CO3: Learn the History and Organisational Structure of world bank

CO4: Understand in detail the functioning of IDA and IFC

CO5: Understand the steps taken by IMF to solve problems of international liquidity

CO6: Understand the Dispute Settlement facilities of international Centre for investment Disputes

Unit 1: International financial institutions
Meaning - objectives- need-functions. International liquidity: meaning, problems of international liquidity-IFIs and their implications on business.

Unit 2: International monitory fund (IMF):
Origin- objectives functions- membership- organization and structure- financial resources- role played by IMF in global business- steps taken by IMF to solve problems of international liquidity.

Unit 3: World Bank:
Origin-History –membership-organisational structure- capital resources- funding objectives- functions of World Bank in international business-loan provision: projects loans, sectoral loans and structural adjustment loans.

Unit 4: IDA and IFC:
IDA: Origin- history-objectives- membership -organizational structure-IDA assistance – Donor contributions.
IFC: Origin-history-objectives - organizational structure-funding mechanisms-Financial resources- Assistance to member countries.

Unit 5:UNCTAD and MIGA:
UNCTAD : Origin-history-functions-organisational structure-activities.
MIGA: Origin-history-functions-organisational structure-activities.

Unit 6:ADB and International Centre for Investment Disputes(ICID):
ADB: Origin- history-objectives- membership -organizational structure-Functions.
International centre for investment Disputes (ICID): Origin- history- membership - organizational structure-activities-Disputes settlement facilities.

Reference:

1. Principles & Practice of Banking – B.S. Raman
2. International Banking operations – Indian institute of Banking and finance
3. Corporate finance for Non finance Security – Prasanna Chandra

Note: Latest edition of the text books should be used

BDF23001

SEMESTER VI
STRATEGIC CORPORATE FINANCE- DSE

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80 Hrs
Tutorials: 16 Hrs

Course Outcome:

On successful completion of this course the students can

CO1: Learn in detail the risk management choices

CO2: Understand the details of value enhancement tools and techniques

CO3: Learn the different types of financial strategy for shareholders wealth maximization of strategic corporate finance

CO4: Understand the significance of strategy in financial decision

CO5: Learn the details of Financial Distress and restructuring

CO6: Learn in depth capital structure and factors affecting the capital structure

Unit 1:Introduction to strategic corporate finance:
Strategy v/s Planning, significance of strategy in financial decisions, Different types of financial strategy for Shareholders Wealth Maximization, overall corporate value addition and Economic Value Addition. Strategic Cost Management: Traditional costing Vs Strategic Costing, Relevant costs v/s Irrelevant costs, Different types of strategic costing and their relevance- Target Costing, Activity based Costing, Life Cycle Costing, Quality Costing, Zero Based Budgeting, Strategic cost reduction techniques and value chain analysis. Valuing Real assets in the presence of risk: tracking portfolios and Real Asset valuation, Different Approaches of Valuing Real Assets, Capital Budgeting and Strategic policy.

Unit 2: **Fundraising**:
Identification of different sources of development capital, determination of capital structure and factors affecting the capital structure, cost of capital and cost saving strategy, production of a business plan and financial forecasts to enable potential funders to assess the proposition. Alternative sources of financing – alternative sources of financing, Different approach to infrastructure projects financing- Public Private Partnership (PPP) and its relevance. Managing credit ratings. Dividend v/s share repurchase policy, problem of too much cash. The issues of stock liquidity and illiquidity.
Financial Distress and restructuring: Meaning of Bankruptcy, Factors leading to bankruptcy, symptoms and predictions of bankruptcy, reorganization of distressed firms, liquidation of firms. Company disposals: retirement sale or the sale of a non-core subsidiary, planned exit, forceful retirement and other disposals. Exit strategy- most appropriate exit route, valuation, timing of sale and tax planning opportunities, identification of potential purchasers, approaching the potential purchaser, negotiate with potential acquirers and selection of a preferred purchaser. Real options: Financial and real options compared, various types of real options, application of Real options, Drawbacks of Real options

Unit 3:Company Valuation:
An overview of valuation, valuation principles and practices more, the impact of "what if" scenarios, the key financial and commercial factors affecting the business. Value enhancement tools & techniques, the link between valuation and corporate finance Management Buy-outs: Establishing feasibility of the buy-out, Negotiating the main terms of

the transaction with the vendor including price and structure, Developing the business plan and financial forecasts in conjunction with the buy-out team for submission to potential funders, negotiations with potential funders so that the most appropriate funding offers are selected. Management Buy-ins: Management Buy-in/Buy-outs ("BIMBOs"), Vendorinitiatedbuy-outs/buy-ins. Due Diligence: financial due diligence for both purchasers and financial institutions.

Unit 4: Strategic risk management:

Strategic risk management, the substitutability of capital structure and risk management choices, such as process control efforts, financial, physical, and operational hedging, value-based management.

Reference:

1.AswathDamodaran: Corporate finance theory and practice; John willey& sons, Inc.
2.AswathDamodaran: Strategic Risk Taking:A Framework for Risk Management ; Prentice Hall
3.IMPandey: Financial Management; Vikas Publishing House
4.Strategic Financial Management: Prasanna Chandra; McGraw Hill Education (India) Private
Limited

Note: Latest edition of text books may be used.

BDF24001

SEMESTER VI
MANAGEMENT OF FINANCIAL INSTITUTIONS- DSE

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80 Hrs
Tutorials: 16 Hrs

Course Outcome:
On successful completion of this course the students can:

CO1: Learn the details of financial institution and its kind
CO2: Understand and analyse the financial statement of Financial institutions
CO3: Identify the financial strength and weakness of Financial institutions
CO4 :Understand the details of capital adequacy norms
CO5: Learn the classification of Institutional risk and the theories of interest rate
CO6: Understand the causes of liquidity risk

Unit 1 Financial Intermediation;
Kinds of Intermediation; Financial Institution and its kinds; An overview of the Indian financial system; Regulation of Banks, NBFCs & FIs; Products offered by Banks and FIs. CRR & SLR management; Capital Adequacy: Capital adequacy norms; Basel agreement-II&III; effect of capital requirements on bank operating policies

Unit 2 Statement of Financial Sector:
Flow of Funds Accounts – Sector wise and Instrument wise. Statements of Financial Institution: Analyzing Bank's Financial Statement: The balance sheet; income statement; Cash Flow Statement; profitability, liquidity and solvency analysis; Performance Analysis of banks: CAMELS Risk system; KPIs; Data Envelopment Analysis. Asset Liability Management: RBI guidelines on asset liability management

Unit 3 Institutional Risk Management:
Interest Rate Risk; Market Risk; Credit Risk; Liquidity Risk; Operational Risk. Determination of Interest Rate. Theories of Interest Rates: Classical Theory; Loan able Funds Theory; Liquidity Preference Theory; Term Structure of Interest Rates. Interest Rate Risk Management: Measurement of Interest Rate Risk; Duration and its kinds; Convexity. Managing Interest Rate Risk: Reprising Gap Model, Maturity Matching Model, Duration Gap Model, Cash Flow Matching Model; Convexity Adjustments.

Unit 4: Credit & Liquidity Risk Management:
Types of Assets, NPA & its types, Management of NPA, Measurement of Credit Risk – Qualitative and Quantitative models. Modelling Credit Risk; Term Structure of Credit Risk; Managing Credit Risk: Credit Analysis and kinds of Loans; Pricing of Loans. Liquidity Risk Management: Measurement of Liquidity Risk; Measures of Liquidity Exposure; Causes of Liquidity risk: Asset-Side and Liability-Side; Managing Liquidity Risk :Purchased Liquidity management and Stored Liquidity management; Liquidity Planning;
Deposit Insurance; Discount Window

Reference:

1. Saunders & Cornett – “Financial Institutions Management – A risk management approach” Tata McGraw Hill
2. Resti & Sironi – “Risk management and shareholders’ value in banking” John Wiley
3. Rose & Hudgins – “Bank management and financial services”
4.IIBF-“Bank Financial Management ”
5.Paul& Suresh – “Management of Banking and Financial Services ”
6.Subramanyam – “Investment Banking ”
7. Madhuvij -- “Management of financial institutions”
8. http://nptel.iitm.ac.in/courses/110106040/
Note: Latest edition of text books may be used.

BDF25001

SEMESTER VI
FINANCIAL DERIVATIVES- DSE

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80 Hrs
Tutorials: 16 Hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Learn the classification and characteristics of financial derivatives in India

CO2: Identify and study the relationship between derivatives and other variables

CO3:Learn the characteristics of options and factors affecting option prices

CO4 :Understand the various types of SWAPS

CO5:Understand in depth forward and future contracts and play an important role in dealing with these contract

Unit 1: **Introduction:**
History of derivatives - origin of derivatives in India - the classification of derivatives – the important features of derivatives – Early delivery, extension and cancellation of forward contracts –financial derivatives market in India.

Unit 2:Forward and Future Contracts:
Meaning of forwards and futures – difference between forwards and futures – Clearing house mechanism - Margin requirements: Initial margin, maintenance margin and margin call – Making to Market – pricing of futures (Problems in preparation of Margin Accounts and Pricing of futures) – Valuation of futures contracts.

Unit 3: Options:
Meaning – Types of Option contracts – factors affecting option prices – Distinction between futures and options. Prices – Upper bounds and lower bounds, early exercise, pul-call parity – Time value and Intrinsic value of options – Concept of options In the money, At the money and Out of the money – Computation of Gross pay off and Net pay off from options contracts – Graphical representation of Pay off from options contracts.

Unit 4:Understanding of SWAPS:
Meaning and types – Interest rates swap – Currency Swaps; Credit Derivatives: Credit ratings, Credit Default Swaps.

Reference:
1. Ruey S. Tsay (2005). Analysis of Financial Time Series (2nd ed.). John Wiley.
2. John C. Hull. Options, Futures and Other Derivatives (7th ed.). Pearson Education.
3. JurgenFranke, Wolfgang Hardle and Christian Hafner. Introduction to Statistics of Financial
Markets.
4. R. Madhumathi, M. Ranganatham. Derivatives and risk management (1st ed.)
Redhead, K. Financial Derivatives- An introduction to futures, forwards, options, swaps Prentice Hall of India
5. Kotreshwar – Derivative Market

Note: Latest edition of text books may be used

BDF26001

SEMESTER VI

RESEARCH SOFTWARE PACKAGE- DSE

(Credits: Lecture – 02, Tutorial – 0, Practical – 02) Lectures: 32 Hrs

Practical: 64 Hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Understand the details of EVIEWS

CO2: Learn the details of importing data to EVIEWS

CO3: Understand the details of estimating a Multiple Regression Equation by Ordinary Least Squares using software

CO4: Identify the details of printing output and graph

CO5 : Understand the details of estimating Logit and Probit equation

A Brief Introduction to EVIEWS (Econometric Views)
A. Importing Data to EVIEWS
B. Executing Simple Procedures
i. Showing Data
ii. Graphing Data
iii. Descriptive Statistic of data
iv. Estimating a Multiple Regression Equation by Ordinary Least Squares
v. Testing of Homoscedasticity
vi. Testing of Error Term
vii. Testing of Multicollinearity
viii. Testing of stationarity
ix. Estimating a Logit and Probit Equation
x. "Views" of the Regression Equation
C. Printing Output and Graph

Readings:

http://www.eviews.com/illustrated/EViews_Illustrated.pdf

Note: Latest edition of text books may be used.

BDF27001

SEMESTER VI
COMPUTERISED ACCOUNTING SYSTEM- DSE

(Credits: Lecture – 04, Tutorial – 00, Practical – 02) Lectures: 64 Hrs
Tutorials: 64 Hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Learn the details of Processing and preparing ledgers, trial balance using SQL query and report modules

CO2: Understand the details of designing accounting support system

CO3: Understand the details of auditing in computerized accounting system using Generic Software

CO4: Learn in detail the creation of sample Data base using view, query and report modules

Unit-1: Computerized Accounting: Using Generic Software (12 Lectures, 12 Practical Lab)

Taxation: TDS, VAT and Service Tax Auditing in Computerized Accounting system: Statutory Audit, Voucher verification, Verification of related party transaction, CAAT: Various Tools

Unit-2: Introduction to DBMS(10 Lectures, 10 Practical Lab)

DBMS - concepts-DBMS Modules - Table, Form, View, Query and Report. Familiarising with SQL. Creating a sample data base and using view, query and report modules.

Unit -3 **Designing Computerised Accounting System (14 Lectures, 14 Practical Lab)**

Requirement Analysis, Designing Main Tables. Creating Voucher entry form, Populating the data base, Processing and preparing ledgers, Trial Balance using SQL query and report modules,

Unit-4 : Designing Accounting Support System (16 Lectures, 16 Practical Lab)

Designing Bills Payable and Bills Receivable Systems for Accounting using Form, Query and Report Modules. Designing Payroll System for Accounting using Form, Query and Report Modules.

Note:

1. The General Purpose Software referred in this course will be notified by the University Departments every three years. If the specific features, referred in the detailed course above, is not available in that software, to that extent it will be deemed to have been modified.

2. Teaching arrangements need to be made in the computer Lab

Reference:

The suggested readings and guidelines shall be notified by the university department at least once in three years based on the selected software.

Note: Latest edition of text books may be used.

BDF28001

SEMESTER VI
Project Work- DSE

(Credits: Lecture – 01, Tutorial – 01, Practical – 04)

Lectures: 16 Hrs
Tutorials: 16 Hrs
Practical: 128 Hrs

Course Outcome:

On successful completion of the project work the students are able to:

CO1: Understand in depth to fill the gap between theory and practical through internship

CO2: Understand in detail with examples the procedure and able to write a report on the problems of human resources, Production, Marketing purchase, financial, consumer's preferences and behaviour, pricing, competition etc of the organisations

CO3: Specify the details in depth and able to communicate effectively

CO4: Learn in detail and able to absorb as an employee by the employer

CO5: Specify and analyse the components of project report and prepare the report effectively

C1 – Proposal of Project Work - 15 Marks
C2 – Progress of Project Work - 15 Marks
Viva - 20 Marks
Valuation of Report – 50 Marks

JSS COLEGE OF ARTS COMMERCE & SCIENCE
(Autonomous)
BN Road, Mysuru – 25
Department of Commerce and Management

Model Question Paper
(For all courses except QT, computer Applications in Business, Computerized Accounting System, Research Software Package)

BBA Programme

Time 3 hrs **Maximum marks: 70**

Allocation of marks and Model Question Paper Commerce

I. The question paper carries 70 marks.

II. It is divided into 3 Parts, Part A, Part B and Part C

III. Part A carries 30 marks. …….. 2x15=30

IV. Part B, carries 20 marks…….……. 2x10=20

V. Part C, carries 20 marks……..……. 4x5=20

BBA

Question Paper Pattern- 2017-18 (CBCS)

(For all courses except QT, computer Applications in Business, Computerized Accounting System, Research Software Package)

PART-A

Answer the following. Each question carries 15 marks. 2X15=30

1. …… ……

OR

2. ……..…….

3. ……..……..

OR

4. ……..…….…….

PART-B

Answer the following. Each question carries 10 marks.
2X10=20

5. …….…….

OR

6. ……..……...……

7. …….…….

OR

8.…….……

PART-C

Answer any four of the following. Each question carries 5 marks.4X5=20

9. …….……

10. …….…….…….

11…….…….
…….
12.…….…….…….……

13.…….…….…….

****

BBA

Question Paper Pattern
4.4 Quantitative Techniques

Time: 3hrs **Max. Marks: 70**

Part-A

Answer the following. Each question carries two marks10X2=20

1. a. …… f. ……
   b. …… g. ……
   c. …….. h. ……
   d. ……..... i. ……..
   e. …….. j. ……..

Part-B

Answer any four of the following. Each question carries five marks 4X5=20

2. ……...

3. ……..……..

4. ……..……..

5. ……

6. ……...……

Part-C

Answer any three of the following. Each question carries ten marks3X10=30

7. ……

8. …….

9. ……

10. ……..…….

****

BBA

Question Paper Pattern
4.5 Computer Application in Business / DSE – Research Software Package

Time: 2 hrs **Max. Marks: 50**

Part-A

Answer the following. Each question carries two marks.10X2=20

1. a. ……..……..
   b. ……..……..
   c. ……..……..
   d. ……..……..
   e. ……..……..
   f. ……..……..
   g. ……..……..
   h. ……..……..
   i. ……..……..
   j.……..……..

Part-B

Answer any two of the following. Each question carries five marks.
2X5=10

2.……..……..

3. ……..……..

4.……..…….

Part-C

Answer any two of the following. Each question carries ten marks
2X10=20

5. ……

6.…….

7. ……..……

****

BBA

Question Paper Pattern
DSE – Computerized Accounting System

Time: 3 hrs **Max. Marks:70**

Part-A

Answer the following. Each question carries two marks.10X2=20

1. a. ……..……..
   b. ……..……..
   c. ……..……..
   d. ……..……..
   e. ……..……..
   f. ……..……..
   g. ……..……..
   h. ……..……..
   i. ……..……..
   j. ……..……..

Part-B

Answer any four of the following. Each question carries five marks.
4X5=20

2. ……..……..
3. ……..……..
4. ……..……..
5. ……
6. ……

Part-C

Answer any three of the following. Each question carries ten marks
3X10=30

7. ……..……
8. ……..……
9. ……..……
10. ……..……

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JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE

(Autonomous)

B N ROAD, MYSURU- 570 025

DEPARTMENT OF COMPUTER SCIENCE

Syllabus

CHOICE BASED CREDIT SYSTEM

For BCA PROGRAMME

Bachelor of Computer Applications

2017-18

CBCS Syllabus - BCA for 2017-2018 onwards

		Course	Title	Hours / Week		Credits	Maximum Marks			Exam Duration	Total
							IA		Exam		
				L	T/ P	L:T: P	C1	C2			Marks
I Year	I Semester	DCA 21001	Computer Fundamentals & MIS	4	4	4:0:2	15	15	70	3 Hours	100
		DCA 23001	Computer System Organization and Architecture	4	4	4:0:2	15	15	70	3 Hours	100
		DCA 25001	Object Oriented Programming In C++	4	4	4:0:2	15	15	70	3 Hours	100
	II Semester	DCB 21001	Data Structures and File Processing	4	4	4:0:2	15	15	70	3 Hours	100
		DCB 23001	Operating Systems with Linux	4	4	4:0:2	15	15	70	3 Hours	100
		DCB 25001	Programming in JAVA	4	4	4:0:2	15	15	70	3 Hours	100
II Year	III Semester	DCC 21001	Discrete Mathematics & Logic Computation	5	1	5:1:0	15	15	70	3 Hours	100
		DCC 23001	Database Management Systems	4	4	4:0:2	15	15	70	3 Hours	100
		DCC 25001	Web Technologies	4	4	4:0:2	15	15	70	3 Hours	100
	IV Semester	DCD 21001	Numerical Analysis And Statistics	4	4	4:0:2	15	15	70	3 Hours	100
		DCD 23001	J2EE	4	4	4:0:2	15	15	70	3 Hours	100
		DCD 25001	Software Engineering & Software Testing	4	4	4:0:2	15	15	70	3 Hours	100
		DCD 31001	Mathematics	3	1	3:1:0	15	15	70	3 Hours	100
		DCD 33001	Business Mathematics	3	1	3:1:0	15	15	70	3 Hours	100
		DCD 35001	Accountancy & Financial Management	3	1	3:1:0	15	15	70	3 Hours	100
		DCD 37001	Entrepreneurship Development	3	1	3:0:1	15	15	70	3 Hours	100

		Course	Title	Hours / Week		Credits	Maximum Marks			Exam Duration	Total
							IA		Exam		
				L	T/ P	L:T:P	C1	C2			Marks
III Year	V Semester	DCE 21001	Data Communication and Computer Networks	4	3	4:0:1	15	15	70	3 Hours	100
		DCE 23001	Computer Graphics	4	3	4:0:1	15	15	70	3 Hours	100
		DCE 25001	Multimedia Systems and Applications	4	3	4:0:1	15	15	70	3 Hours	100
		DCE 31001	ASP. Net	4	3	4:0:1	15	15	70	3 Hours	100
		DCE 33001	Visual Programming	4	3	4:0:1	15	15	70	3 Hours	100
		DCE 35001	Artificial Intelligence and Expert Systems	4	3	4:0:1	15	15	70	3 Hours	100
		DCE 41001	Cloud Computing	4	3	4:0:1	15	15	70	3 Hours	100
		DCE 43001	Enterprise Resource Planning	4	3	4:0:1	15	15	70	3 Hours	100
		DCE 45001	Data Mining & Warehousing	4	3	4:0:1	15	15	70	3 Hours	100
		DCE 51001	Object Oriented Modelling& Design With UML	3	3	3:0:1	15	15	70	3 Hours	100
		DCE 53001	Analysis and Design of Algorithms	3	3	3:0:1	15	15	70	3 Hours	100
		DCE 55001	E-Commerce Technologies	3	3	3:0:1	15	15	70	3 Hours	100
	VI Semester	DCF 31001	Operation Research	4	3	4:0:1	15	15	70	3 Hours	100
		DCF 33001	System Software & Compiler design	4	3	4:0:1	15	15	70	3 Hours	100
		DCF 35001	Digital Image Processing	4	3	4:0:1	15	15	70	3 Hours	100
		DCF 40001	Project	0	12	0:0:6	15	15	70	3 Hours	100
		DCF 51001	PHP Programming	1	2	1:0:1	15	15	70	3 Hours	100
		DCF 53001	Computer Simulations	1	2	1:0:1	15	15	70	3 Hours	100
		DCF 55001	Information Security & Cyber Law	1	2	3:0:1	15	15	70	3 Hours	100

GENERAL RECOMMENDATIONS:

- Teacher who handles theory is completely responsible to prepare the lab exercise well in advance which has to be placed before the department meeting for approval.
- Related practical programs' skeleton has to be discussed in the theory class.
- Lab instructors

Assessment Maximum marks - 100

Course Type	C1		C2		C3 Exam Marks		Assigned Marks (Percentage)			Total
	Theory	Lab	Theory	Lab	Theory	Lab	Theory	Lab	IA	
DSC	**10**	**05**	**10**	**05**	**70**	**70**	**50**	**20**	**30**	**100**
DSE	**10**	**05**	**10**	**05**	**70**	**70**	**50**	**20**	**30**	**100**
DSE (non practical)	**15**	**-**	**15**	**-**	**70**	**-**	**70**	**--**	**30**	**100**
SEC	**15**	**-**	**15**	**-**	**50**	**-**	**70**	**--**	**30**	**100**

Note:

1. **C1 will be conducted for 20 Marks (Theory) with one hour duration - 10 Marks (Lab) with continuous assessment and it will be reduced to assigned marks.**
2. **C2 will be conducted for 20 Marks (Theory) with one hour duration - 10 Marks (Lab) with continuous assessment and it will be reduced to assigned marks.**
3. **C3 will be conducted for 70 Marks (Theory) with three hours duration - 70 Marks (Lab) with 3 hours duration and to be reduced to assigned marks.**
4. **For non-practical course C3 will be conducted for 70 Marks (Theory) with three hours duration.**
5. **In case of SEC, C1 and C2 will be conducted for 15 Marks each with one hour duration and C3 will be conducted for 50 Marks with 2 hours duration.**

Programme Outcomes

After completing the graduation in the Bachelor of Computer Applications the students are able to:

PO1. Get expected skills to be placed in IT sector and self-employment.
PO2. To develop abilities for data analysis and interpretation using ICT.
PO3. Acquire comprehensive knowledge with equal emphasis on theory and practice.
PO4. Analyze and apply latest technologies to solve problems in the areas of computer applications.
PO5. Develop the basic programming skills to enable students to build Utility tools.
PO6. Get the foundation knowledge for higher studies in the field of Computer Application.
PO7. Analyze and synthesis computing systems through quantitative and qualitative techniques
PO8. Develop practical skills to provide solutions to industry, society and business.
PO9. Work effectively both as an individual and a team leader on multidisciplinary projects.
PO10. Improves communication skills so that they can effectively present technical information in oral and written reports
PO11. To integrate ethics and values in designing computer application.

Programme Specific Outcomes

After completing the graduation in the Bachelor of Computer Applications the students are able to:

PSO1. Knowledge of contemporary and emerging issues in computer science

PSO2. Ability to identify, critically analyse, formulate and develop computer application

PSO3. Learn techniques, skills and modern hardware and software tools necessary for innovative software solutions

PSO4. Devise and conduct experiments, interpret data and provide well informed conclusions.

PSO5. Information about computer, technology, organization and management.

PSO6. Know various computer applications and latest development in IT and communication system.

PSO7. Act as software programmer, system and Database administrator, web designer, faculty for computer science and computer applications.

PSO8. Design and conduct experiments, analyze and interpret data.

DCA21001

I SEMESTER

DSC 1A: Computer Fundamentals & MIS
Credit (L: T: P = 4: 0: 2)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Deliberate the details of computer system
CO2. Learn the classification and characteristics of computer system
CO3. Understand in details with examples software
CO4. Identify the characteristics of devices
CO5. Learn the classification and characteristics of software
CO6. Understand the classification and characteristics of Memory units
CO7. Learn the classification and characteristics of CPU
CO8. Identify the characteristics of Computer Components
CO9. Understand the classification and characteristics of Computer Technologies
CO10. Learn the details of Computer Application in Education and research
CO11. Identify in details with examples MIS
CO12. Specify in depth MIS

Unit - 1 **15 Hours**

Introduction: Introduction to computer system, uses, types.

Human Computer Interface: Types of software, Operating system as user interface, utility programs

Devices: Input and output devices (with connections and practical demo), keyboard, mouse, joystick, scanner, OCR, OMR, bar code reader, web camera, monitor, printer, plotter

Unit - 2 **15 Hours**

Memory: Primary, secondary, auxiliary memory, RAM, ROM, cache memory, hard disks, optical disks

Computer Organization and Architecture: C.P.U., registers, system bus, main memory unit, cache memory, Inside a computer, SMPS, Motherboard, Ports and Interfaces, expansion cards, ribbon cables, memory chips, processors.

Unit - 3 **15 Hours**

Overview of Emerging Technologies: Bluetooth, cloud computing, big data, data mining, mobile computing and embedded systems.

Use of Computers in Education and Research: Data analysis, Heterogeneous storage, e-Library, Google Scholar, Domain specific packages such as SPSS, Mathematical etc.

Unit - 4 **15 Hours**

MANAGEMENT INFORMATION SYSTEM: Introduction to data and information, Types of Information, Types of information System. Impact of MIS, Role and Importance, Managers and Activities in IS, Types of Computers Used by Organizations in Setting up MIS, Hardware support for MIS.

Reference Books:

1. A. Goel, Computer Fundamentals, Pearson Education, 2010.
2. P. Aksoy, L. DeNardis, Introduction to Information Technology, Cengage Learning, 2006
3. P. K.Sinha, P. Sinha, Fundamentals of Computers, BPB Publishers, 2007

Computer Fundamentals & MIS Lab

LIST OF EXPERIMENTS

1. Study and Identification of standard desktop personal computer
2. Understanding of Motherboard and its interfacing components
3. Install and configure computer drivers and system components.
4. Disk formatting, partitioning and Disk operating system commands
5. Install, upgrade and configure Windows operating systems.
6. Remote desktop connections and file sharing.
7. Identify, Install and manage network connections Configuring IP address and Domain name system
8. Install, upgrade and configure Linux operating systems.
9. Installation Antivirus and configure the antivirus.
10. Installation of printer and scanner software.
11. Disassembly and Reassembly of hardware.
12. Trouble shooting and Managing Systems

DCA23001

I SEMESTER

DSC 2A: Computer System Organization and Architecture
Credit (L: T: P = 4: 0: 2)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Deliberate in details with examples Boolean algebra and logic circuits

CO2. Learn the details of Data Representation and Computer Arithmetic

CO3. Learn in depth Computer Organization and Design

CO4. Learn the details of architecture of CPU

CO5. Deliberate the classification and characteristics of Basic Computer Programming Concepts

CO6. Write down in depth Basic Computer Programming Concepts

CO7. Learn the classification and characteristics of Input -Output organization

Unit - 1 **15 Hours**

Introduction: Logic gates, Boolean algebra, combinational circuits, circuit simplification, flip-flops and sequential circuits, decoders, multiplexors, registers, counters and memory units.

Data Representation and basic Computer Arithmetic: Number systems, complements.

Unit - 2 **15 Hours**

Fixed and floating point representation, character representation, addition, subtraction, magnitude comparison.

Basic Computer Organization and Design: Computer registers, bus system, instruction set

Unit - 3 **15 Hours**

Timing and control, instruction cycle, memory reference, input-output and interrupt.

Central Processing Unit: Register organization, arithmetic and logical micro-operations, stack organization, micro programmed control.

Unit - 4 **15 Hours**

Programming the Basic Computer: Instruction formats, addressing modes, instruction codes, Machine language, and Assembly language, input output programming.

Input-output Organization: Peripheral devices, I/O interface, Modes of data transfer, direct memory access.

Reference Books:

1. M. Mano, Computer System Architecture, Pearson Education 1992.
2. A. J. Dos Reis, Assembly Language and Computer Architecture using C++ and JAVA, Course Technology, 2004
3. W. Stallings, Computer Organization and Architecture Designing for Performance, 8th Edition, Prentice Hall of India, 2009
4. Digital Design, M.M. Mano, Pearson Education Asia, 1979

Computer System Organization and Architecture Lab

1. Verification of Basic gates(AND,OR,NOT)
2. Verification of Universal gates(NAND,NOR,EX-OR)
3. Verification of NAND gate as a Universal gate
4. Verification of NOR gate as a Universal gate
5. Verification of DeMorgan's theorem
6. Verification of Half adder & Full Adder
7. Verification of Half subtractor& Full Subtractor
8. Verification of Half adder & Half subtractor using NAND gate
9. Conversion of Binary to Gray &gray to Binary Code
10. Simplification of Boolean Expressions
11. Simplification of Boolean Expressions using K-Map
12. Flip-Flops: SR FF (clock, without clock)
13. JK FF
14. Toggle FF
15. Delay FF
16. Multiplexer
17. De-multiplexer
18. Simulate the machine for the following memory-reference instructions with I= 0 and address part = 082. The instruction to be stored at address 022 in RAM. Initialize the memory word at address 082 with the operand B8F2 and AC with A937. Determine the contents of AC, DR, PC, AR and IR in hexadecimal after the execution.
    a. ADD f. BSA
    b. AND g. ISZ
    c. LDA
    d. STA
    e. BUN

19. Simulate the machine for the memory-reference instructions referred in above question with I= 1 and address part = 082. The instruction to be stored at address 026 in RAM. Initialize the memory word at address 082 with the value 298. Initialize the memory word at address 298 with operand B8F2 and AC with A937. Determine the contents of AC, DR, PC, AR and IR in hexadecimal after the execution.
20. Modify the machine created in Practical 1 according to the following instruction format:

Instruction format

0 2	3 4	15
Opcode	I	address

a. The instruction format contains a 3-bit opcode, a 1-bit addressing mode and a 12-bit address. There are only two addressing modes, I = 0 (direct addressing) and I = 1(indirect addressing).
b. Create a new register I of 1 bit.

C. Create two new microinstructions as follows:

i. Check the opcode of instruction to determine type of instruction (Memory Reference/Register Reference/Input-Output) and then jump accordingly.
ii. Check the I bit to determine the addressing mode and then jump accordingly.

DCA25001

I SEMESTER

DSC 3A: Object Oriented Programming in C++
Credit (L: T: P = 4: 0: 2)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Deliberate the classification and characteristics of Basic of Problem Solving Techniques
CO2. Understand the details of Basic of Problem Solving Techniques
CO3. Learn in depth Basic concepts of OOPs and C++ Programming Language
CO4. Deliberate the details of Program Development using OOPs Concepts
CO5. Specify in details with application and Use of Polymorphism Concepts
CO6. Specify the details of implements of Inheritance Using C++

Unit - 1 15 Hours

Problem solving aspects: Introduction, Problem definition, Problem analysis, Design of problem solution, Algorithm, Flowchart, Coding, Debugging, Types of errors in programming, Program Documentation and Program maintenance.

Techniques of Problem Solving: Flowcharting, decision table, algorithms, structured programming concepts, Programming methodologies viz- top-down and bottom-up programming

Introduction to C++: Concepts of Object-oriented programming, benefits of OOP, Structure of C++ program & Applications of OOP.

Fundamentals: Tokens, Keywords, Identifiers and constants, Basic Data Types, User-defined data types, Derived data Types, Symbolic constants, Declaration of variables.

Operators in C++: Scope resolution operator, Memory management operators, Manipulators, Type cast operator, Expressions and their types.

Unit - 2 15 Hours

Control structures & Functions: The main function, Function prototyping, Call by Reference, Return by Reference, Inline functions, Function overloading, Friend and Virtual functions.

Object Oriented Concepts: Abstraction, encapsulation, objects, classes, methods, constructors, inheritance, polymorphism, static and dynamic binding, overloading.

Classes and Objects: Specifying a Class, Defining member functions, Making an Outside function Inline, Nesting of member functions, Private member functions, Arrays within a Class, Static data members, Static member functions, Arrays of Objects.

Unit - 3 **15 Hours**

Program Development: Object oriented analysis, design, unit testing & debugging, system testing & integration, maintenance.

Constructors and Destructors: Constructors, Parameterized constructors, copy constructor, Dynamic constructor and Destructor.

Unit - 4 **15 Hours**

Operator overloading and Type Conversions: Defining operator overloading, Overloading unary operators, Overloading Binary operators, Rules for overloading operators, Type conversions.

Inheritance- introduction, defining derived classes, single inheritance, making a private member inheritable, multilevel inheritance, hierarchical inheritance and hybrid inheritance.

Polymorphism – introduction, pointers, pointers to objects, this pointer, pointers to derived classes, virtual functions, pure virtual functions.

Reference Books:

1. P. K. Sinha&PritiSinha, "Computer Fundamentals", BPB Publications, 2007.
2. Dr. Anita Goel, Computer Fundamentals, Pearson Education, 2010.
3. Object Oriented Programming with C++ , M.T. Somashekara, D.S. Guru, H.S.
4. Nagendraswamy, K.S. Manjunatha, PHI Learning, New Delhi, 2012
5. Object Oriented Programming with C++ by E. Balagurusamy
6. Richard Johnson, An Introduction to Object-Oriented Application Development, Thomson Learning, 2006
7. B. Stroupstrup, the C++ Programming Language, Addison Wesley, 2004.

Object Oriented Programming in C++ Lab

PART-A

1. PROGRAM TO FIND THE ROOTS OF A QUADRATIC EQUATION
2. PROGRAM TO FIND WHETHER GIVEN NUMBER IS EVEN OR NOT
3. PROGRAM TO FIND LARGEST OF 3 NOS USING NESTED IF
4. PROGRAM TO DISPLAY RAINBOW COLOURS USING SWITCH STATEMENT
5. PROGRAM TO CALCULATE SIMPLE & COMPOUND INTEREST
6. PROGRAM TO FIND MINIMA & MAXIMA IN 1-DIMENSIONAL ARRAY
7. PROGRAM TO GENERATE FIBONACCI SERIES OF A GIVEN NO
8. PROGRAM TO FIND FACTORIAL OF A GIVEN NO
9. PROGRAM TO SEARCH AN ELEMENT IN 1-DIMENSIONAL ARRAY
10. PROGRAM TO DISPLAY N NATURAL NUMBERS & THEIR SUM

PART-B

1. PROGRAM TO SWAP TWO NOS USING CALL BY REFERENCE
2. PROGRAM TO ILLUSTRATE INLINE FUNCTION
3. PROGRAM TO ILLUSTRATE FRIEND FUNCTION
4. PROGRAM TO ILLUSTRATE OPERATOR OVERLOADING
5. PROG PROGRAM TO ILLUSTRATE INLINE FUNCTION
6. PROGRAM TO ILLUSTRATE MULTIPLE INHERITANCE
7. PROGRAM TO CREATE A CLASS CALLED EMPLOYEE. ACCEPT PROGRAM TO ILLUSTRATE INLINE FUNCTION USING ARRRAY OF OBJECTS.
8. PROGRAM TO CREATE A CLASS CALLLED STUDENT & TO ACCCEPT & DISPLAY NECESSARY DETAILS OF A STUDENT USING NESTED CLASS.
9. PROGRAM TO CREATE A CLASS CALLED BANK & ACCEPT CUSTOMER DATA.
10. PROGRAM TO ILLUSTRAT FUNCTION OVER LOADING.

DCB21001

II SEMESTER

DSC 1B: Data Structures and File Processing
Credit (L: T: P = 4: 0: 2)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Learn the classification, characteristics and understanding of Data structures
CO2. Specify the details of Searching Techniques
CO3. Deliberate in details with examples Basic Concepts of Memory Management Techniques
CO4. Understand in depth File System Operations
CO5. Specify the characteristics of File Organization Methods
CO6. Deliberate in details with examples of Storage Devices

Unit – 1 **15 Hours**

Basic Data Structures: Introduction, Abstract data structures- stacks, queues, linked lists and binary trees. **Sets:** Dictionary implementation, use of priority queues, hashing, binary trees, balanced trees, sets with merge-find operations.

Unit - 2 **15 Hours**

Searching: Internal and external searching, use of hashing and balancing techniques.

Memory Management: Garbage collection algorithms for equal sized blocks, storage allocation for objects with mixed size, buddy systems.

Unit - 3 **15 Hours**

Physical Devices: Characteristics of storage devices such as disks and tapes, I/O buffering.

Basic File System Operations: Create, open, close, extend, delete, read-block, write-block, protection mechanisms.

Unit - 4 **15 Hours**

File Organizations: Sequential, indexed sequential, direct, inverted, multi-list, directory systems, Indexing using B-tree, B+ tree and their variants, hashing – hash function, collision handling methods, extendible hashing.

Reference Books:

1. M.T. Goodrich, R. Tamassia and D. Mount, Data Structures and Algorithms in C++, John Wiley and Sons, Inc., 2004.
2. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, Introduction to Algorithms, 2nd Ed., Prentice-Hall of India, 2006.
3. Robert L. Kruse and A.J. Ryba, Data Structures and Program Design in C++, Prentice Hall, Inc., NJ, 1998.
4. B. Stroupstrup, The C++ Programming Language, Addison Wesley, 2004
5. D.E. Knuth, Fundamental Algorithms (Vol. I), Addison Wesley, 1997

Data Structures and File Processing Lab

Part - A

1. Program to find lower triangular and upper triangular matrices for the given matrix.
2. Write an interactive program to insert an element at the given position and delete an element at the specified position in the given array.
3. Program to search an element identifies the number of occurrences with locations in linear array.
4. Program to sort the given M x N matrix row-wise and column-wise using bubble sorting technique.
5. Write an interactive program to search an element in the given linear array using linear and binary searching technique.
6. Write a program to merge two sorted arrays.

Part – B

7. Write an interactive program to implement the following operations on stack using arrays
   a. PUSH b. POP
8. Program to implement Tower of Hanoi problem.
9. Write an interactive program to perform insertion and deletion operations in Linear Queue using arrays.
10. Write an interactive program to perform insertion and deletion operations in Circular Queue using arrays.
11. Write an interactive program to insert a node in a linked list at the front, delete a node from the rear and display.
12. Write an interactive program to implement pre order, post order and in order traversal of a binary tree using linked list.

Note: Lecturer May Change the Programs without deviating Theory Paper

DCB23001

II SEMESTER

DSC 2B: Operating Systems with Linux

Credit (L: T: P = 4: 0: 2)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Learn in details with examples system software
CO2. Learn the details of Operating System organization
CO3. Understand the classification and characteristics of Process Management and Scheduling mechanisms
CO4. Understand in depth Memory Management and allocation strategies
CO5. Learn in details with examples basic concepts of shell scripting
CO6. Understand in depth basic Linux environment

Unit - 1 **15 Hours**

Introduction: System Software, Resource Abstraction, OS strategies. Types of operating systems - Multiprogramming, Batch, Time Sharing, Single user and Multiuser, Process Control & Real Time Systems.

Operating System Organization: Factors in operating system design, basic OS functions, implementation consideration; process modes, methods of requesting system services – system calls and system programs.

Unit - 2 **15 Hours**

Process Management: System view of the process and resources, initiating the OS, process address space, process abstraction, resource abstraction, process hierarchy, Thread model

Unit - 3 **15 Hours**

Scheduling: Scheduling Mechanisms, Strategy selection, non-pre-emptive and pre-emptive strategies.

Memory Management: Mapping addresses space to memory space.

Unit - 4 **15 Hours**

Memory allocation strategies, fixed partition, variable partition, paging, virtual memory

Shell introduction and Shell Scripting: What is shell and various type of shell, Various editors present in Linux, Different modes of operation in vi editor, What is shell script, Writing and executing the shell script, Shell variable (user

defined and system variables), System calls, Using system calls, Pipes and Filters, Decision making in Shell Scripts (If else, switch), Loops in shell, Functions, Utility programs (cut, paste, join, tr , unique utilities), Pattern matching utility (grep)

Reference Books:

1. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8th Edition, John Wiley Publications 2008.
2. A.S. Tanenbaum, Modern Operating Systems, 3rd Edition, Pearson Education 2007.
3. G. Nutt, Operating Systems: A Modern Perspective, 2nd Edition Pearson Education 1997.
4. W. Stallings, Operating Systems, Internals & Design Principles, 5th Edition, Prentice Hall of India. 2008.
5. M. Milenkovic, Operating Systems- Concepts and design, Tata McGraw Hill 1992.

Operating Systems with Linux Lab

Software Lab based on Operating Systems

Note: Following exercises can be performed using Linux or UNIX

1. Usage of following commands: ls, pwd, tty, cat, who, who am I, rm, mkdir, rmdir, touch, cd.
2. Usage of following commands: cal, cat (append), cat (concatenate), mv, cp, man, date.
3. Usage of following commands: chmod, grep, tput (clear, highlight), bc.
4. Write a shell script to check if the number entered at the command line is prime or not.
5. Write a shell script to modify "cal" command to display calendars of the specified months.
6. Write a shell script to modify "cal" command to display calendars of the specified range of months.
7. Write a shell script to accept a login name. If not a valid login name display message – "Entered login name is invalid".
8. Write a shell script to display date in the mm/dd/yy format.
9. Write a shell script to display on the screen sorted output of "who" command along with the total number of users.
10. Write a shell script to display the multiplication table any number,
11. Write a shell script to compare two files and if found equal asks the user to delete the duplicate file.
12. Write a shell script to find the sum of digits of a given number.
13. Write a shell script to merge the contents of three files, sort the contents and then display them page by page.
14. Write a shell script to find the LCD (least common divisor) of two numbers.
15. Write a shell script to perform the tasks of basic calculator.
16. Write a shell script to find the power of a given number.
17. Write a shell script to find the factorial of a given number.
18. Write a shell script to check whether the number is Armstrong or not.
19. Write a shell script to check whether the file have all the permissions or not.
20. Program to show the pyramid of special character "*".

DCB25001

II SEMESTER

DSC 3B: Programming in JAVA
Credit (L: T: P = 4: 0: 2)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Deliberate in depth java programming fundamental
CO2. Specify in details with examples Basic java oops Concepts
CO3. Understand in depth java Interface and packages
CO4. Deliberate the details of Exception handling in java
CO5. Identify the classification and characteristics of File handling in java
CO6. Learn the details of File handling in java
CO7. Learn the characteristics of Applet Programming

Unit - 1 **15 Hours**

Introduction to Java: Features of Java, JDK Environment, Object Oriented Programming Concept Overview of Programming, Paradigm, Classes, Abstraction, Encapsulation, Inheritance, Polymorphism, Difference between C++ and JAVA

Java Programming Fundamental: Structure of java program, Data types, Variables, Operators, Keywords, Naming Convention, Decision Making (if, switch),Looping(for, while) ,Type Casting

Unit - 2 **15 Hours**

Classes and Objects: Creating Classes and objects, Memory allocation for objects, Constructor, Implementation of Inheritance, Implementation of Polymorphism, Method Overloading, Method Overriding, Nested and Inner classes

Arrays and Strings: Arrays, Creating an array, Types of Arrays, String class Methods, String Buffer methods.

Unit - 3 **15 Hours**

Abstract Class, Interface and Packages: Modifiers and Access Control, Abstract classes and methods, Interfaces, Packages Concept, Creating user defined packages

Exception Handling: Exception types, Using try catch and multiple catch, Nested try, throw throws and finally, Creating User defined Exceptions.

Unit - 4 **15 Hours**

File Handling: Byte Stream, Character Stream, File IO Basics, File Operations, Creating file, Reading file, Writing File.

Applet Programming: Introduction, Types Applet, Applet Life cycle, Creating Applet, Applet tag.

Reference Books:

1. Ivan Bayross, Web Enabled Commercial Application Development Using Html, Dhtml,javascript, Perl Cgi , BPB Publications, 2009.
2. Cay Horstmann, BIG Java, Wiley Publication , 3rd Edition., 2009
3. Herbert Schildt , Java 7, The Complete Reference, , 8th Edition, 2009.
4. E Balagurusamy , Programming with JAVA, TMH, 2007

Programming in JAVA Lab

Software Lab based on Java

1. WAP to find the largest of n natural numbers.
2. WAP to find whether a given number is prime or not.
3. Write a menu driven program for following:
    a. Display a Fibonacci series
    b. Compute Factorial of a number
    c. WAP to check whether a given number is odd or even.
    d. WAP to check whether a given string is palindrome or not.
4. WAP to print the sum and product of digits of an Integer and reverse the Integer.
5. Write a program to create an array of 10 integers. Accept values from the user in that array. Input another number from the user and find out how many numbers are equal to the number passed, how many are greater and how many are less than the number passed.
6. Write a program that will prompt the user for a list of 5 prices. Compute the average of the prices and find out all the prices that are higher than the calculated average.

7. Write a program in java to input N numbers in an array and print out the Armstrong numbers from the set.
8. Write java program for the following matrix operations:
    a. Addition of two matrices
    b. Summation of two matrices
    c. Transpose of a matrix
    d. Input the elements of matrices from user.
9. Write a java program that computes the area of a circle, rectangle and a Cylinder using function overloading.
10. Write a Java for the implementation of multiple inheritance using interfaces to calculate the area of a rectangle and triangle.
11. Write a java program to create a frame window in an Applet. Display your name, address and qualification in the frame window.
12. Write a java program to draw a line between two coordinates in a window.
13. Write a java program to display the following graphics in an applet window.
    a. Rectangles
    b. Circles
    c. Ellipses
    d. Arcs
    e. Polygons
14. Write a program that reads two integer numbers for the variables a and b. If any other character except number (0-9) is entered then the error is caught by NumberFormatException object. After that ex.getMessage () prints the information about the error occurring causes.
15. Write a program for the following string operations:
    a. Compare two strings
    b. Concatenate two strings
    c. Compute length of a string
16. Create a class called Fraction that can be used to represent the ratio of two integers. Include appropriate constructors and methods. If the denominator becomes zero, throw and handle an exception.

DCC21001

III SEMESTER

DSC 1C: Discrete Mathematics & Logic Computation

Credit (L: T: P = 5: 1: 0)

Course Outcome:

After successful completion of the course, the student is able to

CO 1. Identify the classification and characteristics of Set theory
CO 2. Specify in details with examples graph theory
CO 3. Deliberate the classification and characteristics of relation
CO 4. Write down the details of relation
CO 5. Learn the classification and characteristics of function
CO 6. Write down in details with examples function
CO 7. Identify the characteristics of mathematical logic
CO 8. Understand in depth mathematical logic
CO 9. Identify the classification and characteristics of Boolean algebra
CO 10. Identify the details of Boolean algebra

Unit - 1 **15 Hours**

Basics of Set Theory: Notation, Inclusion and Equality of Sets, The Power set, Operations on sets, Venn diagram, Set identities, Ordered pairs and Cartesian Products.

Graph Theory: Basic Definitions, Paths and Connectedness, Matrix Representation of Graphs, Trees.

Unit - 2 **15 Hours**

Relations and ordering – Properties of binary relations in a Set, Relation Matrix and the Graph of a Relation, Equivalence Relations, Compatibility Relations, Composition of Binary Relation

Unit – 3 **15 Hours**

Functions: Definition and Introduction, Composition of Functions, Inverse Functions.

Unit - 4 **15 Hours**

Mathematical Logic: Statements and Notation, Connectives, Negation, Conjunction, Disjunction, Statement Formulas and Truth Tables, Conditional

and Bi-conditional, Tautologies, Equivalence of Formulas, Tautological Implications.

Unit - 5 **15 Hours**

Boolean Algebra & Formal: Boolean algebra - Application of Boolean Algebra to switching theory. Languages - Recognition and generation - Phase structure grammars and languages – Finite state Machine - Recognition in regular languages.

Reference Books:

1. Discrete Mathematical Structures with Applications to Computer Science by J.P. Tremblay, R Manohar 3rd Edition – Tata McGraw Hill.
2. Discrete mathematical structures by B. Kolman, R.C. Busby and S. Ross, 3rd edition.
3. Introduction to discrete mathematics by Liu, C.L., McGraw Hill, 2nd edition, 1985.
4. Discrete mathematics by S.A. Witala, McGraw Hill, 1987.

DCC23001

III SEMESTER

DSC 2C: Database Management Systems

Credit (L: T: P = 4: 0: 2)

Course Outcome

After successful completion of the course, the student is able to

CO 1. Understand the characteristics of DBMS with examples
CO 2. Deliberate the details of types of database languages with examples
CO 3. Learn the details of ER- Diagrams and Relationship
CO 4. Understand in depth Basic concepts of Relational Model
CO 5. Learn in details with examples MYSQL Commands
CO 6. Learn in details with examples in PL-SQL

Unit - 1 15 Hours

Introduction to Database Management Systems: Definition of Data, Information, DBMS, Data base system application, Purpose of database systems, Characteristics of DB – Self describing nature, Insulation between programs, data and data Abstraction (data Independence), support of multiple views of the data, sharing of data and multiples transaction processing, Storage management, Database language – DDL, DML,DCL. File processing system v/s DBMS, Data models, Levels of Abstraction in a DBMS, Three Schema architecture, Characteristics of database approach,, data models, DBMS architecture and data independence.

Unit - 2 15 Hours

Entity Relationship and Enhanced ER Modelling: Entity types, Entity Sets, Attributes, and Keys, Relationships, Relationship Types, Roles, and Structural Constraints, Weak Entity Types, ER Diagrams, Naming Conventions,SQL99: Schema Definition, constraints, and object modelling

Unit - 3 15 Hours

Relational Data Model: Basic concepts, Relational Constraints and Relational Database Schemas, Update Operations and Dealing with Constraint Violations, Basic Relational Algebra Operations.

Database design: ER and EER to relational mapping, functional dependencies, normal forms-first normal form, second normal forms. Third normal form BCNF

Unit - 4 15 Hours

MYSQL (SQL/PL-SQL): SQL VS. SQL * PLUS: SQL COMMANDS ANDDATA TYPES, OPERATORS AND EXPRESSIONS, INTRODUCTION TO SQL * PLUS.

Managing Tables and Data:

- CREATING AND ALTERING TABLES (INCLUDING CONSTRAINTS)
- DATA MANIPULATION COMMAND LIKE INSERT, UPDATE, DELETE
- SELECT STATEMENT WITH WHERE, GROUP BY AND HAVING, ORDER BY, DISTINCT, SPECIAL OPERATOR LIKE IN, ANY, ALL BETWEEN, EXISTS, LIKE
- JOIN, BUILT IN FUNCTIONS OTHER DATABASE OBJECTS
- VIEW • SYNONYMS, INDEX TRANSACTION CONTROL STATEMENTS
- COMMIT, ROLLBACK, SAVEPOINT INTRODUCTION TO PL/SQL
- SQL V/S PL/SQL • PL/SQL BLOCK STRUCTURE
- LANGUAGE CONSTRUCT OF PL/SQL (VARIABLES, BASIC AND COMPOSITE DATA TYPE, CONDITIONS LOOPING ETC.)
- % TYPE AND % ROWTYPE
- USING CURSOR (IMPLICIT, EXPLICIT)

Reference Books:

1. R. Elmasri, S.B. Navathe, Fundamentals of Database Systems 6th Edition, Pearson Education, 2010.
2. R. Ramakrishanan, J. Gehrke, Database Management Systems 3rd Edition, McGraw-Hill, 2002.
3. A. Silberschatz, H.F. Korth, S. Sudarshan, Database System Concepts 6th Edition, McGraw Hill, 2010.
4. R. Elmasri, S.B. Navathe Database Systems Models, Languages, Design and application Programming, 6th Edition, Pearson Education, 2013.

Database Management Systems Lab

Software Lab based on Database Management Systems

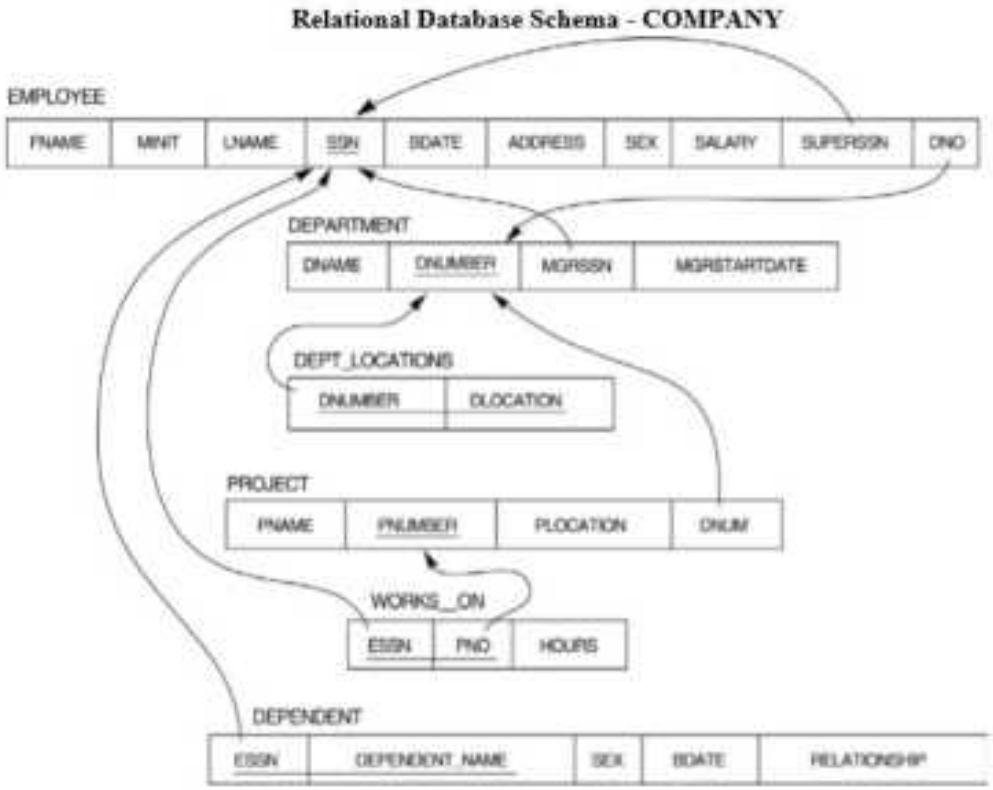
The following concepts must be introduced to the students: **Note:** MS Access / MySQL may be used.

DDL Commands

- Create table, alter table, drop table

DML Commands

- Select, update, delete and insert statements
- Condition specification using Boolean and comparison operators (and, or, not,=,<>,>,<,>=,<=)
- Arithmetic operators and aggregate functions(Count, sum, avg, Min, Max)
- Multiple table queries (join on different and same tables) • Nested select statements
- Set manipulation using (any, in, contains, all, not in, not contains, exists, not exists, union, intersect, minus, etc.)
- Categorization using group by……..having
- Arranging using order by



1. Create tables with relevant foreign key constraints

2. Populate the tables with data
3. Perform the following queries on the database:
   a. Display all the details of all employees working in the company.
   b. Display ssn, lname, fname, address of employees who work in department no 7.
   c. Retrieve the birthdate and address of the employee whose name is 'Franklin T. Wong'
4. Retrieve the name and salary of every employee
5. Retrieve all distinct salary values
6. Retrieve all employee names whose address is in 'Bellaire'
7. Retrieve all employees who were born during the 1950s
8. Retrieve all employees in department 5 whose salary is between 50,000 and 60,000(inclusive)
9. Retrieve the names of all employees who do not have supervisors
10. Retrieve SSN and department name for all employees
11. Retrieve the name and address of all employees who work for the 'Research' department 12. For every project located in 'Stafford', list the project number, the controlling department number, and the department manager's last name, address, and birth date.
13. For each employee, retrieve the employee's name, and the name of his or her immediate supervisor.
14. Retrieve all combinations of Employee Name and Department Name
15. Make a list of all project numbers for projects that involve an employee whose last name is 'Narayan' either as a worker or as a manager of the department that controls the project. 16. Increase the salary of all employees working on the 'ProductX' project by 15%. Retrieve employee name and increased salary of these employees.
17. Retrieve a list of employees and the project name each works in, ordered by the employee's department, and within each department ordered alphabetically by employee first name.
18. Select the names of employees whose salary does not match with salary of any employee in department 10.
19. Retrieve the name of each employee who has a dependent with the same first name and same sex as the employee.
20. Retrieve the employee numbers of all employees who work on project located in Bellaire, Houston, or Stafford.
21. Find the sum of the salaries of all employees, the maximum salary, the minimum salary, and the average salary. Display with proper headings.

22. Find the sum of the salaries and number of employees of all employees of the 'Marketing' department, as well as the maximum salary, the minimum salary, and the average salary in this department
23. Select the names of employees whose salary is greater than the average salary of all employees in department 10.
24. For each department, retrieve the department number, the number of employees in the department, and their average salary.
25. For each project, retrieve the project number, the project name, and the number of employees who work on that project.
26. Change the location and controlling department number for all projects having more than 5 employees to 'Bellaire' and 6 respectively. 27. For each department having more than 10 employees, retrieve the department no, no of employees drawing more than 40,000 as salary.
28. Insert a record in Project table which violates referential integrity constraint with respect to Department number. Now remove the violation by making necessary insertion in the Department table.
29. Delete all dependents of employee whose ssn is '123456789'.
30. Delete an employee from Employee table with ssn = '12345' (make sure that this employee has some dependents, is working on some project, is a manager of some department and is supervising some employees). Check and display the cascading effect on Dependent and Works on table. In Department table MGRSSN should be set to default value and in Employee table SUPERSSN should be set to NULL 31. Perform a query using alter command to drop/add field and a constraint in Employee table.

DCC25001

III SEMESTER

DSC 3C: Web Technologies
Credit (L: T: P = 4: 0: 2)

Course Outcome:

After successful completion of the course, the student is able to
CO 1. Learn the details of HTML tags
CO 2. Understand the details of Basic CSS and implements
CO 3. Understand the details of Basic Concepts of Java Scripts
CO 4. Write down in details with application and Usage of Java scripts
CO 5. Understand in details with examples Document object Model
CO 6. Deliberate in depth Basic of XML

Unit - 1 15 Hours

Introduction to Web Design: Introduction to HyperTextMarkupLanguage (HTML), header, footer, formatting tags, graphical elements, inserting images, lists, hyperlinks, tables. **Frames-**introduction, frameset. Forms- attributes of forms. Creating web pages

Unit - 2 15 Hours

Cascading Style Sheets: Introduction, Understanding the Basic CSS syntax,Types of style sheets, multiple sheets, Background properties,Text properties, Font properties,Border properties, Margin properties Padding list & table properties. DIV, SPAN

Unit - 3 15 Hours

JavaScript: Introduction, Java script in HTML, Java script statement, comments, Expressions, Data types, operators, Conditional statements, Loop statements, functions, Popup boxes ,Array & Boolean Objects Math & Date Objects String & Number Objects, events and event handling & form document object.

Unit - 4 15 Hours

DOM and XML: Basics of DOM, DOM methods, functions Forms collection, table collections Inner HTML.
XML Introduction; Syntax: Document structure; Document Type definitions; Namespaces; XML schemas; Displaying raw XML documents; Displaying XML documents with CSS; XSLT style sheets.

Reference Books:

1. M.Deitel, P.J.Deitel, A.B.Goldberg: Internet & World Wide Web How to program, 3rd Edition, Pearson Education / PHI, 2004.
2. Chris Bates: Web Programming Building Internet Applications, 3rd Edition, Wiley India, 2006.
3. 3. XueBai et al: The Web Warrior Guide to Web Programming, Thomson, 2003.

Web Technologies Lab

1. Program for formatting tags.
2. Creating a Webpage having Hyperlink.
3. Creating Types of Lists (Ordered, UnOrdered, Definition).
4. Creating a Nested List.
5. Creating a Time Table.
6. Creating a HTML document having vertical frames.
7. Creating Student Application Form.
8. Program to insert audio & video files
9. Creating Internal & External Style Sheets.
10. Program to Margin & Padding.
11. Program to create a Greeting card
12. Program to Image Transparency
13. Program to generate Fibonacci series in Javascript.
14. Program to display Rainbow Colours in Javascript.
15. Program to create Pop-Up Boxes.
16. Program to generate multiplication table.
17. Program to find even and odd numbers.
18. Program to add 2 numbers.
19. Program to find factorial of a numbers.
20. Program to generate 2 different patterns.
21. Program to change background color after 5 sec of page load.
22. Display reverse of a given number.
23. Program to generate random numbers.
24. Program to find the sum of individual numbers.
25. Program to display Book information in XML.

DCD21001

IV SEMESTER
DSC 1D: Numerical Analysis and Statistics
Credit (L: T: P = 4: 0: 2)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Understand the details of Computer Numerical data and arithmetic
CO2. Understand the classification and characteristics of Iterative Methods in numerical analysis
CO3. Deliberate in details with examples Matrices and linear system of Equations
CO4. Specify in details with examples Interpolation
CO5. Understand in depth Numerical integration and differentiation
CO6. Learn the details of Importance and limitations of statistics

Unit - 1 **15 Hours**

Computer Arithmetic: Fixed and Floating point representation, Normalization of numbers. Errors in numbers.

Iterative methods: Bisection method, Regula-Falsi method, Secant method, Newton-Raphson method

Unit - 2 **15 Hours**

Matrices and Linear System of Equations: LU decomposition method, Gauss elimination, Gauss seidal and Gauss Jordan for solving system of equations

Interpolation: Polynomial interpolation, Newton-Gregory forward and backward interpolation, Newton's divided differences interpolation formulae.

Unit - 3 **15 Hours**

Numerical Integration: Trapezoidal rule, Simpson's 1/3rd and 3/8th rule,

Numerical Differentiation: Euler's, modified Euler's and Runge-Kutta (RK) 2^{nd} order and 4^{th} order.

Unit - 4 **15 Hours**

Statistics: Definition, Importance, Functions and Limitations of statistics.

Graphic presentation: Frequency distribution, Histogram, Frequency polygon, frequency curve and O gives Measures of central tendency: (Mean, Median, Mode) Dispersion, Correlation, Regression.

Reference Books:

1. K.E. Atkinson, W. Han, Elementary Numerical Analysis, 3rd Ed., Wiley, 2003.
2. C. Xavier, S.S. Iyengar, Introduction to Parallel Algorithms, Wiley-Interscience, 1998.
3. A. Kharab, R.B. Guenther, An Introduction to Numerical Methods: A MATLAB Approach,1st Ed. Chapman and Hall/CRC, 2001.
4. B. Bradie, A Friendly Introduction to Numerical Analysis, Pearson Education, 2007.
5. S.R. Otto and J.P. Denier, An Introduction to Programming and Numerical Methods in MATLAB, Springer, 2005.
6. M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and EngineeringComputation, 7th Ed., New Age International Publishers, 2007.
7. Computer oriented numerical methods by V Rajaraman
8. Statistics Theory and Practice by R S N Pillai, Bagavathi
9. Practical statistics by S P Gupta

Numerical Analysis and Statistics Lab

Software lab based on numerical techniques and statistics

1. BRUTE FORCE METHOD
2. BISECTION METHOD
3. REGULA –FALSI METHOD
4. NEWTON RAPHSON
5. SECANT
6. LU DECOMPOSITION
7. GAUSS ELIMINATION
8. GAUSS JORDAN
9. GAUSS SEIDAL
10. EULER'S
11. MODIFIED EULER'S
12. RUNGE KUTTA II ORDER
13. RUNGE KUTTA IV ORDER
14. TRAPEZOIDAL
15. SIMPSONS 1/3 RD
16. SIMPSONS 3/8 TH
17. FINDING THE MEAN, MEDIAN AND MODE OF A SET OF DATA
18. FINDING THE RANGE OF A SET OF DATA
19. FINDING THE STANDARD DEVIATION OF A SET OF DATA
20. NEWTONS FORWARD AND BACKWARD INTERPOLATION
21. NEWTONS DIVIDED DIFFERENCE

DCD23001

IV SEMESTER
DSC 2D: J2EE
Credit (L: T: P = 4: 0: 2)

Course Outcome:

After successful completion of the course, the student is able to

CO 1. Learn the details of Basic elements of J2EE
CO 2. Deliberate the details of Concepts of Multi-Tier Architectures
CO 3. Understand the characteristics of Enterprise Application Strategy
CO 4. Write down in depth Basic Concepts of JDBC
CO 5. Identify in details with examples implementation of SQL Commands Using JDBC objects
CO 6. Learn in details with examples Basic Concepts of Servlet
CO 7. Learn in details with examples Basic Concepts of JSP

Unit - 1 15 Hours

Interdiction: The ABC of Programming Languages, taking programming languages up a notch, the beginning of java, java byte-code, the advantages of Java, J2EE and J2SE.

J2EE Multi-Tier Architecture: Distributive systems, the Tier, J2EE Multi-Tier Architecture, Client Tier Implementation, Web Tier Implementation, Enterprise JavaBeans Tier Implementation, Enterprise Information Systems Tier Implementation, Challenges.

J2EE Nest Practices: Enterprise Application Strategy, The enterprise application, clients, Sessions Management, Web Tier and Java Server pages, Enterprise Java Beans Tier, The Myth of using inheritance, Maintainable classes, Performance Enhancements, The power of Interfaces, The power of threads, The power of Notification.

Unit - 2 15 Hours

J2EE Database Concepts: Data, Database, Database Schema, the Art of Indexing.

JDBC Objects: The concept of JDBC, JDBC Driver Types, JDBC packages, A Brief overview of the JDBC Process, Database Connection, Associating the JDBC / ODBC Bridge with the database, Statement Objects, Result Set, Transaction Processing, Metadata.

Unit - 3 **15 Hours**

JDBC and Embedded SQL: Model Programs: Model A Program, Model B Program, Tables: Creating a Table, Dropping a Table, Indexing: Creating an Index, Dropping an Index, Inserting Data into tables: Inserting a Row, Inserting the systems date into a column, Inserting the system Time into a column, Inserting a Timestamp into a column, Selecting Data from a Table: Selecting all data from a Table, Requesting one column, Requesting Multiple column, Requesting rows, Requesting rows and columns, AND, OR, and NOT clauses, Joining multiple compound expressions, equal & not equal operators, Less than & greater than operators, Less than equal to & greater than equal to, BETWEEN, LIKE, IS NULL Operator, DISTINCT Modifier, IN modifier,

Unit - 4 **15 Hours**

Metadata: Number of columns in result set, Data type of a column, Name of a column, Column Size, updating Tables: Updating a row and column, updating multiple rows, Deleting Data from a table: Deleting a Row from a table, Joining tables, Calculating Data, Grouping and ordering data, sub queries, view.

Java Servlets: Java servlets and common gateway interface programming: Benefits of using a Java servlet, A simple Java servlet, Anatomy of a java servlet: Development Descriptor, Reading Data from a client, Reading HTTP request Headers, Sending Data to a Client & writing the HTTP response Header, Working with cookies, Tracking Sessions, Quick reference guide.

JAVA Server Pages: JSP installation, JSP Tags: Variables & objects, Methods, Control Statements, Loops, Tomcat, Request string: Parsing other information, User sessions, cookies, Session objects, Quick reference guide.

Reference Books:

1. The complete reference J2EE seventh edition - Java 2 Enterprise edition overview
2. J2EE: The complete Reference - McGraw-Hill Education

J2EE Lab

J2EE LAB CYCLE

1. Program to Create Jdbc Connection
2. Application to access the database using the Java Database Connectivity (JDBC).
3. Perform a Database Query and View Results.
4. Write a program to demonstrate Basic Servlet.
5. Write a program to Display request header information.
6. Write a program to design web application
7. Write a program to display cookie value, cookie age and cookie path.
8. Write a program in JSP file to set and then display the cookie.
9. Write a program for Java script validation.
10. Write a JAVA Servlet Program to implement a dynamic HTML using Servlet (user name and password should be accepted using HTML and displayed using a Servlet).
11. Write a JAVA Servlet Program to Download a file and display it on the screen (A link has to be provided in HTML, when the link is clicked corresponding file has to be displayed on Screen)
12. Write a JAVA Servlet Program to implement RequestDispatcher object (use include() and forward() methods)
13. Write a JAVA Servlet Program to implement and demonstrate get() and Postmethods(Using HTTP Servlet Class).
14. Write a JAVA Servlet Program to implement sendRedirect() method(using HTTP Servlet Class).
15. Write a JAVA Servlet Program to implement sessions (Using HTTP Session Interface).
16. Write a JAVA JSP Program to print 10 even and 10 odd number.
17. Write a JAVA JSP Program to implement verification of a particular user login and display a welcome page.
18. Write a JAVA JSP Program to get student information through a HTML and create a JAVA Bean Class, populate Bean and display the same information through another JSP.
19. Write a JAVA JSP Program which uses <jsp:plugin> tag to run a applet
20. Write a JAVA JSP Program whch implements nested tags and also uses Tag Support Class.

DCD25001

IV SEMESTER

DSC 3D: Software Engineering and Software Testing
Credit (L: T: P = 4: 0: 2)

Course Outcome:

After successful completion of the course, the student is able to

CO 1. Understand in details with examples Concepts of Software process
CO 2. Specify the details of Software requirements and analysis
CO 3. Learn in depth Design concepts and principles of software engineering
CO 4. Understand in depth software Configuration Management and Project Management
CO 5. Learn in details with examples Software Tastings
CO 6. Specify in depth trends in software engineering

Unit - 1 15 Hours

Software Process: Introduction, S/W Engineering Paradigm, life cycle models (water fall, incremental, spiral, evolutionary, prototyping, object oriented) , System engineering, computer based system, verification, validation, life cycle process, development process, system engineering hierarchy.

Software requirements: Functional and non-functional, user, system, requirement engineering process, feasibility studies, requirements, elicitation, validation and management, software prototyping, prototyping in the software process, rapid prototyping techniques, user interface prototyping, S/W document.

Unit - 2 15 Hours

Software Analysis: Analysis and modelling, data, functional and behavioural models, structured analysis and data dictionary.

Design Concepts and Principles: Design process and concepts, modular design, design heuristic, design model and document, Architectural design, software architecture, data design, architectural design, transform and transaction mapping, user interface design, user interface design principles. Real time systems, Real time software design, system design, real time executives, data acquisition system, monitoring and control system.

Unit - 3 15 Hours

Software Configuration Management: The SCM process, Version control, Change control, Configuration audit, SCM standards.

Software Project Management: Measures and measurements, S/W complexity and science measure, size measure, data and logic structure measure, information flow measure. Estimations for Software Projects, Empirical Estimation Models, Project Scheduling.

Unit - 4 **15 Hours**

Testing: Taxonomy of software testing, levels, test activities, types of s/w test, black box testing, testing boundary conditions, structural testing, test coverage criteria based on data flow, mechanisms, regression testing, testing in the large. S/W testing strategies, strategic approach and issues, unit testing, integration testing, validation testing, system testing and debugging.

Trends in Software Engineering: Reverse Engineering and Re-engineering – wrappers – Case Study of CASE tools.

Reference Books:

1. Roger S.Pressman, Software engineering- A practitioner's Approach, McGraw-Hill
2. Ian Sommerville, Software engineering, Pearson education Asia, 6th edition, 2000.
3. PankajJalote- An Integrated Approach to Software Engineering, Springer Verlag, 1997.
4. James F Peters and WitoldPedryez, "Software Engineering – An Engineering Approach", John Wiley and Sons, New Delhi, 2000.
5. Ali Behforooz and Frederick J Hudson, "Software Engineering Fundamentals", Oxfor University Press, New Delhi, 1996.
6. Pfleeger, "Software Engineering", Pearson Education India, New Delhi, 1999.
7. Carlo Ghezzi, Mehdi Jazayari and Dino Mandrioli, "Fundamentals of Software Engineering", Prentice Hall of India, New Delhi, 1991.

Software Engineering and Software Testing Lab

Lab based on Software Engineering

1. Practical Title
   - Problem Statement,
   - Process Model
2. Requirement Analysis
   - Creating a Data Flow
   - Data Dictionary,
   - Use Cases
3. Project Management
   - Computing FP
   - Effort
   - Schedule, Risk Table, Timeline chart
4. Design Engineering
   - Architectural Design
   - Data Design, Component Level Design
5. Testing
   - Basis Path Testing

Sample Projects like

- DTC Route Information: Online information about the bus routes and their frequency and fares
- Car Pooling: To maintain a web based intranet application that enables the corporate
- Employees within an organization to avail the facility of carpooling effectively.
- Patient Appointment and Prescription Management System
- Organized Retail Shopping Management Software
- Parking Allocation System
- Wholesale Management System

DCD31001

IV SEMESTER

SEC 1A: Elective: Mathematics
Credit (L: T: P = 3: 1: 0)

Course Outcome:

After successful completion of the course, the student is able to
CO 1. Deliberate in details with examples partial fraction
CO 2. Learn the characteristics of Theory of equation
CO 3. Understand in details with examples trigonometry
CO 4. Learn in details with examples complex number
CO 5. Understand the classification and characteristics of Analytic geometry
CO 6. Deliberate in details with examples straight lines
CO 7. Specify in details with examples pair of lines
CO 8. Specify the classification and characteristics of conics
CO 9. Understand the classification and characteristics of differentiation
CO 10. Identify in details with examples integration

Unit - 1 15 Hours

PARTIAL FRACTIONS: Proper & improper fractions-all four types.
LOGARITHMS: All problems, except common logarithms.
MATHEMATICAL INDUCTION: Simple problems on all types.
THEORY OF EQUATIONS:
i) Solutions of cubic, bi quadratic equations when complex and irrational roots are given
ii) Solutions of cubic, bi quadratic equations when roots are in AP, GP and HP.
iii) Solutions of cubic, bi quadratic equations using synthetic division.
iv) Operations on complex numbers.
BINOMIAL THEOREM: NO PROOF.
i) Expansion - problems thereon.
ii) Finding middle terms.
iii) Finding constant terms or terms independent of x.
TRIGONOMETRY:
i) Definition of radian (no proof for constant angle)
ii) Problems on conversion of radians to degree and vice versa
iii) Problems on $s = r\theta,\ s = \frac{1}{2} r^2\theta$ (no proofs)

TRIGONOMETRIC FUNCTIONS AND IDENTITIES: Simple problems
GRAPHS OF TRIGONOMETRIC FUNCTIONS: for sine, cos and tan functions.
Allied angles: Problems thereon

Unit - 2 **15 Hours**

COMPLEX NUMBERS:

i) Finding modulus and amplitude of complex numbers
ii) Solving problems using Domoivre's Theorem.

ANALYTICAL GEOMETRY

i) Problems on distance formula - Proving parallelogram, square, rhombus, equilateral triangle, Co linearity.
ii) Problems on section formula - internal division, external division, midpoint formula, centroid of a triangle.
iii) Problems on area of a triangle.

Unit - 3 **15 Hours**

STRAIGHT LINES:

i) By finding slopes - show that lines are parallel and perpendicular.
ii) Finding slopes - when two points are given
iii) Equation of straight lines - passing through given point, parallel and perpendicular to given line.
iv) Problems on intercept form, slope form, normal form, two point form.
v) Problems on angle between two lines.
vi) Concurrency of three lines and point of concurrency.

PAIR OF LINES

ii) Angle between two lines $ax^2 + 2hxy + by^2 = 0$. $ax^2 + 2hxy + by^2 + 2gx + 2fy + C = 0$.
iii) Point of Intersection.
iv) Condition for an equation to represent pair of lines.

CIRCLES:

i) Finding center and radius.
ii) Finding equation of a circle passing through three points, when different conditions are given, passing through x and y- axis.

CONICS: PARABOLA -

Finding vertex, focus, tangent, normal, length of latus rectum, eccentricity. (No proofs)

Unit - 4 15 Hours

LIMITS AND CONTINUITY:

i) Simple direct problems on limits of the form $\left(\frac{x^n - a^n}{x - a}\right)$, $\frac{\sin\theta}{\theta}$, $\frac{\tan\theta}{\theta}$ (no determinate forms).

ii) Simple problems on continuity.

DIFFERENTIATION:

i) Problems on sum , product, quotient, chain rule (No parametric, logarithmic functions)

DIFFERENTIAL EQUATIONS:

Solving problems by variable separable form.

INTEGRATION:

i) By substitution
ii) By parts
iii) By partial fractions
iv) Problems of types

$$\int \frac{dx}{a^2 + x^2}, \int \frac{dx}{a^2 - x^2}, \int \frac{dx}{x^2 - a^2}, \int \frac{dx}{\sqrt{a^2 - x^2}}, \int \frac{dx}{\sqrt{a^2 + x^2}}, \int \frac{dx}{\sqrt{x^2 - a^2}}, \int \frac{dx}{x\sqrt{x^2 - a^2}}, \int \frac{dx}{x\sqrt{x^2 + a^2}}$$

$$\int \sqrt{a^2 - x^2}\,dx, \int \sqrt{a^2 + x^2}\,dx, \int \sqrt{x^2 - a^2}\,dx.$$

$$\int \frac{dx}{ax^2 + bx + c}, \int \frac{dx}{\sqrt{ax^2 + bx + c}}$$

APPLICATION OF INTEGRATION:

Simple problems on area

i) Find the area of circle, ellipse, parabola & the ordinate x=a by integration
ii) Find the area bounded by the parabola $y^2 = 4ax$, x – axis and x = 1, x = y.

Find the area bounded by y = sin x, x - axis &x = 0, y = z.

Reference Books:

1. Theory and Problems in Mathematics – I by BOSCO Publications 2004.
2. Theory and Problems in Mathematics – II by BOSCO Publications 2005.
3. Engineering Mathematics, Volumes I–IV by S Chandrasekhar.

DCD33501

IV SEMESTER

SEC 1B: Elective: Business Mathematics

Credit (L: T: P = 3: 1: 0)

Course Outcome:

After successful completion of the course, the student is able to

CO 1. Specify the characteristics of matrices and determinants
CO 2. Understand the details of straight lines
CO 3. Write down in details with examples matrices and determinants
CO 4. Deliberate the characteristics of algebra
CO 5. Learn the classification and characteristics of permutation and combination
CO 6. Deliberate in details with examples mathematical induction
CO 7. Deliberate the characteristics of sequence and series
CO 8. Understand the classification and characteristics of progression
CO 9. Learn in details with examples compound interest
CO 10. Deliberate the classification and characteristics of coordinate geometry

Unit - 1 **15 Hours**

Matrices and Determinants: Order - Types of matrices - Addition and subtraction of matrices and Multiplication of a matrix by a scalar - Product of matrices. Evaluation of determinants of order two and three - Properties of determinants (Statements only) - Singular and non singular matrices - Product of two determinants.

Unit - 2 **15 Hours**

Algebra: Partial fractions - Linear non repeated and repeated factors - Quadratic non repeated types. Permutations - Applications - Permutation of repeated objects - Circular permutaion.

Combinations - Applications - Mathematical induction - Summation of series using $\sum n$, $\sum n2$ and $\sum n3$.Binomial theorem for a positive integral index - Binomial coefficients.

Unit - 3 **15 Hours**

Sequences and series: Harmonic progression - Means of two positive real numbers - Relation between A.M., G.M., and H.M. - Sequences in general - Specifying a sequence by a rule and by a recursive relation - Compound interest - Nominal rate and effective rate - Annuities - immediate and due.

Unit - 4 **15 Hours**

Ordinate Geometry: Rectangular castes ion Co–ordinates in a Plane, Equations of straight lines and the concept of gradient with its practical applications in real life business problems.

Reference Books:

1. Mathematics for Economics and Business by R.S. Bhardwaj .
2. Business Mathematics by PadmalochanHazarika.
3. Business Mathematics by D.C. Sancheti and V.K. Kapoor.
4. Mathematical Economics by Dowling, T. Edword.
5. Mathematical Analysis for Economics by Allen, RGD.

DCD37001

IV SEMESTER

SEC 1C: Elective: Accountancy & Financial Management

Credit (L: T: P = 3: 1: 0)

Course Outcome:

After successful completion of the course, the student is able to

CO 1. Deliberate the details of Basic Accounting Concepts
CO 2. Specify in depth Examples of Accounting
CO 3. Deliberate the details of Meaning and Scope of Financial Management
CO 4. Learn in depth Functions of Financial Manager
CO 5. Learn the characteristics of Ratio Analysis
CO 6. Understand the detail Concepts of Costing
CO 7. Learn in details with examples Budgetary Control

Unit - 1 **15 Hours**

ACCOUNTING:

1. Introduction: Principles, concepts and conventions, double entry system of Accounting, ledger keeping.
2. Subsidiary books with special reference to simple cash book and three columns cash book.
3. Trial balance and final accounts of sole trader: Preparation trial balance, adjusting entries, including revenue for bad debts, revenue for discount on debtors and creditors, preparation of final accounts.

Unit - 2 **15 Hours**

FINANCIAL MANAGEMENT:

4. Final accounts of joint stock companies.
5. Introduction: Meaning and scope of financial management, functions of the financial manager.
6. Ratio analysis: Meaning of ratio, advantages, limitations, types of ratios and their usefulness, liquidity and ratios, profitability rations, efficiency ratios, solvency ratios, problems including preparation of balance sheet.

Unit - 3 **15 Hours**

COSTING & BUDGETARY CONTROL:

7. Funds flow statement: Meaning and concepts of funds, preparation of fund flow statement.
8. Unit costing: Preparation of cost sheet and tender price statement.

9. Marginal costing: Concepts, Marginal cost equations, P/V ratio, B.E.P., Margin of safety, Sales to earn a desired profit, Problems on the above.

Unit - 4 **15 Hours**

10. Budgetary Control: Meaning and definition, preparation of flexible budget and cash budget.
11. Standard costing: Meaning of standard cost and standard costing, analysis of variances – material and labour variances only.

Reference Books:

1. Accountancy Vol. 1 by B.S. Raman.
2. Accountancy Vol. 2 by B.S. Raman.
3. Management Accounting by R.K. Sharma and Gupta.
4. Financial Management by I.M. Pandey.

DCD39001

IV SEMESTER
SEC 1D: Elective: Entrepreneurship Development
Credit (L: T: P = 3: 1: 0)

Course Outcome

After successful completion of the course, the student is able to
CO1. Specify the characteristics of Entrepreneurship
CO2. Deliberate the details of identification of opportunities
CO3. Understand in depth Feasibility and financial management of the Project
CO4. Write down the details of Project Report
CO5. Learn the characteristics of SWOT Techniques
CO6. Learn the details of Enterprise Rules and regulations

Unit - 1 **15 Hours**

Need scope and characteristics of entrepreneurships special schemes for a technical entrepreneur STED.

Identification of opportunities: Exposure to Demand based, Resource based, Service based important substitutes and expert promotion industries. Market surveys techniques.

Need scope and approaches for the project formulation.

Criteria for the principles of products selection and development.

Unit - 2 **15 Hours**

Structure of the project report, Choice of technology, plant and equipment.

Institutions financing procedure and financial incentives.financial ratios and their significance. Books of accounts, financial statements and funds flow analysis.

Resource management, man machine and material.The critical path method (CPM) and project evolution, review techniques (PERT).

Planning tools for establishing SSI

a. CREATIVITY AND INNOVATION b. ROBLEMSOLVING APPROACH
c. STRENGTH AND WEAKNESS OPPORTUNITY AND THREAT (SWOT) techniques.

Unit - 3 **15 Hours**

Techno economics feasibility of the project.Plan layout and process planning for the product.Quality control / quality assurances and testing of the products. Costing and pricing.

Management of self and understanding human behavior.Sickness in small-scale industries and their remedial measures.

Unit - 4 **15 Hours**

Coping and uncertainties, stress management, and positive reinforcement

a. Licensing registration, b. Municipal by laws and insurance coverage Important provision of factory acts sales of goods act partnership act.
a. DILUTION CONTROL,
b. SOCIAL RESPONSIBILITY AND BUSINESS ETHIQUES Income tax, sales tax and excise rule.

Reference Books:

1. Entrepreneurship Development – Kanaka
2. Entrepreneurship Development – VasanthDesa

DCE21001

V SEMESTER
DSE 1A: Elective: Data Communication and Computer Networks
Credit (L: T: P = 4: 0: 1)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Learn in depth Elements of Data Communications and network Systems
CO2. Learn in depth Transmission Media
CO3. Understanding the various classifications and characteristics of Signals
CO4. Understand in details with examples Network Models
CO5. Learn in depth Error Detection and Corrections Algorithms
CO6. Deliberate in details with examples Switching Concepts
CO7. Deliberate the classification and characteristics of networking and internetworking Devices

Unit - 1 **15 Hours**

Data Communications: Components, Data Representation, Dataflow

Networks: Network criteria, Physical Structures, Topology (Mesh, Star, Tree, Bus, Ring, Hybrid)

Categories of Network: LAN, MAN, WAN

History of Network: Protocols and Standards: Protocols (Standards organization),

Addressing: Physical, Logical, Port, Specific.

Unit - 2 **15 Hours**

Transmission Media: Guided Media – Twisted pair cable, co-axial cable, optical fiber, Unguided Media – Radio waves, microwaves, Infrared.

Signals: Analog and Digital Data, Analog and Digital Signals, periodic and non periodic signals. Analog Signals – Sine wave, Peak Amplitude, Period and frequency, Phase, wave length, composite signals. Digital Signals – Band width, Bit length, Bit rate, base band transmission, Digital v/s Analog. Transmission Impairment, Data rate limits (Noisy and noiseless channel)

Unit - 3 **15 Hours**

Network Models: Layered tasks, OSI model (peer – to – peer), Layered Architecture. Functions of Layers (OSI), TCP / IP Protocol suite

Multiplexing: FDM (MUX and DEMUX process, Application of FDM), WDM, TDM (Interleaving, synchronizing, bit padding)

Switching Concept: Working principle of circuit switching and packet switching. Circuit switched networks, three phases efficiency, delay. Data grams network, routing table, delay efficiency, virtual.

Error Detection and Correction: Types of Errors, Redundancy, Error detection virus Error Correction.

Error Detection: Parity check, Cyclic Redundancy Check (CRC), Check Sum. Error Correction - Retransmission, Forward Error Correction, Burst error Correction.

Unit - 4 **15 Hours**

Networking And Internetworking Devices: Connecting Devices - Hubs, Repeaters, Amplifiers, Bridges – LAN bridges, transparent bridges, Source-route bridges, Routers, Gateways, 2 layer and 3 layers switches.

Routing Concepts: Types, Shortest path, flooding.

Wireless Lan's: Blue tooth - Architecture, Blue tooth layers.

Network Layer : IPV4, IPV6 addresses

Transport Layer: UDP – user datagram, operations, Application. TCP - Services, TCP segment, SCTP - Services, packet format.

Application Layer: - SMTP, SNMP, HTTP, FTP

Reference Books:

1. Data Communication and Networking – Forouzan
2. Computer Network – Tanenbaurn – 3rd Editions
3. Computer Network – Larry L. Peterson & Bruce S. Davie

Data Communication and Computer Networks Lab

1. Program for Identifying well known Ports
2. Program for Data Retrieval from Remote Database.
3. Program for Simulating SMTP Client.
4. Program for Simulating Telnet Client
5. Program for Simple file transfer between two systems, (without using Protocols)
6. Program for implementing HTTP.
7. Program for Downloading Image files.
8. Simulate Checksum Algorithm.
9. Simulate Stop & Wait Protocol.
10. Simulate Go-Back-N Protocol.
11. Simulate Selective Repeat Protocol.
12. Take an example subnet of hosts. Obtain broadcast tree for it.
13. Network address with automatic subnet address generation:

DCE23001

V SEMESTER
DSE 1B: Elective: Computer Graphics
Credit (L: T: P = 4: 0: 1)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Learn the classification and characteristics of Elements of Graphics Systems
CO2. Learn in depth Graphics Algorithms
CO3. Deliberate the classification and characteristics of 2D Graphics
CO4. Understand the characteristics of 3D Graphics
CO5. Deliberate the details of Transformation and Viewing Techniques
CO6. Learn the details of Illumination and Colour Models

Unit - 1 **15 Hours**

INTRODUCTION: Survey of computer graphics, Overview of graphics systems – Video display devices, Raster scan systems, Random scan systems, Graphics monitors and Workstations, Input devices, Hard copy Devices, Graphics Software; Output primitives – points and lines, line drawing algorithms, loading the frame buffer, line function; circle and ellipse generating algorithms; Pixel addressing and object geometry, filled area primitives.

Unit - 2 **15 Hours**

TWO DIMENSIONAL GRAPHICS: Two dimensional geometric transformations – Matrix representations and homogeneous coordinates, composite transformations; Two dimensional viewing – viewing pipeline, viewing coordinate reference frame; widow-to-viewport coordinate transformation, Two dimensional viewing functions; clipping operations – point, line, and polygon clipping algorithms.

Unit - 3 **15 Hours**

THREE DIMENSIONAL GRAPHICS: Three dimensional concepts; Three dimensional object representations – Polygon surfaces Polygon tables- Plane equations – Polygon meshes; Curved Lines and surfaces, Quadratic surfaces; Blobby objects; Spline representations – Bezier curves and surfaces -B-Spline curves and surfaces.

TRANSFORMATION AND VIEWING: Three dimensional geometric and modeling transformations – Translation, Rotation, Scaling, composite transformations; three dimensional viewing – viewing pipeline, viewing coordinates, Projections, Clipping; Visible surface detection methods.

Unit - 4 **15 Hours**

ILLUMINATION AND COLOUR MODELS: Light sources – basic illumination models – halftone patterns and dithering techniques; Properties of light – Standard primaries and chromaticity diagram; Intuitive colour concepts – RGB colour model – YIQ colour model – CMY colour model – HSV colour model – HLS colour model; Colour selection.

Reference Books:

1. Computer Graphics C Version by Donald Hearn & M. Pauline Baker Pearson Education, New Delhi, 2004
2. Procedural Elements for Computer Graphics by David F. Rogers, Tata McGraw Hill Book Company, New Delhi, 2003
3. Computer Graphics: Principles & Practice in C by J. D. Foley, S. K Feiner, A Van Dam F. H John, Pearson Education, 2004
4. Computer Graphics using Open GL by Franscis S Hill Jr Pearson Education, 2004.

Computer Graphics Lab

1. Implementation of Bresenhams Algorithm – Line, Circle, Ellipse.
2. Implementation of Line, Circle and ellipse Attributes
3. Two Dimensional transformations - Translation, Rotation, Scaling, Reflection, Shear.
4. Composite 2D Transformations
5. Cohen Sutherland 2D line clipping and Windowing
6. Sutherland – Hodgeman Polygon clipping Algorithm
7. Three dimensional transformations - Translation, Rotation, Scaling
8. Composite 3D transformations
9. Drawing three dimensional objects and Scenes
10. Generating Fractal images

DCE25001

V SEMESTER
DSE 1C: Elective: Multimedia Systems and Applications
Credit (L: T: P = 4: 0: 1)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Understand the details of Components of Multimedia with applications
CO2. Identify in details with examples Text, Images, Sound and Videos
CO3. Learn in depth Animation Techniques
CO4. Understand the details of Multimedia in internet
CO5. Deliberate the characteristics of Making Multimedia
CO6. Deliberate in depth Multimedia Making Tools

Unit - 1 **15 Hours**

Multimedia: Introduction to multimedia, components, uses of multimedia, multimedia applications, virtual reality.

Text: Fonts & Faces, Using Text in Multimedia, Font Editing & Design Tools, Hypermedia & Hypertext.

Images: Still Images – bitmaps, vector drawing, 3D drawing & rendering, natural light &colors, computerized colors, color palettes, image file formats.

Unit - 2 **15 Hours**

Sound: Digital Audio, MIDI Audio, MIDI vs Digital Audio, Audio File Formats.

Video: How video works, analog video, digital video, video file formats, video shooting and editing.

Unit - 3 **15 Hours**

Animation: Principle of animations, animation techniques, animation file formats.

Internet and Multimedia: www and HTML, multimedia on the web – web servers, web browsers, web page makers and site builders.

Unit - 4 **15 Hours**

Making Multimedia: Stages of a multimedia project, Requirements to make good multimedia, Multimedia Hardware - Macintosh and Windows production

Platforms, Hardware peripherals - Connections, Memory and storage devices, Multimedia software and Authoring tools.

Reference Books:

1. Tay Vaughan, "Multimedia: Making it work", TMH, Eighth edition.
2. Ralf Steinmetz and KlaraNaharstedt, "Multimedia: Computing, Communications Applications", Pearson.
3. Keyes, "Multimedia Handbook", TMH.
4. K. Andleigh and K. Thakkar, "Multimedia System Design", PHI.

Multimedia Systems and Applications Lab

Practical exercises based on concepts listed in theory using Presentation tools in office automation tool / GIMP / Blender / Audacity / Animation Tools / Image Editors / Video Editors.

Implement the followings using Blender -

1. Create an animation using the tools panel and the properties panel to draw the following – Line, pe , oval, circle, rectangle , square, pencil , brush , lasso tool
2. Create an animation using text tool to set the font , size , color etc.
3. Create an animation using Free transform tool that should use followings-
   - Move Objects
   - Skew Objects
   - Stretch Objects
   - Rotate Objects
   - Stretch Objects while maintaining proportion
   - Rotate Objects after relocating the center dot
4. Create an animation using layers having following features- Insert layer, Delete layer, guide layer, Mask layer.
5. Modify the document (changing background color etc.)using the following tools
   - Eraser tool
   - Hand tool
   - Ink bottle tool
   - Zoom tool
   - Paint Bucket tool
   - Eyedropper tool
6. Create an animation for bus car race in which both starts from the same point and car wins the race.
7. Create an animation in which text Hello gets converted into GoodBye (using motion/shape tweening).
8. Create an animation having five images having fade-in fade-out effect.
9. Create an scene to show the sunrise (using multiple layers and motion tweening)
10. Create an animation to show the ripple effect.
11. Create an animation (using Shape tweening and shape hints) for transforming one shape into another.
12. Create an animation for bouncing ball (you may use motion guide layer).

OR

Project :

Design a minimum 10 page interactive website using Joomla or WordPress.

DCE31001

V SEMESTER
DSE 2A: Elective: ASP.Net
Credit (L: T: P = 4: 0: 1)

Course Outcome:

After successful completion of the course, the student is able to

CO 1. Learn the details of ASP.NET Framework
CO 2. Learn the details of ASP.NET working Environment
CO 3. Deliberate in details with examples Standard Control Of Asp.NET
CO 4. Understand the details of Developing Simple Websites Using Asp.net Controls
CO 5. Deliberate in depth Developing Simple Web Application Using Asp.net Controls
CO 6. Learn the details of Database Access Controls
CO 7. Identify in details with examples Database Access Controls

Unit - 1 **15 Hours**

Overview of the ASP.NET: Introduction of different Web Technology, What is Asp.Net, How Asp.Net Works, Use of visual studio, Different Languages used in ASP.Net. Summary.

Framework: Common Language Runtime (CLR), .NET Framework Class Library, Summary

Unit - 2 **15 Hours**

Setting up and Installing ASP.NET: Installing Internet Information Server, Installation of Asp.Net, virtual directory, Application Setting in IIS, Summary.

Unit - 3 **15 Hours**

Asp.Net Standard Controls, Displaying information, Label Controls, Literal Controls, Bulleted List, Accepting User Input, Textbox controls, Radio Button and Radio Button List Controls, Checkbox and Checkbox List Controls, Button controls, Link Button Control, Image Button Control, Using Hyperlink Control, Dropdown List, List Box, Displaying Images, Image Control, Image Map Control, Using Panel Control, Using Hyperlink Control, Asp.Net, Page & State Management, Overview of events in page, Summary.

Unit - 4 **15 Hours**

Designing Websites with master pages, creating master pages, Creating default contents, nesting master pages, registering master pages in web configuration, Summary.

ASP.Net Theme: ASP.NET Website Theme, Named Skin and Default Skin In ASP.NET Theme, Style Sheet Theme and Theme Attributes Of A Page Directive

Using the Rich Controls: Accepting File Uploads, Saving files to file system, Calendar Control, Displaying advertisements, Displaying Different Page view, Displaying a Tabbed Page View, Wizard Control, Summary.

Reference Books:

1. Mathew Mac Donald, ASP . Net The Complete Reference, McGraw –Hill, 2002.

ASP . Net Lab

LAB MANUAL:

1. Write a Program to generate the factorial operation.
2. Write a Program to perform Money Conversion.
3. Write a Program to generate the Quadratic Equation.
4. Write a Program to generate the Login control.
5. Write a Program to perform Asp.Net state.
6. Write a Program to perform validation operation.
7. Write a Program to perform Tree view operation.
8. Write a Program to display the phone no of an author using database.
9. Write a Program to insert the data in to database using Execute-Non Query.
10. Write a Program to bind data using template in data list.
11. Write a Program to bind data using Hyperlink column in data grid.

DCE35001

V SEMESTER
DSE 2B: Elective: Visual Programming
Credit (L: T: P = 4: 0: 1)

{**Note:** Use any open source alternative such as Tkinter with Python /Sharp Develop/GAMBAS/OPENXAVA with JAVA}

Course Outcome:

After successful completion of the course, the student is able to

CO 1. Learn in details with examples Basic concept Of GUI Environment
CO 2. Deliberate the details of GUI Controls
CO 3. Learn in details with examples Data types and Operations in Visual Programming
CO 4. Learn in details with examples Control statements in Visual Programming
CO 5. Write down in details with examples Modular Programming
CO 6. Learn the details of Forms Handling in Visual Programming
CO 7. Understand in depth Database Connectivity in Visual Programming

Unit - 1 **15 Hours**

GUI Environment: Introduction to graphical user interface (GUI), programming language (procedural, object oriented, event driven), the GUI environment, compiling, debugging, and running the programs.

Controls: Introduction to controls textboxes, frames, check boxes, option buttons, images, setting borders and styles, the shape control, the line control, working with multiple controls and their properties, designing the user interface, keyboard access, tab controls, default & cancel property, coding for controls.

Operations: Data types, constants, named & intrinsic, declaring variables, scope of variables, val function, arithmetic operations, formatting data.

Unit - 2 **15 Hours**

Decision Making: If statement, comparing strings, compound conditions (and, or, not), nested if statements, case structure, using if statements with option buttons & check boxes, displaying message in message box, testing whether input is valid or not.

Modular programming: Menus, sub-procedures and sub-functions defining / creating and modifying a menu, using common dialog box, creating a new sub-procedure, passing variables to procedures, passing argument by value or by reference, writing a function/ procedure.

Unit - 3 **15 Hours**

Forms Handling: Multiple forms creating, adding, removing forms in project, hide, show method, load, unload statement, me keyword, referring to objects on a different forms

Iteration Handling: Do/loops, for/next loops, using msgbox function, using string function

Arrays and Grouped Data Control: Arrays - 1-dimension arrays, initializing an array using for each, user-defined data types, accessing information with user-defined data types, using list boxes with array, two dimensional arrays.

Unit - 4 **15 Hours**

lists, loops and printing list boxes & combo boxes, filling the list using property window / add item method, clear method, list box properties, removing an item from a list, list box/ combo box operations.

Database Connectivity: Database connectivity of forms with back end tool like mysql, populating the data in text boxes, list boxes etc. searching of data in database using forms. Updating/ editing of data based on a criterion.

Reference Books:

1. Reference: Programming in Visual Basic 6.0 by Julia Case Bradley, Anita C. Millispangh (Tata Mcgraw Hill Edition 2000 (Fourteenth Reprint 2004))

Visual Programming Lab

1. Print a table of numbers from 5 to 15 and their squares and Cubes.
2. Print the largest of three numbers.
3. Find the factional of a number n.
4. Enter a list of positive numbers terminated by zero. Find the sum and average of these numbers.
5. A person deposits Rs. 1000 in a fixed account yielding 5% interest. Complete the amount in the account at the end of each year for n years.
6. Read n numbers. Count the number of negative numbers, positive numbers and zeros in the list.
7. Read n numbers. Count the number of negative numbers, positive numbers and zeroes in the list. use arrays.
8. Read a single dimension array. Find the sum and average of these numbers.
9. Read a two dimension array. Find the sum of two 2D Array.
10. Create a database Employee and Make a form to allow data entry to Employee Form with the following command buttons:

DCE37001

V SEMESTER
DSE 3C: Elective: Artificial Intelligence and Expert Systems
Credit (L: T: P = 4: 0: 1)

Course Outcome

After successful completion of the course, the student is able to

CO1. Deliberate in details with examples Artificial intelligence system
CO2. Learn the characteristics of Concepts of Representation of knowledge
CO3. Understand in details with examples Concepts of Representation of knowledge
CO4. Understand the details of knowledge inference methods
CO5. Understand in details with examples Concepts of Machine Learning Techniques
CO6. Learn the details of Expert System

Unit - 1 **15 Hours**

INTRODUCTION TO AI AND PRODUCTION SYSTEMS: Introduction to AI-Problem formulation, Problem Definition -Production systems, Control strategies, Search strategies. Problem characteristics, Production system characteristics -Specialized production system- Problem solving methods - Problem graphs, Matching, Indexing and Heuristic functions -Hill Climbing-Depth first and Breath first, Constraints satisfaction - Related algorithms, Measure of performance and analysis of search algorithms.

REPRESENTATION OF KNOWLEDGE: Game playing - Knowledge representation, Knowledge representation using Predicate logic,

Unit - 2 **15 Hours**

Introduction to predicate calculus, Resolution, Use of predicate calculus, Knowledge representation using other logic-Structured representation of knowledge.

KNOWLEDGE INFERENCE: Knowledge representation -Production based system, Frame based system. Inference - Backward chaining, Forward chaining, Rule value approach, Fuzzy reasoning - Certainty factors, Bayesian Theory-Bayesian Network-Dempster -Shafer theory.

Unit - 3 **15 Hours**

PLANNING AND MACHINE LEARNING: Basic plan generation systems - Strips -Advanced plan generation systems - Kstrips -Strategic explanations - Why, Why not and how explanations. Learning- Machine learning, adaptive Learning.

Unit - 4 **15 Hours**

EXPERT SYSTEMS: Expert systems - Architecture of expert systems, Roles of expert systems -Knowledge Acquisition –Meta knowledge, Heuristics. Typical expert systems - MYCIN, DART, XOON, Expert systems shells.

Reference Books:

1. Kevin Night, Elaine Rich, Nair B., "Artificial Intelligence (SIE)",McGraw Hill- 2008. (Unit-1,2,4,5)
2. Dan W. Patterson, "Introduction to AI and ES", Pearson Education, 2007. (Unit-III)
3. Peter Jackson, "Introduction to Expert Systems", 3rd Edition, Pearson Education, 2007.
4. Stuart Russel, Peter Norvig "AI – A Modern Approach", 2nd Edition, Pearson Education 2007.

Artificial Intelligence and Expert Systems Lab

1. Implement Breadth First Search (for 8 puzzle problem or Water Jug problem or any AI search problem)
2. Implement Depth First Search (for 8 puzzle problem or Water Jug problem or any AI search problem)
3. Implement Best First Search (for 8 puzzle problem or Water Jug problem or any AI search problem)
4. Implement Single Player Game (Using Heuristic Function)
5. Implement Two Player Game (Using Heuristic Function)
6. Implement A* Algorithm
7. Implement Propositional calculus related problem
8. Implement First order propositional calculus related problem
9. Implement Certainty Factor problem
10. Implement Syntax Checking of English sentences-English Grammar
11. Develop an Expert system for Medical diagnosis.
12. Develop any Rule based system for an application of your choice.

DCE41001

V SEMESTER

DSE 3A: Cloud Computing
Credit (L: T: P = 4: 0: 1)

Course Outcome

After successful completion of the course, the student is able to

CO1. Learn in depth Fundamentals of Cloud Computing
CO2. Understand the details of Cloud Services and File System
CO3. Learn in depth Concept of Collaborating with Cloud
CO4. Understand the details of Virtualization in cloud
CO5. Learn the classification and characteristics of Security challenges in Cloud Computing
CO6. Specify the classification and characteristics of Security challenges in Cloud Computing
CO7. Understand the details of Security challenges in Cloud Computing
CO8. Understand the Common standardsof Cloud Computing
CO9. Deliberate in details with examples Various Application of Cloud Computing

Unit - 1 15 Hours

Cloud Introduction: Cloud Computing Fundamentals: Cloud Computing definition, Types of cloud, Cloud services: Benefits and challenges of cloud computing, Evolution of Cloud Computing , usage scenarios and Applications , Business models around Cloud– Major Players in Cloud Computing - Issues in Cloud - Eucalyptus - Nimbus - Open Nebula, CloudSim.

Cloud Services and File System: Types of Cloud services: Software as a Service - Platform as a Service – Infrastructure as a Service - Database as a Service - Monitoring as a Service –Communication as services.

Unit - 2 15 Hours

Service providers- Google App Engine, Amazon EC2, Microsoft Azure, Sales force.

Collaborating With Cloud: Collaborating on Calendars, Schedules and Task Management – Collaborating on Event Management, Contact Management, Project Management –Collaborating on Word Processing , Databases – Storing and Sharing Files- Collaborating via Web-Based Communication Tools – Evaluating Web Mail Services – Collaborating via Social Networks – Collaborating via Blogs and Wikis.

Unit - 3 **15 Hours**

Virtualization For Cloud: Need for Virtualization – Pros and cons of Virtualization – Types of Virtualization – System Vm, Process VM, Virtual Machine monitor – Virtual machine properties - Interpretation and binary translation, HLL VM - Hypervisors – Xen, KVM , VMWare, Virtual Box, Hyper-V.

Unit - 4 **15 Hours**

Security, Standards, And Applications: Security in Clouds: Cloud security challenges – Software as a Service Security, Common Standards: The Open Cloud Consortium –The Distributed management Task Force – Standards for application Developers – Standards for Messaging – Standards for Security, End user access to cloud computing, Mobile Internet devices and the cloud.

Reference Books:

1. Bloor R., Kanfman M., Halper F. Judith Hurwitz "Cloud Computing " Wiley India Edition,2010
2. John Rittinghouse& James Ransome, "Cloud Computing Implementation Management and Strategy", CRC Press, 2010
3. Antohy T Velte ,Cloud Computing : "A Practical Approach", McGraw Hill,2009
4. Michael Miller, Cloud Computing: "Web-Based Applications That Change the Way You Work and Collaborate Online", Que Publishing, August 2008.
5. James E Smith, Ravi Nair, "Virtual Machines", Morgan Kaufmann Publishers, 2006.

Online Reading/Supporting Material

1. Haley Beard, "Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing", Applications and Data Centers in the Cloud with SLAs, Emereo Pty Limited, July 2008
2. Webpages.iust.ac.ir/hsalimi/.../89.../Cloud%20Common%20standards.pptop ennebula.org,
3. www.cloudbus.org/cloudsim/, http://www.eucalyptus.com/
4. hadoop.apache.org
5. http://hadoop.apache.org/docs/stable/hdfs_design.html
6. http://static.googleusercontent.com/external_content/untrusted_dlcp/ research.google.com/en//archive /mapreduce-osdi04.pdf

Cloud Computing Lab

Software Lab based on Cloud Computing:

1. Create virtual machines that access different programs on same platform.
2. Create virtual machines that access different programs on different platforms.
3. Exploring Google cloud for the following

    a) Storage
    b) Sharing of data
    c) Manage your calendar, to-do lists,
    d) A document editing tool

4. Exploring Open source cloud (Any two)

DCE43001

V SEMESTER
DSE 3B: Elective: Enterprise Resource Planning
Credit (L: T: P = 4: 0: 1)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Deliberate the details of ERP
CO2. Learn in depth Models of ERP
CO3. Write down in depth Business Process Mapping for ERP
CO4. Understand in details with applications of ERP and Related Technologies
CO5. Deliberate the details of ERP Modules
CO6. Specify in details with examples SAP

Unit - 1 **15 Hours**

Introduction to ERP, Evolution of ERP, What is ERP? Reasons for the growth of ERP, Scenario and Justification of ERP in India, Evaluation of ERP, Various Modules of ERP, Advantage of ERP and Disadvantage of ERP.

Unit - 2 **15 Hours**

An overview of Enterprise, Integrated Management Information, Business Modeling, ERP for Small Business, ERP for make to order companies, Business Process Mapping for ERP Module Design, Hardware Environment and its Selection for ERP Implementation.

Unit - 3 **15 Hours**

ERP and Related Technologies, Business Process Reengineering (BPR), Management Information System (MIS), Executive Information System (EIS), Decision support System (DSS), Supply Chain Management (SCM) (With Example)

Unit - 4 **15 Hours**

ERP Modules, Introduction to Finance, Plant Maintenance, Quality Management, Materials Management, ERP Market, Introduction, SAP AG, Baan Company, Oracle Corporation, People Soft, JD Edwards World Solutions Company, System Software Associates.

Reference Books:

1. C.S. V Murthy Enterprise Resource Planning
2. R.G. Saha – Enterprise Resource Planning - HPH
3. Alexis Leon, Leon Publishers: Enterprise Resource Planning

4. Ravi Anupindi, Sunil Chopra, Pearson Education". "Managing Business Process Flows
5. Altekar, PHI. Enterprise Resource Planning
6. Srivatsava, I.K. International Publishers, Enterprise Resource Planning
7. P. DiwanVinod Kumar Garg and N.K. Venkitakrishnan, PHI. Enterprise Resource Planning
8. Introduction to SAP, an Overview of SD: MM, PP, FI/CO Modules of SAP. 10. ZaveriJyotindra Enterprise Resource Planning

Enterprise Resource Planning Lab

Students should be Prepare ERP Solution Report for his / her Case Study under the supervision of Teacher/ Lecturer

DCE45001

V SEMESTER
DSE 3C: Elective: Data Mining and Data Warehousing
Credit (L: T: P = 4: 0: 1)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Understand the characteristics of Data Warehousing
CO2. Understand the details of Data Warehousing Architecture
CO3. Deliberate in depth Data Mining
CO4. Learn in details with examples Association Rule Mining
CO5. Specify the details of Classification and Prediction Techniques
CO6. Learn in depth Clustering Methods
CO7. Write down in depth Application of Data Mining

Unit - 1 **15 Hours**

Data Warehousing: Introduction- Definition and description need for data ware housing, need `for strategic information, failures of past decision support systems, OLTP vs DWH-DWH requirements-trends in DWH-Application of DWH.

Data Warehousing Architecture: Reference architecture- Components of reference architecture - Data warehouse building blocks, implementation, physical design process and DWH deployment process.

Unit - 2 **15 Hours**

A Multidimensional Data, Model Data Warehouse Architecture.

Data Mining: Data mining tasks-Data mining vs KDD- Issues in data mining, Data Mining metrics, Data mining architecture - Data cleaning- Data transformation- Data reduction - Data mining primitives.

Unit - 3 **15 Hours**

Association Rule Mining: Introduction - Mining single dimensional Boolean association rules from transactional databases - Mining multi-dimensional association rules.

Classification and Prediction: Classification Techniques - Issues regarding classification and prediction - decision tree - Bayesian classification –Classifier accuracy.

Unit - 4 **15 Hours**

Clustering: Clustering Methods - Outlier analysis.

Applications and Other Data Mining Methods: Distributed and parallel Data Mining Algorithms, Text mining- Web mining.

Reference Books:

1. Jiawei Han and MichelineKamber, " Data Mining Concepts and Techniques", Morgan Kaufmann Publishers, USA, 2006.
2. Berson,"DataWarehousing, Data Mining and OLAP", Tata McGraw Hill Ltd, New Delhi, 2004.
3. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Introduction to Data Mining, , Pearson Education.
4. Arun K Pujari,"Data mining techniques", Oxford University Press, London, 2003.
5. Dunham M H,"Data mining: Introductory and Advanced Topics". Pearson Education, New Delhi, 2003.
6. MehmedKantardzic," Data Mining Concepts, Methods and Algorithms", John Wiley and Sons, USA, 2003.
7. Soman K. P., DiwakarShyam, Ajay V., Insight into Data mining: Theory and Practice, PHI 2006

Data Mining and Data Warehousing Lab

Software Lab based on Data Mining:

Practical List: Practical are to be done using Weka, and a report prepared as per the format*.

The operations are to be performed on built-in dummy data sets of weka and / or the downloadable datasets mentioned in references below. Also wherever applicable, the parameter values are to be varied (upto 3 distinct values). The 'Visualize' tab is to be explored with each operation.

1. Preprocessing: Apply the following filters –
   a. weka>filter>supervised>attributed>
      AddClassification ,AttributeSelection, Discretize , NominalToBinary
   b. weka>filter>supervised>instance:
      StratifiedRemoveFolds, Resample
   c. weka>filter>unsupervised>attribute>
      Add, AddExpression, AddNoise ,Center , Discretize , MathExpression ,MergeTwoValues , NominalToBinary , NominalToString, Normalize
      NumericToBinary ,NumericToNominal , NumericTransform , PrincipalComponent,
      RandomSubset , Remove , RemoveType , ReplaceMissingValues , Standardize
   d. weka>filter>unsupervised>instance>
      Normalize , Randomize , Standardize, RemoveFrequentValues, RemoveWithValues , Resample , SubsetByExpression
2. Explore the 'select attribute' as follows
      weka>attributeSelection> , FilteredSubsetEval , WrapperSubsetEval
3. Association mining
   weka>associations> , Apriori, FPGrowth
4. Classification**
   weka>classifiers>bayes> , NaïveBayes , weka>classifiers>lazy> : IB1 , IBkweka>classifiers>trees , SimpleCart , RandomTree , ID3
5. Clustering**
   weka>clusters> , SimpleKMeans , FarthestFirst algorithm, DBSCAN, hierarchicalClusterer

DCE51001

V SEMESTER

SEC 2A: Elective: Object Oriented Modelling& Design with UML
Credit (L: T: P = 3: 0: 1)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Deliberate in details with examples Object Oriented Development
CO2. Write down the details of OO Modeling Concepts
CO3. Learn the details of OO process Overview
CO4. Identify in depth Design of System Using OO Model
CO5. Specify the details of Steps for Implementation of OO Modeling
CO6. Learn the details of Design a System Using UML Tool

Unit - 1 15 Hours

INTRODUCTION: What is object orientation? What is OO development? OO themes, Evidence for usefulness of OO development, OO Modeling history. Introduction to UML, Importance of modeling, Principles of modeling, Object oriented modeling, Overview of UML, Conceptual model of the UML, Architecture, Software development life cycle.

MODELING CONCEPTS: Modeling as a design technique- Modeling, Abstraction, the three models. Class modeling -object and class concepts, link and association concepts, Generalization and inheritance, a sample model, navigation of class models, Advanced class modeling, advanced object and class concepts, association ends, n-ray associations, aggregation, abstract classes, multiple inheritance, metadata, reification, constraints, derived data, packages.

Unit - 2 15 Hours

State modeling events, states, transitions and conditions, state diagrams, state diagram behavior. Interaction modeling- use case models, sequence models, activity models. Advanced Interaction Modeling- use case relationships, procedural sequence models, special constructs for activity models

PROCESS OVERVIEW- development stages, development life cycle, Doman analysis- overview of analysis, domain class model, domain state model, domain interaction model, iterating the analysis.

Unit - 3 15 Hours

SYSTEM DESIGN-overview of system design, estimating performance, making a reuse plan, breaking a system into subsystems, identifying

concurrency, allocation of subsystems, management of data storage, handling global resources, choosing a software control strategy, handling boundary conditions.

CLASS DESIGN- Overview of class design, Bridging the gap, realizing use cases, designing algorithms, Recursing downward, refactoring, Design Optimization Reification of Behavior, adjustment of inheritance, organizing a class design.

IMPLEMENTATION MODELING-Overview of Implementation, fine-tuning classes Fine-tuning generalizations, Realizing associations testing.

Reference Books:

1. Object –oriented modeling and design- Michael R Blaha and James R Rumbaugh
2. Object Technology- David A.Taylor
3. Designing Flexible Object Oriented systems with UML – Charles Ritcher
4. Object Oriented Analysis & Design, Sat/.inger. Jackson, BurdThomson
5. Object Oriented Modeling and Design - James Rumbaugh
6. Teach Yourself UML in 24 Hours - Joseph Schmuilers

Object Oriented Modelling& Design with UML Lab

Term Work / Assignment

Each candidate will submit an approximately10-page written report on a case study or mini project. Students have todo OO analysis & design for the project problem, and develop use case model, analysis model and design model for it, using UML.

Practical assignment

Nine assignments, one on each of the diagrams learnt in UML.

DCE53001

V SEMESTER

SEC 2B: Elective: Analysis and Design of Algorithms

(Credit L: T: P = 3: 0: 1)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Learn the details of Types of notion of Algorithm
CO2. Learn in details with examples Algorithm Design Techniques
CO3. Deliberate in depth Sorting Techniques
CO4. Deliberate in depth of Searching Techniques
CO5. Identify in details with examples Analysis of Graph Algorithms
CO6. Learn the details of Dynamic Programming Methods

Unit - 1 15 Hours

Introduction: Notion of Algorithm, Review of Asymptotic Notations, Mathematical Analysis of Non-Recursive and Recursive Algorithms Correctness of Algorithm

Algorithm Design Techniques: Iterative techniques Divide and conquer greedy algorithms.

Sorting Techniques: Selection sort, bubble sort, insertion sort, more sorting techniques-quick sort, merge sort. Radix sort,

Unit - 2 15 Hours

Searching Techniques: Linear and Binary search, Complexity Analysis.

Graphs: Analysis of Graph algorithms -Depth-First Search Breadth-First Search and its applications, minimum Spanning Trees and Shortest Paths - PRIM 'S, KRUSKAL, Dijkstra's algorithm. Branching-Hamiltonian Circuit problem.

Unit - 3 15 Hours

DYNAMIC PROGRAMMING: The General Method, Warshall's Algorithm, Floyd's Algorithm for the All-Pairs Shortest Paths, Single-Source Shortest Paths: The Travelling Salesperson problem.

Reference Books:

1. Analysis & design of Algorithm-Padma Reddy
2. A.V. Levitin, Introduction to the Design and Analysis of Algorithms, Pearson Education, 2006.
3. J. Kleinberg and E. Tardos, Algorithms Design, Pearson Education, 2006.

Analysis and Design of Algorithms Lab

1. Implement Insertion Sort.
2. Implement Merge Sort.
3. Implement recursive algorithm
4. Implement Randomized Quick sort.
5. Implement Radix Sort.
6. Implement Searching Techniques (linear & Binary)
7. Implement selection sort
8. Implement Bubble sort
9. Implement Prim's Algorithm
10. Implement Dijkstra's Algorithm
11. Implement Krushkal's Algorithm
12. Implement Travelling Salesperson problem
13. Implement Floyd's Algorithm
14. Implement Depth First Search
15. Implement Binary Search tree.

DCE55001

V SEMESTER
SEC 2C: Elective: E-Commerce Technologies
Credit (L: T: P = 3: 0: 1)

Course Outcome:

After successful completion of the course, the student is able to
CO1. Understand the details of E-Commerce
CO2. Learn the details of Basic Concepts Of Internet and WWW
CO3. Identify in depth Internet Security Methods
CO4. Learn in details with examples Concepts of Electronic Data Exchange and applications
CO5. Learn in details with examples Planning For E-Commerce
CO6. Understand in depth Features of Internet Marketing

Unit - 1 15 Hours

An introduction to Electronic commerce: What is E-Commerce (Introduction And Definition), Main activities E-Commerce, Goals of E-Commerce, Technical Components of E-Commerce, Functions of E-Commerce, Advantages and disadvantages of E-Commerce, Scope of E-Commerce, Electronic Commerce Applications, 9 Electronic Commerce and Electronic Business(C2C)(C2G,G2G, B2G, B2P, B2A, P2P, B2A, C2A, B2B, B2C)

The Internet and WWW: Evolution of Internet, Domain Names and Internet Organization (.edu, .com, .mil, .gov, .net etc.) , Types of Network, Internet Service Provider, World Wide Web, Internet & Extranet, Role of Internet in B2B Application, building own website, Cost, Time, Reach, Registering a Domain Name, Web promotion, Target email, Baner, Exchange, Shopping Bots.

Unit - 2 15 Hours

Internet Security: Secure Transaction, Computer Monitoring, Privacy on Internet, Corporate Email privacy, Computer Crime(Laws , Types of Crimes), Threats, Attack on Computer System, Software Packages for privacy, Hacking, Computer Virus(How it spreads, Virus problem, virus protection, Encryption and Decryption, Secret key Cryptography, DES, Public Key Encryption, RSA, Authorization and Authentication, Firewall, Digital Signature(How it Works)

Electronic Data Exchange: Introduction, Concepts of EDI and Limitation, Applications of EDI, Disadvantages of EDI, EDI model, Electronic Payment System: Introduction, Types of Electronic Payment System, Payment Types,

Value Exchange System, Credit Card System, Electronic Fund Transfer, Paperless bill, Modern Payment Cash, Electronic Cash.

Unit - 3 **15 Hours**

Planning for Electronic Commerce: Planning Electronic Commerce initiates, linking objectives to business strategies, measuring cost objectives, Comparing benefits to Costs, Strategies for developing electronic commerce web sites.

Internet Marketing: The PROS and CONS of online shopping, The cons of online shopping, Justify an Internet business, Internet marketing techniques, The E-cycle of Internet marketing, Personalization e-commerce.

Reference Books:

1. G.S.V.Murthy, E-Commerce Concepts, Models, Strategies- :- Himalaya Publishing House, 2011.
2. Kamlesh K Bajaj and DebjaniNag , E- Commerce , 2005.
3. Gray P. Schneider , Electronic commerce, International Student Edition, 2011,
4. HENRY CHAN, RAYMOND LEE, THARAM DILLON, ELIZABETH CHANG E COMMERCE, FUNDAMENTALS AND APPLICATIONS, Wiely Student Edition, 2011

E-Commerce Technologies Lab

Software Lab based on E-Commerce Technologies

E-commerce concepts are to be implemented in developing a website using a combination of following technologies:

1. Hyper Text Markup Language (HTML)
2. Cascading Style Sheets (CSS)
3. JavaScript
4. ASP
5. PHP
6. XML
7. Joomla

DCF31001

VI SEMESTER

DSE 4A: Elective: Operation Research
Credit (L: T: P = 4: 0: 1)

Course Outcome

After successful completion of the course, the student is able to

CO1. Write down the details of Origin and Development of Operation Research
CO2. Understand the characteristics of Linear Programming Problems and Methods
CO3. Deliberate in depth Transportation Problems
CO4. Deliberate in depth Assignment Problem
CO5. Identify in details with examples Network Analysis
CO6. Learn in depth Application of Operation Research

Unit - 1 **15 Hours**

Linear Programming Problems: Origin and development of operations research, formulation of Linear Programming problem, Graphical solution. Theory of simplex method, Use of artificial variables and their solution.

Unit - 2 **15 Hours**

Transportation Problem: Mathematical formulation of transportation problem, Initial basic Feasible solution, North West corner rule, Matrix minima method, Vogel's approximation method, MODI method to find optimal solution.

Unit - 3 **15 Hours**

Assignment Problem: Mathematical formulation of an Assignment problem, Assignment algorithm, Hungarian Method to solve Assignment Problem.

Unit - 4 **15 Hours**

Network Analysis: Basic components of Network, Rules for drawing Network diagram Time calculation in Networks. Critical Path Method and PROJECT Evaluation and Review Techniques. Algorithm and flow chart for CPM and PERT.

Reference Books:

1. Taha, "Operations Research", 7th edition, Pearson Education, 2007.
2. Billey E. Gillett, "Introduction to Operations Research", Himalaya Publishing House, Delhi,1979.
3. HamadyA.Taha "Operations Research" , Collin Mac Millan, 1982

Operation Research Lab

Lab based on Operation Research

1. LPP
2. Simplex
3. Dual Simplex
4. Big – M
5. Vogel's
6. Maxima and Minima
7. North West corner
8. Sequencing Problems
9. Modi Method
10. Hugarian Method
11. Assignment Problem

DCF33001

VI SEMESTER

DSE 4B: Elective: System Software & Compiler design
Credit (L: T: P = 4: 0: 1)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Understand the classification and characteristics of language Processors
CO2. Learn the details of Concepts Of Macros
CO3. Learn the details of Linkers and Loaders
CO4. Understand in details with examples of Compiler Concepts
CO5. Understand the details of Parsing Methods
CO6. Write down the details of Code optimization

Unit - 1 **15 Hours**

ASSEMBLERS & MACROS: Overview of Language processors – Assemblers: Design of two pass assemblers - single pass assemblers

MACRO: Macro definition- macro call – macro expansion- nested macro advanced

Macro facilities- Design of Microprocessor.

LINKERS & LOADERS: Relocation and linking concepts – Design of linker – self relocating programs – linking in MS-DOS – overlays

DYNAMIC LINKING: Loaders – Absolute loaders- relocating loaders

Unit - 2 **15 Hours**

COMPILERS: GRAMMARS & AUTOMATA - Languages – Grammars – Types of grammars – Context free grammar – regular expression - Recognizing of patterns - finite automation (deterministic & non deterministic) Conversion of NDFA to DFA - Conversion of regular expression of NDFA – Thompson's construction- minimization of NDFA - Derivation - parse tree - ambiguity – Lexical analysis- handles - token specification - design of lexical analysis (LEX) - Automatic generation of lexical analyzer - input buffering – A language for specifying lexical analyzers - implementation of lexical analyzer

SYNTAX ANALYSIS – PARSING: Definition - role of parsers - top down parsing - bottom-up parsing - Left recursion - left factoring - Handle pruning , Shift reduce parsing - operator precedence parsing – FIRST- FOLLOW- LEADING- TRAILING

Unit - 3 **15 Hours**

Predictive parsing – recursive descent parsing. LR parsing – LR (0) items - SLR parsing – Canonical LR – LALR parsing - generation of LALR - Ambiguous grammars - error recovery

SYNTAX DIRECTED TRANSLATION & CODE OPTIMIZATION: Intermediate Languages - prefix - postfix - Quadruple - triple - indirect triples – syntax tree- Evaluation of expression - three-address code- Synthesized attributes – Inherited attributes – Conversion of Assignment statements- Boolean expressions –Backpatching - Declaration - CASE statements

Unit - 4 **15 Hours**

CODE OPTIMIZATION: Local optimization- Loop Optimization techniques – DAG –Dominators- Flow graphs – Storage allocations- Peephole optimization – Issues in Code Generation.

Reference Books:

1. Alfred V Aho , Jeffery D Ullman , Ravi Sethi, " Compilers , Principles techniques and tools ", Pearson Education 2011
2. Dhamdhere D.M., “Systems Programming”, Tata McGraw Hill Education Pvt. Ltd., 2011.
3. Srimanta Pal, “Systems Programming”, Oxford University Press, 2011.
4. Raghavan V., “Principles of Compiler Design”, Tata McGraw Hill Education Pvt. Ltd., 2010.
5. David Galles, “Modern Compiler Design”, Pearson Education, Reprint 2012.
6. DasaradhRamaiah. K., “Introduction to Automata and Compiler Design”, PHI, 2011.

System Software & Compiler design Lab

1. Implementation of a text editor
2. Implementation of an Assembler
3. Implementation of Macro processor
4. Converting a regular expression to NFA
5. Conversion of an NFA to DFA
6. Computation of FIRST and FOLLOW sets

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7. Computation of Leading and Trailing Sets
8. Construction of Predictive Parsing Table
9. Implementation of Shift Reduce Parsing
10. Computation of LR(0) items
11. Construction of DAG
12. Intermediate code generation

DCF35001

VI SEMESTER

DSE 4C: Elective: Digital Image Processing
Credit (L: T: P = 4: 0: 1)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Learn in details with examples Element of Digital Image Processing Systems
CO2. Specify in depth Image Enhancement Techniques
CO3. Write down in depth Image Restoration Methods
CO4. Learn the details of Image Segmentation Algorithms
CO5. Identify in details with examples Data Image Compression
CO6. Learn in depth - Various Application of Image Processing

Unit - 1 **15 Hours**

DIGITAL IMAGE FUNDAMENTALS Elements of digital image processing systems, Videocon and Digital Camera working principles, Elements of visual perception, brightness, contrast, hue, saturation, mach band effect, Color image fundamentals - RGB, HSI models, Image sampling, Quantization, dither, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT, KLT, SVD.

IMAGE ENHANCEMENT: Histogram equalization and specification techniques, Noise distributions, Spatial averaging,

Unit - 2 **15 Hours**

Directional Smoothing, Median, Geometric mean, Harmonic mean, Contra harmonic mean filters, Homomorphism filtering, Color image enhancement.

IMAGE RESTORATION: Image Restoration - degradation model, Unconstrained restoration - Lagrange multiplier and Constrained restoration, Inverse filtering-removal of blur caused by uniform linear motion, Wiener filtering,

Unit - 3 **15 Hours**

Geometric transformations-spatial transformations.

IMAGE SEGMENTATION: Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and Merging – Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.

Unit - 4 **15 Hours**

IMAGE COMPRESSION: Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, Vector Quantization, Transform coding, JPEG standard, MPEG.

Reference Books:

1. Rafael C. Gonzalez, Richard E. Woods, , Digital Image Processing', Pearson, Second Edition, 2004.
2. Anil K. Jain, , Fundamentals of Digital Image Processing', Pearson 2002.

Digital Image Processing Lab

Lab 1: Write a program for image enhancement

Lab2: Write a program for image compression

Lab3: Write a program for color image processing

Lab4: Write a program for image segmentation

Lab 5: Write a program for image morphology

Lab 6: Image Restoration

Lab 7: Edge detection

Lab 8: Blurring 8 bit color versus monochrome

DCF40001

VI SEMESTER

DSE 5: Elective: Dissertation / Project
Credit (L: T: P = 0: 0: 6) 12 Hours/Week

Course Outcome:

After successful completion of the course, the student is able to

CO1. Identify in details with examples Problem identification
CO2. Write down in depth System Analysis
CO3. Understand and Develop SRS for selected System Problem
CO4. Understand and Develop System Design for selected System Problem
CO5. Learn in details and Develop a Code and Test the System
CO6. Understand the details of Presentation and Demo of Project Work

- This option is to be offered only in 6th Semester.
- The students will be allowed to work on any project based on the concepts studied in
  Core/elective or skill based elective courses.
- The group size should be maximum of TWO (02) students.
- Each group will be assigned a teacher as a supervisor who will handle both their theory as Well as lab classes.
- A maximum of Four (04) projects would be assigned to one teacher.

DCF51001

VI SEMESTER

SEC 3A: PHP Programming
Credit (L: T: P = 1: 0: 1)

Course Outcome:

After successful completion of the course, the student is able to
CO1. Learn in depth Elements of PHP
CO2. Learn in depth Interaction Methods Between HTML and PHP
CO3. Understand in depth PHP function
CO4. Understand in depth String Manipulation
CO5. Learn the characteristics of Regular Expression
CO6. Learn the details of Developing PHP Web Application

Unit - 1 15 Hours

Introduction Basic PHP Development Control Structure: Introduction to www, History, Understanding client/server roles Apache, PHP, MySQL, XAMPP Installation PHP Basic syntax, PHP data Types, PHP Variables PHP Constants, PHP Expressions, PHP Operators Control Structures & Loop

Working With the File System Working With Regular Expressions, Opening a File, Reading from a File, Writing to a File, File Locking, Uploading Files via an HTML Form, Getting File Information, Directory Functions, Getting a Directory Listing, The basic regular expressions, Matching patterns, Finding matches, Replace patterns

WORKING WITH FORMS: PHP Form handling, PHP GET/POST, PHP Form Validation, Accessing user input, Combine HTML and PHP code using hidden fields, Redirecting the user, File upload

CLASSES AND OBJECTS: Object oriented concepts, Define a class, attributes, Object, Object properties, methods, constructors and destructors, Class constants, Static method, Class inheritance, Abstract classes, Final keyword, Implementing Interface, Object serialization

Reference Books:

1. Complete Beginner's Guide to PHP: Programming & Web Development by Cedric Palmer (22 February 2014)
2. PHP and MySQL Web Development by Laura Thomson and Luke Welling
3. PHP Reference: Beginner to Intermediate PHP5 by Mario Lurig
4. PHP 4: A Beginner's Guide by William Mccarty

PHP Programming Lab

Students should do Mini Project Using PHP under the supervision of Teacher/ Lecturer

DCF53001

V SEMESTER
SEC 3B: Elective: Computer Simulations
Credit (L: T: P = 1: 0: 1)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Deliberate the details of Concepts of Simulation and Methods
CO2. Understand the details of Random Numbers/variates
CO3. Learn the details of Design of Simulation Experiments
CO4. Understand the characteristics of Discrete System simulation languages
CO5. Learn in details with Case studies using Simulation Languages
CO6. Identify the details of applications of simulation

Unit - 1 15 Hours

INTRODUCTION: Concept of simulation – simulation as a decision making tool-Monte Carlo simulation.

RANDOM NUMBERS/VARIATES: Pseudo random numbers – methods of generating random variates – random variates for uniform, normal, binominal, passion, exponential distributions.

DESIGN OF SIMULATION EXPERIMENTS: Problem formulation – data collection and reduction – logic developments – initial conditions – run length, tabular method of simulation – development of models using higher level languages for systems like queuing, production, inventory and maintenance – output analysis and interpretation, validation.

DISCRETE SYSTEM SIMULATION LANGUAGES: Need for simulation language – Comparison of simulation languages: SIMCRIPT, GASP, SIMULA, GPSS, PROMODEL, etc…

CASE STUDIES USING SIMULATION LANGUAGES: Development of simulation models using the simulation language studies for systems for systems like, queuing systems, production systems, inventory systems, maintenance and replacement systems, investment analysis and network.

Reference Books:

1. Jerry Banks and John S.Carson, Barry L Nelson, David M.Nicol, P.Shahabudeen "Discrete event system simulation"' Pearson, 2007.
2. Thomas J.Schriber, "Simulation using GPSS", John Wiley, 2002.
3. Law A.M. and Kelton W.D "Simulation Modeling and Analysis, McGraw Hill, 2003

Computer Simulations Lab

Design lab Cycle based on Computer Simulations (Theory) Paper by Concerned Teacher / Lecturer

DCF55001

V SEMESTER

SEC 3C: Elective: Information Security and Cyber Laws

Credit (L: T: P = 1: 0: 1)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Learn in depth Computer Network Threats
CO2. Understand the details of Digital Crimes
CO3. Understand the details of Risk Analysis
CO4. Understand in details with examples Concepts of Cryptography
CO5. Learn in details with examples Application of Cryptography
CO6. Learn in details with examples safety tools and Cyber Laws

Unit - 1 15 Hours

Introduction: Computer network as a threat, hardware vulnerability, software vulnerability, importance of data security.

Digital Crime: Overview of digital crime, criminology of computer crime.

Information Gathering Techniques: Tools of the attacker, information and cyber warfare, scanning and spoofing, password cracking, malicious software, session hijacking

Risk Analysis and Threat: Risk analysis, process, key principles of conventional computer security, security policies, authentication, data protection, access control, and internal vs. external threat, security assurance, passwords, authentication, and access control, computer forensics and incident response

Introduction to Cryptography and Applications: Important terms, Threat, Flaw, Vulnerability, Exploit, Attack, Ciphers, Codes, Substitution Cipher (Caesar), Transposition Cipher (Rail-Fence), Public key cryptography (Definitions only), Private key cryptography (Definition and Example), Cyber forensics, Steganography

Safety Tools and Issues: Firewalls, logging and intrusion detection systems, Windows and windows XP / NT security, Unix/Linux security, ethics of hacking and cracking

Cyber laws to be covered as per IT 2008

Reference Books:

1. M. Merkow, J. Breithaupt, Information Security Principles and Practices, Pearson Education.
2. G.R.F. Snyder, T. Pardoe, Network Security, Cengage Learning, 2010
3. A. Basta, W.Halton, Computer Security: Concepts, Issues and Implementation, Cengage Learning India, 2008
4. Anderson, Ross. Security engineering.John Wiley & Sons, 2008. (Freely available online)

Information Security and Cyber Laws Lab

1. Demonstrate the use of Network tools: ping, ipconfig, ifconfig, tracert, arp, netstat, whois
2. Use of Password cracking tools: John the Ripper, Ophcrack. Verify the strength of passwords using these tools.
3. Perform encryption and decryption of Caesar cipher. Write a script for performing these operations.
4. Perform encryption and decryption of a Rail fence cipher. Write a script for performing these operations.
5. Use nmap / zenmap to analyse a remote machine.
6. Use Burp proxy to capture and modify the message.
7. Demonstrate sending of a protected word document.
8. Demonstrate sending of a digitally signed document.
9. Demonstrate sending of a protected worksheet.
10. Demonstrate use of steganography tools.
11. Demonstrate use of gpg utility for signing and encrypting purposes.

Question Paper Pattern
Theory (3 or 4 Credits)

Time: 3 Hours Max. Marks: 70

Part – A

I. Answer any Eleven Question out of given Twelve Questions.11 X 2 = 22

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
11.
12.

Note: Three Questions each from the Units 1, 2, 3, and 4

Part - B

II. Answer any Two Sub Questions from each main Question.

13. A) **2 X 6 = 12**
B)
C)

14. A) **2 X 6 = 12**
B)
C)

15. A) **2 X 6 = 12**
B)
C)

16. A) **2 X 6 = 12**
B)
C)

Note: Each Main questions contains 3 sub questions carries 06 Marks (may have internal Split-ups) and from Units 1, 2, 3 and 4 respectively

Question Paper Pattern

Theory (1 or 2 Credits)

Time: 2 Hours Max. Marks: 50

Part – A

I. Answer all Questions. 05 X 02 = 10

1.
2.
3.
4.
5.

Part - B

II. Answer any Four Questions out of given Five Questions.4 X 10 = 40

1.
2.
3.
4.
5.

Note: Each Main questions contains 3 sub questions carries 06 Marks (may have internal Split-ups) and from Units 1, 2, 3 and 4 respectively

Question Paper Pattern

Practical / Project (1 or 2 Credits)

Time: 3 Hours Max. Marks: 70

Practicals

1. Two Experiments/ Programs 20 Marks Each 2 x 20 = 40 Marks
   a. Write-ups 10 Marks
   b. Conducting & Results 10 Marks (Any One for 2 Hours of Practical's)
2. Viva – Voice 10 Marks
3. Record 10 Marks

Project

1. Project Presentation 10% Marks
2. Project Demo 20% Marks
3. Viva – Voice 20% Marks
4. Record / Report 20% Marks
5. IA (C1 & C2) 30% Marks

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE
(An autonomous College of University of Mysuru)
Re-accredited by NAAC with 'A' grade
Ooty road, Mysuru-570 025, Karnataka

DEPARTMENT OF BIOCHEMISTRY

SYLLABUS

CHOICE BASED CREDIT SYSTEM

FOR
B.Sc. PROGRAMME

Biochemistry, Microbiology, Biotechnology

Botany, Biochemistry, Microbiology

2017-2018

Programme: Biochemistry, Microbiology, Biotechnology

Scheme of Study

Year	Semester	Course code	Title of the Paper	Credits	Total credits	Total Hours		Total Hours
				L:T:P		Th	Pr	
I BSc	I	CMA21006	FUNDAMENTALS OF CHEMISTRY AND MOLECULES OF LIFE	4:0:2	06	60	60	8
	II	CMB21006	PHYSIOLOGY	4:0:2	06	60	60	8
II BSc	III	CMC21006	METABOLISM	4:0:2	06	60	60	8
	IV	CMD21006	ENZYMOLOGY & BIOENERGETICS	4:0:2	06	60	60	8
III BSc	V	CME21006 CME21206	No. Of course 1 DSE 1- NUTRITIONAL BIOCHEMISTRY DSE 2- MOLECULAR BASIS OF INFECTIOUS DISEASES	4:0:1.0	4.0	60	30	6
		CME21406 CME21606	No. Of course 1 SEC 1- TOOLS AND TECHNIQUES IN BIOCHEMISTRY SEC 2- CLINICAL BIOCHEMISTRY	2:0:0	02	30	00	2
	VI	CMF21006 CMF21206	No. Of course 1 DSE 1- ADVANCED CELL BIOLOGY AND ENDOCRINOLOGY DSE 2- PLANT BIOCHEMISTRY	4:0:1.0	4.0	60	30	6

Programme: Botany, Biochemistry, Microbiology

Scheme of Study

Year	Semester	Course code	Title of the Paper	Credits	Total credits	Total Hours		Total Hours
				L:T:P		Th	Pr	
I BSc	I	CMA21006	FUNDAMENTALS OF CHEMISTRY AND MOLECULES OF LIFE	4:0:2	06	60	60	8
	II	CMB21006	PHYSIOLOGY	4:0:2	06	60	60	8
II BSc	III	CMC21006	METABOLISM	4:0:2	06	60	60	8
	IV	CMD21006	ENZYMOLOGY & BIOENERGETICS	4:0:2	06	60	60	8
III BSc	V	CME21006 CME21206	No. Of course 1 DSE 1- NUTRITIONAL BIOCHEMISTRY DSE 2- MOLECULAR BASIS OF INFECTIOUS DISEASES	4:0:1.0	4.0	60	30	6
		CME21406 CME21606	No. Of course 1 SEC 1- TOOLS AND TECHNIQUES IN BIOCHEMISTRY SEC 2- CLINICAL BIOCHEMISTRY	2:0:0	02	30	00	2

	VI	CMF21006 CMF21206	No. Of course 1 DSE 1- ADVANCED CELL BIOLOGY AND ENDOCRINOLOGY DSE 2- PLANT BIOCHEMISTRY	4:0:1.0	4.0	60	30	6

Programme: Biochemistry, Microbiology, Biotechnology

Scheme of Assessment

Year	Sem	Course code	Title of the Paper	Credits	Percentage			Maximum Marks						Exam Duration	
				L:T:P	Th	Pr	IA	Th	Pr	IA-1		IA-2		Th	Pr
										Th	Pr	Th	Pr		
I BSc	I	CMA21006	FUNDAMENTALS OF CHEMISTRY AND MOLECULES OF LIFE	4:0:2	50	20	30	70	70	10	05	10	05	3H	3H
	II	CMB21006	PHYSIOLOGY	4:0:2	50	20	30	70	70	10	05	10	05	3H	3H
II BSc	III	CMC21006	METABOLISM	4:0:2	50	20	30	70	70	10	05	10	05	3H	3H
	IV	CMD21006	ENZYMOLOGY & BIOENERGETICS	4:0:2	50	20	30	70	70	10	05	10	05	3H	3H
III BSc	V	CME21006 CME21206	No. Of course 1 DSE 1- NUTRITIONAL BIOCHEMISTRY DSE 2- MOLECULAR BASIS OF INFECTIOUS DISEASES	4:0:1.0	50	20	30	70	70	10	05	10	05	3H	3H
		CME21406 CME21606	No. Of course 1 SEC 1- TOOLS AND TECHNIQUES IN BIOCHEMISTRY SEC 2- CLINICAL BIOCHEMISTRY	2:0:0	70	-	30	50	-	10	05	10	05	2H	-
	VI	CMF21006 CMF21206	No. Of course 1 DSE 1- ADVANCED CELL BIOLOGY AND ENDOCRINOLOGY DSE 2- PLANT BIOCHEMISTRY	4:0:1.0	50	20	30	70	70	10	05	10	05	3H	3H

Programme: Botany, Biochemistry, Microbiology

Scheme of Assessment

Year	Sem	Course code	Title of the Paper	Credits	Percentage			Maximum Marks						Exam Duration	
				L:T:P	Th	Pr	IA	Th	Pr	IA-1		IA-2		Th	Pr
										Th	Pr	Th	Pr		
I BSc	I	CMA21006	FUNDAMENTALS OF CHEMISTRY AND MOLECULES OF LIFE	4:0:2	50	20	30	70	70	10	05	10	05	3H	3H
	II	CMB21006	PHYSIOLOGY	4:0:2	50	20	30	70	70	10	05	10	05	3H	3H
II BSc	III	CMC21006	METABOLISM	4:0:2	50	20	30	70	70	10	05	10	05	3H	3H
	IV	CMD21006	ENZYMOLOGY & BIOENERGETICS	4:0:2	50	20	30	70	70	10	05	10	05	3H	3H
III BSc	V	CME21006 CME21206	No. Of course 1 DSE 1- NUTRITIONAL BIOCHEMISTRY DSE 2- MOLECULAR BASIS OF INFECTIOUS DISEASES	4:0:1.0	50	20	30	70	70	10	05	10	05	3H	3H
		CME21406 CME21606	No. Of course 1 SEC 1- TOOLS AND TECHNIQUES IN BIOCHEMISTRY SEC 2- CLINICAL BIOCHEMISTRY	2:0:0	70	-	30	50	-	10	05	10	05	2H	-
	VI	CMF21006 CMF21206	No. Of course 1 DSE 1- ADVANCED CELL BIOLOGY AND ENDOCRINOLOGY DSE 2- PLANT BIOCHEMISTRY	4:0:1.0	50	20	30	70	70	10	05	10	05	3H	3H

SCHEME OF VALUATION FOR PRACTICAL EXAMINATION

- A candidate appearing for the first time should submit a duly signed and certified practical record
- Each candidate has to perform one experiment in the specified duration of three hours for ***FORTY FIVE*** **marks**
- Practical record has to be valued for ***TEN*** ***m*****arks** by examiners at the time of examination
- Viva-voce for ***FIFTEEN marks*** in practical is awarded by continuous assessment in the lab

Sl no	**Component**	**Marks**
1	Write up of the experiment	15
2	Conducting experiment	25
3	Result	05
4	Viva-voce	15
5	Practical record	10
	TOTAL	**70**

Core papers -Credit: 06 each

Sl. No	Sem	Course Code	Title of the paper	Total credits	
				Th	Pr
1	I	CMA21006/ CMA21007	Fundamentals of Chemistry and Molecules of Life	04	02
2	II	CMB21006/ CMB21007	Physiology	04	02
3	III	CMC21006/ CMC21007	Metabolism	04	02
4	IV	CMD21006/ CMD21007	Enzymology & Bioenergetics	04	02

Discipline Specific Electives (Credit: 05 each)

Sl. No	Sem	Course Code	Title of the paper	Total credits	
				Th	Pr
1	V		No. of course 1	04	1
		CME21006/ CME21007	DSE 1- Nutritional Biochemistry		
		CME21206/ CME21207	DSE 2- Molecular Basis of Infectious Diseases		
2	VI		No. of course 1	04	1
		CMF21006/ CMF21007	DSE 1- Advanced Cell Biology and Endocrinology		
		CMF21206/ CMF21207	DSE 2- Plant Biochemistry		

Skill Enhancement Course: (Credit: 02)

Sl. No	Course Code	Title of the paper	Total credits
			Th
1	CME21406/ CME21407	No. of course 1 SEC 1- Tools and Techniques in Biochemistry	02
	CME21606/ CME21607	SEC 2- Clinical Biochemistry	

Programme Outcome for Bachelor of Science in Biochemistry, Microbiology, Biotechnology

After completing the graduation in the Bachelor of Science the students are able to:

PO1. Demonstrate the ability to justify and explain their thinking and/or approach

PO2. Develop state-of-the-art laboratory and professional communication skills

PO3. Apply the scientific method to design, execute, and analyze an experiment

PO4. Explain scientific procedures and their experimental observations

PO5. Demonstrate an understanding of fundamental biochemical principles, structure and function

PO6. Work as a laboratory technician, biochemists or medical scientist

PO7. Explain the processes used by microorganisms for the growth

PO8. Explain the theoretical basis of tools, technologies and methods of microbiology

PO9. Design and develop solution to Biotechnology problems

PO10. Applying appropriate tools keeping in mind safety factor for environment & society

PO11. Create, select, and apply appropriate techniques, resources, and modern tools

PO12. Support biotechnology research activity with strong technical background

Programme Specific Outcome

Bachelor of Science in Biochemistry, Microbiology, Biotechnology

After completing the graduation in the Bachelor of Science the students are able to;

PSO1. Gain and understand biochemical and molecular processes

PSO2. Communicate scientific information effectively, relating to microbes and their role in ecosystem and health

PSO3. Acquire, articulate, retain and demonstrate laboratory safety skills

PSO4. Demonstrate applications of biochemical and biological sciences

PSO5. Apply appropriate tools and techniques in biotechnological manipulation

PSO6. Understand the responsibilities of biotechnological practices

Programme Outcome for Bachelor of Science in Botany, Biochemistry, Microbiology

After completing the graduation in the Bachelor of Science the students are able to:

PO1. Identify the taxonomic position of plants using principles and methods of nomenclature and classification in Botany

PO2. Understand the impact of the plant diversity in societal and environmental context

PO3. Demonstrate the knowledge of, and need for sustainable development

PO4. Use interdisciplinary approaches with quantitative skills to work on biological problems

PO5. Demonstrate the ability to justify and explain their thinking and/or approach

PO6. Develop state-of-the-art laboratory and professional communication skills

PO7. Apply the scientific method to design, execute, and analyze an experiment

PO8. Explain scientific procedures and their experimental observations

PO9. Demonstrate an understanding of fundamental biochemical principles, structure and function

PO10. Work as a laboratory technician, biochemists or medical scientist

PO11. Explain the processes used by microorganisms for the growth

PO12. Explain the theoretical basis of the tools, technologies and methods of microbiology

Programme Specific Outcome

Bachelor of Science in Botany, Biochemistry, Microbiology

After completing the graduation in the Bachelor of Science the students are able to;

PSO1. Demonstrate applications of biochemical and biological sciences

PSO2. Inculcating proficiency in all experimental techniques and methods of analysis

PSO3. Acquire, articulate, retain and demonstrate laboratory safety skills

PSO4. Communicate scientific information effectively, relating to microbes and their role in ecosystem and health

PSO5. Gain proper procedures and regulations in handling and disposal of chemicals

PSO6. Understand biochemical and molecular processes that occur in and between the cells

CMA21006/ CMA21007

SEMESTER I

CORE: FUNDAMENTALS OF CHEMISTRY AND MOLECULES OF LIFE

(Credits: Theory – 04, Practical – 02) **Theory: 60 Hrs**

Course Outcome:

After completion of the course the student is able to:

CO1: Understand in detail with examples stereochemistry
CO2: Specify the characteristics of carbohydrates & glycobiology
CO3: Learn the characteristics of proteins
CO4: Understand the classification and characteristics of vitamins

Unit : 1	**THE FOUNDATIONS OF BIOCHEMISTRY :** Cellular and chemical foundations of life	**2 Hrs**
Unit : 2	**WATER:** Unique properties, weak interactions in aqueous systems, ionization of water, buffers, water as a reactant and fitness of the aqueous environment.	**4 Hrs**
Unit : 3	**CONCENTRATION UNITS:** Mole, Mole fraction, Molality, Molarity and Normality (problems to be worked out).	**1 Hrs**
Unit : 4	**STEREOCHEMISTRY:** Stereoisomerism, types. Geometrical Isomerism- Cis Trans & E/Z nomenclature. Optical Isomerism- asymmetric carbon atom, Optical activity, plane polarized light, Chirality, Specfic molecular rotation, Projection formula- Fischer & Newman projection formulae, optical isomerism in Glyceraldehyde, Lactic acid, and Tartaric acid. Nomenclature of enantiomers - D and L system, Recimisation and resolution (biochemical method)	**4 Hrs**
Unit : 5	**REACTION MECHANISM:** Concept of inductive, mesomeric and resonance.effect. Concept of the reaction intermediates- carbanions, carbocations, free radicals, carbenes. Nucleophiles and Electrophiles.	**3 Hrs**
Unit : 6	**CARBOHYDRATES & GLYCOBIOLOGY:** Monosaccharides - structure of aldoses and ketoses, ring structure of sugars, conformations of sugars, mutarotation, anomers, epimers and enantiomers, structure of biologically important sugar derivatives, oxidation of sugars. Formation of disaccharides, reducing and nonreducing disaccharides. Polysaccharides – homo- and heteropolysaccharides, structural and storage polysaccharides. Structure and role of proteoglycans, glycoproteins and glycolipids (gangliosides and lipopolysaccharides). Carbohydrates as informational molecules, working with carbohydrates	**12 Hrs**
Unit : 7	**LIPIDS:** Building blocks of lipids - fatty acids, glycerol, and ceramide. Storage lipids - triacyl glycerol and waxes. Structural lipids in membranes- glycerophospholipids, galactolipids and sulpholipids, sphingolipids and sterols, structure, distribution and role of membrane lipids. Saponification value, Iodine value, Peroxide value, Acid value and their significance. Ecosinoids: Definition, types, Protaglandins: Definition, biological functions, structure of PGE1 & E2 and PGF1&F2. Throboxans and leukotrienes- Biological roles. Plant steroids. Lipids as signals, cofactors and pigments	**12 Hrs**

Unit : 8 **AMINO ACIDS & PROTEINS:** Structure and classification, physical, chemical and optical properties of amino acids. Peptide bond - Formation and structure. Structure and biological importance of Glutathione, Oxytosine, Vasopressine, Endorphene. Synthetic peptides – importance of polyglutamic acid, polylysine. **8 Hrs**

Classification of proteins based on structure with examples. Primary structure of proteins – Determination of amino acid composition, determination of N- and C-terminal amino acids, sequencing by Edman's degradation method. Secondary structure**: -** a Helix, b- sheet, b barrel and b turn. Tertiary structure-Fibrousproteins (collagen) and Globular proteins (Myoglobin). Quaternary Structure – hemoglobin, Denaturation and renaturation of proteins by Anfinsen's experiment.

Unit : 9 **NUCLEIC ACIDS:** Nucleotides - structure and properties. Nucleic acid structure -Watson-Crick model of DNA. Structure of major species of RNA - mRNA, tRNA and rRNA. Nucleic acid chemistry - UV absorption, effect of acid and alkali on DNA. Other functions of nucleotides - source of energy, component of coenzymes, second messengers. **8 Hrs**

Unit : 10 **VITAMINS :** Structure and active forms of water soluble and fat soluble vitamins, deficiency diseases and symptoms, hypervitaminosis. **6 Hrs**

PRACTICALS

1 Safety measures in laboratories.
2 Preparation of normal and molar solutions.
3 Preparation of buffers.
4 Determination of pKa of acetic acid and glycine.
5 Qualitative tests for carbohydrates.
6 Qualitative tests for lipids.
7 Qualitative tests for amino acids, proteins.
8 Qualitative tests for nucleic acids.
9 Separation of amino acids/ sugars/ bases by thin layer chromatography.
10 Estimation of vitamin C by iodometric method
11 Preparation of $ZnSO_4$ standard solution, standardization of aproximatly N/10 EDTA solution and estimation of total hardness of water using Erichrome black –T indicator.
12 Preparation of standard sodium carbonate solution. Standardization of aproximatly N/10 NaOH and estimation of HCl in the given solution.
13 Determination of density the given protein solution or liquid using specific gravity bottle and viscosity by using ostwald's viscometer.
14 Conductometric titration of Amino acid against astrong base.

Note: Minimum of ten experiments to be done.

Reference:

1. Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W.H.Freeman and Company (New York), ISBN:13: 978-1-4641-0962-1 / ISBN:10:1-4292-3414-8.

2. Textbook of Biochemistry with Clinical Correlations (2011) 7th ed., Devlin, T.M., JohnWiley & Sons, Inc. (New York), ISBN:978-0-470-28173-4.

CMB21006/CMB21007

SEMESTER II

CORE: PHYSIOLOGY

(Credits: Theory – 04, Practical – 02) **Theory: 60 Hrs**

Course Outcome:

After completion of the course the student is able to:

CO1: Understand in depth cardiovascular physiology
CO2: Specify the characteristics of renal physiology
CO3: Deliberate the detail of musculoskeletal system
CO4: Learn the detail of reproductive physiology

Unit : 1 **HOMEOSTASIS & THE ORGANIZATION OF BODY FLUID COMPARTMENTS:** Intracellular, extracellular and interstitial fluid. Homeostasis, control system and their components. Plasma as an extracellular fluid, RBC, molecular mechanism of blood coagulation, role of vitamin K in coagulation, anticoagulant and fibrinolytic systems. Anemias, polycythemia, haemophilia and thrombosis **8 Hrs**

Unit: 2 **CARDIOVASCULAR PHYSIOLOGY:** Anatomy of heart. Physiology of the cardiac muscle, Pressure, flow and resistance. Ventricular volumes and the ECG, control of cardiac function and output. The arterial system, venous system, the microcirculation and mechanics of capillary fluid exchange. Control of blood flow to the tissues. Portal circulations. Hypertension, congestive heart disease, atherosclerosis and myocardial infarction. **8 Hrs**

Unit: 3 **RESPIRATION**: Mechanism of respiration. Principles of gas exchange and transport. Regulation of respiration. Pulmonary oedema and regulation of pleural fluid. Hypoxia, hypercapnea, pulmonary distress, emphesema, ARDS. **6 Hrs**

Unit: 4 **RENAL PHYSIOLOGY:** Anatomy of the kidney and the nephron. Regulation of renal blood flow. Cell biology of the bowmans' capsule. Physiology of glomerular filtration and GFR. Tubular processing of the glomerular filtrate. Blood buffer systems, renal and pulmonary control of blood pH, renal clearance. Assessment of kidney function. Acidosis and alkalosis. Glomerular nephritis, renal failure, dialysis and diuretics. **7 Hrs**

Unit: 5 **GASTROINTESTINAL & HEPATIC PHYSIOLOGY:** Propulsion and motility of food and digested material. Digestion and absorption of macro and micronutrients. Peptic ulcer, Sprue, celiac disease, IBD, regurgitation, diarrhoea and constipation. Anatomy of the hepatic lobule and blood flow into the liver. Formation and secretion of bile. Enterohepatic cycle, reticuloendothelial system, metabolic importance of liver. Liver function tests. Jaundice, liver cirrhosis and fatty liver. **6 Hrs**

Unit :6 **MUSCULOSKELETAL SYSTEM:** Bone structure and formation. Physiology of muscle contraction in striated and non-striated muscle. **4 Hrs**

Unit: 7 **REPRODUCTIVE PHYSIOLOGY:** Sex determination and differentiation. **7 Hrs**

Development of female and male genital tracts.
Spermatogenesis, capacitation and transport of sperm, blood testis barrier. Ovarian function and its control. Uterine changes, fertilization and implantation. Placenta as a feto- maternal unit, gestation and parturition.

Unit: 8 **NEUROCHEMISTRY & NEUROPHYSIOLOGY:** Central Nervous system. Peripheral Nervous system. Blood brain barrier and CSF. Membrane potentials. Synaptic transmission. Neurotransmitters. Sensory receptors and neural pathways. **6 Hrs**
Somatic sensation, EEG, sleep, coma, learning and memory**.**

Unit: 9 **PLANT RESPIRATION:** Overview of glycolysis, Alternative reactions of glycolysis, Regulation of plant glycolysis, Translocation of metabolites across mitochondrial membrane, TCA cycle, Alternative NAD(P)H oxidative pathways; Cyanide resistant respiration. **8 Hrs**

PRACTICALS

1 Hematology.
2 a. RBC and WBC counting
3 b. Differential leucocytes count.
4 c. Clotting time.
5 Estimation of haemoglobin.
6 Separation of plasma proteins.
7 Determination of total iron binding capacity.
8 Pulmonary function tests, spirometry and measurement of blood pressure.
9 Separation of isoenzymes of LDH by electrophoresis.
10 Histology of connective tissue, liver and/ brain permanent slides.
11 Case studies (Renal clearance, GFR, ECG).
12 Estimation of serum phospholipids
13 Demonstration of ELISA
14 Identification of PMN leucocytes from human peripheral blood sample by staining

Note: Minimum of ten experiments to be done.

Reference:

1. Vander's Human Physiology (2008) 11th ed., Widmaier, E.P., Raff, H. and Strang, K.T., McGraw Hill International Publications (New York), ISBN: 978-0-07-128366-3.

2. Harper's Biochemistry (2012) 29th ed., Murray, R.K., Granner, D.K., Mayes and P.A., Rodwell, V.W., Lange Medical Books/McGraw Hill. ISBN:978-0-07-176-576-3.

3. Textbook of Medical Physiology (2011) 10th ed., Guyton, A.C. and Hall, J.E., Reed Elseviers India Pvt. Ltd. (New Delhi). ISBN: 978-1-4160-4574-8.

4. Fundamental of Anatomy and Physiology (2009), 8th ed., Martini, F.H. and Nath, J.L., Pearson Publications (San Francisco), ISBN: 10:0-321-53910-9 / ISBN: 13: 978-0321-539106.

SEMESTER III

CORE: METABOLISM

(Credits: Theory – 04, Practical – 02) **Theory: 60 Hrs**

Course Outcome:

After completion of the course the student is able to:

CO1: Specify the detail of metabolism of lipids
CO2: Understand the detail of metabolism of carbohydrates
CO3: Deliberate the characteristics of metabolism of proteins
CO4: Understand the detail of metabolism of nucleic acids

Unit : 1 **INTRODUCTION TO METABOLISM:** Anabolism and catabolism, compartmentalization of metabolic pathways. **02 Hrs**

Unit : 2 **METABOLISM OF CARBOHYDRATES:** Glycolysis - reactions, regulation and energetics. Entry of other carbohydrates (Fructose, Galactose and Mannose) into glycolytic pathway. **10 Hrs**
Fates of pyruvate – Under airobic and anaerobic conditions (conversion of pyruvate to lactate, alcohol and acetyl coA

Unit: 3 **CITRIC ACID CYCLE:** Reactions, regulation and energetics. Amphibolic and integrating roles of TCA cycle. Anaplerosis. Pentose Phosphate pathway and its significance. Cori cycle - its significance. Rapoport and luebering cycle, Gluconeogenesis pathway & their significance. **10 Hrs**

Unit: 4 **Uronic acid pathway** –Reactions and its significance. **06 Hrs**
Glyoxalate pathway – Reactions and its significance.
Glycogen metabolism – glycogenolysis and glycogen synthesis and its regulation

Unit: 5 **METABOLISM OF LIPID:** Oxidation of fatty acid α, β and ω - oxidation of saturated fatty acids, Energetics of β - oxidation. **08 Hrs**
Biosynthesis of even number saturated fatty acids, ketone bodies- formation and its significance.

Unit: 6 Bio synthesis of triglycerides, glycolipids, phospholipids and spingolipids **08 Hrs**
Cholesterol - Outline of biosynthesis and its degradation

Unit:7 **METABOLISM OF AMINO ACIDS:** General reaction of amino acid degradation – Transamination, deamination and decarboxylation (oxidative and non oxidative). Ketogenic and glucogenic amino acids. Urea cycle and its significance. Biosynthesis of amino acids (Phenyl alanine and Glutamic acid) and their degradation. **08 Hrs**

Unit: 8 **NUCLEIC ACID METABOLISM:** Degradation of Nucleic acids by DNase I & II, pancreatic RNase and phosphodiesterases. Biosynthesis and degradartion of purine and pyrimidine nucleotides, salwage pathways, regulation of purine and pyrimidine synthesis. **08 Hrs**

PRACTICALS

1 Glucose by DNS method.
2 Amino acid by Ninhydrine method.
3 Protein by Lowry's method.
4 Urea by DAMO or nitroprusside method.
5 Creatinine by Jaffe's method.
6 Phosphorous by Fiske and Subbarow's method.
7 Iron by Wong's method.
8 Ketoacids by DNPH method
9 Glycogen by anthrone method
10 Cholesterol by Zak's method
11 Isolation of lecithin, identification by TLC, and its estimation.
12 Isolation of cholesterol from egg yolk and its estimation.
13 Assay of serum transaminases – SGOT and SGPT.

Note: Minimum of ten experiments to be done.

Reference:

1. Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W.H.Freeman and Company (New York), ISBN:13:978-1-4641-0962-1 / ISBN:10:1-4641-0962-1.

2. Textbook of Biochemistry with Clinical Correlations (2011) 7th ed., Devlin, T.M., JohnWiley & Sons, Inc. (New York), ISBN: 978-0-470-28173-4 / BRV ISBN: 978-0-470-60152-5.

CMD21006 / CMD21007

SEMESTER IV

CORE: ENZYMOLOGY & BIOENERGETICS

(Credits: Theory – 04, Practical – 02) **Theory: 60 Hrs**

Course Outcome:
After completion of the course the student is able to:

CO1: Learn the characteristics of enzyme kinetics
CO2: Learn in depth enzyme inhibitions
CO3: Specify in detail with examples enzyme activity
CO4: Understand the classification and characteristics of bioenergetics

Unit : 1 **INTRODUCTION TO ENZYMES:** Nature of enzymes - protein and non-protein (ribozyme). Cofactor and prosthetic group, apoenzyme, holoenzyme. IUBMB classification of enzymes. **02 Hrs**

Unit : 2 **FEATURES OF ENZYME CATALYSIS:** Factors affecting the rate of chemical reactions, collision theory, activation energy and transition state theory, catalysis, reaction rates and thermodynamics of reaction. Catalytic power and specificity of enzymes (concept of active site), Fischer's lock and key hypothesis, Koshland's induced fit hypothesis. **06 Hrs**

Unit : 3 **ENZYME KINETICS:** Relationship between initial velocity and substrate concentration, steady state kinetics, equilibrium constant - monosubstrate reactions. Michaelis-Menten equation, Lineweaver-Burk plot, Eadie-Hofstee and Hanes plot. Km and Vmax, Kcat and turnover number. Effect of pH, temperature and metal ions on the activity of enzyme. **07 Hrs**

Unit : 4 **ENZYME INHIBITION:** Reversible inhibition (competitive, uncompetitive, non-competitive, mixed and substrate). Mechanism based inhibitors - antibiotics as inhibitors **06 Hrs**

Unit : 5 **MECHANISM OF ACTION OF ENZYMES:** General features - proximity and orientation, strain and distortion, acid base and covalent catalysis (chymotrypsin, lysozyme). **05 Hrs**

Unit : 6 **REGULATION OF ENZYME ACTIVITY:** Control of activities of single enzymes (end product inhibition) and metabolic pathways, feedback inhibition (aspartate transcarbomoylase). Occurrence and isolation, phylogenetic distribution and properties (pyruvate dehydrogenase, fatty acyl synthase) Isoenzymes - properties and physiological significance (lactate dehydrogenase). **06 Hrs**

Unit : 7 **INVOLVEMENT OF COENZYMES IN ENZYME CATALYSED REACTIONS:** TPP, FAD, NAD, Pyridoxal Phosphate, Biotin, Coenzyme A, Tetrahydrofolate, Lipoic Acid. **06 Hrs**

Unit: 8 **APPLICATIONS OF ENZYMES:** Application of enzymes in **06 Hrs**

diagnostics (SGPT, SGOT, creatine kinase, alkaline and acid phosphatases), enzyme immunoassay (HRPO), enzyme therapy (Streptokinase). Immobilized enzymes.

Unit : 9 **INTRODUCTION TO BIOENERGETICS: Laws** of thermodynamics, state functions, equilibrium constant, coupled reactions, energy charge, ATP cycle, phosphorylation potential, phosphoryl group transfers. Chemical basis of high standard energy of hydrolysis of ATP, other phosphorylated compounds and thioesters. Redox reactions, standard redox potentials and Nernst equation. Universal electron carriers. **08 Hrs**

Unit: 10 **OXIDATIVE PHOSPHORYLATION:** Mitochondria. Electron transport chain - its organization and function. Inhibitors of ETC and uncouplers. Peter Mitchell's chemiosmotic hypothesis. Proton motive force. Fo F1ATP synthase, structure and mechanism of ATP synthesis. Metabolite transporters in mitochondria. Regulation of oxidative phosphorylation. ROS production and antioxidant mechanisms. Thermogenesis. Alternative respiratory pathways in plants. **08 Hrs**

PRACTICALS

1 Partial purification of acid phosphatase from germinating mung bean.
2 Assay of enzyme activity and specific activity, e.g. acid phosphatase.
3 Effect of pH on enzyme activity
4 Determination of Km and Vmax using Lineweaver-Burk graph.
5 Enzyme inhibition - calculation of Ki for competitive inhibition.
6 Continuous assay of lactate dehydrogenase.
7 Coupled assay of glucose-6-phosphate dehydrogenase
8 Determination of specific activity of Salivary amylase by DNS (2 practicals)
9 Determination of pH optimum of Salivary amylase.
10 Determination of Km and Vmax of Salivary amylase
11 Determination of initial velocity (time Kinetics) of Salivary amylase.
12 Determination of optimum temperature and energy of activation of Salivary amylase.
13 Separation of photosynthetic pigments by TLC

Note: Minimum of ten experiments to be done.

Reference:

1. Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W.H.Freeman and Company (New York), ISBN:13: 978-1-4641-0962-1 / ISBN:10:1-4292-3414-8.

2. Biochemistry (2011) 4th ed., Donald, V. and Judith G.V., John Wiley & Sons Asia Pvt.Ltd. (New Jersey), ISBN:978-1180-25024.

3. Fundamentals of Enzymology (1999) 3rd ed., Nicholas C.P. and Lewis S., Oxford University Press Inc. (New York), ISBN:0 19 850229 X.

SEMESTER V

DSE -1: NUTRITIONAL BIOCHEMISTRY

(Credits: Theory – 04, Practical – 01) **Theory: 60 Hrs**

Course Outcome:

After completion of the course the student is able to:

CO1: Understand the characteristics of energy metabolism
CO2: Specify the characteristics of dietary carbohydrates
CO3: Identify in detail with examples dietary lipid & health
CO4: Understand the characteristics of minerals

Unit : 1 INTRODUCTION TO NUTRITION & ENERGY METABOLISM **08 Hrs**

Defining Nutrition, role of nutrients. Unit of energy, Biological oxidation of foodstuff. Measurement of energy content of food, Physiological energy value of foods, SDA.

Measurement of energy expenditure. Direct and Indirect Calorimetry, factors affecting thermogenesis, energy utilization by cells, energy output – Basal and Resting metabolism, physical activity, factors affecting energy input - hunger, appetite, energy balance Energy expenditure in man. Estimating energy requirements, BMR factors Recommended Nutrient Intakes (RNI) and Recommended Dietary Allowances for different age groups.

Unit: 2 **DIETARY CARBOHYDRATES & HEALTH**: Review functions of carbohydrates. Digestion, absorption, utilization and storage, hormonal regulation of blood glucose. Dietary requirements and source of carbohydrates, Dietary fiber, role of fibre in lipid metabolism, colon function, blood glucose level and GI tract functions. **08 Hrs**

Unit :3 **DIETARY LIPID & HEALTH:** Review of classification, sources, functions, digestion, absorption, utilization and storage. **08 Hrs**

Essential Fatty Acids; Functions of EFA, RDA, – excess and deficiency of EFA. Lipotropic factors, role of saturated fat, cholesterol, lipoprotein and triglycerides. Importance of the following: a) Omega – fatty acids. Omega 3/ omega 6 ratio b) Phospholipids c) Cholesterol in the body d) Mono, Polyunsaturated and Saturated Fatty Acids. Dietary implications of fats and oils, Combination ratios of n6 and n3, MUFA, PUFA and SFA.

Unit: 4 **DIETARY PROTEINS & HEALTH:** Review of functions of proteins in the body, Digestion and absorption. Essential and Nonessential amino acids. Amino Acid Availability Antagonism, Toxicity and Imbalance, Amino acid Supplementation. Effects of deficiency. Food source and Recommended Dietary Allowances for different age group. Amino acid pool. NPU, Biological Value, Nitrogen balance. PEM and Kwashiorkor. **08 Hrs**

Unit :5 **FAT & WATER SOLUBLE VITAMINS:** Vitamin A, C, E, K and D Dietary sources, RDA, Adsorption, Distribution, Metabolism and excretion (ADME), Deficiency. Role of Vitamin A as an antioxidant, in Visual cycle, dermatology and immunity. Role of Vitamin K in Gamma carboxylation. Role of Vitamin E as an antioxidant. Extra-skeletal role of Vitamin D and its effect on bone physiology. **08 Hrs**

Hypervitaminosis. Vitamin C role as cofactor in amino acid modifications. Niacin- Metabolic interrelation between tryptophan, Niacin and NAD/ NADP. Vitamin B6-Dietary source, RDA, conversion to Pyridoxal Phosphate. Role in metabolism, Biochemical basis for deficiency symptoms. Vitamin B12 and folate; Dietary source, RDA, absorption, metabolic role Biochemical basis for deficiency symptoms.

Unit: 6 **MINERALS:** Calcium, Phosphorus and Iron - Distribution in the body digestion, Absorption, Utilization, Transport, Excretion, Balance, Deficiency, Toxicity, Sources, RDA. Calcium: Phosphorus ratio, Role of iron in prevention of anemia. Iodine and iodine cycle. Iodine, Fluoride, Mg, Cu, Zn, Se, Manganese, Chromium, Molybdenum Distribution in the human body, Physiology, Function, deficiency, Toxicity and Sources. **12 Hrs**

Unit: 7 **ASSESSMENT OF NUTRITIONAL STATUS:** Anthropometric measurements; Z scores, BMI, skinfold, circumference ratios. Biochemical assessment; Basal metabolic panel, Comprehensive metabolic panel, CBC, Urine Analysis, Assessment of Anemia, ROS assessment, GTT and glycosylated Hb, Differential diagnosis of B12 and folate. **04 Hrs**

Unit: 8 **FOOD & DRUG INTERACTIONS & NUTRICEUTICALS:** Nutrient interactions affecting ADME of drugs, Alcohol and nutrient deficiency, Antidepressants, psychoactive drugs and nutrient interactions, Appetite changes with drug intakes and malnutrition. Food as medicine. **04 Hrs**

PRACTICALS

1 Bioassay for vitamin B12/B1.
2 Homocystiene estimation.
3 Serum/ urine MMA estimation.
4 Anthropometric identifications for Kwashiorkor, Marasmus and Obesity.
5 Determination of oxidative stress: TBARS, antioxidant enzymes in hemolysate.
6 Vitamin A/E estimation in serum.
7 Bone densitometry /bone ultrasound test demonstration (visit to a nearby clinic)
8 Proximate analysis of food samples- Moisture, fibre, protein fat and carbohydrate (by difference) (3 practical)
9 Detection of adulterants in food.
10 Estimation of Calcium in ragi.
11 Estimation of Vitamin – C in lemon or gooseberries by DPPH method
12 Estimation of Lactose in milk by Benedict's method
13 Estimation of Vitamin – E by alpha- alpha bipyiridyl method in a given sample (Cod liver oil)

Note: Minimum of eight experiments to be done.

Reference:

1. Textbook of Biochemistry with Clinical Correlations (2011) Devlin, T.M. John Wiley & Sons, Inc. (New York), ISBN: 978-0-4710-28173-4.

2. Nutrition for health, fitness and sport (2013) Williams.M.H,Anderson,D.E, Rawson,E.S. McGraw Hill international edition. ISBN-978-0-07-131816-7.

3. Krause's Food and Nutrition Care process (2012); Mahan, L.K Strings,S.E, Raymond,J. Elsevier's Publications. ISBN- 978-1-4377-2233-8.

4. The vitamins, Fundamental aspects in Nutrition and Health (2008); G.F. Coombs Jr. Elsevier's Publications. ISBN-13- 978-0-12- 183493-7.

5. Principles of Nutritional Assessment (2005) Rosalind Gibson. Oxford University Press.

CME21206 / CME21207

SEMESTER V

DSE -2: MOLECULAR BASIS OF INFECTIOUS DISEASES

(Credits: Theory – 04, Practical – 01) **Theory: 60 Hrs**

Course Outcome:
After completion of the course the student is able to:

CO1: Deliberate in depth infectious agents
CO2: Learn the detail of bacterial diseases
CO3: Understand the detail of viral diseases
CO4: Learn the characteristics of fungal diseases

Unit : 1 **CLASSIFICATION OF INFECTIOUS AGENTS:** Bacteria, Viruses, protozoa and fungi. Past and present emerging and re-emerging infectious diseases and pathogens. Source, reservoir and transmission of pathogens, Antigenic shift and antigenic drift. Host parasite relationship, types of infections associated with parasitic organisms. Overview of viral and bacterial pathogenesis. Infection and evasion **12 Hrs**

Unit: 2 **OVERVIEW OF DISEASES CAUSED BY BACTERIA:** Detailed study of tuberculosis: History, causative agent, molecular basis of host specificity, infection and pathogenicity, Diagnostics, Therapeutics, inhibitors and vaccines. Drug resistance and implications on public health. Other bacterial diseases including Typhoid, Diphtheria, Pertussis, Tetanus, Typhoid and Pneumonia. **18 Hrs**

Unit: 3 **OVERVIEW OF DISEASES CAUSED BY VIRUSES:** Detailed study of AIDS, history, causative agent, pathogenesis, Diagnostics, Drugs and inhibitors. Other viral diseases including hepatitis, influenza, rabies, chikungunya and polio. **12 Hrs**

Unit: 4 **OVERVIEW OF DISEASES CAUSED BY PARASITES:** Detailed study of Malaria, history, causative agents, Vectors, life cycle, Host parasite interactions, Diagnostics, Drugs and Inhibitors, Resistance, Vaccine development. Other diseases including leishmaniasis, amoebiasis. **08 Hrs**

Unit :5 **OVERVIEW OF DISEASES CAUSED BY OTHER ORGANISMS:** Fungal diseases, General characteristics. Medical importance of major groups, pathogenesis, treatment. **10 Hrs**

PRACTICALS

1 WIDAL test
2 Gram staining
3 Acid fast staining
4 PCR based diagnosis
5 Amino acid by Ninhydrine method.
6 Protein by Lowry's method.

7 Urea by DAMO or nitroprusside method.
8 Creatinine by Jaffe's method.
9 Phosphorous by Fiske and Subbarow's method.
10 Iron by Wong's method.
11 Ketoacids by DNPH method
12 Ammonia by nitroprusside method
13 Glycogen by anthrone method
14 Cholesterol by Zak's method

Note: Minimum of eight experiments to be done.

Reference:

1. Prescott, Harley, Klein's Microbiology (2008) 7th Ed., Willey, J.M., Sherwood, L.M., Woolverton, C.J. Mc Graw Hill International Edition (New York) ISBN: 978-007-126727.

2. Mandell, Douglas and Bennett.S, Principles and practices of Infectious diseases, 7th edition, Volume, 2. Churchill Livingstone Elsevier.

3. Sherris Medical Microbiology: An Introduction to Infectious Diseases by Kenneth J.Ryan, C. George Ray, Publisher: McGraw-Hill.

4. Medical Microbiology by Patrick R. Murray, Ken S. Rosenthal, Michael A. Pfaller, Elsevier Health Sciences

CME21406/ CME21407

SEMESTER V

SEC-1: TOOLS AND TECHNIQUES IN BIOCHEMISTRY

(Credits: Theory – 02) **Theory: 30 Hrs**

Course Outcome:

After completion of the course the student is able to:

CO1: Understand in depth chromatography
CO2: Learn in depth electrophoresis technique
CO3: Deliberate the characteristics of centrifugation
CO4: Understand in detail with examples spectrophotometry

Unit : 1	**BIOCHEMICAL REAGENTS & SOLUTIONS:** Safety practices in the laboratory. Preparation and storage of solutions. Concepts of solution concentration and storing solutions. Quantitative transfer of liquids. Concept of a buffer, Henderson-Hasselbach equation, working of a pH meter. **Exercise** Preparation of a buffer of given pH and molarity.	**07 Hrs**
Unit : 2	**Chromatography**- Definition**,** types, Principles of Adsorption and Partition chromatography. Techniques of circular, 2D chromatography, Thin Layer Chromatography**-** and its advantages Column chromatography – Principle and applications of Gel Filtration chromatography, HPLC and GLC	**06 Hrs**
Unit : 3	**Electrophoresis**: Principle and applications of electrophoresis technique- PAGE, SDS - PAGE	**03 Hrs**
Unit : 4	**Centrifugation:** Principle of differential and density gradient centrifugation. Ultra centrifuge – construction and applications	**03 Hrs**
Unit: 5	**SPECTROPHOTOMETRIC TECHNIQUES:** Principle and instrumentation of UV-visible and fluorescence spectroscopy. **Exercises** Determination of the absorption maxima and molar extinction coefficient (of a relevant organic molecule). Measurement of fluorescence spectrum. Determination of concentration of a protein solution by Lowry/BCA method.	**05 Hrs**
Unit :6	**Introduction and importance of virtual labs in biochemistry**	**06 Hrs**

Reference:

1. Physical Biochemistry: Principles and Applications (2010) 2nd ed., Sheehan, D., Wiley Blackwell (West Sussex), ISBN:978-0-470-85602-4 / ISBN:978-0-470-85603-1.

2. Physical Biochemistry: Applications to Biochemistry and Molecular Biology (1982) 2nd ed., Freifelder, D., W.H. Freeman and Company, ISBN:0-7167-1315-2/ISBN:0-7167-1444-2.

3. An Introduction to Practical Biochemistry (1998) 3rd ed., Plummer D. T., Tata McGraw Hill Education Pvt. Ltd. (New Delhi), ISBN:13: 978-0-07-099487-4 / ISBN:10: 0-07-099487-0.

CME21606/ CME21607

SEMESTER V

SEC-2: CLINICAL BIOCHEMISTRY

(Credits: Theory – 02) **Theory: 30 Hrs**

Course Outcome:
After completion of the course the student is able to:

CO1: Specify the characteristics of clinical laboratory
CO2: Identify in depth blood glucose
CO3: Deliberate the detail of lipid profile
CO4: Learn in detail with examples cardiovascular diseases

Unit : 1 **INTRODUCTION:** Organization of clinical laboratory, Introduction to instrumentation and automation in clinical biochemistry laboratories safety regulations and first aid. General comments on specimen collection, types of specimen for biochemical analysis. Precision, accuracy, quality control, precautions and limitations. **04 Hrs**

Exercises
Collection of blood and storage.
Separation and storage of serum.

Unit :2 **EVALUATION OF BIOCHEMICAL CHANGES IN DISEASES:** Basic hepatic, renal and cardiovascular physiology. Biochemical symptoms associated with disease and their evaluation. Diagnostic biochemical profile. **04 Hrs**

Unit: 3 **ASSESSMENT OF GLUCOSE METABOLISM IN BLOOD**: Clinical significance of variations in blood glucose. Diabetes mellitus. **04 Hrs**

Exercises
Estimation of blood glucose by glucose oxidase peroxidase method.

Unit :4 **LIPID PROFILE:** Composition and functions of lipoproteins. Clinical significance of elevated lipoprotein. **04 Hrs**

Exercises
Estimation of triglycerides.

Unit :5 **LIVER FUNCTION TESTS** **04 Hrs**

Exercises
Estimation of bilirubin (direct and indirect).

Unit: 6 **RENAL FUNCTION TESTS & URINE ANALYSIS:** Use of urine strip / dipstick method for urine analysis. **06 Hrs**

Exercises
Quantitative determination of serum creatinine and urea.

Unit: 7 **TESTS FOR CARDIOVASCULAR DISEASES:** Involvement of enzymes in diagnostics of heart disease including aspartate transaminase, isoenzymes of creatine kinase and lactate dehydrogenase and troponin. **04 Hrs**

Exercises
Estimation of creatine kinase MB.

Reference:

1. Medical Laboratory Technology - a Procedure Manual for Routine Diagnostic Tests Vol.I (2010), Mukherjee, K.L., Tata Mc Graw–Hill Publishing Company Limited (New Delhi). ISBN: 9780070076594 / ISBN: 9780070076631.

2. Medical Laboratory Technology - a Procedure Manual for Routine Diagnostic Tests VoI. II (2010), Mukherjee, K.L., Tata Mc Graw – Hill Publishing Company Ltd. (New Delhi), ISBN: 9780070076648.

3. Medical Biochemistry (2005) 2nd ed., Baynes, J.W. and Dominiczak, M.H., Elsevier Mosby Ltd. (Philadelphia), ISBN:0-7234-3341-0.

CMF21006/ CMF21007

SEMESTER VI

DSE-1: ADVANCED CELL BIOLOGY AND ENDOCRINOLOGY

(Credits: Theory – 04, Practical – 01) **Theory: 60 Hrs**

Course Outcome:

After completion of the course the student is able to:

CO1: Learn the detail of cell membrane
CO2: Understand in detail with examples cell-cell interactions
CO3: Identify in depth endocrine organs
CO4: Deliberate the detail of immunohistochemistry

Unit : 1 **PLASMA MEMBRANE & NUCLEAR TRANSPORT:** Properties and Composition of Cell Membrane; Structure of Nuclear Envelope; Nuclear Pore Complex; Transport Across Nuclear Envelope; Regulation of Nuclear Protein Import and Export. **08 Hrs**

Unit: 2 **CELL-CELL INTERACTION:** Cell-Cell Interactions and Cell-Matrix Interactions; Components of Extracellular Matrix:
Collagen and Non-Collagen Components; Tight Junctions; Gap Junctions; Desmosomes; Hemidesmosomes; Focal Adhesions And Plasmodesmata; Cell Wall; Role Of Cell Interaction In Development. **10 Hrs**

Unit :3 **CELL CYCLE & PROGRAMMED CELL DEATH:** Overview of The Cell Cycle; Eukaryotic Cell Cycle; Events Of Mitotic Phase; Cytokinesis; Events Of Meiosis And Fertilization; Regulation Of Cell Division And Cell Growth; Apoptosis And Necrosis, Stem Cells And Maintenance of Adult Tissues, Hematopoiesis, Embryonic Stem Cells and Therapeutic Cloning. **12 Hrs**

Unit :4 **CANCER BIOLOGY:** Development and causes Of Cancer; Genetic Basis of Cancer; Oncogenes, Tumor Viruses; Molecular Approach to Cancer Treatment. **10 Hrs**

Unit: 5 **ADVANCED METHODS IN CELL BIOLOGY:** Ultracentrifugation, Fluorescence Microscopy- FACS, Confocal Microscopy, Electron Microscopy, Plant and Animal Cell Culture, Immunohistochemistry. **10 Hrs**

Unit: 6 **ENDOCRINE SYSTEM:** Endocrine organs, hormones- classification, Hierarchy, interplay, dynamic balance and regulation of their secretions. Functions of the hormones of Hypothalamus, Pituitary, Adrenal, Thyroid, pancreas and Gonads.Concept of receptors- Membrane and cytosolic. Mechanism of hormone action - Steroid hormone and Peptide hormone (second messengers hypothesis. Eg: cAMP, DAG, IP3). **10 Hrs**

PRACTICALS

1 Isolation of organelles by sub-cellular fractionation.
2 Study of cell viability /death assay by use of trypan blue and MTT assay.
3 Study of apoptosis through analysis of DNA fragmentation patterns in mitochondria.

4 Identification and study of cancerous cells using permanent slides and photomicrographs.
5 Isolation of organelles by sub-cellular fractionation.
6 Cell counting methods: counting using Haemocytometer.
7 Calibration of ocular micrometer and Measurement of average cell size using Stage micrometer
8 Separation of cell organelles by differential centrifugation and assay of marker enzymes. (2 Practicals)
9 Study of different types of cells.
10 Isolation of chloroplast by differential centrifugation & its identification.
11 Buccal smear- barr bodies
12 Identification of normal & abnormal karyotype

Note: Minimum of eight experiments to be done.

Reference:

1. Cooper, G.M. and Hausman, R.E. 2009 The Cell: A Molecular Approach. 5th edition ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.

2. Karp, G. 2010 Cell and Molecular Biology: Concepts and Experiments. 6 edition. JohnWiley & Sons. Inc.

3. Alberts, B., Johnson,A., Lewis, J., and Enlarge, M. 2008 Molecular Biology of the Cell.5th ed., Garland Science (Princeton).

4. Lodish, H., Berk, A., Zipursky, S.L., Matsudaira, P., Baltimore, D. and Darnell. J. 2012. Molecular Cell Biology. 7th ed., W.H. Freeman & Company (New York).

SEMESTER VI

DSE-2: PLANT BIOCHEMISTRY

(Credits: Theory – 04, Practical – 01) **Theory: 60 Hrs**

Course Outcome:

After completion of the course the student is able to:

CO1: Specify the characteristics of plant cell structure
CO2: Deliberate in detail with examples photosynthesis
CO3: Understand the detail of nitrogen metabolism
CO4: Learn in detail with examples secondary metabolites

Unit : 1	**INTRODUCTION TO PLANT CELL STRUCTURE:** Plasma membrane, Vacuole and tonoplast membrane, cell wall, plastids and peroxisomes.	**05 Hrs**
Unit :2	**PHOTOSYNTHESIS & CARBON ASSIMILATION:** Structure of PSI and PSII complexes, Light reaction, Cyclic and non cyclic photophosphorylation, Calvin cycle and regulation; C_4 cycle and Crassulacean acid metabolism (CAM), Photorespiration.	**14 Hrs**
Unit :3	**NITROGEN METABOLISM:** Biological Nitrogen fixation by free living and in symbiotic association, structure and function of enzyme Nitrogenase. Nitrate assimilation: Nitrate and Nitrite reductase. Primary and secondary ammonia assimilation in plants; ammonia assimilation by Glutamine synthetase-glutamine oxoglutarate amino transferase (GS-GOGAT) pathway. Seed storage proteins in legumes and cereals.	**14 Hrs**
Unit :4	**REGULATION OF PLANT GROWTH:** Introduction to plant hormones and their effect on plant growth and development, Regulation of plant morphogenetic processes by light.	**07 Hrs**
Unit :5	**SECONDARY METABOLITES:** Representatives alkaloid group and their amino acid precursors, function of alkaloids, Examples of major phenolic groups; simple phenylpropanoids, Coumarins, Benzoic acid derivatives, flavonoids, tannins and lignin, biological role of plant phenolics, Classification of terpenoids and representative examples from each class, biological functions of terpenoids.	**12 Hrs**
Unit :6	**PLANT TISSUE CULTURE:** Cell and tissue culture techniques, types of cultures: organ and explants culture, callus culture, cell suspension culture and protoplast culture. Plant regeneration pathways: organogenesis and somatic embryogenesis. Applications of cell and tissue culture and somoclonal variation.	**08 Hrs**

PRACTICALS

1 Induction of hydrolytic enzymes proteinases /amylases/lipase during germination
2 Extraction and assay of Urease from Jack bean
3 Estimation of carotene/ascorbic acid/phenols/tannins in fruits and vegetables
4 Separation of photosynthetic pigments by TLC
5 Culture of plant plants (explants).

Note: Minimum of eight experiments to be done.

Reference:

1. Plant Biochemistry (2008), Caroline Bowsher, Martin steer, Alyson Tobin, Garland science ISBN 978-0-8153-4121-5.

2. Biochemistry and molecular Biology of plant-Buchanan. (2005) 1 edition. Publisher: IK International. ISBN-10: 8188237116, ISBN-13: 978-8188237111.

3. Plant Biochemistry by P.M Dey and J.B. Harborne (Editors) (1997) Publisher: Academic Press ISBN-10:0122146743, ISBN-13:978-01221467.

Pattern of Question Paper
Semester I to VI
Paper I to V and VII (DSC and DSE)

Time : 3 Hrs **Max Marks: 70**

1. Answer all the questions 5 X 1 = 5

a. ----------
b. ----------
c. ----------
d. ----------
e. ----------

2. Answer any five of the following questions 5 X 3 = 15

a. ----------
b. ----------
c. ----------
d. ----------
e. ----------
f. ----------
g. ----------

3. Answer any four of the following questions 4 X 5 = 20

a. ----------
b. ----------
c. ----------
d. ----------
e. ----------
f. ----------

4. Answer any three questions of the following 3 X 10 = 30

a. ----------
b. ----------
c. ----------
d. ----------
e. ----------

(Note- 10 Marks may be divided in to 6+4 or 5+5)

Pattern of Question Paper
Semester V
Paper VI (SEC)

Time : 2 Hrs Max Marks: 50

1. Answer all the questions 5 X 1 = 5

a. ----------
b. ----------
c. ----------
d. ----------
e. ----------

2. Answer any five of the following questions 5 X 3 = 15

a. ----------
b. ----------
c. ----------
d. ----------
e. ----------
f. ----------
g. ----------

3. Answer any four of the following questions 4 X 5 = 20

a. ----------
b. ----------
c. ----------
d. ----------
e. ----------
f. ----------

4. Answer any one question of the following 1 X 10 = 10

a. ----------
b. ----------

(Note- 10 Marks may be divided in to 6+4 or 5+5)

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE
(AUTONOMOUS)
OOTY ROAD, MYSORE – 25

DEPARTMENT OF BIOTECHNOLOGY

SCHEMATIC SYLLABUS UNDER CHOICE BASED CREDIT SYSTEM (CBCS)

For B.Sc.Programmes

Chemistry, Zoology, Biotechnology

Biochemistry, Microbiology, Biotechnology

2017-18

B.Sc., UG SYLLABUS- PROGRAMME - CZBt

Scheme of study for B.Sc. Biotechnology under CBCS scheme from 2017-18

YEAR	SEMESTER	COURSE CODE	TITLE OF THE PAPERS	NO. OF CREDITS		LECTURE/ PRACTICAL/ HOUR/WEEK		TOTAL TEACHING HOURS	
				TH	P	TH	P	TH	P
I	I	CMA22005	CELL BIOLOGY & GENETICS	4	2	4	4	60	60
	II	CMB22005	BIOMOLECULES & BIO-ANALYTICAL TECHNIQUES	4	2	4	4	60	60
II	III	CMC22005	MOLECULAR BIOLOGY & GENETIC ENGINEERING	4	2	4	4	60	60
	IV	CMD22005	PLANT TISSUE & ANIMAL CELL CULTURE	4	2	4	4	60	60
III	V	CME22005	IMMUNOLOGY & MEDICAL BIOTECHNOLO	4	1	4	4	60	30
		CME22205	MICROBIALTECHNOLOGY & AGRICULTURAL BIOTECHNOLOGY	4	1	4	4	60	30
	VI	CMF22005	ENVIRONMENTAL BIOTECHNOLOGY & BIOSTATISTICS	4	1	4	4	60	30
		CMF22205	BIOINFORMATICS AND BIOPROCESS TECHNOLOGY	4	1	4	4	60	30
III	VI SEC	CMF22405	MICROBIAL TECHNIQUES	2	-	2	-	30	-
		CMF22605	ENZYMOLOGY	2	-	2	-	30	-

B.Sc., UG SYLLABUS- PROGRAMME - BMBt

Scheme of study for B.Sc. Biotechnology under CBCS scheme from 2017-18

YEAR	SEMESTER	COURSE CODE	TITLE OF THE PAPERS	NO. OF CREDITS		LECTURE/ PRACTICAL/ HOUR/WEEK		TOTAL TEACHING HOURS	
				TH	P	TH	P	TH	P
I	I	CMA22006	CELL BIOLOGY & GENETICS	4	2	4	4	60	60
	II	CMB22006	BIOMOLECULES & BIO-ANALYTICAL TECHNIQUES	4	2	4	4	60	60
II	III	CMC22006	MOLECULAR BIOLOGY & GENETIC ENGINEERING	4	2	4	4	60	60
	IV	CMD22006	PLANT TISSUE & ANIMAL CELL CULTURE	4	2	4	4	60	60
III	V	CME22006	IMMUNOLOGY & MEDICAL BIOTECHNOLO	4	1	4	4	60	30
		CME22206	MICROBIALTECHNOLOGY & AGRICULTURAL BIOTECHNOLOGY	4	1	4	4	60	30
	VI	CMF22006	ENVIRONMENTAL BIOTECHNOLOGY & BIOSTATISTICS	4	1	4	4	60	30
		CMF22206	BIOINFORMATICS AND BIOPROCESS TECHNOLOGY	4	1	4	4	60	30
III	VI SEC	CMF22406	MICROBIAL TECHNIQUES	2	-	2	-	30	-
		CMF22606	ENZYMOLOGY	2	-	2	-	30	-

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE, OOTY ROAD, MYSORE

DEPARTMENT OF BIOTECHNOLOGY

Scheme of Examination Programme – B.Sc., CZBt ; Programme code–BSC05

Year	Sem	Course code	Title of the Paper	Credits	Maximum Marks						Exam Duration	
				L:T:P	Th	Pr	IA-1		IA-2		Th	Pr
							Th	Pr	Th	Pr		
I BSc	I	CMA22005	CELL BIOLOGY & GENETICS	4:0:2	70	70	10	05	10	05	3H	3H
	II	CMB22005	BIOMOLECULES & BIO-ANALYTICAL TECHNIQUES	4:0:2	70	70	10	05	10	05	3H	3H
II BSc	III	CMC22005	MOLECULAR BIOLOGY &GENETIC ENGINEERING	4:0:2	70	70	10	05	10	05	3H	3H
	IV	CMD22005	PLANT TISSUE & ANIMAL CELL CULTURE	4:0:2	70	70	10	05	10	05	3H	3H
III BSc	V	CME22005	DSE 1-IMMUNOLOGY & MEDICAL BIOTECHNOLOGY	4:0:1	70	70	10	05	10	05	3H	3H
		CME22205	DSE 2-MICROBIALTECHNOLOGY & AGRICULTURAL BIOTECHNOLOGY									
	VI	CMF22005	DSE 1-ENVIRONMENTAL BIOTECHNOLOGY &BIOSTATISTICS	4:0:1	70	70	10	05	10	05	3H	3H
		CMF22205	DSE 2-BIOINFORMATICS AND BIOPROCESS TECHNOLOGY									
		SEC CMF22405	No. Of course 1 SEC 1 -MICROBIAL TECHNIQUES	2:0:0	50	-	10	05	10	05	2H	-
		CMF22605	SEC 2 -ENZYMOLOGY									

Scheme of Examination Programme – B.Sc., BMBt ; Programme code –BSC06

Year	Sem	Course code	Title of the Paper	Credits	Maximum Marks						Exam Duration	
				L:T:P	Th	Pr	IA-1		IA-2		Th	Pr
							Th	Pr	Th	Pr		
I BSc	I	CMA22006	CELL BIOLOGY & GENETICS	4:0:2	70	70	10	05	10	05	3H	3H
	II	CMB22006	BIOMOLECULES & BIO-ANALYTICAL TECHNIQUES	4:0:2	70	70	10	05	10	05	3H	3H
II BSc	III	CMC22006	MOLECULAR BIOLOGY &GENETIC ENGINEERING	4:0:2	70	70	10	05	10	05	3H	3H
	IV	CMD22006	PLANT TISSUE & ANIMAL CELL CULTURE	4:0:2	70	70	10	05	10	05	3H	3H
III BSc	V	CME22006	DSE 1-IMMUNOLOGY & MEDICAL BIOTECHNOLOGY	4:0:1	70	70	10	05	10	05	3H	3H
		CME22206	DSE 2-MICROBIALTECHNOLOGY & AGRICULTURAL BIOTECHNOLOGY									
	VI	CMF22006	DSE 1-ENVIRONMENTAL BIOTECHNOLOGY &BIOSTATISTICS	4:0:1	70	70	10	05	10	05	3H	3H
		CMF22206	DSE 2-BIOINFORMATICS AND BIOPROCESS TECHNOLOGY									
		SEC CMF22406	No. Of course 1 SEC 1 -MICROBIAL TECHNIQUES Or	2:0:0	50	-	10	05	10	05	2H	-
		CMF22606	SEC 2 -ENZYMOLOGY									

Programme Outcome for Bachelor of Science in Chemistry, Zoology, Biotechnology:

After completing the graduation in the Bachelor of Science the students are able to:

PO1. Demonstrate the ability to justify, explain, and approach the concept both in written and oral forms

PO2. Demonstrate the ability to present clear, logical and succinct arguments

PO3. Develop state-of-the-art laboratory skills and professional communication skills.

PO4. Apply the scientific method to design, execute, and analyze an experiment.

PO5. Appreciate the central role of chemistry in the society and use this as a basis for ethical behaviour in issues facing chemists/drugs.

PO6. Understand Chemistry as an integral part for addressing social, economic, and environmental problems.

PO7. Identify the major groups of organisms with an emphasis on animals and plants.

PO8. Compare and contrast the characteristics of animals that differentiate themselves from other living and non-living creatures.

PO9. Give specific examples of physiological adaptations.

PO10. Design and develop solution to Biotechnology problems keeping in mind the safety measures for environment and society.

PO11. Support Biotechnology research activity with strong technical background knowledge.

Programme Specific Outcome

Bachelor of Science in Chemistry, Zoology and Biotechnology

After completing the graduation in the Bachelor of Science the students are able to:

PSO1. Find jobs at all level of chemical, pharmaceutical, food products and life oriented material industries

PSO2. Apply appropriate techniques for the qualitative and quantitative analysis of chemicals inlaboratories and in industries.

PSO3. Recognize the relationship between different structures and functions at different levels.

PSO4. Characterize the biological, chemical and physical features of environments that Animals inhabit.

PSO5. Demonstrate effectively the applications of biochemical and biological sciences.

PSO6. Know and apply appropriate tools and techniques in biotechnological manipulation

PSO7. Understand his or her responsibilities in biotechnological practices.

Programme Outcome for Bachelor of Science in Biochemistry, Microbiology, Biotechnology:

After completing the graduation in the Bachelor of Science the students are able to:

PO1. Demonstrate the ability to justify and explain their thinking and/or approach

PO2. Develop state-of-the-art laboratory and professional communication skills

PO3. Apply the scientific method to design, execute, and analyze an experiment

PO4. Explain scientific procedures and their experimental observations

PO5.Demonstrate an understanding of fundamental biochemical principles, structure and function

PO6. Work as a laboratory technician, biochemists or medical scientist

PO7. Explain the processes used by microorganisms for the growth

PO8. Explain the theoretical basis of tools, technologies and methods of microbiology

PO9. Design and develop solution to Biotechnology problems

PO10.Applying appropriate tools keeping in mind safety factor for environment & society

PO11. Create, select, and apply appropriate techniques, resources, and modern tools

PO12. Support biotechnology research activity with strong technical background

Programme Specific Outcome
Bachelor of Science inBiochemistry, Microbiology, Biotechnology

After completing the graduation in the Bachelor of Science the students are able to;

PSO 1: Gain and understand biochemical and molecular processes

PSO2: Communicate scientific information effectively, relating to microbes and their role in ecosystem and health

PSO3: Acquire, articulate, retain and demonstrate laboratory safety skills

PSO4: Demonstrate applications of biochemical and biological sciences

PSO5: Apply appropriate tools and techniques in biotechnological manipulation

PSO6: Understand the responsibilities of biotechnological practices

CMA22005/ CMA22006

SEMESTER I
CELL BIOLOGY AND GENETICS (4 CREDITS)

Course Outcome:

After completing the course students are able to:

CO1. Understand in depth cell organelles.

CO2. Understand the details of chromosomes and stem cells.

CO3. Learn the details of Mendelian Genetics and deviation to mendalism.

CO4. Specify in details with examples mutations and chromosomal aberrations.

CELL BIOLOGY

NO. HOURS

UNIT I **15**

Cell: Introduction and Historical perspective, the cell theory, ultra structure of plant and animal cell.

Cell organelles: Structure and functions of – cell wall, plasma membrane, membrane protein, cytoplasm, mitochondria, chloroplast, Golgi complex , endoplasmic reticulum, ribosome, lysosomes, peroxisomes, nucleus. Extracellular Matrix: Composition, molecules that mediate cell adhesion, membrane receptors for extra cellular matrix, macromolecules, regulation of receptor expression and function. Signal transduction.

UNIT II **15**

Eukaryotic chromosomes: Types, chromatin structure, nucleosomes, and higher order chromatin organization.

Special chromosomes – Polytene and B chromosome, lamp brush chromosome.

Cell interaction and motility: Cell motility flagellar and ciliary motion .Structure and function of muscle cells, muscle contraction, nerve cell structure and function.

Stem cells, differentiation of stem cells (eg: Haematopoitic stem cells) and their application, blood cells, identification, structure and different types of blood cells, cancer cells.

GENETICS

UNIT III **15**

Introduction: Historical developments in the field of genetics. Organisms suitable for genetic experimentation and their genetic significance. Mendelian genetics: Mendel's experimental on monohybrid and di-hybrid crosses, Law of segregation & Principle of independent assortment. Verification of segregates by test and back crosses. Deviation to Mendelian inheritance of genes (13:3 ratio), incomplete dominance (Flower colour in sweet peas) , co dominance (Blood groups in human beings), epistasis(Dominant &recessive epistasis). Sex-linked inheritance (colour blindness), chromosomal theory of inheritance, linkage, crossing over and cytoplasmic inheritance (Plastid inheritance in Mirabilis)

UNIT IV

15 Mutation: Natural and induced mutations, chemical, physical and biological mutagens with an example each.

Structure and characteristics of bacterial and eukaryotic chromosome, chromosome morphology, concept of euchromatin and heterochromatin.

Chromosomal aberrations: Deletion, duplication, inversion and translocation. Chromosomal aberrations in human beings, abnormalities– Aneuploidy and Euploidy.

PRACTICALS (2 CREDITS)

HOURS : 4 HOURS /WEEK

1. Cell counting methods: using Haemocytometer.
2. Measurements with the help of light microscope.
    a. Calibration of ocular micrometer
    b. Measurement of biological materials (cells/spores etc.).
    c. Demonstration-Separation of cell organelles by differential centrifugation
3. Study of Mitosis -onion root tips.
4. Study of Meiosis –onion flowers buds/rheo flowers
5. Demonstration of plasmolysis and deplasmolysis
6. Isolation of chloroplast from leaves
7. Study of at least five simple mutants of Drosophila-Photographic demonstration
8. Preparation of polytene chromosome from salivary glands of Drosophila
9. Genetic Problems; Monohybrid, Di hybrid and interactions of Genes
10. Special Chromosomes; Lampbrush and Polytene chromosomes
11. Comment (Types of chromosome (slide/picture), chromosomal disorders in humans-Humans -Down's Turner's and Klinefelter's Syndrome

REFERENCES

1. Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wiley & Sons. Inc.

2. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition.Lippincott Williams and Wilkins, Philadelphia.

3. Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th edition. ASMPress& Sunderland, Washington, D.C.; Sinauer Associates, MA.

4.Gardner, E.J., Simmons, M.J., Snustad, D.P. (2006). Principles of Genetics. VIII Edition John Wiley & Sons.

5.Snustad, D.P., Simmons, M.J. (2009). Principles of Genetics. V Edition. John Wiley and Sons
Inc.

6.Klug, W.S., Cummings, M.R., Spencer, C.A. (2009). Concepts of Genetics. IX Edition. Benjamin Cummings.

CMB22005/ CMB22006

SEMESTER II
BIOMOLECULES & BIO-ANALYTICAL TECHNIQUES
(4 CREDITS)

Course Outcome:
After completing the course students are able to:
CO1. Understand the properties, structure and biological importance of bio molecules.
CO2. Learn the details of lipids and nuclei acids.
CO3. Identify the classification and characteristics of enzymes.
CO4. Understand in depth bio analytical techniques.

BIOMOLECULES

NO. HOURS

UNIT I: 15
Carbohydrates: Structure (Fischer and Haworth structure), function and properties of Monosaccharide's (Glucose, Fructose), disaccharides (Sucrose, Maltose and Lactose) and Heteropolysaccharide's- hyaluronic acid and heparin. Reducing and Non reducing Sugars, Stereochemistry- Epimers, Enantiomers, Anomers and Isomers.
Proteins: Amino acids- Zwitter ionic structure, classification based on polarity, pka value. D and L amino acids, optical activity. Peptide bond, primary, secondary, tertiary and quaternary structural organization of proteins. Globular and fibrous proteins with special reference to structure of haemoglobin and collagen.

UNIT II: 15
Lipids: Classification of lipids with examples. Simple and compound lipids, unsaturated and saturated fatty acids, physical and chemical properties of fats and oils. Structure and biological importance of phospholipids and cholesterol.
Nucleic acids: Structure of bases, nucleosides, nucleotides and secondary structure of DNA and different forms of DNA. Types and functions of RNA, cloverleaf structure of tRNA.

UNIT III: 15
General characteristics of enzymes, nomenclature and classification of enzymes. Mechanism of enzyme action: active site, enzyme substrate complex formation-lock and key and induced fit theory. Concept of co-enzymes and cofactors with an example. Factors influencing enzyme activity: pH, temperature, substrate concentration, metal ion, inhibitors (allosteric) and activators, energy of activation. Isozymes, multienzyme complex and multifunctional enzymes with an example to each

BIO-ANALYTICAL TECHNIQUES
UNIT IV: 15 Bio-analytical
Techniques: Lambert-Beer Law, working principles of UV-Visible spectrophotometry and colorimetry.
Centrifugation: Basic principle of centrifugation, ultracentrifuge and its application.
Chromatography: Principles of chromatography, Types- Partition chromatography- paper and thin layer chromatography & Adsorption chromatography - column chromatography, ion exchange& molecular sieve (principle &application).
Isotopes: Their importance in biological studies, measure of radioactivity & GM counter.

PRACTICALS **(2 CREDITS)**

HOURS : 4 HOURS /WEEK

1. Qualitative analysis of Carbohydrates.
2. Qualitative analysis of Lipids.
3. Estimation of reducing sugar by DNS method.
4. Estimation of Protein by Biuret method.
5. Estimation of amino acid by ninhydrin method /formal titration
6. Determination of activity and specific activity of enzyme-Salivary amylase.
7. Effect of pH on enzyme activity
8.. Effect of temperature on enzyme activity.
9. Effect of metal ions on enzyme activity.
10. Preparation of buffer solution.
11. Identification of amino acids by circular paper chromatography.

REFERENCES

1.Nelson, D.L., Cox, M.M. 2004 Lehninger Principles of Biochemistry, 4 th edition, W.H. Freeman and Company, New York, USA.

2. Biochemistry, LubertStryer, 6th Edition, WH Freeman, 2006.

3. Harper's illustrated Biochemistry by Robert K. Murray, David A Bender, Kathleen M.Botham, Peter J. Kennelly, Victor W. Rodwell, P. Anthony Weil. 28th Edition, McGrawHill, 2009.

4. Biochemistry, Donald Voet and Judith Voet, 2nd Edition, Publisher: John Wiley andSons, 1995.

5. Biochemistry by Mary K.Campbell& Shawn O.Farrell, 5th Edition, Cenage Learning,2005.

6. Fundamentals of Enzymology Nicholas Price and Lewis Stevens Oxford University Press 1999

7. Fundamentals of Enzyme Kinetics Athel Cornish-Bowden Portland Press 2004

8. Practical Enzymology Hans Bisswanger Wiley–VCH 2004

CMC22005/ CMC22006

SEMESTER III
MOLECULAR BIOLOGY & GENETIC ENGINEERING
(4 CREDITS)

Course Outcome:
After completing the course students are able to:
CO1.Learn the details of concept of gene and replication. CO2. Understand in depth transcription and translation.CO3. Specify in depth enzymes in genetic engineering and cloning vectors. CO4.Understand in depth recombinant DNA technology and genetic engineering techniques.

MOLECULAR BIOLOGY
NO. HOURS

UNIT I **15**

Central Dogma of Molecular biology and modification.
Concept of gene: Definition, types, generalized structure of Prokaryotes and Eukaryotes.
DNA Replication: DNA as genetic material, Replication of DNA in prokaryotes and eukaryotes: Semiconservative, conservative and dispersive method. Components of replication –lagging strand leading strand Okazaki fragment, role of SSBP, gyrase, helicase, RNA polymerase, DNA polymerase. Inhibitors of replication- role of actinomycin, novobioci, amphidicolin and N-ethylmaleimide.
Genetic code: outline of Deciphering of genetic code, major features of genetic code, Wobble hypothesis.

UNIT II **15**

Transcription and RNA processing : RNA structure and types of RNA, Transcription in prokaryotes: Prokaryotic RNA polymerase, role of sigma factor, promoter, Initiation, elongation and termination of RNA chains. Inhibitors of Transcription- rifampicin, actinomycin, alpha amantinin and platinum antitumor drugs. Transcription in eukaryotes: Eukaryotic RNA polymerases, transcription factors, promoters, enhancers, mechanism of transcription initiation, promoter clearance and elongation RNA splicing and processing: processing of pre-mRNA: 5' cap formation, polyadenylation, splicing, rRNA and tRNA splicing.
Translation: Activation of amino acids, ribosome (composition & components), formation of initiation complex. Initiation, elongation and termination, inhibitors of protein synthesis.

GENETIC ENGINEERING

UNIT III **15** Enzymes in Genetic engineering and its importance-Restriction endonucleases-types of restriction enzymes, ligases, alkaline phosphatases, polynucleotide kinase, terminal deoxynucleotidyltransferase, S1 nuclease, Klenow fragment, taq DNA polymerases, ribonuclease, reverse transcriptase
Gene cloning vectors: Types of vectors –Cloning vector and expression vector . Plasmids (pBR322, pUC 19) and cosmids (pLFR5, pJB8). Importance of plasmids as cloning vectors, stability of plasmids, different forms of plasmid, concepts of YAC and BAC.

UNIT IV **15**

Recombinant DNA technology: Isolation of gene, construction and preparation of complementary DNA. Probes- types, preparation and hybridization, genomic library. Genetic engineering techniques: Gel electrophoresis, southern and northern blotting techniques, PCR and its types, Sanger's, Maxam& Gilbert method of DNA sequencing. Applications of Genetic Engineering: Therapeutic products produced by genetic engineering-blood proteins, human hormones.Genetic engineering in plants: Use of Agrobacterium tumefaciens and A. rhizogenes, Ti plasmids, Direct DNA transfer to plants.

PRACTICALS **(2 CREDITS)**

HOURS : 4 HOURS /WEEK

1.Preparation of stock solution for molecular biology experiments.
2. Colorimetric estimation of DNA.
3. Colorimetric estimation of RNA.
4. Demonstration of Tm value of DNA.
5. Extraction of DNA from plant and microbial source.
6. Quantification of DNA by spectrophotomery.
7. Determination of purity of DNA.
8. Agarose gel electrophoresis of DNA.
9. Southern blotting (demonstration).
10. Isolation of plasmid DNA.

REFERENCES

1. Russell, P.J. 2009 Genetics – A Molecular Approach. 3rdedition. Benjamin Co. 7. Sambrook&Russel. Molecular Cloning: A laboratory manual. (3rd edition) 8. Slater, A., Scott, N.W. & Fowler, M.R. 2008 Plant Biotechnology: The Genetic Manipulation of Plants, Oxford University Press.

2. Brown, T.A. (1998). Molecular biology Labfax II: Gene analysis. II Edition. Academic Press, California,USA.

3. Griffiths, A.J.F., J.H. Miller, Suzuki, D.T., Lewontin, R.C. and Gelbart, W.M. (2009). An introduction to genetic analysis. IX Edition. Freeman & Co., N.Y., USA.

4. Watson, J.D., Myers, R.M., Caudy, A. and Witkowski, J.K. (2007). Recombinant DNAgenes and genomes- A short course. III Edition. Freeman and Co., N.Y., USA.

5. Brown, T. A. Gene cloning and DNA analysis: An Introduction. Blackwell Publication.

CMD22005/ CODECMD22006

SEMESTER IV

PLANT TISSUE & ANIMAL CELL CULTURE(4 CREDITS)

Course Outcome:
After completing the course students are able to:
CO1. Understand the details of introduction and principles of plant tissue culture.CO2. Learn in depth micropropagation, somoclonal variation and protoplast culture. CO3. Understand the details of laboratory facilities and culture medial of animal cell culture.CO4: Learn the details of primary culture, established cell lines and hybridoma technology.

PLANT CELL CULTURE
NO. HOURS

UNIT I **15**
Plant tissue culture introduction: History and development, Importance of plant tissue culture. Laboratory organization and culture techniques: general requirements and aseptic conditions. Media preparation, culture media, sterilization, and pre-treatment to explants. Principles of tissue culture: Callus culture- Definition of callus, initiation, maintenance, sub culture and organogenesis .Factors affecting organogenesis .organ culture- culture protocols and importance of root and meristem culture.

UNIT- II **15**Micropropagation in plants: stages of micropropagation, methods, advantages, applications. Somaclonal variation for disease resistance and agronomic traits. Somatic embryogenesis: Embryoid and embryogenesis. Protocol and importance of somatic embryogenesis, Synthetic seeds and its applications, germplasm conservation and preservation.
Suspension culture: Batch and continuous cell suspension culture. Importance of suspension culture in production of secondary metabolites. Protoplast culture and fusion: Definition of protoplast, isolation principle, culture protocol, action of enzymes, regeneration of plants, protoplast fusion, somatic cell hybridization and its application.

ANIMAL TISSUE CULTURE

UNIT - III **15**
Introduction: History, developments and importance of animal cell culture. Characteristics of animal cell growth, Advantages and disadvantages of tissue culture methods and laboratory facilities (Essential Equipment, Washing facilities, beneficial equipment's, Consumable items). Animal tissue culture media: Culture media containing naturally occurring ingredients, blood plasma, blood serum, serum-free media, tissue extracts, complex natural media, chemically defined media, and basal salt solution –HBSS.

UNIT – IV **15**
Primary culture, cell lines and cloning: Preparation of primary culture –mechanical and enzymatic method. Primary and established cell lines, somatic cell fusion. Tissue cultures-cover slip method, watch glass method and use of agar.

Whole embryo culture. (e.g. Chick embryo).
Hybridoma technology: Production of monoclonal antibodies.
Gene transfer methods in Animals – Microinjection, Embryonic Stem cell, gene transfer, Retrovirus & Gene transfer. Animal propagation –Artificial insemination, superovulation, embryo transfer, in-vitro fertilization, embryo splitting. Genetic modification in Medicine - vectors in gene therapy

PRACTICALS **(2 CREDITS)**

HOURS : 4 HOURS /WEEK

1. Media preparation and sterilization techniques.
2. Callus cultures: choice of explants, preparation of explants, callus induction, subculture and maintenance.
3. Regeneration of plants from growth hormones.
4. Meristem culture for pathogen free plants.
5. Preparation synthetic seed
6. Suspension culture – initiation of suspension culture from callus.
7. Plant protoplast Isolation.
8 .Cell viability test by tryphan blue method.
9. Preparation of HSS and glasswares of cell culture experiments
10.Isolation of PMN leucocytes from human peripheral blood sample and staining and identification.(lishman stain).
11. Demonstration of dissegration of cells by mechanical and enzymatic methods.
12. Photographic Demonstration of Animal Cell culture Lab equipments

REFERENCES

1. Hopkins, W.G. and Huner, P.A. 2008 Introduction to Plant Physiology. John Wiley and Sons.

2. Mauseth, J.D. 1988 Plant Anatomy. The Benjammin/Cummings Publisher, USA.

3. Bhojwani, S.S. and Razdan 2004 Plant Tissue Culture and Practice.

4. Butler, M. (2004). Animal cell culture and technology: The basics. II Edition. Bios scientific publishers. 3. Glick, B.R. and Pasternak, J.J. (2009). Molecular biotechnology-Principles and applications of recombinant DNA. IV Edition. ASM press, Washington, USA.

5. Reinert, J. and Bajaj, Y.P.S. 1997 Applied and Fundamental Aspects of Plant Cell, Tissue and Organ Culture. Narosa Publishing House.

CME22005/CME22006

SEMESTER V
DSE: IMMUNOLOGY AND MEDICAL BIOTECHNOLOGY
(4 CREDITS)

Course Outcome:

After completing the course students are able to:

CO1. Identify the characteristics of cells and organs of immune system.

CO2. Specify in detail with examples immune disorders and techniques

CO3. Understand the details of vaccines, diagnostics and therapeutic enzymes.

CO4. Learn the details of therapeutic hormones, proteins and gene therapy.

IMMUNOLOGY

NO. HOURS

UNIT I **15**

Historical account and chronological events of EdwardJenner and Louis Pasture.

Antigens: Definition, hatpins, epitops, antigenicity, blood group antigens. Antibodies: Definition, types, structure of IgG. Types of immunity – Innate- mechanism of innate immunity. Adaptive immunity – active and passive and adoptive immunity.

Cells and organs involved in immune system – T- cells, B-cells, antigen presentation and macrophages, their role in antigen recognition, clonal selection, and immunological memory.

Immunological aspects of viral (HIV), bacterial and parasitic infection (one example each)

UNIT II **15**

Immune disorders: Hypersensitivity, auto immune disorders- organ specific and systemic specific Grave's diseases, Hashimoto's disease , systemic lupus erythematosus. Immuno techniques: Precipitation reaction, immuno diffusion-ODD and RID, RIA, Heamagglutination, ELISA, immunofluroscent, Western blotting. Major Histocompatibility complexes – class I & class II MHC antigens, antigen processing.Vaccines& Vaccination – adjuvants, cytokines, DNA vaccines, recombinant vaccines, bacterial vaccines, viral vaccines, vaccines to other infectious agents, passive & active immunization.

MEDICAL BIOTECHNOLOGY

UNIT III **15** Vaccine production: Introduction, new developments, types of vaccines – Inactivate Attenuated and Recombinant Vaccines-Peptide and DNA, production of vaccines using genetically engineered microorganisms (HBV).

Enzymes in diagnosis: Enzymes used for diagnosis, immobilized enzymes as diagnostic tools, proteins in diagnosis.

Nucleic acid analysis: Features of DNA probes and its applications in diagnosis, identification of *Mycobacterium tuberculosis* in clinical samples using PCR.

Enzymes in therapy: List of enzymes and their therapeutic applications.

UNIT IV **15**

Hormone therapy: List of hormones and their therapeutic applications, production of humulin by recombinant DNA technology.

Therapeutic proteins: Cytokines as therapeutic proteins, production of interferon by recombinant DNA technology.
Human gene therapy: Definition, differences between somatic and germ line gene therapy, one example each, principle and applications.
Transgenic plants for production of biopharmaceutical (tobacco, tomatoes, and potatoes)

PRACTICALS **(2 CREDITS)**

HOURS : 4 HOURS /WEEK

1 Determination of blood group
a) ABO blood grouping
b) Rh blood grouping.
2 Immuno diffusion :
a) ODD
b) RID.
3 Separation of serum from blood
4 Demonstration of ELISA
5Demonstration of Western blotting
6 MIC assay
7 Isolation of antibiotic resistant strains using gradient plate method
8 Estimation of urea by BAMO method
9 Qualitative analysis of normal and abnormal constituents of urine
10 Photographic demonstration of transgenic animals and plants for production of biopharmaceutical

REFERENCES

1. Abbas AK, Lichtman AH, Pillai S. (2007). Cellular and Molecular Immunology. 6 th edition Saunders Publication, Philadelphia.

2. Delves P, Martin S, Burton D, Roitt IM. (2006). Roitt's Essential Immunology. 11th edition Wiley-Blackwell Scientific Publication, Oxford.

3. Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's Immunology. 6th edition W.H. Freeman and Company, New York.

4. Murphy K, Travers P, Walport M. (2008). Janeway'sImmunobiology. 7th edition Garland Science Publishers, New York.

5. Peakman M, and Vergani D. (2009). Basic and Clinical Immunology. 2nd edition Churchill Livingstone Publishers, Edinberg.

6. Richard C and Geiffrey S. (2009). Immunology. 6th edition. Wiley Blackwell Publication.

CME22205/CME22206

SEMESTER V
DSE: MICROBIALTECHNOLOGY &AGRICULTURAL BIOTECHNOLOGY (4 CREDITS)

Course Outcome:
After completing the course students are able to:
CO1. Understand in depth metabolic pathways and production of secondary metabolites.
CO2. Specify the details of microbial growth kinetics and bioreactors.
CO3. Learn in detail with example crop improvement, nitrogen fixation and bio fertilizers.
CO4. Deliberate the details of genetic engineering of crop plants and microbial pesticides

MICROBIALTECHNOLOGY

NO. HOURS **UNIT I**
15

Introduction to biotechnological importance of microorganisms.
Metabolic pathway involved in microbial products, primary and secondary metabolites, enzymes and microbial biomass.
Microbial production: Use of microbes in production of vitamins (vit-C), enzymes (Amylase), organic acids (citricacid),amino acids (glutamicacid),polysaccharides (xanthan),growth regulators (auxins), colorants (phycocyanin) ,flavors (diactyl), antibiotics (penicillin).

UNIT II **15**

Kinetics of microbial growth and product formation: Phase of cell growth in batch cultures and continuous culture. Growth associated and non-growth associated product formation kinetics, substrate and product inhibition on cell growth and product formation. Bioreactors-Types and functions. Purification & characterization of proteins, Upstream and downstream processing, solids and liquid handling. Distribution of microbial cells, centrifugation, filtration of fermentation broth, ultra centrifugation, liquid extraction, ion-exchange recovery of biological products. Immobilization of cell- Introduction and methods of microbial cell immobilization.

AGRICULTURAL BIOTECHNOLOGY

UNIT III **15**

Introduction: Biotechnology for crop improvement, future prospects of biotechnology for agriculture.
Biological nitrogen fixation: Nitrogen fixing microorganisms, role of nitrogenase, genetics of nitrogen fixing microorganisms, regulation of nif gene expression and mechanism of nitrogen fixation.
Bio fertilizers and phyto-stimulations: Mechanism of growth promotion by microbial inoculants- microbial production and application methods of microbial inoculants- *Rhizobium, azospirillum, azotobacter, mycorhizae.*

UNIT IV **15**

Genetic engineering of crop plant: Gene transfer technique for desirable traits in crop plants. Agro bacterium mediated gene transfer, Direct gene transfer methods to protoplast. Few examples of transgenic plants, plants obtained through gene transfer techniques –BT cotton, herbicide tolerant soybean, virus resistance (papaya ring spot). Microbial pesticides: Fungicides and herbicides. Bacterial, fungal and viral bio agents- *Bacillus Thurengensis* (BT) and*BeaveriaBassiana*. Mechanism of control of plant disease-hypo virulence, competition antibiosis, induced resistance, mycoparasitism.

PRACTICALS **(2 CREDITS)**

HOURS : 4 HOURS /WEEK

1 . Identification of important microorganisms relevant to biotechnology: E.coli, sacchromycescervisiae, spirulina.

2 .Demonstration of commercial products-single cell proteins microbial flavours.

3 .Entrapment of yeast for enzyme action & estimation of invertase activity

4. Preparation of wine.

5. Estimation of percentage of alcohol by Specific gravity method .6 .Seed inoculation with rhizobium culture and observation for root nodulation.

7. Preparation of bio control formulations.

8. Biofertilizers formulation.

9. Isolation and identification of *Rhizobium.*

10. Isolation and identification of *azospirillum.*Isoalation and Identification of *azotobacter.*Study of morphology of*mycorhizae.*

11. Photographic demonstration of BT cotton, herbicide tolerant soybean, virus resistance (papaya ring spot).

12. Demonstration of steps involved in large scale production of biofertilizers.

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1. Casida LE. (1991). Industrial Microbiology. 1st edition. Wiley Eastern Limited.

2. Crueger W and Crueger A. (2000). Biotechnology: A textbook of Industrial Microbiology. 2nd edition. Panima Publishing Co. New Delhi.

3. Mauseth, J.D. 1988 Plant Anatomy. The Benjammin/Cummings Publisher, USA.

4. Bhojwani, S.S. and Razdan 2004 Plant Tissue Culture and Practice.

5. Butler, M. (2004). Animal cell culture and technology: The basics. II Edition. Bios scientific publishers. 3. Glick, B.R. and Pasternak, J.J. (2009). Molecular biotechnology-Principles and applications of recombinant DNA. IV Edition. ASM press, Washington, USA.

6. Agricultural Biotechnology, S.S. Purohit

CMF22005/ CMF22006

SEMESTER VI
DSE: ENVIRONMENTAL BIOTECHNOLOGY AND BIOSTATISTICS (4 CREDITS)

Course Outcome:
After completing the course students are able to:
CO1. Understand the details of issues of environmental pollution, pollution detection and abatement.CO2. Specify in detail with examples bio degradation, mining and industrial waste treatment. CO3. Understand in detail with examples basic concepts and sampling methods of biostatistics.
CO4. Deliberate in detail with examples diagrammatic and graphical representation of data.

ENVIRONMENTAL BIOTECHNOLOGY

NO. HOURS **UNIT I**

15 Introduction: Major issues in environment pollution. Role of Biotechnology to solve the problems.
Biotechnological methods of pollution detection: General bioassay, cell biological methods, immunoassay, DNA based methods, use of biosensor.
Biotechnological methods in pollution abatement: reduction of CO_2 emission, Waste water treatment – conventional waste treatment, Use of Algae, Eutrophication, Use of Cell Immobilization.

UNIT II **15** Biotechnology and biodegradation: Degradation of Xenobiotic compounds-organic (chlorinated hydrocarbons, substituted simple aromatic compounds, polyaromatic hydrocarbons, pesticides and surfactants.
Biohydrometallurgy and Biomining: Bioleaching, biosorption, oil degradation and creation of super bugs.
Treatment of Industrial wastes: Pulp, Dye, leather and solid waste management. Genetically engineered microbes for waste treatment.
Ecofriendlybioproducts: Biomass resources, biogas, and alcohol as a fuel, biological hydrogen generation and biodegradable plastics.

BIOSTATISTICS

UNIT III **15** Introduction, Basic concepts- population, data, sample and variable. Types of data-primary and secondary, methods of data collection- direct personal interview, indirect oral interview, through correspondence, questionnaire and census. Classification of data- qualitative, quantitative and simple classification. Sampling methods- random and non-random. Tabulation of data- structure of a table, simple and complex table.

UNIT IV **15**Graphical and diagrammatic representation of data- histogram, bar graph and pie diagram. Frequency of distribution- without class intervals, with class intervals and cumulative frequency distribution. Measures of central tendency- mean, median and

mode. Measure of dispersion- range, mean deviation, co-efficient of deviation and standard deviation.

PRACTICALS **(2 CREDITS)**

HOURS : 4 HOURS /WEEK

1 & 2. Analysis of sewage water for BOD & COD.
3 Estimation of Hydrogen sulphides in the sewage water.
b. Estimation of chloride in sewage water sample.
c. Estimation of residual chloride in sewage water sample.
d. Estimation of carbon dioxide in sewage water sample.
4. Identification of microbial flora in the given water sample.
5 . Estimation of percentage of alcohol by specific gravity bottle method
6 a. Photographic demonstration of septic tank, sand filters, Imhoff's tank and biosensors.
b. Photographic demonstration of creation of superbug.
c. Photographic demonstration of genetically modified microbes.
d. Photographic demonstration of genetically modified plants.
e. Photographic demonstration of genetically modified animals.

Biostatistics problems
7 Problems on graphical and diagrammatic representation of data
(histogram, bar graph and pie chart)
8 Calculation of mean, median, mode, standard deviation

REFERENCES

1. Environmental Science, S.C. Santra

2. Environmental Biotechnology, Pradipta Kumar Mohapatra

3. Environmental Biotechnology – Concepts and Applications, Hans-Joachim Jordening and Jesef Winter

4. Le CT (2003) Introductory biostatistics. 1st edition, John Wiley, USA

5. Glaser AN (2001) High YieldTM Biostatistics. Lippincott Williams and Wilkins, USA

6. Edmondson A and Druce D (1996) Advanced Biology Statistics, Oxford University Press.

7. Danial W (2004) Biostatistics : A foundation for Analysis in Health Sciences, John Wiley and Sons Inc.

CMF22205/ CMF22206

SEMESTER VI
DSE: BIOINFORMATICSAND BIOPROCESS TECHNOLOGY
(4 CREDITS)

Course Outcome:
After completing the course students are able to:
CO1. Understand the details of bioinformatics basics and data base.
CO2. Learn in depth genomics, proteomics and human genome project.
CO3. Deliberate the details of basic principles of bio processing technology.
CO4. Learn the details of designing of bioreactors and upstream processing.

BIOINFORMATICS

NO. HOURS

UNIT I 15 Bioinformatics and the Internet: Introduction, Internet basics, connecting to the internet electronic mail, File transfer protocol, The World Web. Database- DNA, protein, genomic mapping database, sequence alignment software-pair wise& multiple alignments, gene families

UNIT II 15 Information retrieval from databases: Databases similarity searching, FASTA, BLAST SEARCH, Clustal W, Clustal X,DIALIGN2,Multalign Navigating the NCBI web site.
Genomics and Proteomics: Types of genomes, bacterial genome sequence project. Human genome project, Micro array technologies-types and applications.

BIOPROCESS TECHNOLOGY

UNIT-III 15
Introduction to bioprocess technology. Range of bioprocess technology and its chronological development. Basic principle components of fermentation technology. Types of microbial culture and its growth kinetics– Batch, Fed batch and Continuous culture.

UNIT IV 15
Design of bioprocess vessels- Significance of Impeller, Baffles, Sparger; Types of culture/production vessels- Airlift; Cyclone Column; Packed Tower and their application in production processes. Principles of upstream processing – Media preparation, Inoculation, development and sterilization. Introduction to oxygen requirement in bioprocess; mass transfer coefficient; factors affecting KLa. Bioprocess measurement and control system with special reference to computer aided process control.

PRACTICALS (2 CREDITS)

HOURS : 4 HOURS /WEEK

1. Sequence information resource
2. Understanding and use of various web resources: EMBL, Genbank, Entrez, Unigene, Protein information resource (PIR)
3. Understanding and using: PDB, Swissprot, TREMBL
4. Using various BLAST and interpretation of results.
5. Retrieval of information from nucleotide databases.
6. Sequence alignment using BLAST.
7. Multiple sequence alignment using Clustal W.
8. Bacterial growth curve.
9. Production and analysis of ethanol.
10. Production and analysis of amylase.
11. Production and analysis of lactic acid.
12. Isolation of industrially important microorganism from natural resource.

REFERENCES

1. Stanbury PF, Whitaker A and Hall SJ. (2006). Principles of Fermentation Technology. 2nd edition, Elsevier Science Ltd.

2. Salisbury, Whitaker and Hall. Principles of fermentation Technology,

4. Waste Water Engineering, Metcalf and Eddy, Tata McGraw hill

5.Wong, K.C.92016). Computational bilolgy and bioinformatics: gene regulation, CRC press/ Taylor & Francis Group.

6. Joyce, A. P.; Zhang, C.; Bradley, P.; Havranek, J. J. (2015). "Structure –based modeling of protein : DNAspecificity". Briefings in Functional Genomics.

CMF22405/ CMF22406

SEC

MICROBIAL TECHNIQUES (2 CREDITS)

Course Outcome:
After completing the course students are able to:CO1. Deliberate in depth concept of prokaryotes, eukaryotes and classification of microbes. CO2. Understand in depth sterilization techniques. CO3. Specify the details of microscopy and staining technique. CO4. Learn in depth microbial nutrition and growth measurement.

MICROBIAL TECHNIQUES **NO. HOURS**

UNIT I **07**
General introduction. Concept of Prokaryotes and Eukaryotes. General account on Structure, Classification & Reproduction of Bacteria, Fungi & Viruses.

UNIT II **08**
Microbial Techniques: Sterilization: Principles and applications of
a. Physical Methods: Autoclave, Hot air oven, Laminar airflow, Seitz filter, Sintered glass Filter, membrane filter.
b. Chemical Methods: Alcohol, Aldehydes, Phenols, Halogens and Gaseous agents.
c. Radiation Methods: UV rays and Gamma rays.

UNIT III **08**
Microscopy: working principle and applications of Light microscopy, phase contrast microscopy and electron microscopy.
Staining-Types, Simple and differential (Gram's and acid fast)

UNIT IV **07**
Microbial nutrition and growth: nutritional classes of microorganisms, culture media, pure culture, microbial growth pattern and methods of growth measurements, method of maintenance and preservation of cultures.
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REFERENCES

1 Prescott L.M. Harley J.P and Klein D.A (Microbiology 5th Edition)
2. PelzarJr, M.J. Chan, E.C.S. and Krieig N.R (Microbiology)
3. Salle. A.J Fundamental Principles of Bacteriology .
4. Caldmell, D.R. Microbial Physiology and metabolism

CMF22605/ CMF22606:

SEC

ENZYMOLOGY (2 CREDITS)

Course Outcome:

After completing the course students are able to:

CO1. Understand in details with examples classification and characteristics of enzymes.
CO2. Understand in depth enzyme kinetics.
CO3. Learn in detail with applications allosteric, isozymes and multifunctional enzymes.
CO4. Understand in depth large scale production and immobilization of enzymes.

ENZYMOLOGY

NO. HOURS

UNIT – I **7**

Enzyme classification . Enzyme substrate complex: concept of E-S complex, binding sites, active site, specificity, factors affecting initial rate, E, S, temp. &pH.

UNIT – II **8**

Kinetics of enzyme activity, Michaelis-Menten equation, Different plots for the determination of Km and Vmax and their physiological significance. Enzyme inhibition types of inhibition, Mechanism of enzyme action: General mechanistic principle.

UNIT – III **7** Allosteric enzymes with special reference to phosphofructokinase. Kinetics of allosteric enzymes. Isoenzymes– multiple forms of enzymes with special reference to lactate dehydrogenase. Multienzyme complexes. Ribozymes. Multifunctional enzyme- eg Fatty Acid synthase.

UNIT – IV **8**

Enzyme Technology: Methods for large scale production of enzymes. Immobilized enzyme and their comparison with soluble enzymes, Methods for immobilization of enzymes. Immobilized enzyme reactors. Application of Immobilized and soluble enzyme in health and industry.

REFERENCES

1.Nelson, D.L., Cox, M.M. 2004 Lehninger Principles of Biochemistry, 4 th edition, W.H. Freeman and Company, New York, USA.

2. Biochemistry, LubertStryer, 6th Edition, WH Freeman, 2006.

3. Harper's illustrated Biochemistry by Robert K. Murray, David A Bender, Kathleen M.Botham, Peter J. Kennelly, Victor W. Rodwell, P. Anthony Weil. 28th Edition, McGrawHill, 2009.

4. Biochemistry, Donald Voet and Judith Voet, 2nd Edition, Publisher: John Wiley andSons, 1995.

5. Biochemistry by Mary K.Campbell& Shawn O.Farrell, 5th Edition, Cenage Learning,2005.

6. Fundamentals of Enzymology Nicholas Price and Lewis Stevens Oxford University Press 1999

Pattern of Question Paper
Semester I to VI
Paper I to VI (DSC)

Time : 3 Hrs Max Marks: 70

I. Answer all the questions 5 X 1 = 5

1 ----------
2----------
3----------
4----------
5----------

II. Answer any five questions 5 X 3 = 15

6----------
7----------
8----------
9----------
10----------
11----------

III. Answer any four questions 4 X 5 = 20

1 ----------
13----------
14----------
15----------
16----------

IV. Answer any three questions 3 X 10 = 30

17----------
18----------
19----------
20----------

(Note- 10 Marks may be divided in to 6+4 or 5+5)

Pattern of Question Paper
Semester VI
(SEC)

Time : 2 Hrs Max Marks: 50

I. Answer all the questions 5 X 1 = 5

1 ----------
2----------
3----------
4----------
5----------

II. Answer any five questions 5 X 3 = 15

6----------
7----------
8----------
9----------
10----------
11----------

III. Answer any four questions 4 X 5 = 20

1 ----------
13----------
14----------
15----------
16----------

IV. Answer any one question 1 X 10 = 10

17----------
18----------

(Note- 10 Marks may be divided in to 6+4 or 5+5)

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE

(Autonomous)

B N ROAD, MYSURU- 570 025

DEPARTMENT OF BOTANY

Syllabus

CHOICE BASED CREDIT SYSTEM

For B.Sc programmes

Chemistry, Botany, Zoology

Botany, Biochemistry, Microbiology

2017-18

SCHEMATIC SYLLABUS UNDER CHOICE BASED CREDIT SYSTEM (CBCS)

w.e.f.

2017-2018

BSc CBZ (Chemistry, Botany, Zoology)

Semester/ Course code	Title of the paper	Duration for teaching hours /week		No. of credits			Total credits	Total Hours/ sem		Continuous assessment						Duration for exam	
										C_1(15)		C_2(15)		C_3 (70%)			
	Core courses	**T**	**P**	**L**	**T**	**P**		**T**	**P**	**T**	**P**	**T**	**P**	**T**	**P**	**T**	**P**
I CMA23008	BIODIVERSITY OF MICROBES AND ARCHEGONIATE	04	04	4	-	2	06	60	60	10	05	10	05	70	70	3	4
II CMB23008	PLANT ECOLOGY MORPHOLOGY AND TAXONOMY	04	04	4	-	2	06	60	60	10	05	10	05	70	70	3	4
III CMC23008	PLANT ANATON AND EMBYOLO	04	04	4	-	2	06	60	60	10	05	10	05	70	70	3	4
IV CMD23008	PLANT PHYSIOLOGY AND METABOLISM	04	04	4	-	2	06	60	60	10	05	10	05	70	70	3	4
V CME23008	**Discipline specifi elective** CELL AND MOLECULAR BIOLOGY	04	03	4	-	1.5	5.5	60	60	10	05	10	05	70	70	3	4

CME23208	OR ECONOMIC BOTANY AND BIOTECHNOLO																
CMF23408 CMF23608	**Skill enhancemer course** ETHNOBOTANY OR FLORICULTURE	02	-	2	-	-	02	30	-	15	-	15	-	50	-	2	-
VI	**Discipline specific elective**																
CMF23008 CMF23208	GENETICS PLANT BREEDING OR ANALYTICAL TECHNIQUES AND PLANT SCIENCES	04	03	4	-	1.5	5.5	60	60	10	05	10	05	70	70	3	4
TOTAL CREDITS = 37																	
Practical=70 marks(50marks For Practical Exam Proper,10marks For Record,10marks for submission of specimens /photographs)																	

Programme Outcome for Bachelor of Science in Chemistry, Botany, Zoology:

After completing the graduation in the Bachelor of Science the students are able to:

PO1. Demonstrate the ability to justify, explain, and/or approach the concept

PO2. Demonstrate the ability to present clear, logical and succinct arguments

PO3. Develop state-of-the-art laboratory skills and professional communication skills

PO4. Apply the scientific method to design, execute, and analyze an experiment

PO5. Appreciate the role and use of chemistry for ethical issues facing chemists/drugs

PO6 Understand the impact of the plant diversity in societal and environmental context

PO7. Use interdisciplinary approaches with quantitative skills to work on biological problems

PO8. Use interdisciplinary approaches with quantitative skills to work on biological problems

PO9. Understand Chemistry as an integral part for addressing social, economic, and environmental problems

PO10. Identify the major groups of organisms with an emphasis on animals and plants

Programme Specific Outcome

Bachelor of Science in Chemistry, Botany and Zoology

After completing the graduation in the Bachelor of Science the students are able to:

PSO1. Find jobs at all level of chemical, pharmaceutical, food products, life oriented material industries, etc.

PSO2. Apply appropriate techniques for the qualitative and quantitative analysis of chemicals in laboratories and in industries.

PSO3. Explicate ecological interconnectedness of life

PSO4: Analyse the avenues and remedies for burning environmental issues

PSO5. Recognized the relationships between different structures and functions at different levels

PSO6. Characterize the biological, chemical and physical features of environments that

Animals inhabits

BSc BBM (Botany, Biochemistry, Microbiology)

Semester/ Course code	Title of the paper	Duration for teach hours /w		No. of credits			Tota cred	Total Hours/ sem		Continuous assessment						Duration r exam	
										C_1(15)		C_2(15)		C_3 (70%			
	Core courses	**T**	**P**	**L**	**T**	**P**		**T**	**P**	**T**	**P**	**T**	**P**	**T**	**P**	**T**	**P**
I CMA23007	BIODIVERSITY OF MICROBES AND ARCHEGONIATE	04	04	4	-	2	06	60	60	10	05	10	05	70	70	3	4
II CMB23007	PLANT ECOLOGY MORPHOLOGY AND TAXONOMY	04	04	4	-	2	06	60	60	10	05	10	05	70	70	3	4
III CMC23007	PLANT ANATOMY AND EMBYOLOGY	04	04	4	-	2	06	60	60	10	05	10	05	70	70	3	4
IV CMD23007	PLANT PHYSIOLOGY AND METABOLISM	04	04	4	-	2	06	60	60	10	05	10	05	70	70	3	4
V CME23007	**Discipline specific elective**																
	CELL AND MOLECULAR BIOLOGY	04	03	4	-	1.5	5.5	60	60	10	05	10	05	70	70	3	4
CME23207	OR ECONOMIC BOTANY A BIOTECHNOLOGY																
CMF23407 CMF23607	**Skill enhancement course**	02	-	2	-	-	02	30	-	15	-	15	-	50	-	2	-
	ETHNOBOTANY OR																

	FLORICULTURE																
VI	**Discipline specific elective**	04	03	4	-	1	5	60	60	10	05	10	05	70	70	3	4
CMF23007	GENETICS PLANT BREEDING OR																
CMF23207	ANALYTICAL TECHNIQUES AND PLANT SCIENCES																
															TOTAL CREDITS = 37		
Practical=70 marks(50marks For Practical Exam Proper,10marks For Record,10marks for submission of specimens /photographs)																	

Programme Outcome for Bachelor of Science in Botany, Biochemistry & Microbiology

After completing the graduation in the Bachelor of Science the students are able to:

PO1. Identify the taxonomic position of plants using principles and methods of nomenclature and classification in Botany

PO2. Understand the impact of the plant diversity in societal and environmental context

PO3.Demonstrate the knowledge of, and need for sustainable development

PO4. Use interdisciplinary approaches with quantitative skills to work on biological problems

PO5. Demonstrate the ability to justify and explain their thinking and/or approach

PO6. Develop state-of-the-art laboratory and professional communication skills

PO7. Apply the scientific method to design, execute, and analyze an experiment

PO8. Explain scientific procedures and their experimental observations

PO9.Demonstrate an understanding of fundamental biochemical principles, structure and function

PO10. Work as a laboratory technician, biochemists or medical scientist

PO11. Explain the processes used by microorganisms for the growth

PO12. Explain the theoretical basis of the tools, technologies and methods of microbiology

Programme Specific Outcome
Bachelor of Science in Botany, Biochemistry & Microbiology

After completing the graduation in the Bachelor of Science the students are able to;

PSO 1: Demonstrate applications of biochemical and biological sciences

PSO2: Inculcating proficiency in all experimental techniques and methods of analysis

PSO3: Acquire, articulate, retain and demonstrate laboratory safety skills

PSO4: Communicate scientific information effectively, relating to microbes and their role in ecosystem and health

PSO5: Gain proper procedures and regulations in handling and disposal of chemicals

PSO6: Understand biochemical and molecular processes that occur in and between the cells

CMA23008/CMA23007

I Semester

Credits: Theory-4, Practicals-2 **Theory**: 60 Lectures

Course Outcome

After completion of the course the student is able to:

CO1. Understand the characteristics of viruses

CO2. Learn the classification and characteristics of bacteria

CO3. Identify the classification and characteristics of archegoniate

CO4. Identify the characteristics of algae

CO5. Understand the classification and characteristics of fungi

DSC-I: Biodiversity of Microbes and Archegoniate

Unit 1: Microbial diversity: **(34 Lectures)**

A. Virus **(5 Lectures)**

Discovery, general structure, replication (general account), DNA virus (T-phage); Lytic and lysogenic cycle, RNA virus (TMV); Economic importance;

B. Bacteria **(5 Lectures)**

Discovery, General characteristics and cell structure; Reproduction – vegetative, asexual and recombination (Conjugation, Transformation and Transduction); Economic importance

C. Algae **(12 Lectures)**

General characteristics; Ecology and distribution; Reproduction; Classification of algae; Morphology and life-cycles of the following: Nostoc, Spirogyra, Sargassum, Polysiphonia (Only Morphology). Economic importance of algae

D. Fungi **(12 Lectures)**

Introduction- General characteristics, ecology cell wall composition, nutrition, reproduction and classification; ecology and significance, life cycle of Rhizopus, Penicillium, Puccinia, Symbiotic Associations-Lichens: General account, reproduction and significance.

Unit 2: Archegoniate: (26 Lectures)

Introduction, Transition to land habit, Alternation of generations **(2 Lectures)**

A. **Bryophytes** **(10 Lectures)**

B. General characteristics, adaptations to land habit, Classification, Range of thallus organization. Classification (up to family), Morphology, Anatomy and Reproduction of Marchantia and Polytrichum. (Developmental details not to be included). Ecology and economic importance of bryophytes with special mention of Sphagnum.

C. **Pteridophytes** **(8 Lectures)**

D. General characteristics, classification, early land plants (Rhynia). Classification (up to 11 family) morphology, anatomy and reproduction of Selaginella, Equisetum and Marsilia. (Developmental details not to be included). stelar evolution. Ecological and economical importance of Pteridophytes.

C. Gymnosperms **(6 Lectures)**

General characteristics, classification. Classification (up to family), Morphology, Anatomy and Reproduction of Cycas and Pinus(Developmental details not to be included). Ecological and economical importance

Practicals

1. **T-Phage and TMV**, Line drawing/Photograph of Lytic and Lysogenic Cycle.

2. **Types of Bacteria**, structure of bacterium; Binary Fission; Conjugation; Structure of root nodule.

3. **Gram staining** of Bacteria.

4. Study of vegetative and reproductive structures of ***Nostoc*** **and** ***Spirogyra*****,** through temporary preparations and permanent slides. (Specimen and permanent slides)

5. Study of ***Sargassum*** (vegetative and reproductive) and ***Polysiphonia*** (vegetative morphology)

6. ***Rhizopus*** **and** ***Penicillium***: Asexual stage from temporary mounts and sexual structures through permanent slides.

7. ***Puccinia****:* Study of Uredosorus, Teleutosorus, Basidiospores, Pycnidium and Aeciospores.

8**. Lichens**: Study of growth forms of lichens (crustose, foliose and fruticose), T.S. of thallus, L.S of Apothecium .

9. ***Marchantia***- morphology of thallus, V.S thallus through gemma cup, w.m. gemmae , V.S. antheridiophore, archegoniophore, L.S. sporophyte .

10. ***Polytrichum*****-** morphology, operculum, peristome, annulus, spores, permanent slides showing antheridial and archegonial heads, L.S capsule and protonema. (photographs)

11. ***Selaginella***- morphology, W.M. leaf with ligule, T.S. stem, w.m. strobilus, W.M. microsporophyll and megasporophyll (temporary slides), L.S. strobilus (permanent slide).

12. ***Equisetum***- morphology, T.S. through internode, L.S. strobilus, T.S. strobilus, W.M. sporangiophore, W.M. spores wet and dry.

13. ***Marsilea***- morphology, T.S. of rhizome,W.M and T.S of Sporocarp.

14. ***Cycas***- morphology (coralloid roots, bulbil, leaf), T.S. coralloid root, T.S. leaflet, V.S. microsporophyll, L.S. ovule.

15. ***Pinus***- morphology. W.M dwarf shoot, T.S. needle, L.S. of male cone, L.S. female cone.

References

1. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West. Press Pvt. Ltd. Delhi. 2nd edition.

2. Tortora, G.J., Funke, B.R., Case, C.L. (2010). Microbiology: An Introduction, Pearson Benjamin Cummings, U.S.A. 10th edition.

3. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi & Their Allies, MacMillan Publishers Pvt. Ltd., Delhi.

4. Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley and Sons (Asia), Singapore. 4th edition.

5. Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R., (2005). Biology. Tata McGraw Hill, Delhi, India.

6. Vashishta, P.C., Sinha, A.K., Kumar, A., (2010). Pteridophyta, S. Chand. Delhi, India.

7. Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.

8. Parihar, N.S. (1991). An introduction to Embryophyta. Vol. I. Bryophyta. Central Book Depot, Allahabad.

BOTANY THEORY

I B.Sc. SEMESTER I: PAPER I

SCHEME OF THEORY QUESTION PAPER

Time: 3.00 Hours **Max. Marks: 70**

Blue print

Units	No. of questions from each category			Total marks
	2 marks (5/8)	4marks (4/6)	6marks (4/6)	
Unit I :Microbial Diversity				
A&B.Virus and Bacteria (10hrs)	2X1=2	5X1=5	10X1=10	**17**
C. Algae (12 hrs)	2X1=2	5X2=10	10X1=10	**22**
D. Fungi (12hrs)	2X1=2	5X2=10	10X1=10	**22**
Unit II: Archegoniate				
A. Bryophytes (12hrs)	2X1=2	5X1=5	10X1=10	**17**
B. Pteridophytes (08hrs)	2X2=4	-	10X1=10	**14**
C. Gymnosperms (06hrs)	2X2=4	-	10X1=10	**14**
Total	**8X2=16**	**4X6=30**	**6X6=60**	**106**

CMA23008/CMA23007

BOTANY PRACTICALS

I B.Sc. SEMESTER I -PAPER 1

SCHEME OF QUESTION PAPER

Biodiversity of Microbes and Archegoniate

Time: 4 Hours **Max. Marks: 70**

(50+10+10)

I. Identify the specimens 'A' and 'B' with reasons and labelled sketches

5x2=10 marks

(**A**-Algae and **B**-fungi)

Identification – 1 mark

Classification – 1 mark

Reasons with labelled sketch – 3 marks

II. Prepare a stained temporary slide of 'C'. Sketch, label and Identify with reasons. Leave the preparation for evaluation. 5 marks

(C-Cyanobacteria)

Identification – 1 marks

Preparation/staining and mounting– 2 marks

Reasons with labelled sketch – 2 marks

III. Write critical notes on 'D', 'E' and 'F' 5x3=15 marks

(D-Algae/Fungi, E-Lichens/Bryophytes, F- Pteridophytes /Gymnosperms)

Identification _ 1 mark

Classification – 1 mark

Reasons with lablled sketch – 3 marks

IV. Identify the Microslides 'G', 'H', 'I' and 'J' and with reasons and labeled sketches

5x4=20 marks

(G-Algae,H-Fungi,I-lichens /Bryophytes,J-pteridophytes/gymnosperms)

Identification – 1 mark

Classification – 1 mark

Reasons with lablled sketch – 3 marks

V. Practical record **10marks**

VI. Submissions **10marks**

Note: Each student should submit the **Duly valued and certified practical record and Assigned submissions** at the time of practical examination.

CMA23008/CMA23007

BOTANY PRACTICALS

IB.Sc. SEMESTER I : PAPER 1

MODEL QUESTION PAPER

Biodiversity of Microbes and Archegoniate

Time: 4 Hours **Max. Marks: 70**

(50+10+10)

I. Identify the specimens 'A' and 'B' with reasons and labelled sketches

5x2=10 marks

II. Prepare a stained temporary slide of 'C'. Sketch, label and Identify with reasons. Leave the preparation for evaluation. 5 marks

III. Write critical notes on 'D', 'E'and 'F' 5x3=15 marks

IV. Identify the Microslides 'G', 'H', 'I' and 'J' and with reasons and labelled sketches

5x4=20 marks

V. Practical record 10marks

VI. Submissions 10marks

Note: Each student should submit the **Duly valued and certified practical record** and **Assigned submissions** at the time of practical examination.

CMB23008/CMB23007

II Semester

Credits: Theory-4, Practicals- 2 Theory 60**:** Lectures

Course outcome

After completion of the course the student is able to:

CO1. Learn the classification and characteristics of plant communities

CO2. Understand in depth herbarium

CO3. Understand in details with examples plant morphology

CO4. Specify the characteristics of ecosystem

DSC-II: Plant Ecology, Morphology and Taxonomy

Unit 1: Plant Ecology

A. Introduction to Ecology and significance. (6 Lectures)

Structure; energy flow trophic organisation; Food chains and food webs, Ecological pyramids, pond and forest ecosystem, Biogeochemical cycling; Cycling of carbon, nitrogen and Phosphorous

B. Ecological factors (6 Lectures)

Soil: Origin, formation, composition, soil profile. Water: States of water in the environment, precipitation types. Light and temperature: Variation Optimal and limiting factors; Shelford law of tolerance.

D. **Plant communities (6 Lectures)**

E. Morphological Adaptation of hydrophytes and xerophytes, Succession; Processes and types, Characters; Ecotone and edge effect.

D: Phytogeography (4 Lectures)

Principle biogeographical zones; Endemism

Unit 2: Leaf and Floral Morphology (08 Lectures)

A. Structure of a typical leaf (*Hibiscus*), variation in leaf morphology, types of leaves, phyllotaxy.
B. Parts of a typical flower (*Tribulus terrestris* / *Muntingia calabura*), Variation in floral morphology and floral organs in detail (aestivation and placentation).

Unit 3: Taxonomy

A. Introduction to plant taxonomy (10 Lectures)

1. Principles of taxonomy

2. Taxonomic hierarchy Ranks, categories and taxonomic groups

2. Types of classification (artificial, natural and phylogenetic)

3. Systems of classification-Bentham and Hooker, Engler and Prantl

4. Plant Nomenclature-Binomial system

5. ICN principles

6. Recent trends in Taxonomy: a brief account of Chemotaxonomy, Cytotaxonomy. & APG System of Classification

B. Herbarium technique (6 Lectures)

1. Herbarium (mentioning important herbaria and botanical gardens of the world and India)

2. Botanical gardens

3. Flora and their importance

4. Botanical survey of India (B.S.I) and its function.

C: Angiosperm families (14 Lectures)

Study of the following families according to Bentham and Hooker's system of classification

Malvaceae ,Fabaceae (Papilionaceae, Caesalpiniaceae and Mimosaceae), Apiaceae Apocynaceae and Acanthaceae.

Practicals

1. Study of instruments used to measure microclimatic variables: Soil thermometer, Maximum and Minimum Thermometer, Anemometer, Psychrometer/Hygrometer, Rain gauge.

2. Determination of pH and analysis of two soil samples and plant extracts and Porosity of water in soil of three habitats.

3. (I) Study of morphological adaptations of the following

a. Hydrophytes Eg: ***Hydrilla. Pistia and Eichhornia***

b. Xerophytes Eg: ***Opuntia, Euphorbia Tirucalli,Nerium and Casuarina***

(II)Study of biotic interactions of the following:

a.Stem parasite Eg: ***Cuscuta.***

b.Root parasite Eg: ***Striga***.

c.Epiphytes, Eg: ***Vanda***

d. Predatary plants (Insectivorous plants) Eg: ***Nepenthes***.

4. Determination of minimal quadrat size for the study of herbaceous vegetation in the college campus by species area curve method. (Species to be listed)

5. Quantitative analysis of herbaceous vegetation in the college campus for frequency and comparison with Raunkiaer's frequency distribution law

6. Study of leaf, types, phyllotaxy and its modifications.

7. Parts of a typical flower **(*Tribulus terrestris* / *Muntingia calabura*),** Variation in floral morphology.

8. Floral organs in detail with their variations.

9. Study of vegetative and floral characters of the following families (Description, V.S. flower, section of ovary, floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification).

Brassicaceae and Malvaceae

10 Fabaceae (Papilionaceae, Caesalpiniaceae and Mimosaceae)
11 Apiaceae, Apocynaceae
12 Solanaceae, Acanthaceae,
13 Lamiaceae, Asteraceae
14 Liliaceae, Arecaceae
15 Mounting of a properly dried and pressed specimen of any wild plant with herbarium label (to be submitted in the record book).

References

1. Kormondy, E.J. (1996). Concepts of Ecology. Prentice Hall, U.S.A. 4th edition.

2. Sharma, P.D. (2010) Ecology and Environment. Rastogi Publications, Meerut, India. 8th edition.

3. Simpson, M.G. (2006). Plant Systematics. Elsevier Academic Press, San Diego, CA, U.S.A.

4. Singh, G. (2012). Plant Systematics: Theory and Practice. Oxford & IBH Pvt. Ltd., New Delhi. 3rd

CMB23008/CMB23007

BOTANY THEORY

I B.Sc SEMESTER II: PAPER II

SCHEME OF THEORY QUESTION PAPER

Plant Ecology, Morphology and Taxonomy

Time: 3.00 Hours **Max. Marks: 70**

units	2 marks (5/8)	5marks (4/6)	10marks (4/6)	Total marks
Unit 1: Plant Ecology				
A. Introduction to Ecology ıd significance (6hrs)	2x1=2	5x1=5	-	**7**
B. Ecological factors (6hrs)	-	-	10x1=10	**10**
C. Plant communities (6 hrs)	2x1=2	5x1=5	-	**7**
D: Phytogeography (4hrs)	2x1=2	5x1=5	-	**7**
Unit II: Leaf and Floral Morphology(8hrs)	2x2=4	-	10x1=10	**14**
Unit III: Taxonomy				
A. Introduction to plant xonomy (10 's)	2X2=4	5x1=5	10x1=10	**19**
B. Herbarium technique (6hrs)	-	5x1=5	10x1=10	**15**
C:Angiosperm families(14hrs)	2x1=2	5x1=5	10x2=20	**27**
Total	**8x2=16**	**5x6=30**	**10x6=60**	**106**

CMB23008/CMB23007

BOTANY PRACTICALS

I B.Sc SEMESTER II : PAPER II

SCHEME OF PRACTICAL QUESTION PAPER

Plant Ecology, Morphology and Taxonomy

Time: 4 Hour **Max. Marks: 70 (50+10+10)**

I. Write critical motes on 'A' 'B' and 'C' with reasons and labeled sketches 5x3=15 marks

(A-Ecological instruments, B-Hydrophytes/xerophytes/parasites/ephiphytes, C-Leaf phyllotaxy /leaf types/ essential organs of flower)

Identification – 1 mark

Labelled sketch with reasons – 4marks

II. Assign the plants 'D', 'E' and 'F' to their respective families giving reasons. 5x3=15marks

(D-Apiaceae/Apocynaceae/Acanthaceae,E- Lamiaceae/Asclepiadaceae/Liliaceae/Arecaceae)

Family name – 1 mark

Salient features – 4 marks

III. Describe the plant 'G' in technical terms. 5x1=5 marks

(Papilionaceae /Caesalpiniaceae)

Family name – 1 mark

Technical terms – 4 marks

IV. Draw the floral diagram and write the floral formula of the give plant 'H'.

(Malvaceae, Solanacae, Apocynaceae) **5x1=5 marks**

Floral formula -1mark

Floral diagram-4marks

V. Identify the slide 'I'. (Placentation) 5x1=5 marks

Identification – 1 mark

Definition -1mark

Reasons – 3 marks

VI. Determination of pH in the given plant extract by pH paper method 5x1=5marks

Definition –1 mark

Principle– 3marks

Result – 1 mark

VII. Practical record 10marks

VIII. Submissions 10marks

Note: each student should submit the **Duly valued and certified practical record and Assigned Submissions**, at the time of practical examination.

CMB23008/CMB23007

BOTANY PRACTICALS

I B.Sc SEMESTER II: PAPER II

SCHEME OF PRACTICAL QUESTION PAPER

Plant Ecology, Morphology and Taxonomy

Time: 4 Hours **Max. Marks: 70**

(50+10+10)

I. Write critical notes on 'A' 'B' and 'C' with reasons and labeled sketches. 5x3=15 marks

II.Assign the plants 'D', 'E' and 'F' to their respective families giving reasons. 5x3=15marks

III. Describe the plant 'G' in technical terms. 5x1=5 marks

IV. Draw the floral diagram and write the floral formula of the give plant 'H'.

5x1=5 marks

V. Identify the slide 'I'. (Placentation) 5x1=5 marks

VI. Determination of pH in the given plant extract by pH paper method 5x1=5marks

VII. Practical record 10marks

VIII. Submissions 10marks

Note: each student should submit the **Duly valued and certified practical record and Assigned Submissions**, at the time of practical examination.

CMC23008/CMC23007

III Semester

Credits: Theory-4, Practicals- 2 **Theory: 60Lectures**

Course outcome

After completion of the course the student is able to:

CO1. Learn the details of embryology

CO2. Understand the details of anatomy

CO3. Understand the details of histology

CO4. Understand the characteristics of secondary growth

DSC: III Plant Anatomy and Embryology

Unit 1: Meristematic and permanent tissues (8 Lectures)

Root and shoot apical meristems; Simple and complex tissues.

Unit 2: Organs (4 Lectures)

tructure of dicot and monocot root stem and leaf.

Unit 3: Secondary Growth (8 Lectures)

Vascular cambium – structure and function, seasonal activity Secondary growth in root and stem, Wood (heartwood and sapwood)

Unit 4: Adaptive and protective systems (8 Lectures)

Epidermis, cuticle, stomata; General account of anatomical adaptations in xerophytes and hydrophytes

Unit 5: Structural organization of Reproductive organs (8 Lectures)

Structure of stamen, anther and pollen Structure of gynoecium/pistil and types of ovules; Types of embryo sacs, organization and ultra structure of mature embryo sac

Unit 6: Pollination and fertilization (8 Lectures)

Pollination mechanisms and adaptations; Double fertilization; Seed-structure appendages and dispersal mechanisms.

Unit 7: Embryo and endosperm (8 Lectures)

Endosperm types, structure and functions; Dicot and monocot embryo; Embryoendosperm relationship.

Unit 8: Apomixis and polyembryony **(8 Lectures)**

Definition, types and practical applications

Practicals

1. Study of Meristems through permanent slides and photographs.
2. Study of simple Tissues (parenchyma, collenchyma and sclerenchyma) through (Permanent slides, photographs).
3. Study of complex Tissue, Macerated xylary elements, Phloem (Permanent slides, photographs).
4. Stem: Monocot: *Zea mays*; Dicot: *Helianthus*.
5. Study of Dicot stem Secondary growth: *Helianthus* (only Permanent slides).
6. Root: Monocot: *Zea mays*; Dicot: *Helianthus*; Secondary: *Helianthus* (only Permanent slides).
7. Leaf: Dicot and Monocot leaf (only Permanent slides).
8. Adaptive anatomy: Xerophyte (Nerium leaf); Hydrophyte (*Hydrilla* stem).
9. Structure of anther (young and mature), tapetum (amoeboid and secretory) (Permanent slides).
10. Types of ovules: Anatropous, Orthotropous, Circinotropous, Amphitropous/ Campylotropous.
11. Female gametophyte: Polygonum (monosporic) type of Embryo sac Development (Permanent slides/photographs).
12. Ultra structure of mature egg apparatus cells through electron micrographs.
13. Pollination types and seed dispersal mechanisms (including appendages, aril, caruncle) (Photographs and specimens).
14. Dissection of embryo/endosperm from developing seeds.
15. Calculation of percentage of germinated pollen in a given medium.

References

1. Bhojwani, S.S. & Bhatnagar, S.P. (2011). Embryology of Angiosperms. Vikas Publication House Pvt. Ltd. New Delhi. 5th edition.

2. Mauseth, J.D. (1988). Plant Anatomy. The Benjamin/Cummings Publisher, USA.

CMD23008/CMD23007

IV Semester

Credits: Theory-4, Practicals- 2 Theory: 60Lectures

Course outcomes

After completion of the course the student is able to:

CO1. Identify the characteristics of plant response to light and temperature

CO2. Understand the details of photosynthesis

CO3. Learn in depth translocation in phloem

CO4. Specify the classification and characteristics of enzyme

DSC IV: Plant Physiology and Metabolism

Unit 1: Plant-water relations (8 Lectures)

Importance of water, water potential and its components; Transpiration and its significance; Factors affecting transpiration; Root pressure and guttation

Unit 2: Mineral nutrition (8 Lectures)

Essential elements, macro and micronutrients; Criteria of essentiality of elements; Role of essential elements; Transport of ions across cell membrane, active and passive transport, carriers, channels and pumps.

Unit 3: Translocation in phloem (6 Lectures)

Composition of phloem sap, girdling experiment; Pressure flow model; Phloem loading and unloading.

Unit 4: Photosynthesis (12 Lectures)

Photosynthetic Pigments ($Chl_{a,\ b}$, xanthophylls, carotene); Photosystem I and II, reaction center, antenna molecules; Electron transport and mechanism of ATP synthesis; C3, C4 and CAM pathways of carbon fixation; Photorespiration

Unit 5: Respiration (6 Lectures)

Glycolysis, anaerobic respiration, TCA cycle; Oxidative phosphorylation, Glyoxylate, Oxidative Pentose Phosphate Pathway

Unit 6: Enzymes (4 Lectures)

Structure and properties; Mechanism of enzyme catalysis and enzyme inhibition

Unit 7: Nitrogen metabolism (4 Lectures)

Biological nitrogen fixation; Nitrate and ammonia assimilation

Unit 8: Plant growth regulators (6 Lectures)

Discovery and physiological roles of auxins, gibberellins, cytokinins, ABA, ethylene

Unit 9: Plant response to light and temperature (6 Lectures)

Photoperiodism (SDP, LDP, Day neutral plants); Phytochrome (discovery and structure), red and far red light responses on photomorphogenesis; Vernalization.

Practicals

1. Determination of osmotic potential of plant cell sap by plasmolytic method. Study of plasmolysis and deplasmolysis on Rhoeo leaf.
2. To study the effect of two environmental factors (light and wind) on transpiration by excised twig,using Ganong's potometer.
3. Calculation of stomatal index and stomatal frequency of a mesophyte and a xerophyte.
4. Experiments pertaining to growth- i.Phototropism, ii.Geotropism.
5. Experiments pertaining to growth-Arc Auxanometer experiment.
6. To study the effect of light intensity and bicarbonate concentration on O2 evolution in photosynthesis.
7. Comparison of the rate of respiration in any two parts of a plant using Ganong's respiroscope
8. Separation of photosynthetic pigments by paper chromatography.
9. Separation of amino acids by paper chromatography
10. Qualitative biochemical tests for carbohydrates, fats and proteins

Demonstration experiments (any four)

1. Bolting.
2. Effect of auxins on rooting.
3. Suction due to transpiration.
4. Relation between absorption and transpiration.
5. Kuhne's experiment.

References

1. Taiz, L., Zeiger, E., (2010). Plant Physiology. Sinauer Associates Inc., U.S.A. 5th Edition.

2. Hopkins, W.G., Huner, N.P., (2009). Introduction to Plant Physiology. John Wiley & Sons, U.S.A. 4th Edition.

3. Bajracharya, D., (1999). Experiments in Plant Physiology- A Laboratory Manual. Narosa Publishing House, New Delhi.

Discipline Centric Elective Courses

Two (2) be selected from each of the three disciplines

Discipline Centric Elective Botany

CME23008/CME23007

V Semester

Credits: Theory-4, Practicals-2 **Theory: 60Lectures**

Course outcomes

After completion of the course the student is able to:

CO1. Understand in depth microscopy

CO2. Learn the details of cell

CO3. Specify the details of DNA

CO4. Learn the details of gene regulation

DSE-1: Cell and Molecular Biology

Unit 1: Techniques in Biology (8 Lectures)

Principles of microscopy; Light Microscopy; Phase contrast microscopy; Fluorescence microscopy; Confocal microscopy; Sample Preparation for light microscopy; Electron microscopy (EM)- Scanning EM and Scanning Transmission EM (STEM); Sample Preparation for electron microscopy; X-ray diffraction analysis.

Unit 2: Cell as a unit of Life (2 Lectures)

The Cell Theory; Prokaryotic and eukaryotic cells; Cell size and shape; Eukaryotic Cell components

Unit 3: Cell Organelles (20 Lectures)

Mitochondria: Structure, marker enzymes, composition; Semiautonomous nature; Symbiont hypothesis; Proteins synthesized within mitochondria; mitochondrial DNA.

Chloroplast Structure, marker enzymes, composition; semiautonomous nature, chloroplast DNA

ER, Golgi body & Lysosomes: Structures and roles.

Peroxisomes and Glyoxisomes: Structures, composition, functions in animals and plants and biogenesis.

Nucleus: Nuclear Envelope- structure of nuclear pore complex; chromatin; molecular organization, DNA packaging in eukaryotes, euchromatin and heterochromatin, nucleolus and ribosome structure (brief).

Unit 4: Cell Membrane and Cell Wall (6 Lectures)

The functions of membranes; Models of membrane structure; The fluidity of membranes; Membrane proteins and their functions; Carbohydrates in the membrane; Faces of the membranes; Selective permeability of the membranes; Cell wall.

Unit 5: Cell Cycle (6 Lectures)

Overview of Cell cycle, Mitosis and Meiosis; Molecular controls.

Unit 6: Genetic material **(6 Lectures)**

DNA: Miescher to Watson and Crick- historic perspective, Griffith's and Avery's transformation experiments, Hershey-Chase bacteriophage experiment, DNA structure, types of DNA, types of genetic material.

DNA replication (Prokaryotes and eukaryotes): bidirectional replication, semi–conservative, semi discontinuous RNA priming, Ǿ (theta) mode of replication, replication of linear, dsDNA, replicating the 5′end of linear chromosome including replication enzymes.

Unit 7: Transcription (Prokaryotes and Eukaryotes) **(6 Lectures)**

Types of structures of RNA (mRNA, tRNA, rRNA), RNA polymerase- various types; Translation (Prokaryotes and eukaryotes), genetic code

Unit 8: Regulation of gene expression **(6 Lectures)**

Prokaryotes:Lac operon and Tryptophan operon ; and in Eukaryotes.

Practicals

1. Preparation of fixatives and stains: FAA, Carnoy"s fixative, safranine, acetocarmine and acetorcein.
2. To study prokaryotic cells (bacteria), viruses, eukaryotic cells with the help of light and electron micrographs.
3. Study of the photomicrographs of cell organelles
4. To study the structure of plant cell through temporary mounts.
5. Study of mitosis (temporary mounts and permanent slides).
6. Study of meiosis (temporary mounts and permanent slides).
7. Measure the cell size (either length or breadth/diameter) by micrometry.
8. Study the structure of nuclear pore complex by photograph (from Gerald Karp)Study of special chromosomes (polytene & lampbrush) either by slides or photographs.
9. Study DNA packaging by micrographs.
10. Preparation of the karyotype and ideogram from given photograph of somatic metaphase chromosome.

References

1. Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wiley & Sons. Inc.

2. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia.

3. Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA. 4. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. 2009. The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco.

CME23208/CME23207

V Semester

Credits: Theory-4, Practicals- 2 **Theory: 60Lectures**

Course outcome

After completion of the course the student is able to:

CO1. Specify the details of plant tissue culture

CO2. Understand in details with application, if applicable, economic botany

CO3. Understand in details with examples recombinant DNA technology

DSE-2: Economic Botany and Biotechnology

Unit 1: Origin of Cultivated Plants (4 Lectures)

Concept of centres of origin, their importance with reference to Vavilov's work

Unit 2: Cereals (4 Lectures)

Wheat -Origin, morphology, uses

Unit 3: Legumes (6 Lectures)

General account with special reference to Gram and soybean

Unit 4: Spices (6 Lectures)

General account with special reference to clove and black pepper (Botanical name, family, part used morphology and uses)

Unit 5: Beverages (4 Lectures)

Tea (morphology, processing, uses)

Unit 6: Oils and Fats (4 Lectures)

General description with special reference to groundnut

Unit 7: Fibre Yielding Plants (4 Lectures)

General description with special reference to Cotton (Botanical name, family, part used, morphology and uses)

Unit 8: Introduction to biotechnology (2 lecture)

Unit 9: Plant tissue culture (8 Lectures)
Micropropagation; haploid production through androgenesis and gynogenesis; brief account of embryo & endosperm culture with their applications

Unit 10: Recombinant DNA Techniques (18 Lectures)
Blotting techniques: Northern, Southern and Western Blotting, DNA Fingerprinting; Molecular DNA

markers i.e. RAPD, RFLP, SNPs; DNA sequencing, PCR and Reverse Transcriptase-PCR. Hybridoma and monoclonal antibodies, ELISA and Immunodetection Molecular diagnosis of human disease, Human gene Therapy

Practicals

1. Study of economically important plants: Wheat, Gram, Soybean, Black pepper, Clove Tea, Cotton, Groundnut through specimens, sections and microchemical tests

2. Familiarization with basic equipments in tissue culture.

3. Study through photographs: Anther culture, somatic embryogenesis, endosperm and embryo culture; micropropagation.

4. Study of molecular techniques: PCR, Blotting techniques, AGE and PAGE.

References

1. Kochhar, S.L. (2011). Economic Botany in the Tropics, MacMillan Publishers India Ltd., New Delhi. 4th edition.

2. Bhojwani, S.S. and Razdan, M.K., (1996). Plant Tissue Culture: Theory and Practice. Elsevier Science Amsterdam. The Netherlands.

3. Glick, B.R., Pasternak, J.J. (2003). Molecular Biotechnology- Principles and Applications of recombinant DNA. ASM Press, Washington.

CMF23608/ CMF23607

V SEMESTER

Credits 2 **Theory: 30Lectures**

Course outcome

After completion of the course the student is able to:

CO1 Specify the classification and characteristics of gardening

CO2 Understand in depth nursery management

CO3 Identify in details with examples ornamental plants

SEC-1: Floriculture

Unit 1: Introduction: History of gardening; **(2 Lectures)**

Importance and scope of floriculture and landscape gardening

Unit 2: Nursery Management and Routine Garden Operations: **(8 Lectures)**

Sexual and vegetative methods of propagation; Soil sterilization; Seed sowing; Pricking; Planting and transplanting; Shading; Stopping or pinching; Defoliation; Wintering; Mulching; Topiary; Role of plant growth regulators

Unit 3: Ornamental Plants: **(4 Lectures)**

Flowering annuals; Herbaceous perennials; Divine vines; Shade and ornamental trees; Ornamental bulbous and foliage plants; Cacti and succulents; Palms and Cycads; Ferns and *Selaginellas*; Cultivation of plants in pots; Indoor gardening; Bonsai.

Unit 4: Principles of Garden Designs: **(4Lectures)**

English, Italian, French, Persian, Mughal and Japanese gardens; Features of a garden (Garden wall, Fencing, Steps, Hedge, Edging, Lawn, Flower beds, Shrubbery, Borders, Water garden Some Famous gardens of India.

Unit 5: Landscaping Places of Public Importance: **(4 Lectures)**

Landscaping highways and Educational institutions

Unit 6: Commercial Floriculture: (6 Lectures)

Factors affecting flower production; Production and packaging of cut flowers; Flower arrangements; Methods to prolong vase life; Cultivation of Important cut flowers (Carnation, Aster, Chrysanthemum, Dahlia, Gerbera, Gladiolous, Marigold,Rose, Lilium, Orchids).

Unit 7: Diseases and Pests of Ornamental Plants. (2 Lectures)

References

1. Randhawa, G.S. and Mukhopadhyay, A. 1986. Floriculture in India Allied Publishers

CMF23408/ CMF23407

SEMESTER V

Credits 2 **Theory: 30Lectures**

Course outcome

After completion of the course the student is able to:

CO1. Understand the details of Ethnobotany

CO2. Learn the characteristics of traditional medicinal plants

SEC-2: Ethnobotany

Unit 1: Ethnobotany (6 Lectures)

Introduction, concept, scope and objectives; Ethnobotany as an interdisciplinary science

The relevance of ethnobotany in the present context; Major and minor ethnic groups or

Tribals of India, and their life styles. Plants used by the tribals: a) Food plants b) intoxicants

and beverages c) Resins and oils and miscellaneous uses.

Unit 2: Methodology of Ethnobotanical studies (6 Lectures)

a) Field work b) Herbarium c) Ancient Literature d) Archaeological findings e) temples and

sacred places.

Unit 3: Role of ethnobotany in modern Medicine (10 Lectures)

Medico-ethnobotanical sources in India;Significance of the following plants in ethno botanical practices (along with their habitat and morphology) a) *Azadiractha indica* b) *Ocimum sanctum*

c) *Vitex negundo* d) *Gloriosa superba* e) *Tribulus terrestris* f) *Pongamia pinnata*

g) *Cassia auriculata* h) *Indigofera tinctoria*

Role of ethnobotany in modern medicine with special example *Rauvolfia sepentina, Trichopus zeylanicus, Artemisia,Withania.*

Role of ethnic groups in conservation of plant genetic resources Endangered taxa and forest

management (participatory forest management).

Unit 4: Ethnobotany and legal aspects (8 Lectures)

Ethnobotany as a tool to protect interests of ethnic groups.Sharing of wealth concept with

few examples from India. Biopiracy, Intellectual Property Rights and Traditional Knowledge.

References

1) S.K. Jain, Manual of Ethnobotany, Scientific Publishers, Jodhpur, 1995.

2) S.K. Jain (ed.) Glimpses of Indian. Ethnobotny, Oxford and I B H, New Delhi – 1981

3) Lone et al,. Palaeoethnobotany

4) S.K. Jain (ed.) 1989. Methods and approaches in ethnobotany. Society of ethnobotanists, Lucknow, India.

5) S.K. Jain, 1990. Contributions of Indian ethnobotny. Scientific publishers, Jodhpur.

6) Colton C.M. 1997. Ethnobotany – Principles and applications. John Wiley and sons – Chichester

7) Rama Ro, N and A.N. Henry (1996). The Ethnobotany of Eastern Ghats in Andhra Pradesh, India. Botanical Survey of India. Howrah.8) Rajiv K. Sinha – Ethnobotany The Renaissance of Traditional Herbal Medicine – INA –SHREE Publishers, Jaipur-19969)

CMF23008/ CMF23007

VI Semester

Credits: Theory-4, Practicals- 2 **Theory: 60Lectures**

Course outcome

After completion of the course the student is able to:

CO1. Specify the details of heredity

CO2. Write down the classification and characteristics of mutations

CO3. Learn the details of plant breeding

CO4. Identify in details with examples linkage

DSE-2: Genetics and Plant Breeding

Unit 1: Heredity (24 Lectures)

1. Brief life history of Mendel

2. Terminologies

3. Laws of Inheritance

4. Modified Mandelian Ratios: 2:1- lethal Genes; 1:2:1- Co- dominance, incomplete dominance; 9:7; 9:4:3; 13:3; 12:3:1.

5. Multiple allelism,

6.Pleiotropism

7. Pedigree Analysis

8. Cytoplasmic Inheritance: leaf variegation in Mirabilis jalapa, Male sterility.

9. Chromosome theory of Inheritance.

10.Quantitative inheritance-Concept, mechanism, examples. Monogenic vs polygenic Inheritance.

Unit 2: Sex-determination and Sex-linked Inheritance (4 Lectures)

Unit 3: Linkage and Crossing over (8 Lectures)

Linkage: concept & history, complete & incomplete linkage, bridges experiment, coupling & repulsion, recombination frequency, linkage maps based on two and three factor crosses. Crossing over: concept and significance, cytological proof of crossing over.

Unit 4: Mutations and Chromosomal Aberrations (4 Lectures)

Types of mutations, effects of physical & chemical mutagens Numerical chromosomal changes: Euploidy, Polyploidy and Aneuploidy; Structural chromosomal changes: Deletions, Duplications, Inversions & Translocations.

Unit 5: Plant Breeding (4 lectures)

Introduction and objectives. Breeding systems: modes of reproduction in crop plants. Important achievements and undesirable consequences of plant breeding

Unit 6: Methods of crop improvement (8 lectures)

Introduction: Centres of origin and domestication of crop plants, plant genetic resources; Acclimatization; Selection methods: For self pollinated, cross pollinated and vegetatively propagated plants; Hybridization: For self, cross and vegetatively propagated plants – Procedure, advantages and limitations.

Unit 7: Inbreeding depression and heterosis (4 lectures)

History, genetic basis of inbreeding depression and heterosis; Applications

Unit 8: Crop improvement and breeding (4 lectures)

Role of mutations; Polyploidy; Distant hybridization and role of biotechnology in crop improvement

Practicals

1. Mendel's laws through seed ratios. Laboratory exercises in probability and chisquare.

2. Chromosome mapping using point test cross data.

3. Pedigree analysis for dominant and recessive autosomal and sex linked traits.

4. Incomplete dominance and gene interaction through seed ratios (9:7, 9:6:1, 13:3, 15:1, 12:3:1, 9:3:4).
5. Study of aneuploidy: Down's, Klinefelter's and Turner's syndromes through photographs.

6. Photographs/Permanent Slides showing Translocation Ring, Laggards and Inversion Bridge.

7. Hybridization techniques - Emasculation, Bagging (For demonstration only).

8. Induction of polyploidy conditions in plants (For demonstration only).

References

1. Gardner EJ, Simmons MJ, Snustad DP (2008). Principles of Genetics. 8th Ed. WileyIndia.

2. Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics, John Wiley & Sons Inc., India. 5th edition.

3. Klug WS, Cummings MR, Spencer, C, Palladino, M (2011). Concepts of Genetics, 10th Ed., Benjamin Cummings

4. Griffiths, A.J.F., Wessler, S.R., Carroll, S.B., Doebley, J. (2010). Introduction to Genetic Analysis. W. H. Freeman and Co., U.S.A. 10th edition.

5. Pierce BA (2011) Genetics: A Conceptual Approach, 4th Ed., Macmillan Higher Education Learning
6. Singh, B.D. (2005). Plant Breeding: Principles and Methods. Kalyani Publishers. 7th edition.

7. Chaudhari, H.K. (1984). Elementary Principles of Plant Breeding. Oxford – IBH. 2nd edition.

8. Acquaah, G. (2007). Principles of Plant Genetics & Breeding. Blackwell Publishing.

CMF23208/ CMF23207

VI SEMESTER

Credits: Theory-4, Practicals-2 **Theory: 60Lectures**

Course outcome

After completion of the course the student is able to:

CO1. Learn the details of Spectrophotometry

CO2. Write down the details of chromatography

CO3. Specify the details of cell fractioning

CO4. Identify in details with application, if applicable, biostatistics

DSE-2: Analytical Techniques in Plant Sciences

Unit 1: Imaging and related techniques (15 Lectures)

Principles of microscopy; Light microscopy; Fluorescence microscopy; Confocal microscopy; Use of fluorochromes: (a) Flow cytometry (FACS); (b) Applications of fluorescence microscopy: Chromosome banding, FISH, chromosome painting; Transmission and Scanning electron microscopy – sample preparation for electron microscopy, cryofixation, negative staining, shadow casting, freeze fracture, freeze etching.

Unit 2: Cell fractionation (8 Lectures)

Centrifugation: Differential and density gradient centrifugation, sucrose density gradient,

CsCl2 gradient, analytical centrifugation, ultracentrifugation, marker enzymes

Unit 3: Radioisotopes (4 Lectures)

Use in biological research, auto-radiography, pulse chase experiment.

Unit 4: **Spectrophotometry (4 Lectures)**

Principle and its application in biological research

Unit 5: Chromatography (8 Lectures)

Principle; Paper chromatography; Column chromatography, TLC, GLC, HPLC, Ionexchange

chromatography Molecular sieve chromatography; Affinity chromatography.

Unit 6: Characterization of proteins and nucleic acids (6 Lectures)

Mass spectrometry; X-ray diffraction; X-ray crystallography; Characterization of proteins and nucleic acids; Electrophoresis: AGE, PAGE, SDS-PAGE

Unit 7: Biostatistics **(15 Lectures)**

Statistics, data, population, samples, parameters; Representation of Data: Tabular, Graphical; Measures of central tendency: Arithmetic mean, mode, median; Measures of dispersion: Range, mean deviation, variation, standard deviation; Chi-square test for goodness of fit

.

Practicals

1. Study of Blotting techniques: Southern, Northern and Western, DNA fingerprinting, DNA sequencing, PCR through photographs

2. Demonstration of ELISA.

3. To separate nitrogenous bases by paper chromatography.

4. To separate sugars by thin layer chromatography.

5. Isolation of chloroplasts by differential centrifugation.

6. To separate chloroplast pigments by column chromatography.

7. To estimate protein concentration through Lowry's methods.

8. To separate proteins using PAGE.

9. To separate DNA (marker) using AGE.

10. Study of different microscopic techniques using photographs/micrographs (freeze fracture, freeze etching, negative staining, positive staining, fluorescence and FISH).

11. Preparation of permanent slides (double staining).

References

1. Plummer, D.T. (1996). An Introduction to Practical Biochemistry. Tata McGrawHill Publishing Co. Ltd. New Delhi. 3rd edition.

2. Ruzin, S.E. (1999). Plant Microtechnique and Microscopy, Oxford University Press, New York. U.S.A.

3. Ausubel, F., Brent, R., Kingston, R. E., Moore, D.D., Seidman, J.G., Smith, J.A., Struhl, K. (1995). Short Protocols in Molecular Biology. John Wiley & Sons. 3rd edition.

4. Zar, J.H. (2012). Biostatistical Analysis. Pearson Publication. U.S.A. 4th edition

JSS MAHAVIDYAPEETHA

ESTD-1964

JSS COLLEGE OF ARTS, COMMERCE & SCIENCE

(An Autonomous College of University of Mysore)

Re-accredited by NAAC with 'A' grade

OOTY ROAD, MYSORE-570 025, KARNATAKA

Syllabus

B. Voc in Animation and Multimedia

2018-19

COMPUTER SCIENCE DEPARTMENT (UG)

B. Voc in Animation and Multimedia
Certificate – Level 4- Character Designer
(National Competency Certificate)

Semester 1
Vocational Content

MES / N 0501 - Understanding the script

Section – A

Pre-Production Techniques: Ideas, Themes, Concepts, Story Development. Script- Format, Storyboard. Short Film, Documentary, Feature Film. Script Terms, Understanding Genre, Different Types of Genres and Sub Genres, Read-through and Identifying
Character types. Understanding Narration Style, Time, Place and society condition status of the Character. Plot Interpretation. Three act Structure.

Introduction on how to make drawings for animation, Shapes and forms,
About 2d and drawings, Clay modeling, Layout design according to a storyboard.
Human anatomy, skeleton structure, animal anatomy and mythical creatures.
Studying Human and animal movement through sequential drawings, gesture drawing, Caricaturing – fundamentals, Exaggeration, Attitude, Silhouettes, Boundary breaking exercises and warm ups, gesture drawing, Line drawing and quick sketches, Drawing from observation, memory and imagination.

Section – B

1. Story Reading (Read-through)
2. Group Discussion
3. Observation of Character development.
4. Acting (Read-through)

MES / N 0502 - Ensuring consistency across all scenes

Section – A

Introduction to Pencil Drawing- Introduction to basic drawing techniques including proportions and Line, Using Pencils for shading, People and Animals, Proportion in portrait drawing, Highlighting and shadows, Drawings with the help of basic shapes, understanding of the relationship of bones and muscles at rest and in movement to able to translate and maintaining correct volumes.

Introduction to Perspectives: Perspective in 1 point, Perspective in 2 point, Perspective in 3 point, Eye levels, Vanishing point, Significance of Perspective in animation and composition, Humans and animal forms in perspective, Perspective-blocks, boxes and shapes, Scale diagrams in perspective, Different viewpoints, Importance of eye level.

Section – B

1. Drawing Basic shapes
2. Shapes in to forms
3. One-point Perspective - Table
4. Two-points Perspective - Exterior
5. Three-points perspective – Interior
6. Drawing simple characters using simple shapes
7. Drawing cartoons
8. Drawing male characters (6&7 Heads)
9. Drawing Female Characters (4&5 Heads)
10. Drawing an animal Character
11. Drawing a Hybrid Character (Fantasy)

MES / N 0503 - Design Characters

Section – A

Introduction on how to make drawings for animation, Shapes and forms, About 2d and drawings, Clay modeling, Layout design according to a storyboard. Human anatomy, skeleton structure, animal anatomy and mythical creatures. Studying Human and animal movement through sequential drawings, gesture drawing, Caricaturing – fundamentals, Exaggeration, Attitude, Silhouettes, Boundary breaking exercises and warm ups, gesture drawing, Line drawing and quick sketches, Drawing from observation, memory and imagination.

Intro to Raster: Foreground & background, Changing Foreground and Background colors, using the large color selection Boxes and small color swathes, using the Eyedropper tool to sample Image color, changing the Foreground Color While using a Painting Tool. Using Brushes, Selecting the Brush Shape, drawing a vertical and Horizontal Straight lines with any brush, Drawing connecting Straight Lines (at any angle) with any brush, creating a New Brush, Saving Brushes, Loading Brushes, creating a Custom Brushes, Using the Painting Modes, Fade, Airbrush Options, Pencil Options.

Intro to Vector: Understanding paths, views, selection tools, fills and strokes, setting up preferences and color settings, Creating basic geometric shapes with the Shape tools, Using a grid and smart guides to aid symmetrical drawing, Using the Bezier Pen, Direct Selection tool, and Convert tool efficiently, Applying and editing color gradients to filled regions, Creating and using swatches, tints, gradients, and patterns on filled regions.

3D MODELING: Introduction to various 3D modeling Techniques: - Organic Modeling, Mechanical & Technical Modeling. Using Templates for Modeling. Polygon and Patch. Concept of edit meshes and edit poly. Low poly modeling. Modifiers and compound objects. How to manage vertex, faces and polygon selections.

Introduction to, curves, create a curve from a surface edge, isoparm, or curve-on-surface and Bezier curve editing curves, Surface tools, Trimming, Stitching. Sculpting NURBS surfaces, NURBS Modeling Reference, import vector data as curves or generate polygonal surfaces.

Section – B(1)

1. Perspective art.
2. Traditional designs.
3. 2D Character Designing
4. Photo Collage
5. Matt Painting
6. Digital painting
7. 2d Animation basics
8. Gif Animation.

Section – B(2)

1. Modeling an Apple.
2. Modeling a simple Robot Character.
3. Modeling a Human Face.
4. Modeling Human Body.
5. Modeling Prop for Character (Costume).
6. Modeling an animal character.
7. Modeling a Fantasy Character.

MES / N 0513 - Manage and store assets

Section – A

Understanding Management, SOP, research appropriate tools, techniques, technologies and procedures for effective asset storage, Saving the work with appropriate names and/or naming conventions so that it can be identified easily.
Storing the work in an appropriate place using appropriate storage techniques to ensure it is protected from damage.

Making backup copies at appropriate time intervals of any digital files. Routinely archive any work and store it securely in a second location, if required. Identify and retrieve previous work from storage, as required.

Section – B

1. Arranging Materials in order
2. Writing Logs
3. Group discussion on Assets Allocation.
4. Assets handling and Proper storage Techniques
5. Data storage techniques.

MES / N 0104 - Maintain workplace health and safety

Section – A

Understand and comply with the organization's current health, safety and security policies and procedures

Understand the safe working practices pertaining to own occupation. Understand the government norms and policies relating to health and safety including emergency procedures for illness, accidents, fires or others which may involve evacuation of the premises. Participate in organization health and safety knowledge sessions and drills

Section – B

1. Identify the people responsible for health and safety in the workplace, including those to contact in case of an emergency.
2. Identify security signals e.g. fire alarms and places such as staircases, fire warden stations, first aid and medical rooms.
3. Identify aspects of your workplace that could cause potential risk to own and others health and safety.
4. Ensure own personal health and safety, and that of others in the workplace though precautionary measures.
5. Identify and recommend opportunities for improving health, safety, and security to the designated person.
6. Report any hazards outside the individual's authority to the relevant person in line with organizational procedures and warn other people who may be affected.
7. Follow organization's emergency procedures for accidents, fires or any other natural calamity in case of a hazard.
8. Identify and correct risks like illness, accidents, fires or any other natural calamity safely and within the limits of individual's authority.

Semester 1
General Content

L4 – Sem 1 - GC - Communication Language Kannada

ಸಾಹಿತ್ಯ ಘಟಕ

12 ಗಂಟೆಗಳು

1. ಕಾವ್ಯ

1.	ಯಾವ ಕಾಲದ ಶಾಸ್ತ್ರವೇನು ಹೇಳಿದರೇನು?	- ಕುವೆಂಪು
2.	ಪುಟ್ಟ ವಿಧವೆ	- ಬೇಂದ್ರೆ
3.	ರಂಗೋಲಿ	- ಪುತಿನ
4.	ಮುಂಬೈ ಜಾತಕ	- ಜಿಎಸ್ಎಸ್
5.	ಅಡುಗೆ ಮನೆಯ ಹುಡುಗಿ	- ವೈದೇಹಿ
6.	ನನ್ನ ಜನಗಳು	- ಸಿದ್ಧಲಿಂಗಯ್ಯ

2. ಗದ್ಯ — 12 ಗಂಟೆಗಳು

1.	ನಿರಂತರ ನೀರಿಗಾಗಿ ನಿಂತಲ್ಲೇ ಓಟ	- ನಾಗೇಶ್ ಹೆಗಡೆ
2.	ಮಾಹಿತಿ ತಂತ್ರಜ್ಞಾನ : ಒಂದು ಸ್ಥೂಲ ನೋಟ	- ಜಿ.ಎನ್. ನರಸಿಂಹಮೂರ್ತಿ
3.	ಮೂಢನಂಬಿಕೆಗಳ ಬೀಡಿನಲ್ಲಿ	- ಭುವನೇಶ್ವರಿ ಹೆಗಡೆ
4.	ಬೇಡದ ಅತಿಥಿಗಳು	- ಎ ಎನ್ ಮೂರ್ತಿರಾಯರು

ಭಾಷಾ ಘಟಕ

3. ಆಡಳಿತ ಮತ್ತು ವಾಣಿಜ್ಯ ಕನ್ನಡ — 21 ಗಂಟೆಗಳು

1. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ ಸ್ವರೂಪ ಮತ್ತು ಲಕ್ಷಣ
2. ಸರ್ಕಾರಿ ಪತ್ರ ಸ್ವರೂಪ ಅಧಿಕೃತ ಜ್ಞಾಪನ ಮತ್ತು ಸುತ್ತೋಲೆ
3. ವಿವಿಧ ರೀತಿಯ ಅರ್ಜಿಗಳು - ರಜೆ, ವೇತನ, ಬಡ್ತಿ, ಪದೋನ್ನತಿ ಇತರೆ
4. ವಾಣಿಜ್ಯ ಕನ್ನಡದ ಸ್ವರೂಪ ಮತ್ತು ಲಕ್ಷಣ
5. ವಾಣಿಜ್ಯ ಪತ್ರದ ವಿವಿಧ ಅಂಗಗಳುವಾಣಿಜ್ಯ ಪತ್ರಗಳು- ವಿಚಾರಣಾ ಪತ್ರ, ಆದೇಶ ಪತ್ರ, ಉದರಿಪತ್ರ, ವಸೂಲಿ ಪತ್ರ, ಪರಿಚಯ ಪತ್ರ, ಪರಾಮರ್ಶನ ಪತ್ರ, ವ್ಯವಹಾರೋಜ್ಜೀವನ ಪತ್ರ, ಪರಿಪತ್ರ
6. ಗಣಕದಲ್ಲಿ ಕನ್ನಡ ಕನ್ನಡದ ಅಂತರ್ಜಾಲ ತಾಣಗಳು- ನುಡಿ, ಬರಹ- ಪಾರಿಭಾಷಿಕ ಪದಗಳು
7. ಭಾಷಾಂತರ : ಸ್ವರೂಪ ಮತ್ತು ಲಕ್ಷಣ- ಕನ್ನಡದಿಂದ ಇಂಗ್ಲಿಷಿಗೆ- ಇಂಗ್ಲಿಷಿನಿಂದ ಕನ್ನಡಕ್ಕೆ

ಪರಾಮರ್ಶನ ಗ್ರಂಥಗಳು

1.	ಸಮಗ್ರಕಾವ್ಯ	-	ಜಿ ಎಸ್ ಶಿವರುದ್ರಪ್ಪ
2.	ಬಿಂದು ಬಿಂದಿಗೆ	-	ವೈದೇಹಿ
3.	ಪಕ್ಷಿಕಾಶಿ	-	ಕುವೆಂಪು
4.	ಸಮಗ್ರಕಾವ್ಯ	-	ಬೇಂದ್ರೆ
5.	ಶತ್ರುವಿಲ್ಲದ ಸಮರ	-	ನಾಗೇಶ್‌ಹೆಗ್ಡೆ
6.	ವ್ಯಾವಹಾರಿಕ ಕನ್ನಡ	-	ಎಚ್ ಎಸ್ ಕೆ
7.	ಆಡಳಿತಕನ್ನಡ	-	ಡಾ ಅಶೋಕ್‌ಕುಮಾರ್ ರಂಜೇರ ಮತ್ತು ಇತರರು
8.	ಕಛೇರಿ ಕೈಪಿಡಿ	-	ಕುವೆಂಪು ಕನ್ನಡ ಅಧ್ಯಯನ ಸಂಸ್ಥೆ
9.	ಲೇಖನಕಲೆ	-	ಎಸ್ ಪ್ರಹ್ಲಾದರಾವ್
10.	ಆಡಳಿತಭಾಷೆ ಕೆಲವು ವಿವರಗಳು	-	ಪ್ರಧಾನ ಗುರುದತ್ತ

L4 – Sem 1 - GC - Mathematics:

Unit 1: Algebra

Quadratic and cubic equations – Progressions –Vectors-Scalar product- vector product – vector triple product –standard results and simple problems.

Unit 2: Analytical Geometry

Cartesian coordinate system –Distance formula –section formula –Equation of lines. simple problems –circles –parabola-ellipse-hyperbola-simple problems.

Unit 3: Trigonometry and Calculus

Trigonometric ratios- inverse trigonometric functions –simple problems .

Limits –Rules of differentiation –simple problems.

L4 – Sem 1 - GC – Physics:

PHYSICAL WORLD

Physics: Scope and excitement of physics - Physics, technology and society - Mention of fundamental forces in nature - Nature of physical laws.

UNITS AND MEASUREMENTS

Unit of measurement - System of units - SI units - Fundamental and derived units - Length, mass and time measurements - Accuracy and precision of measuring instruments, Errors in measurement. Significant figures, Numerical problems.

SCALAR AND VECTORS

Scalars and Vectors – Position and displacement vectors - Equality of vectors - Multiplication of a vector by real number, Addition and subtraction of two vectors, Triangle method and parallelogram method.

List of Experiments:

1) To measure diameter of a small spherical body using Vernier Calipers.
2) To measure diameter of a small cylindrical body using Vernier Calipers.
3) To measure internal diameter and depth of a given beaker using Vernier Calipers and hence find its volume.
4) To measure internal diameter and depth of a given calorimeter using Vernier Calipers and hence find its volume.
5) To measure diameter of a given wire using screw gauge.
6) To measure thickness of a given sheet using screw gauge.
7) To measure volume of an irregular lamina using screw gauge.
8) To determine the masses of two different objects using a beam balance.

L4 – Sem 1 – GC - Computer science:

L4-Sem-1-GC: COMPUTER SCIENCE – I

Computer Fundamentals
Unit 1:
Knowing computer: What is Computer, Basic Applications of Computer; Components of Computer System, Central Processing Unit (CPU), VDU, Keyboard and Mouse, Other input/output Devices, Computer Memory, Concepts of Hardware and Software; Concept of Computing, Data and Information; Applications of IECT; Connecting keyboard, mouse, monitor and printer to CPU and checking power supply. Operating Computer using GUI Based Operating System: What is an Operating System; Basics of Popular Operating Systems; The User Interface, Using Mouse; Using right Button of the Mouse and Moving Icons on the screen, Use of Common Icons, Status Bar, Using Menu and Menu-selection, Running an Application, Viewing of File, Folders and Directories, Creating and Renaming of files and folders, Opening and closing of different Windows; Using help; Creating Short cuts, Basics of O.S Setup; Common utilities.

Unit 2:
Programming Development life cycle
Understanding Word Processing: Word Processing Basics; Opening and Closing of documents; Text creation and Manipulation; Formatting of text; Table handling; Spell check, language setting and thesaurus; Printing of word document.

Using Spread Sheet: Basics of Spreadsheet; Manipulation of cells; Formulas and Functions; Editing of Spread Sheet, printing of Spread Sheet.
Introduction to Internet, WWW and Web Browsers: Basic of Computer networks; LAN, WAN; Concept of Internet; Applications of Internet; connecting to internet; What is ISP; Knowing the Internet; Basics of internet connectivity related troubleshooting, World Wide Web; Web Browsing software's, Search Engines; Understanding URL; Domain name; IP Address; Using e-governance website.

Communications and collaboration: Basics of electronic mail; Getting an email account; Sending and receiving emails; Accessing sent emails; Using Emails; Document collaboration; Instant Messaging; Netiquettes.

Small Presentation Making: Basics of presentation software; Creating Presentation; Preparation and Presentation of Slides; Slide Show; Taking printouts of presentation / handouts.

Reference Books:
Computer today by Donald H. Sanders - McGraw-Hill, 1983

Semester 2
Certificate – Level 5- Script Researcher
(National Competency Certificate)

Vocational Content

MES / N 3001 - Understand and detail the concept

Section – A

What Is a Short Story? Finding a Story to Write, A Short Story's Basic Ingredients, Sitting Down to Write.
Choosing a Protagonist, choosing a Point of View, Bringing Your Characters to Life, Tip Sheet: Three-Dimensional Characters, Character's Bio Chart, Giving Your Characters a Voice, Tip Sheet: Dialogue
How Conflict Works in a Short Story, The Protagonist's Predicament, Bad Guys, Hurricanes, and Fatal Flaws, Conflict Equals Suspense.

Scriptwriting terminology: Action, Angle, BG close up, Exterior, fade in fade out, Pan, Parenthetical, POV, Scene Heading, Slug line, SFX, Sotto voce, track with, Voice over, Character name, Cast List, Dialogue, Script Length, Action Description, Extension, Dual-Column Dialogue, Act numbers, Scene Numbers, short lines, dialogue paragraphs, Character Arc.

Section - B
1. Exercises: Generating Ideas.
2. Exercises: Creating Characters.
3. Exercises: Finding Story Conflict.
4. Exercises: Constructing a Plot.
5. Exercises: Making a Setting Vivid.
6. Exercises: Discovering and Developing Your Voice.
7. Public domain material, Protecting the idea, Proof of ownership, Confidentiality agreement, Piracy, Animation Industry in India, Case Study.

MES / N 3002 - Undertake research for scripts

Section - A

Creating Your Own Show, Writing a TV Proposal, Drama and Comedy, Documentary and Reality, Formatting and Presentation, One hour Drama, Procedural, Serialized, Half-hour Comedy or Sitcom, Single-Camera Format, Multi-Camera Format, Limited Series or Miniseries.

Scriptwriting for both short film: Dialogue, Parenthetical, Extension, Shot Transition, Dual-Column Dialogue, Act numbers, Scene Numbers, Cast List, short lines, dialogue paragraphs, Script Styles & Types, Script Length Scene Heading Action Description , Character Name, Dialogue, Parenthetical, Extension, Transition, Shots.

Section - B
1. Do a Research.
2. Understanding the impact on the society.
3. Finding the common interest.
4. Creating the effective narration format.

MES / N 3005 - Assist in drafting scripts

Section – A

Scriptwriting for feature film: Dialogue split by Action, Emphasis in Action, Abbreviations, Short Lines, Dialogue Paragraphs, Montage & Series of Shots, Supers - Titles, Signs, etc, Phone Calls and Intercuts Two people talking at the same time.

Introduction to storyboard: Introduction, Multimedia Storyboarding Tools, The Advantages of Storyboarding, Interactive Storyboarding, Using Interactive Storyboarding to Speed-up the Content-writing Phase, Using Interactive Storyboarding to Speed-up Report Document Production.
Steps of storyboard writing: Storyboard table, Topic, Timeline, Sketches, color scheme, text attributes, Audio, camera angle, Interaction of buttons and text.

Section - B
Understanding Camera terms: Extreme Lon Shot, Long Shot, Mid Shot, Close-up, Extreme Close-up, Over the shoulder. Panning, Tilt, Dolly shot, Crane Shot, Moving Shot.

MES / N 0104 - Maintain workplace health and safety

Section – A
Understand and comply with the organization's current health, safety and security policies and procedures
Understand the safe working practices pertaining to own occupation. Understand the government norms and policies relating to health and safety including emergency procedures for illness, accidents, fires or others which may involve evacuation of the premises. Participate in organization health and safety knowledge sessions and drills

Section – B
1. Identify the people responsible for health and safety in the workplace, including those to contact in case of an emergency.
2. Identify security signals e.g. fire alarms and places such as staircases, fire warden stations, first aid and medical rooms.
3. Identify aspects of your workplace that could cause potential risk to own and others health and safety.

4. Ensure own personal health and safety, and that of others in the workplace though precautionary measures.
5. Identify and recommend opportunities for improving health, safety, and security to the designated person.
6. Report any hazards outside the individual's authority to the relevant person in line with organizational procedures and warn other people who may be affected.
7. Follow organization's emergency procedures for accidents, fires or any other natural calamity in case of a hazard.
8. Identify and correct risks like illness, accidents, fires or any other natural calamity safely and within the limits of individual's authority.

Semester 2
General Content

L5 – Sem 2 - GC - Communication English:

AIMS: 1) To familiarize students with basic English
2) To enable them to develop listening & speaking skills

OBJECTIVES: Students should be able to ___

1) Write English without grammatical errors
2) Speak English Language Effectively and Accurately
3) Listen and understand public announcements and news on TV & Radio

Module – 1 Grammar

1. Subject and Verb Agreement
2. Voice
3. Articles
4. Speech
5. Question tag
6. Framing of Questions

Module – 2 Writing Skills

1. Letter Writing
   Letter of Application/Letter of Grievances/Resume Preparation
2. Comprehension
3. Essay Writing

Module – 3 Speaking Skills

1. Greeting
2. Requesting
3. Enquiring
4. Explaining
5. Reporting
6. Permission
7. Thanking

L5 – Sem 2 - GC - Mathematics:

Section – A

Unit 1: Algebra
Sets –Relation - functions- Mathematical logic and Graph theory, Matrices and determinants –invertible matrices (only 2×2 matrices) - Characteristic equations and Eigen values
(only 2×2 matrices).

Unit 2: Quadric Surfaces
Sphere - Ellipse –Cone-Ellipsoid-Paraboloid-Hyperboloid of one and two sheets – Intersection of Quadric surface and plane – Tetrahedron.

Unit 3: Integration and differential equations
Indefinite and definite integrals –simple problems – Differential equations of first order – separation of variables.

L5 – Sem 2 - GC - Physics:

Section – A

THERMODYNAMICS:
Definition of temperature, heat, change of state, green-house effect, first law of thermodynamics, thermal equilibrium, classification of thermodynamic system, zeroth law of thermodynamics, internal energy, work, isothermal process, adiabatic process, isochoric, Isobaric Process, Second law of thermodynamics, reversible and irreversible process.

MOTION IN A STRAIGHT LINE:
Rest, motion, Position and frame of reference - Definitions of path length and displacement - Definitions of average speed and average velocity, instantaneous speed and instantaneous velocity& uniform and non-uniform motion – Uniformly accelerated motion.

Section – B
List of Experiments:
1) Using a simple pendulum, plot L-T and L-T2 graphs, hence find the effectivelength of second's pendulum using appropriate graph.
2) To find the weight of a given body using parallelogram law of vectors.
3) To determine the coefficient of viscosity of a given liquid by measuring the terminal velocity of a spherical body by stoke's method.
4) To determine Surface tension of Water by capillary rise method.
5) Interfacial between Water and Kerosene.
6) Verification of Lami's theorem.
7) Verification of Gaussian distribution and calculation of standard deviation in a Monte Carlo experiment.
8) Determination of the moment of inertia of an irregular body using Torsional pendulum.

L5 – Sem 2 - GC - Computer Science:

Section - A

1. Concepts of object oriented programming: object class. Encapsulation data hiding Inheritance. Polymorphism. Analysis and design of system using Object Oriented Approach.

2. Structure of a C++Program: Include files, Declaration of an object, Main function, I/O streams.

3. Classes: Class Declaration: Data Members, Member Functions, Private and Public members. Data hiding and encapsulation, arrays within a class. Class function Defection, scope resolution operator, Private and Public member function, Nesting of member functions.

4. Objects: Creating Objects, accessing class data members, Accessing member functions. Arrays of Objects, Objects as function arguments: Pass by value by Reference, Pointers, to Objects.

Section - B

5. Constructors and Destructors: Constructors: Declaration and Definition, Default Constructors, Parameterized Constructors, Copy Constructors. Destructors: Definition and use.

Section - C

6. Function Overloading: Function Overloading: Declaration and definition.

7. Inheritance – Extending Classes: Concept of inheritance, base, derived class, defining derived, classes, visibility modes, private, public, protected; sinle inheritance: private and protected members by member functions of a derived class, multilevel inheritance, nesting of classes.

Reference Books:

Object Oriented Programming with C++ By Balagurusamy- McGraw-Hill,
Object Oriented Programming And C++ By R. Rajaram

PRACTICAL: Practical's based OBJECT ORIENTED PROGRAMING (USING C++)
Objective

Semester 3
Certificate – Level 6 – Animation Director(A)
(National Competency Certificate)

Vocational Content

MES / N 1304 - Communicate requirements to the team

Section - A

Introduction to Communication, Verbal Communication, Face to Face communication, Tone of Voice, Body Language, Physical Communication.

Introduction to Listening Skills, Self-Awareness, Active Listening, Listening in Difficult Situations, Shades of Meaning. Formal Communication, and Informal communication.

Effective Communication: Voice with Emotions, Speaking what you thinking, Having a group discussions, Making Teams and Dividing responsibility.

Section – B

1. Writing Letter
    a. Writing a letter for Long leave
    b. Writing a letter for Pramotion
2. Improvising the Content
    a. Adding an emotional touch to your letter.
    b. Correcting the meaning.
3. Group Discussion and Games for Communication.
    a. Wordless Acting
    b. Famous Pair
    c. Listen, Interpret, Draw
    d. Role-playing and Conflict Resolution
    e. y-o-u-r-n-a-m-e
4. Communication Through Activities.
    a. Listening with Intention
    b. Record/Watch yourself talk
    c. DPR on Given Content.

MES / N 1306 - Direct the animation process

Section – A

Basic Principles in animation: Squash and stretch, Anticipation, Staging, straight ahead and pose to pose, follow through and overlapping action, Slow in and slow out, Arcs, Secondary action, Timing, Exaggeration, Solid drawing, Appeal, Mass and weight, Character acting, Volume, Line of action, Path of action, Walk cycles- animal and human.

Introduction to Sculpting software interface: Mesh Manipulation, Using different, applying strokes, Projection mapping, Dynamic topology, Adding detail to poly mesh, Using symmetry tool, Exporting the mesh.

Introduction to basic material types & procedurals: Study of concepts:- opacity, smoothness, specularity and color. Drawing 2D art templates, Creating complex effects like water fire and smoke. Unwrapping the map for various 3D characters.

Introduction to the mapping and advanced texturing techniques. Shadow maps, Raytraced shadows & radiosity. Concept of lighting system and shadows. Introduction to 3 point, 2 point and dramatic lighting. Creating photo real environments and textures. Applying on to a 3D objects. Understanding how to produce final output, rendering the scene, rendering the effects, network rendering.

Introduction to advance lighting effects: Mental ray rendering and Toon shade rendering. Creating various outputs as per the end user requirements and maintaining the resolution.

Introduction to Character setup: Riggers role, Criteria for a good rig, Joints and skeletons, Creating skeleton hierarchy, Constraints, Forward(FK) and Inverse kinematics(IK), FK, IK joint structures, Animation controllers, Blend shapes, Clusters, Biped Rig- Analyzing reference, Anatomy of human body, Bone placements, Setting up Torso, Biped Arms, Fingers, Legs/Foot controls, Skinning, Facial Rig- Anatomy of a face, The Facial Action Coding System(FACS), Mouth shapes, Phonemes, Animation controllers for Face, Character GUI.

Introduction to Fur, Procedural textures: Inclination, roll and polar, Fur volume and Noise, Painting fur attributes, modifying fur direction, Modifying color of a fur descriptions, Creating nCloth collision, Constraints, Hair System: Artisan, Hair system components, Modify curve tools, Paintfx with hair, Hair collision, Hair system caching, Hairstyles.

Muscle systems Introduction to 3D Muscle system: Components of Muscle, Capsules, Spline based muscle system, Stretch based muscle systems, Muscle Objects and skins, Assigning weights to Muscle skin, Muscle Builder, Muscle Parameters, Custom muscle systems, Wrinkles, fold, jiggle, Slide, Collide, Muscle control.

Section – B(1)

1. Exercises: Ball Bounce (Heavy & Light).
2. Exercises: pendulum.
3. Exercises: Walk Cycle.
4. Exercises: Run.
5. Exercises: Vanilla Walk.
6. Exercises: Animal Walk Cycle.

Section – B(2)
1. Exercises: Human Nose sculpt.
2. Exercises: Human Eyes Sculpt.
3. Exercises: Human Mouth Sculpt.
4. Exercises: Human Ears Sculpt.
5. Exercises: Human Character planning.
6. Exercises: Human Character body sculpting.
7. Exercises: Human Character Face sculpting.

Section – B(3)
1. Exercises: Shading networks.
2. Exercises: Tire Texturing.
3. Exercises: Rusty Automotive Texturing.
4. Exercises: Human Skin Texturing.
5. Exercises: Animal Skin Texturing.
6. Exercises: 2 Point lighting.
7. Exercises: 3 Point lighting.
8. Exercises: Interior lighting (Lamps, Bulbs).

Section – B(4)

1. Exercises: Rigging with Deformers.
2. Exercises: Rigging simple vehicle.
3. Exercises: Rigging cartoon character-Legs.
4. Exercises: Rigging cartoon character- Arms.
5. Exercises: Rigging cartoon character- Face rigging.
6. Exercises: Face expressions using Blend shapes.

Section – B(5)

1. Exercises: Creating fur.
2. Exercises: Creating Hair.
3. Exercises: Simulating Sparks.
4. Exercises: Jiggle animation.
5. Exercises: Adding Muscle System to a human Arm.
6. Exercises: Muscle Weight Paint.

Semester 3
General Content

L6-Sem 3 – GC – Physics:

LAWS OF MOTION
Newton's first law of motion: Concept of inertia and force – Concept of momentum - Newton's second law of motion - Impulse, impulsive force and examples - Newton's third law of motion: Identification of action and reaction pairs with examples in everyday life.

Collisions: Elastic and inelastic collisions

SYSTEMS OF PARTICLES AND ROTATIONAL MOTION
Definitions of a rigid body, translator motion and rotatory motion - Centre of mass of a two-particle system - Mention of expression for position coordinates of centre of mass of (a) n particle system (b) a rigid body and (c) a uniform thin rod.

Section – B

List of Experiments:

1) To study the relation between force of limiting friction and normal reaction and to find the coefficient of friction between surface of a moving block and horizontal surface.

2) To find the downward force, along an inclined plane, acting on a roller due to gravity and study its relationship with the angle of Inclination by plotting graph between force and sinθ

3) Determination of the Moment of inertia of rectangular lamina by using torsional pendulum.

4) Determination of the Moment of inertia of circular lamina by using torsional pendulum.

5) Determination of the acceleration due to gravity and the radius of gyration by using Bar pendulum(Graphical method)

6) Determination of the Moment of inertia of irregular body by using torsional pendulum.

7) To find the force constant and effective mass of a helical spring by plotting T2 –m graph using the method of oscillation.

8) To study the relationship between the temperature of a hot body and time by plotting a cooling curve.

L6-Sem 3 – GC – Electronics:

Unit 1: Introduction to Electronics

AC and DC sources.
Ohm's law – statement and limitations, numerical as applicable. Definition of power and unit. Kirchhoff`s laws- statement and explanation, numerical.
Passive components
Resistors – types, fixed resistors – definition and example. Colour code. Variable resistors – definition and example. Combination of resistors in series and parallel (no derivation) numerical.
Capacitors- Types – fixed Capacitors – definition and example, Variable Capacitors – definition and example. Equivalent of capacitors in series and parallel combination (no derivation) numerical.
Inductors – types – fixed inductor - definition and example. Equivalent of inductors in series and parallel combination (no derivation) numerical.
(15 hrs)

Unit 2: Semiconductor devices

Classification of solids, Introduction to semiconductors – Intrinsic and extrinsic Semiconductors, PN Junction diodes - characteristics.
Mention of Zener diode, tunnel diode, photo diode and LED and their applications.
(15 hrs)

L6-Sem 3 – GC – Computer Science:

Section – A
Unit 1:Python: Introduction, features, First Step with Python, Interactive Mode, Script Mode, Variables and Types, Mutable and Immutable Variables, Keywords, Operators and Operands, Expression and Statements, Input and Output, Comments.
Functions: Introduction, Module, Built in Function, Composition, User Defined Functions, Parameters and Arguments, Scope of Variables, ways of defining Functions.

Conditional and Looping Construct: Control Flow Structure, Looping Constructs.
Strings: introduction, Creating and initializing strings, Strings are immutable, Traversing a string, Strings Operations & string Slicing, String methods & built in functions, Regular expressions and Pattern matching

Section - B
Unit 2:

Lists: Introduction, creating a list, accessing an element of list, traversing a List, Appending in the list, Updating array elements, Deleting Elements, Other functions & methods, List as arguments, Matrix implementation using list, Functions with list, Function call.

Dictionaries: What is dictionary? Key-value pair, Creation, initializing and accessing the elements in a Dictionary, Traversing a dictionary, Creating, initializing values during run time (Dynamic allocation), Appending values to the dictionary, Merging dictionaries: An update, Removing an item from dictionary, Dictionary functions and methods.

Tuples: What is a Tuple? Tuple Creation, Add new element to Tuple, Tuple Assignment, Tuple Slices, Tuple Functions

Reference Books:
Beginning Programming with Python for Dummies by stef Maruch & Aahz Maruch.

L6-Sem 3 – GC – Indian Constitution:

UNIT I
Preamble of the Indian Constitution

a) Salient features of Indian Constitution

UNIT II

a) Fundamental Rights
b) Fundamental Duties
c) Directive principles of State Policy

UNIT III

a) President – Election Method, Powers and Functions
b) The Role of the Prime Minister
c) The Parliament – Structure, Power and Functions(Lok Sabha and Rajya Sabha)
d) Supreme Court – Organization and Jurisdiction

UNIT IV

a) The Role of Governor in the Administration of State
b) Powers and Functions of the Chief Minister
c) Composition, Powers and Functions of both the Houses of State Legislature
d) High Court – Organization and Jurisdiction

Semester 4
Certificate – Level 6 – Animation Director (B)
(National Competency Certificate)

Vocational Content

MES / N 1307 - Direct the post-production process

Advanced Dynamics and pyrotechnics: Introduction to Dynamics, and Dyna motive solver, Particles, Emitters, Fields: Air, Drag, Gravity, Newton, Turbulence, Vortex, Volume, Particle collusions, Particle cache, Goals, Soft bodies, Springs, Rigid bodies, Constraints, Effect: Fire, Smoke, Fireworks, Lightening, Shatter, Curve flow, Surface flow, Rendering particles and effects, Maya Paint Effects, baking simulations, Render types. UNIT – 2 Fluid Effects Introduction to Fluids, Fluid field interaction, Fluid attributes, , Creating a non-dynamic 3d fluid effects, Creating dynamic 3D effect, Creating fire and smoke using Fluid dynamics, creating an ocean.

Introduction to nParticles and Nucleus solver, Nucleus node, Nucleus forces, Nucleus plane, Nucleus attributes, nParticles interaction, nConstraints, nCloth: simulations, nCloth dynamics properties, Working with nConstraints, Tearing cloth, Dynamic Property maps, Simulating cloth on moving character, nParticle caching, nConstraints, Creating Smoke simulations in nParticles, Creating liquid simulations in nParticles, Introduction to nHair, Creating Basic hair style, Creating a dynamic curve simulations.

Introduction to Video Compositing techniques and Colour Keying advanced 2D compositing and Ink paint techniques. Creating color models as per the model sheets. Creating color pallets as required paint and ink fields. Understand the dope sheets / X- sheets in production level. Arranging and adjusting the layers as per X- sheet. Advanced panning of camera and background, multiple cameras for showing depth in-between background, over lay and character layers. Introduction to compositing special effects into a scene using 3d graphics and 3d special effects in 2d layers. Concepts for Broadcast animation for logos, channel IDs and montages. Multi-Layer Compositing, Special Effects, Superimposition and Titling. Exporting various file format outputs as per the end user requirements.

Introduction to Audio Editing sound design in animated films, including recording, gathering audio, editing, mixing, and audio design principles, high-end Pro Tools editing, including use of plug-ins to premix a soundtrack, sound is a catalyst for the imagination, master/slave relationship of picture/sound, sound and memory, psychological implications of sound. Psycho-acoustics and the physics of sound. voice-over, musical composition, psychological role of Sound and aesthetic

3D Compositing and Color Grading: Compositing in Z axis, Creating camera and lights in compositing program, Creating shadows and reflections using layers, Blending videos, Roto Paint, using particles and advanced effects, 3D camera tracking and polishing, Integrating 3 D elements. Using Color correction tools, curve tool, masking and Isolating elements, Using adjustment layer for color grading, Noir theme, color and its meaning and impact on audience.

Advanced Video Editing and Visual Story Narration: post-production strategies, narrative structure, editing rhythms and cutting for performance logging and organization exercises; cutting a short scene provided by the instructor; analysis of editing in a feature film; and active participation in class discussions of student.

Section – B(1)

1. Exercises: 3d Disintegration/Shattering effects.
2. Exercises: Smoke Simulation and Rendering.
3. Exercises: Creating Ocean and waves.
4. Exercises: Creating Fire Blast Simulation-Configuring Container and emitter properties.
5. Exercises: Creating Fire Blast Simulation-Creating Debris.
6. Exercises: Creating Rain and fog.

Section – B(2)

1. Exercises: Video stabilization.
2. Exercises: Chroma Keying & Matte.
3. Exercises: 2D Camera Tracking.
4. Exercises: 3D Camera Tracking.
5. Exercises: 3D Camera Tracking and Alignment.
6. Exercises: Motion Graphics-Planning and Asset preparation
7. Exercises: Motion graphics- Final Animation
8. Exercises: Rotoscopy-Biped
9. Exercises: Rotoscopy-Qudraped.

Section – B(3)

1. Exercises: Adding BG Music.
2. Exercises: Mixing two tracks.
3. Exercises: Recording audio.
4. Exercises: Noise reduction Process.
5. Exercises: Adding Effects.
6. Exercises: Creating Physiological Effects
7. Exercises: Foley Lab.

Section – B(4)

1. Exercises: 3D camera tracking and exporting to 3D Program.
2. Exercises: adjusting Track Points.
3. Exercises: Set extension.
4. Exercises: Match Moving.
5. Exercises: matching Lighting

Section – B(5)

1. Creating Titles using text and images.
2. Storytelling with images.
3. Editing using video effects.
4. 180-degree dialogue shot editing.
5. Editing a Montage (Future, Past).
6. Shooting and editing a documentary- Shoot/Acquiring a footage
7. Shooting and Editing a documentary-Rough cuts
8. Shooting and Editing a documentary-Syncing Audio and Video
9. Shooting and Editing a documentary-Final cut and Export to media format.

Semester 4
General Content

L6 – Sem 4 – GC – Physics:

Section – A

OPTICS:
Reflection, Refraction, Spherical mirror, Concave mirror, refractive index, Relation between focal length and radius of curvature. Laws of Refraction, Snell's law, Dispersion, wave front, interference, diffraction.

CURRENT ELECTRICITY:
Resistance, Capacitance and Inductance, Ohm's law, Current and Voltage, Conductors, Insulators, Semiconductors and Super conductors and their applications, Alternating current and Direct current, Transformers and their constructions, rectification.

Section – B

List of Experiments:
1) To find the focal length of a convex mirror, using a convex lens.
2) To find the refractive index of glass.
3) To find the refractive index of water.
4) To find the focal length of a concave mirror.
5) Verification of ohm's law.
6) To determine effective resistance of two resistances connected in series.
7) To determine effective resistance of two resistances connected in parallel.
8) To determine resistance per unit length of the wire.

L6 – Sem 4 – GC – Physics:

Unit 1: Number Systems, Boolean algebra and Logic gates

Number Systems: Introduction to decimal, binary Inter – Conversion. Addition, Subtraction, Multiplication and Division in binary Number system.
1's and 2's Complement method in binary number system. Subtraction using 1's and 2's compliment
Boolean Algebra: Laws of Boolean Algebra, Logic gates - AND gate, OR gate, NOT gate, NAND gate and NOR gate Logic symbol and truth table
De – Morgan's theorem, simplification of Boolean expressions. Logic circuit for Boolean expressions and vice versa.
Universal gates - NAND gate and NOR gate.

Unit 2: Logic circuit and Memories

Combinational logic circuit: Half adder, Full adder, half subtractor, Full subtractor.
Sequential logic circuit: Flip – flop: RS, D, JK, and T flip - flop.
Shift registers: SIPO, SISO, PISO and PIPO.
Digital computer: Block diagram of digital computer and function of each block.
Semiconductor Memories: Idea of different types of semiconductor memories (RAM, ROM, PROM, EPROM and EEPROM).

L6 – Sem 4 – GC – Computer Science:

Section – A
Unit 1:

Classes in Python: Introduction, Namespaces, Scope Rules, LEGB Rule, Defining Classes, Importance of self, Class Attributes v/s Instance Attributes, Instances attributes, Adding methods dynamically, Accessing Attributes and methods, Accessing Methods, Built in class attributes, Private Members - Limited Support, Data Hiding, Static methods, Destroying Objects (Garbage Collection) Inheritance: Introduction, types of Inheritance, Method-I- By using super() function, Method-II- By using name of the super class, Multiple Inheritance, Overriding Methods, Abstract Methods,

Unit 2:

Linear List Manipulation- Data Structures, Implementation of List in memory, Sequential Memory Allocation, List Operations, Traversal in a List, Insertion of an element in a sorted list, Searching Techniques, Sorting a list.

Stacks and Queues in List: Stack , Push operation, Pop operation, Traversal in a stack, Expression- Conversion of an infix expression to postfix expression, Evaluation of Postfix Expression
Queue- Queue operations,
Data File Handling: Introduction, File access modes:

Exception Handling & Generator Functions: Generator Functions, Advantages of using generator

Reference Books:
Beginning Programming with Python for Dummies by stef Maruch & Aahz Maruch.

Semester 5
Certificate – Level 7 – Live Action Director(A)

Vocational Content

MES / N 1301 (Evaluate production concepts and ideas)
SECTION A

Unit-I: Film as a Storytelling Device- The history of Storytelling - Plays vs. novels vs. film - What is a "story"? - The "idea" vs. "story" vs. "screenplay". Structure of Screen play

Unit -II: The three act screenplay - The scene - Plot points. Script writing formats - Master Scene script format - Split page format – Fiction Script writing - Dramatic structure - Nonfiction forms and formats-Characterization

Unit- III: Narrative, tone, contrast, coincidence, Surprise, Suspense, tension techniques. Nature of protoganists, antoganists. Genres of screenplays. Principles of Characterisation.

Unit-IV Director's preparation. Directors role in film. Introduction to scene study and staging. Beats, fulcrum, dramatic blocks. Scene analysis. Art direction - location - floor management - out- doors and indoors.

Unit-V: Planning - pre-production- Concept, Story development - Casting, Locations, Financing. Production –Shooting, Direction and Cinematography. Distribution and Exhibition.

References:

- Writing the Script by Wells Root ,Jan 15, 1980
- Secrets of Film Writing by Tom Lazarus Jun 2, 2001
- Arora: Encyclopedia of Indian Cinema

SECTION B

Exercises
1. Story Development (Conceptualization)
2. Script Improvisation (Shooting Script)
3. Casting and Team building
4. Location Scouting
5. Working out the finance
6. Presentation of full production planning(by PPT)

MES / N 1302 (Sourcing financiers)

SECTION A
UNIT 1: Film business: distribution and exhibition of films - the basic mechanism of distribution and its relationship to various exhibition platforms. How the entrepreneurship of production relates to the distribution and exhibition.

UNIT 2: Publicity platforms: the who's/when/how's of publicity and a brief exposition of the various platforms available now.
Certification: a brief history and the current structure of central board of film certification. The procedure to go about film certification in India.

UNIT 3: Organizational structure of indian film industry: an overview of the different bodies that regulate and monitor the various constituents directly involved in making and marketing of films in india.
Budgeting for different types of films: relationship between budget, cost and time frame.

SECTION B
Producing practical:

location study: creative/logistics, script breakdown, mix-n-match
Budget top sheet, scheduling & call sheet preparation.

MES / N 1303 (Conceptualise the creative vision)

SECTION A

Unit I: Vision and visualisation - The social conditions and effects of visual objects. Visual culture. Critical visual methodology- Metaphor and metonymy – codes – semiology of the television medium

Unit II: An introduction to compositional interpretation - Colour - Spatial organization – Light - Expressive content- the Oedipus complex – id, ego, super ego – symbols – defence mechanisms – Dreams – Aggression and guilt – psychoanalytic analysis of the media

Unit III: Cultural analysis of visual – semiotics, denotation, connotation and iconography.

Unit IV: Analysis of film and television – six levels of analysis - psychoanalytic understanding of visual images.

Unit V: Selling magic – Breaking the advertising code – commercials and anxiety – Laconian gaze: other ways of seeing -Laura Mulvey and visual pleasure.

SECTION B
Practical Assignment: Actuality - field trip and writing observation report, and write a short film script on its basis. Produce photos of trip.

References:

☐ Media Analysis Techniques, Arthur Asa Berger, SAGE Publications, New Delhi, 1976
☐ Visual Methodologies, Gillian Rose, SAGE Publications, New Delhi, 2001
☐ Mythologies, Paladin. Barthes, R. London, 1973
☐ Techniques of interpretation, Dallas J.R.Ewing. SAGE Publication, New Delhi.

MES / N 1304 (Communicate requirements to the team)

SECTION A
Unit I: Introduction to Communication: Purpose of Communication; Process of Communication; Importance of Communication in Business; Differences between Technical and General Communication; Barriers to Communication; Measures to Overcome the Barriers to Communication.

Unit 2: Types of Communication: Types of Communication; Verbal Communication- Importance of verbal communication- Advantages of verbal communication- Advantages of written communication; Significance of Non-verbal Communication Listening Skills: Listening Process; Classification of Listening; Purpose of Listening; Common Barriers to the Listening Process; Measures to Improve Listening; Listening as an Important Skill in Work Place.

Unit 3: Language for Communication: Language and Communication; General Principles of Writing; Improving Writing Skills, Essentials of good style, Expressions and words to be avoided; Grammar and Usage

Unit 4: Communication in Organizations: Internal Communication; Stake Holders in Internal Communication; Channels of Internal Communication; External Communication; Stake Holders in External Communication; Channels of External Communication.
Communication Network: Scope and Types of Communication Network; Formal and Informal Communication Network; Upward Communication; Downward Communication; Horizontal Communication; Diagonal Communication.

SECTION B:
Practical Assignment:
1.Reading Skills: Reading Skill; Purpose of Reading; Types of Reading; Techniques for Effective Reading.

2. Team Co-ordination: Create small teams of students and assign them in different production role and ask them to prepare a PPT of there production planning.

Semester 5
General Content

L7 – Sem 5 – GC – Advertising-Concepts and Principles:

Section – A

Unit I: Advertising - Definition, Nature, scope, Origin and Growth. Roles of advertising:
Social, Communication, Marketing and Economic.

Unit II: Functions of advertising. - Advertising in marketing mix - Types of advertising - merits and demerits - advertising and consumers - buying systems - target plans.

Unit III: Advertising objectives - Advertising campaign. Conceptualization of Advertising for TV, Radio and Print. Copy, Slogans and Writings.
Media planning - developing media objectives - media budget - selection of media - implementing media plans - pre-testing and launch.
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Unit IV: PR Definition, Elements of PR – functions of PR – Need of PR – Growth of PR in India, - Publicity, propaganda and public opinion Corporate Communication with the public – internal and external - Community Relations.

Unit V: Advertising agencies, Luminaries of Advertising, Advertising Ethics. Corporate Social Responsibilities and Advertising case studies.

SECTION B:
Practical Exercise: Each Student Should Choose a product and have to Create
1. Print Ad
2. Flier
3. Poster
4. Handouts
5. CD Cover
6. Ad video

Reference:

☐ Advertising Basics BovellMichael Newman Wiley, Creative Leaps(Reference), John Wiley & Sons (Asia), 2003
☐ Innovative Promotions That Work, Lisa l.Cyr, Rock Port Publishers, 2006.
☐ Mass Media, Anmol Publications Pvt ltd., J.L Kumar, New Delhi.2006
☐ The Public Relations, 2nd Edtion, Alison Theaker, Routledge, USA, 2004
☐ Public Relations: Theory and Practice, Jane Johnston, Clara Zawawi, Allen & Unwin, 2009

L7 – Sem 5 – GC – Photography and Cinematography:

Section – A

Unit I: History of Photography, Painting and Photography, Types of Cameras – parts and functions of camera

Unit II: Lens and types of lenses for photography - Short, medium and long focal lengths. Exposure – Focusing, aperture, shutter speed, depth of field. Points of View, Composition and perspectives.

Unit III: Kinds of light- indoor and outdoor - Electronic flash and artificial lights. Capturing Colours. Light meters. Accessories and equipments for photography. Aesthetics and Technology.

Unit IV: Photo journalism – Basics of News Photography, specialization of Photography - Nature – Wild life – everyday life - People and places - Sports - Advertising - object photography.

Unit V: Ethical issues in Photography – Codes of Ethics for photographers. Tragedy image, digital improvements, privacy, moral rights of subjects etc., – Basic software of Photo Editing tools.

SECTION B:
Practical Assignments:
1. Intro to DSLR
2. Portrait Photography
3. Landscape Photography
4. Rule of third
5. Shot Composition
6. Camera moments

Reference:

- John hedgecoe's, New Introductory Photographic Course, Mitchell Beazley, 1990
- , 35mm Photographers Handbook, Pan Macmillan, Julian Clader, John Garrelt 1990
- Richard New man, How to take great Photographs at Night, Collins Brown,2003
- Photo-Journalism, Terry Hope Rotovision SA, 2001
- Lighting for Portrait Photography, Steve Bavister, Rotovision SA, 2001
- Roger hicks &Francis schultz, Darkroom basics and beyond, Patterson, 2000

L7 – Sem 5 – GC – Introduction to television broadcasting:

Section – A

Unit I: Origin and Development of Electronic Journalism – Broadcasting System UK, US and other developed and Third World Nations – Comparison.

Unit II: Indian Broadcasting Policy – Major recommendations of committees and working groups – Prasar Bharathi Bill – Question of autonomy.

Unit III: Planning and Production of TV, Radio Programmes – General and Special audience Programmes – Principles of writing for radio – Language – Different formats of radio programmes – Features, Debate, Talks, Drama, Interview etc.,

Unit IV: Planning and Production of TV Programmes – TV crews – Writing for TV –
Visualization – Anatomy of News Cast & News Gathering – Various Programmes – General and Special Audience Programmes - Various formats of TV Programmes – ETV – News, Soaps, Epics, Sports, Talk Shows etc., - TV Commercials – Sponsors – TV News Agencies – Private Channels.

Semester 6
Certificate – Level 7 – Live Action Director(B)

Vocational Content

L7 - Sem 6 – SC - MES / N 1305 (Direct the production process)

SECTION A
Unit I: Direction : Role of a contemporary director, screen grammar, spatial connections, temporal connections, mise-en-scene.

Unit II: Principles of film, narrative form, non-narrative films, dividing a feature film into parts and Genres.

Unit III: Planning, pre-production- Concept / Story development, Scripting / Screen play writing, Budgeting, Casting – Locations - Financing.

Unit IV: Basics of mise-en-scene. Space and time, narrative aspect of mise-en-scene. Cinematographer – set properties - composition, duration of the shot, scene and sequences.

Unit V:. Production – Shooting – Shots and scenes. Direction & Cinematography. Post production- Editing, Editing Equipments Sound recording, Dubbing, Special effects, Graphics & final editing.

Unit V: Architecture of the film's style and plot patterning, Codified formal system of narration devices. Ideological Constraints.
133

SECTION B:
Practical Assignment: Students should Submit a Short Film or a Documentary of 5 Minutes
in team or individually.

References

- The Cinema of India(1896-2000), Thoraval, Yves(2000)
- The Subject of Cinema, Roberge, Gaston
- Films for an ecology of Mind, Roberge, Gaston (1977):
- Encyclopedia of indian Cinema, Arora.

L7 - Sem 6 – SC - MES / N 1307 (Direct the post-production process)

SECTION A

Unit I: Direction : Role of a contemporary director, screen grammar, spatial connections, temporal connections, mise-en-scene.

UNIT II : Bird's-eye view of the modern editing process and modern editing terminology
Principles of Video Editing: Various principles of Editing like Contrast, Parallelism, Symbolism, Simultaneity Continuity, Making an edit invisible, Motivation for every edit, Delivering a message, Bearing audio in mind, editing is creating, Control of Overuse technique or Visual effects.
Editing setup:-efficient editing habit, factory-standard systems to support the editing process
Non- Linear Editing (NLE) Concept.
The Three- Point Edit: Understanding Three-Point Editing, Overview of the Three-Point Editing Process, Different Ways to Do Three-Point Editing.
Working in the Timeline / Transitions / Key framing / Applying Filters / NLE Compositing / ColorCorrection & Color Grading / Titling / Final Review &Project.

UNIT III: Stabilizing a Shot , Controling shakey video, Cropping the borders efficently, Analysing and Tracking a Point in the footage, The Tracker Panel & Motion Tracker Options, Corner Pin Tracking, Exporting Track data,
Introduction to Masks, Animating Masks, Working with Mask Interpolation, Basics of Rotoscopy, Analysing the shot for Rotoscopy, Using Masks for Position Key frames, Creating a Simple Rotoscopic Animation.

UNIT IV: Introduction to Particle Playground, Filters, Plugins, Understanding the Gravity, Mass, Vortex, Turbalance, Color, Fields etc.
Animating the Emitter, Key frame animation, Path Animation, Basic expressions, BASIC COMPOSITING, Applying Layer Blending Modes, Creating a Track Matte, Keying & Key light, Compound Effects: Gradient Wipe Displacement Map, Wave World & Caustics, Pre- composing & Nesting.

SECTION B:
Practical Assignment :
1. Arrange the previously shot Rushes in Sequence(Rough cut 1)
2. Dubbing the audio (Recording the audio)
3. Aligning the audio with the Rushes (Rough Cut 2)
4. Compositing the Shots
5. Match moving
6. Finalizing the Edit and Adding Title Card and Credits
7. Rendering the Edit (Exporting)

Reference Books:

1. Eve Light Honthaner, “The Complete film Production Handbook, Volume 1”, Focal Press Publications, 2001, 3rd Illustrated Edition.
2. Adele Droblas and Seth Greenbeg, “Adobe Premiere Pro 2 Bible (W/ Cd)”, Wiley – India Publications, 2007 Edition.
3.J. J. Marshall and Zed Saeed, “After Effects 5 Bible”, John Wiley and Sons Publication, 2002.

L7 - Sem 6 – SC - MES / N 1 308 (Manage the production’s marketing and release)

SECTION A

Unit I: Concept of Brand: Introduction, Role of brand, Advantages of Branding, Core Values of Brand. Brand Equity: Concept, Brand elements. Principles of Branding, Communication Mix Strategy. Brand Media: Communication Channels and techniques, Advertising, Brand
Perception.

UNIT II: Role of media, selection of media for advertising, formulation of message, art of
copywriting. Branding and packaging strategies: Brand equity, image and personality, packaging decisions, perceptual mapping of customers, control aspects of advertising, advertising budget.

UNIT III: Strategic marketing- GAP analysis, Porte’s five force model, Ansoff’s matrix, SWOT analysis, customer relation management.

SECTION B:
Practical Assignment:
Attend a Film Launch event and write a brief Note on it with Photographic reference.

MES / N 0104 - Maintain workplace health and safety

Section – A

Understand and comply with the organization's current health, safety and security policies and procedures

Understand the safe working practices pertaining to own occupation. Understand the government norms and policies relating to health and safety including emergency procedures for illness, accidents, fires or others which may involve evacuation of the premises. Participate in organization health and safety knowledge sessions and drills

Section – B

1. Identify the people responsible for health and safety in the workplace, including those to contact in case of an emergency.
2. Identify security signals e.g. fire alarms and places such as staircases, fire warden stations, first aid and medical rooms.
3. Identify aspects of your workplace that could cause potential risk to own and others health and safety.

4. Ensure own personal health and safety, and that of others in the workplace though precautionary measures.
5. Identify and recommend opportunities for improving health, safety, and security to the designated person.
6. Report any hazards outside the individual's authority to the relevant person in line with organisational procedures and warn other people who may be affected.
7. Follow organisation's emergency procedures for accidents, fires or any other natural calamity in case of a hazard.
8. Identify and correct risks like illness, accidents, fires or any other natural calamity safely and within the limits of individual's authority.

Semester 6
General Content

L7 – Sem 6 – GC – Film Aesthetics and appreciation:

Section – A

Unit I: Introduction - Genres of films – Film History - language, style, grammar, syntax. Film perception: levels of understanding – Film as a medium: Development of cinema as a medium of art and communication.

Unit II: Understanding basic elements of Film: Aesthetics, Acting, Costume, Music Cinematography, Mise-en scene, Sound, Editing, Visual Effects and roles of artists. Film and Meaning.

Unit-III: Classic Film theory and semiotics – Sociology of films - film language - film and psycho – analysis. Post Modernism and structuralism and deconstruction. Post Colonial theory. Impressionism, expressionism, and surrealism - Subjectivity, causality and time and various schools of thoughts.

Unit-IV: Concepts of films – identities and issues - narrative form - non-narrative form- Film style: French New Wave, Soviet Montage Cinema, Asian Cinema.

Unit- V: Indian Classic Cinema. Indian Luminaries of Film and their films. Trend setters. Tamil Cinema and trends - Impact in politics, culture and economy. Film and post modernism - Film and cultural identity: Criticism and Film Review Writing.

Section – B

Practical Assignment: Students must watch select a genre and watch at least 10 movies of that genre and rank them from 1 to 10 with a brief note.

References:

- Indian Film, Eric Baranenn & Krishnaswamy OVP, 1980 2nd Edition
- How films are made, Khwaja Ahemad Abbas, National Book Trust, 1977
- Film as an art and appreciation, Maric Setton, NCERT, New Delhi
- Cinematography Censorship rules, Govt. of India Press, Nasik, 1969

L7 – Sem 6 – GC – Introduction to modern media:

Section – A

Unit I: Communication – Technology – Genesis – Application of Scientific Advancements – Electronic Revolution – Elementary Idea and about Electronic Devices – Valves – Transmitters, Integrated Circuits etc.,
Amplifiers – Oscillators – Modulators – Antenna etc.,

Unit II: Basic Block Diagram of Telecommunication Systems – Telegraphy – Telephone Exchange – Fax etc., - Telecommunication Networks – Policies.

Unit III: Principles of Radio Communication – Working of Radio Transmitters and Receivers
Elements of Radio Transmitters – Receivers – FM / AM Radio Systems – Narrowcasting.

Unit IV: Printing Technology – Type Faces – Fonts – Point System – Method of Composing Machine, Photo, Computers – VDT – DTP – Printing Methods – Traditional and Modern Methods of Electronic Scanners – Laser Printers – Facsimile.

Unit V: Computers – Digital – Computer Networks – E-Mail – Teleconferencing – Internet
Optical Fiber – Interactive Video – CD ROM – Transponder Data Flows – New Communication Technologies and Social Implications, Social Media, Blogging, Micro Blogging. Etc.,

SECTION B:
Practical Assignment:
Each student should create a Blog and a YouTube Channel.

Reference Books
1. Asok Mitra, Information Imbalance in Asia – AMIC, 1978.
2. Binod C.Agarwal, SITE INSAT.
3. Everett M.Rogers, Communication Technology, The New Media in Society.
4. Everett M. Rogers & Others, India's Information Revolution, Sage Publication, New Delhi, 1986.

L7 – Sem 6 – GC – Introduction to modern media:

Section – A

Unit I: Nature and Principles of Constitution of India (a) Fundamental Rights (b) Rights to Information (c) Freedom of Expression (d) and Freedom of Press in various political setup (i) in Capitalistic (ii) in socialistic Countries (iii) India before and after Independence.

Unit II: Constitutional restrictions on Media – Privileges of Media Personnel – The Indian Penal Code, Indian Evidence Act – Libel – Slander – Defamation – Contempt of Court. The Press Registration of Books Act 1867 – Copy Right Act – Periodical Changes – Post and Telegraphy Act – Official Secrets Act of 1923.

Unit III: Press Council – Working Journalists Act – MRPTC (Monopolies and Restrictive Trade Practice Commission) – Industrial Dispute Act – Incident Representation of Women Act of 19896. Rights and Abilities of the Editor, Printer and Publisher – Editorial autonomy and Independence – Government Information Services and their controls – PIB.

Unit IV: Code of Ethics in Different media – Morality of the Press and Cinema as Private Sectors - Radio and TV as States owned – Public utility undertakings. Evolution of code of ethics for media – Historical Perspectives & details.

Unit V: Freedom and Social Responsibility of Media - Tabloid Journalism – Investigative Journalism. Cable Media, its regulation and laws governing cable media –Internet as a media and the governing of rules of internet.

Reference Books

1. Adhikari Gautam, Press Council, Press Institute of India, New Delhi.
2. Arun Bhattacharjee, The Indian Press, Profession to Industry, Vikas Publication, New Delhi, 1972.
3. Chatterjee P.C., Broadcasting in India, Sage Publication, New Delhi,1988.
4. Christians K. Rozeth Media Ethics, Cases and Moral Reasoning, Longmans, New York/ London, 1987.
5. Clement J. Jones, Mass Media, Code of Ethics and Councils.
6. Durga Das Basu Laws of the Press in India, Joy Print Pack Pvt. Ltd, New Delhi, 1986.

JSS COLLEGE OF ARTS, COMMERCE & SCIENCE

(An Autonomous College of University of Mysore)

Re-accredited by NAAC with 'A' grade

OOTY ROAD, MYSORE-570 025, KARNATAKA

ESTD-1964

SYLLABUS

B. Voc. (Food Processing & Engineering)

2018 - 2019

DEPARTMENT OF FOOD PROCESSING & ENGINEERING

Scheme of Instruction For B. Voc. (Food Processing & Engineering)								
General Education Component								
(L-Lecture; T-Tutorial; P-Practical/Practice) (1 Credit = 15 Hrs)								
Semesters	**Paper No.**	**Title**	**L:T:P**	**Theory Hours**	**Tutorial Hours**	**Practical Hours**	**Total Hours**	**Total Credits**
Sem I	FPA 020	Communication Language Kannada	3:0:0	45	0	0	45	3
	FPA 510	Biochemistry-I	2:0:1	30	0	15	45	3
	FPA 520	Microbiology-I	2:0:1	30	0	15	45	3
	FPA 540	Computer Fundamentals & DOS	2:0:1	30	0	15	45	3
								12
Sem II	FPB540	Communication Language English	3:0:0	45	0	0	45	3
	FPB 510	Biochemistry-II	2:0:1	30	0	15	45	3
	FPB 520	Microbiology-II	2:0:1	30	0	15	45	3
	FPB 550	Computer C Programming	2:0:1	30	0	15	45	3
								12
Sem III	FPC 550	Indian Constitution	3:0:0	45	0	0	45	3
	FPD 580	Bio statistics	2:0:1	30	0	15	45	3
	FPC 510	Biochemistry-III	2:0:1	30	0	15	45	3
	FPC 520	Microbiology-III	2:0:1	30	0	15	45	3
								12
Sem IV	FPC 570	ICT	2:0:1	30	0	15	45	3
	FPD 510	Biochemistry-IV	2:0:1	30	0	15	45	3
	FPD 520	Microbiology-IV	2:0:1	30	0	15	45	3
	FPD 560	Environmental Studies	3:0:0	45	0	0	45	3
								12
Sem V	FPE 510	Biochemistry-V	4:0:2	60	0	30	90	6
	FPE 520	Microbiology-V	4:0:2	60	0	30	90	6
								12
Sem VI	FPF 510	Biochemistry-V	4:0:2	60	0	30	90	6
	FPF 520	Microbiology-V	4:0:2	60	0	30	90	6
								12

DEPARTMENT OF BIOCHEMISTRY
SCHEME OF INSTRUCTION

Scheme of Instruction For B.Voc- Food Processing and Engineering 2018-19									
General Education Component									
NSQF/ NVE QF Level	**Vocational Qualification**	**Semester**	**Title**	**L:T:P**	**Theory Hours**	**Tutorial Hours**	**Practical Hours**	**Total Hours**	**Credits**
Level- IV	**Diploma**	Semester- I	Biomolecule	2:0:1	30	0	15	45	3
Level- V		Semester-II	Enzymology and Bioenergetics	2:0:1	30	0	15	45	3
Level- VI	**Advanced Diploma**	Semester-III	Metabolism	2:0:1	30	0	15	45	3
		Semester-IV	Biochemical Techniques	2:0:1	30	0	15	45	3
Level- VII	**Degree**	Semester-V	Food and Nutrition	4:0:2	60	0	30	90	6
		Semester-VI	Applied Biochemistry	4:0:2	60	0	30	90	6

Proforma of assessment For B.Voc- Food Processing and Engineering 2018-19
General Education Component-Biochemistry

NSQF/ NVE QF Level	Vocational Qualification	Semester	Title		Theory			Practical				Credits
				Exam		C-1	C-2	Exam		C-1	C-2	
				Code	Marks	Marks	Marks	Code	Marks	Marks	Marks	
Level- IV	**Diploma**	Semester- I	Biomolecule	FPA510	70	10	10	FPA530	70	05	05	3
Level- V		Semester-II	Enzymology and Bioenergetics	FPB510	70	10	10	FPB530	70	05	05	3
Level- VI	**Advanced Diploma**	Semester-III	Metabolism	FPC510	70	10	10	FPC530	70	05	05	3
		Semester-IV	Biochemical Techniques	FPD510	70	10	10	FPD530	70	05	05	3
Level- VII	**Degree**	Semester-V	Food & Nutrition	FPE510	70	10	10	FPE530	70	05	05	6
		Semester-VI	Applied Biochemistry	FPF510	70	10	10	FPF530	70	05	05	6

SCHEME OF VALUATION FOR PRACTICAL EXAMINATION

- ✓ A candidate appearing for the first time should submit a duly signed and certified practical record
- ✓ Each candidate has to perform one experiment in the specified duration of three hours for ***FORTY FIVE*** **marks**
- ✓ Practical record has to be valued for ***TEN m*****arks** by examiners at the time of examination
- ✓ Viva-voce for ***FIFTEEN marks*** in practical is awarded by continuous assessment in the lab

Sl no	Component	Marks
1	Write up of the experiment	15
2	Conducting experiment	25
3	Result	05
4	Viva-voce	15
5	Practical record	10
	TOTAL	**70**

FPA510

SEMESTER I

Paper –I **(30 hours -2 Credits)**

BIOMOLECULES

Course Outcome:

After completion of the course a student is able to

CO1: Explian the structure and properties of carbohydrates, lipids, proteins, and nucleic acids in living organisms

CO2: Describe the structure and functions of RNA and DNA

CO3: Understand the role of vitamins in our body

CO4: Understand the behaviour of proteins in solutions

SECTION-I : Amino Acids & Proteins: **09 hrs**

1. Introduction to Bio-chemistry.
2. Definition, classification and biological functions of Amino acids and proteins.
3. **Amino Acids:** Common structural features. Stereoisomerism and RS system of designating optical isomers. Classification based on the nature of "R" groups. Amino acids present in proteins and non-protein amino acids. Specialized role of amino acids.Physical and Chemical properties of amino acids.Titration of amino acids.
4. **Proteins:** Levels of protein structure. Forces stabilising structure and shape of proteins. Native proteins and their conformations. Behavior of proteins in solutions. Salting in & salting out of proteins. Denaturation of proteins.

SECTION-II: Carbohydrates: **08 hrs**

1. Definition, classification and biological functions of carbohydrates.
2. Monosaccharides-Fischer and Haworth structures of monosacharides,. Derivatives of monosaccharides (Sugar acids, deoxysugars, amino sugars and other derivatives of biological importance). Oligosaccharides (structure of maltose, lactose, sucrose, cellobiose, and trehalose).
3. Homo-and hetero-polysaccharides (structures of starch, inulin, glycogen, cellulose, chitin). Polysaccharides of bacterial cell well.

SECTION-III: Lipids **08 hrs**

1. Definition and classification of lipids, fatty acids (saturated and unsaturated).Essential fatty acids. m. p., b. p. and their relation to molecular size. Fats as source of energy.Waxes.
2. Structures and functions of lipids :Triacylglycerols, phospholipids : lecithins (PhosphotidylCholines),

cephalins (Phosphotidylethanolamines), Phosphatidylserines, phosphatidyl inositol, sphingomyelins,
plasmalogens), cerebrosides, gangliosides.

3. Lipoproteins—Composition, classification and biological functions.Liposomes.
4. Prostaglandins, Leukotrienes, Thromboxanes and their importance.
5. Sources and biochemical functions of water & fat soluble vitamins.

SECTION-IV : Nucleic Acid **05 hrs**

1. Nucleic Acids: Structure and properties of purine and pyrimidine bases. Nucleosides and nucleotides. Biologically important nucleotides. Double helical model of DNA. Denaturation of DNA. Physical and chemical properties of nucleic acids.

FPA530 **PRACTICALS** **(15 Hrs 1 Credits)**

1. Qualitative tests for : (a) Carbohydrates. (b) Amino acids and proteins (c) Cholesterol and lipids **3 Hrs X 2**
2. Estimation of amino acid by formal titration **3 Hrs**
3. Estimation of ascorbic acid by dye method. **3 Hrs**
4. Estimation of reducing sugars by DNS method **3 Hrs**

FPB510 **Semester II**

Paper II **(30 hours – 2 credits)**

ENZYMOLOGY AND BIOENERGETICS

Course Outcome:

After completion of the course a student is able to;

CO1: Describe the role and functions of enzymes.

CO2: Understand the role of cofactor and coenzymes in enzyme catalysed reactions.

CO3: Describe the applications of enzymes in diagnostics.

CO4: Discuss the commercial importance of enzymes.

SECTION-I : Enzymology
08 hrs

Introduction to enzymes - General characteristics of enzymes. Prostheticgroup. Holoenzymes, apoenzyme and cofactors. Coenzymes and their biochemical functions, assay of enzyme activity, units of enzyme activity. Active sites(s) of enzymes.IUB system of nomenclature and classification of enzymes. Enzymes as catalysts. Theories of enzymes catalysis: Acidbase catalysis, covalent catalysis.

SECTION-II: Enzyme Purification : **08 hrs**

Need for purification. Preliminary fractionation procedures and precipitation techniques, Chromatography methods : Gel filteration, adsorption–, ion exchange– and affinity chromatography. Types of support materials.Selection of appropriate conditions and elution procedures.Criteria of enzyme purity.

SECTION-III : Enzyme Kinetics **09 hrs**

Factors affecting velocity of enzyme catalysed reactions: Enzyme concentration, pH and temperature. Michaelis –Menten equation. Determination of Km and its significance.

Enzyme inhibition.Various types of enzyme inhibitions..Enzyme inhibitors and their importance.Allosteric enzymes and enzyme regulation.Isoenzymes and their clinical significance.

SECTION-IV: Bioenergetics **05 hrs**

Biological systems and concept of free energy, Endergonic processes and role of ATP & other high energy compounds. Biological oxidations. Redox potential. Commercial importence of enzymes

FPB530 **PRACTICALS (15 Hrs – 1 Credit)**

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1. Assay of salivary amylase enzyme activity**.** **3 Hrs**
2. Effect of pH on enzyme activity**.** **3 Hrs**
3. Effect of temperature on enzyme activity **3 Hrs**
4. Effect of substrate concentration on enzyme activity and determination of Km and Vmax **3 Hrs**
5. Effect of activators (NaCl) on salivary enzyme activity **3 Hrs**

FPC510 **Semester III**

Paper – III **(30 hours- 2 Credits)**

METABOLISM

Course Outcome:

After completion of the course a student is able to;

CO1: Gain the knowledge on cellular metabolism and their regulations

CO2: Able to describe the linked pathways of metabolism

CO3: Demonstrate an understanding of the metabolic pathways - the energy-yielding and energy-requiring reactions in life.

CO4: Understand the role of enzymes in metabolic reactions.

SECTION-I

Carbohydrate Metabolism **08 hrs**

Digestion, Absorption and transport of Carbohydrates, Metabolic Pathways, Glycolysis, Pentose Phosphate Pathway, Glucuronate and glyoxylate pathway, TCA cycle, Glycogenolysis& Glycogenesis, Gluconeogenesis. Diseases associated with carbohydrate metabolism.

SECTION-II

Lipid Metabolism **08 hrs**

Digestion, absorption & Transport of Lipids, β-Oxidation of fatty acids. α and ω oxidation of fatty acids Degradation of triglycerides and phospholipids.Formation and utilization of ketone bodies.Biosynthesis of saturated fatty acids ,Biosynthesis of Cholesterol. Diseases associated with Lipid metabolism.

SECTION-III **08 hrs**

Protein Metabolism

Digestion, absorption & transport of Proteins, General Reactions of Amino Acids : Deamination, transamination and decarboxylation. Urea cycle and its significance. Ketogenic and glucogenic amino acids. Biosynthesis of amino acids (Phenyl alanine and Glutamic acid) and their degradation. Diseases associated with Proteins metabolism.

SECTION-IV **06 hrs**

Nucleic acid Metabolism

Degradation of purines and pyrimidines. Biosynthesis of purines, pyrimidines and nucleotides. Catabolism of Heme & Formation of Bile pigments. Diseases associated with Nucleic acid metabolism.

FPC530 **PRACTICALS** **(15 Hrs = 1 Credits)**

1. Estimation of protein by Biuret method. **3 Hrs**
2. Estimation of Ca+ in serum. **3 Hrs**
3. Estimation of iron in drumstics **3 Hrs**
4. Estimation of creatinine in serum. **3 Hrs**

5. Estimation of uric acid in urine **3 Hrs**

FPD510 **Semester IV**

Paper IV **(30 hours -2 Credits)**

BIOCHEMICAL TECHNIQUES

Course Outcome:

After completion of the course a student is able to;

CO1: Use selected analytical techniques for the sepration of biomolecules.

CO2: Differentiate certain functionalities of biomolecules by using spectroscopic techniques.

CO3: Understand the intersection of life and information sciences, using different sequencing and mapping like SDS-PAGE, TLC, GLC and Chromatography.

CO4: Explain the dangers and safety precautions associated with x-rays and identify the various isotopes used in radiography.

SECTION-I **08 hrs**

Spectroscopic Techniques :

Beer-Lambert's Law. Light absorption and its transmittance. Determination and application of extinction coefficient. Principle and Applications of following spectroscopic techniques - U.V.-Visible, infra-red, Fluorescent emission and NMR spectroscopy.

SECTION-II **08 hrs**

Electrophoretic Techniques :

Principles and applications of the following electrophoresis techniques. Paper electrophoresis, PAGE, SDS- PAGE.

Centrifugation Techniques :

Principle of differential and density gradient centrifugation. Ultra centrifuge – construction and applications

SECTION-III **08 hrs**

Chromatographic Techniques:

Principles of Adsorption and Partition chromatography. Techniques of ascending, descending, circular paper chromatography.

Thin Layer Chromatography-Technique and advantages over paper chromatography

Column chromatography – Principle and applications of Gel Filtration chromatography, ion – exchange chromatography.

SECTION-IV **06 hrs**

Radio Isotopic Techniques :

Properties of radioactive emissions.Units of radioactivity. Isotopes and their applications in biological studies - ^{3}H, ^{14}C, ^{131}I, ^{60}CO, and ^{32}P. Techniques used to measure radioactivity- GM counter. Biological hazards of radiation and safety measures in handling radioisotopes.

FPD530 PRACTICAL (15 Hrs = 1 Credits)

1. Identification of amino acids by circular paper chromatography. **3 Hrs**
2. Identification of amino acids by asending Paper chromatography **3 Hrs**
3. Separation of phospholipids by thin layer chromatography. **3 Hrs**
4. Separation of leaf pigments by column chromatography. **3 Hrs**
5. Separation of proteins by PAGE. **3 Hrs**

FPE510 **Semester V**

PaperV **(60 hours-4 Credits)**

FOOD AND NUTRITION

Course Outcome:

After completion of the course a student is able to;

CO1: Explain the theoretical and practical uses on micro and macronutrients.

CO2: Describe the role of electrolytes in nutritional biochemistry and their functions in metabolism.

CO3: Explain the role of nutrients in the optimal functioning of key biochemical pathways in the body.

CO4: Discuss the biological roles and deficiency disorders of proteins.

SECTION-I

15 Hrs

1. Introduction:

Concept of Nutrition, Calorific value of foods and its determination (Bomb calorimeter), different components of energy expenditure, measurement of energy expenditure by direct and indirect calorometric method (principles only) Energy expenditure at rest and work, respiratory quotient, Basal Metabolic Rate (BMR), determination of BMR by indirect calorimetric method, factors affecting BMR. Specific dynamic action of foods.

Proximate analysis of food samples:

Moisture, fiber, ash, proteins, carbohydrates, fats and their importance

Carbohydrates:

Dietary sources, dietary fibres and protein sparing action, glycemic index and its importance

Fats

Dietary sources, Visible and invisible fats, trans fats and its effects in fried foods

Water Metabolism

Distribution in the body, factors maintaining water balance and factors influencing water balance.

SECTION-II **15 Hrs**

1. Proteins:

Dietary sources, nutritional classification, Nutritional value of proteins – PER, Digestive coefficient, NPU and Biological value of proteins (BV). Essential amino acids. Nitrogen balance, mutual supplementation of proteins, Malnutrition – Kwashiorkor and marasmus (causes, clinical signs with symptoms & treatment

Vitamins

Classification, example with structure, dietary sources, daily requirement, biological roles and deficiency disorders with symptoms– Thiamine, Riboflavin, Niacin, pantothenic acid, Pyridoxine, Biotin, Folic acid,.

SECTION – III **15 Hrs**

Structures, dietary sources, daily requirement, biological roles and deficiency disorders with symptoms- Vitamin B12,C,A,D,E & K. Hypervitaminosis.

Minerals:

Dietary sources, physiological functions, deficiency disorders, absorption, balance and excretion of Macro nutrients- Ca, P, Na, K, Cl and Micronutrients – Fe, Zn, Cu, I &Mg

SECTION IV **15Hrs**

Digestion:

Gastrointestinal tract secretions - Composition and functions of Saliva, gastric, bile, pancreatic and intestinal Juices. Appetite, gastrointestinal tract hormones.

Digestion, absorption and transport of carbohydrates, proteins and fats

Antinutritional factors: Sources and harmful effects of anti vitamins (e.g.: avidin, dicumarol), Protease inhibitors, oxalates and fitates. Natural toxicants, (e.g.: Lathyrus sativa).Food adultrants- structure and harmfull effects of - Butter yellow, lead chromate and malachite green.

FPE530 **PRACTICAL** **(30 Hrs = 2 Credits)**

1. Estimation of haemoglobin in blood. **3 Hrs**
2. Identification of Sugars in fruit juice using paper chromatography. **3 Hrs**
3. Determination of nature of inhibition of alkaline phosphatase by cysteine. **3 Hrs**
4. Determination of proteins by dye binding assay. **3 Hrs**
5. Proximate analysis of food samples- Moisture, fibre, protein fat and carbohydrate (by difference) (3 experiments) **3 HrsX3**
6. Detection of adulterants in food. **3 Hrs**
7. Estimation of Calcium in ragi. **3 Hrs**
8. Estimation of Vitamin – C in lemon or gooseberries by DPPH method. **3 Hrs**

FPF510 **Semester VI**

Paper– VI **(60 hours -4 Credits)**

APPLIED BIOCHEMISTRY

Course Outcome:

After completion of the course a student is able to;

CO1: Explain concepts such as gene structure, function, and its regulation.

CO2: Discuss the molecular events and enzymes involved in DNA replication.

CO3: Understand the functions of immune system including organs, cells and receptors.

CO4: Discuss the elementary aspects of the molecular biology of cancer

SECTION-I **10 Hrs**

DNA Organization: Structure of chromatin – Histones and Nucleosomes. Active and inactive chromatin. Compaction of Chromatin. Chromosomes, Structure of Genome in eukaryotes. Rearrangements in Genetic Material. Integration of Chromosomes with viruses. Transposition, Experimental proofs for DNA as genetic material.

SECTION-II **20 Hrs**

DNA Replication : Semiconservative replication-proof. Molecular events and enzymes involved in DNA replication. DNA repair mechanisms. Mutations. RNA Synthesis : Initiation, elongation and termination during RNA synthesis. Transcription signals. Processing of RNA. Introns and Exons. Nucleases.

Genetic Code and Protein Biosynthesis : Characteristics of Genetic code, Deciphering of Genetic Code. Initiation, elongation and termination of protein chains. Post translational modifications in proteins. Inhibitors of protein biosynthesis.

SECTION-III **15 Hrs**

Definition of immune system and antigens. Cells involved in immune response. T-cell and B-cells, Immunoglobulins, chemical structure of the Antibody molecule.Haptens and carrier molecules, cell mediated immune response. Complement system, activation and its role in defense.

Brief discussion of various immunological techniques; Precipitation reactions in gels Haemagglutination, Immuno-fluorescence, radio-immunoassay (RIA), enzyme likedimmunoadsorbent assay (ELISA) and immunoblotting.

SECTION-IV **15 Hrs**

Membranes : Structure and functions of biological membranes, various models of membrane structure. Transport of solutes across membranes, Sodium pump.

Elementary aspects of the Molecular Biology of cancer and introduction to stem cells.Molecular basis of the Origin and Evolution of Life.

FPF530 **PRACTICALS** **(30 Hrs = 2 Credits)**

1. Estimation of DNA by diphenylamine method.	**3 Hrs**
2. Effect of temperature on the Viscosity of DNA using Oswald's viscometer.	**3 Hrs**
3. Assays of SGPT and SGOT in serum.	**3 Hrs X**
4. Extraction of RNA from yeast and its estimation by Orcinol method.	**3 HrsX2**
5. Determination of total protein and A/G ratio in serum.	**3 Hrs**
6. Estimation of serum phospholipids.	**3 Hrs**
7. Immobilization of enzymes/ cells by entrapment in alginate gel.	**3 Hrs**
8. Demonstration of ELISA.	**3 Hrs**

Pattern of Question Paper for Boc Voc
Semester I to VI
Paper I to VI

Time : 2 Hrs 30 Mins Max Marks 70

1. Answer all the questions in one sentence or a word 10 X 1 = 10

a. ----------
b. ----------
c. ----------
d. ----------
e. ----------
a. ----------
b. ----------
c. ----------
d. ----------
e. ----------

5. Answer any four of the following questions 4 X 5 = 20

a. ----------
b. ----------
c. ----------
d. ----------
e. ----------

6. Answer any four questions of the following 4 X 10 = 40

a. ----------
b. ----------
c. ----------
d. ----------
e. ----------

(Note- 10 Marks may be divided in to 6+4 or 5+5)

I SEMESTER PRACTICAL EXAMINATION

BIOMOLECULES

PRACTICAL I

SCHEME OF EXAMINATION

DURATION: 3 Hours

Maximum Marks: 70

Practical proper: 60

Record marks: 10

NOTE :- Candidates are required to submit the records duly signed by the teacher-in charge and certified by the Head of the Department

PART **15** Marks

The candidate has to write principle and procedure with tabular column for one experiment in the first 15 min. Then the examiner has to put his/her signature and value the paper at the end of the examination

1. Estimation of amino acid by formal titration
2. Estimation of ascorbic acid by dye method.
3. Estimation of reducing sugars by DNS method

PART B

Qualitative Analysis of Biomolecules 30 Marks

Any one of the following substances may be given for identification

1 Carbohydrate – Glucose, Fructose, Galactose, Lactose, Maltose, Sucrose and Starch.

2 Amino acids – Arginine, Tryptophan, Tyrosine, Cystein, Histidine, phenyl alanine

3 Proteins- Albumin and casein.

PART C 15 Marks

Viva

SCHEME OF VALUATION

(ASSESMENT OF EXPARIMENTAL RESULTS)

CLASS RECORDS :

i) For conducting and recording 5 experiments = 07 marks.

4 experiments = 06 marks

Less than 4 experiments = 04 marks

ii) For accuracy and neatness = 03 marks.

PART A

Principle- 7 Marks

Procedure- 8 Marks

PART B

Qualitative Analysis Of Biomolecules

1	Identification of the class of biomolecule	4 Marks
	If carbohydrate is given	
	i) Reducing test(any two test)	7 Marks
	ii) Classification test	6 Marks
	iii) Distinguishing test (aldose or ketose)	6 Marks
	iv) Preparation of osazone and identification	7 Marks
	If aminoacid or protein is given, following tests may be conducted	
	i) Precipitation test	
	ii) Xanthoproteic test	
	iii) Millons test	
	iv) Sakaguchi test	
	v) Lead acetate/Sodium nitroprusside test	5 x 6 = 30 Marks

PART C

Viva- Five questions 5 x 3 = 15 Marks

II SEMESTER PRACTICAL EXAMINATION

ENZYMOLOGY AND BIOENERGETICS

PRACTICAL II

SCHEME OF EXAMINATION

SCHEME OF EXAMINATION

DURATION: 3 Hours

Maximum Marks: 70

Practical proper: 60

Record marks: 10

NOTE:- Candidates are required to submit the records duly signed by the teacher-in charge and certified by the Head of the Department

PART A 15 Marks

The candidate has to write procedure with tabular column for one experiment in the first 15 min.

Then the examiner has to put his/her signature and value the paper at the end of the examination

1. Assay of salivary amylase enzyme activity**.**
2. Effect of pH on enzyme activity**.**
3. Effect of temperature on enzyme activity
4. Effect of substrate concentration on enzyme activity and determination of Km and Vmax
5. Effect of activators (NaCl) on salivary enzyme activity

PART B 30 Marks

Any one of the following experiment may be set

1. Determination of specific activity of Salivary amylase by DNS.
2. Determination of pH optimum of Salivary amylase.
3. Determination of Km and Vmax of Salivary amylase.
4. Determination of initial velocity (time Kinetics) of Salivary amylase.

Note-

1. Specifiv activity:

i) Standard solution of reducing sugar must be supplied by the examiner.

ii) Concentration of protein in enzyme solution must be given to the students.

2. Optimum pH: buffer of 5 different values from 5 to 9 may be given (buffer solutions is to be supplied named as A,B,C,D,E and asked to found out the buffer in which activity is maximum)
3. Optimum time: 10' , 20' , 30' , 40' and 50'range may be considered for the time kinetics.
4. Determination of Km and Vmax: substrates of different concentration range such as 2, 5, 10, 15, 20 and 30 uMole maybe given(Standard graph of the substrate must be given).

PART C 15 Marks

Viva

SCHEME OF VALUATION

(ASSESMENT OF EXPARIMENTAL RESULTS)

CLASS RECORDS :

i) For conducting and recording 5 experiments = 07 marks.

4 experiments = 06 marks

Less than 4 experiments = 04 marks

ii) For accuracy and neatness = 03 marks.

PART B

Distribution of marks for enzyme assay

1. Tabular column	5 Marks
2. For conduction of experiment	12 Marks
3. Graph	5 Marks
4. Calculation	4 Marks
5. Result	4 Marks

PART C

Viva- Five questions 5 x 3 = 15 Marks

III SEMESTER PRACTICAL EXAMINATION

METABOLISM

PRACTICAL III

SCHEME OF EXAMINATION

SCHEME OF EXAMINATION

DURATION: 3 Hours

Maximum Marks: 70

Practical proper: 60

Record marks: 10

NOTE:- Candidates are required to submit the records duly signed by the teacher-in charge and certified by the Head of the Department

PART A 15 Marks

The candidate has to write procedure with tabular column for one experiment in the first 15 min. Then the examiner has to put his/her signature and value the paper at the end of the examination

1. Estimation of protein by Biuret method.
2. Estimation of Ca+ in serum.
3. Estimation of iron in drumstics
4. Estimation of creatinine in serum
5. Estimation of uric acid in urine

PART B 30 Marks

Any one of the following experiment may be set

1. Estimation of protein by Biuret method.
2. Estimation of Ca+ in serum.
3. Estimation of iron in drumstics
4. Estimation of creatinine in serum
5. Estimation of uric acid in urine

PART C 15 Marks

Viva

SCHEME OF VALUATION

(ASSESMENT OF EXPARIMENTAL RESULTS)

CLASS RECORDS :

i) For conducting and recording 5 experiments = 07 marks.

4 experiments = 06 marks

Less than 4 experiments = 04 marks

ii) For accuracy and neatness = 03 marks.

PART A

Principle- 7 Marks

Procedure- 8 Marks

PART B

Assessment of experimental results for colorimetric estimation

Preparation standard and working solution - 5 Marks

Distribution of marks for assay

1. Tabular column	5 Marks
2. For conduction of experiment	5 Marks
3. Graph	5 Marks
4. Result	
Up to 10% error	10 Marks
Up to 15% error	8 Marks
Up to 20% error	6 Marks
Any other value	4 Marks

Assessment of experimental results for Calcium estimation

Preparation of standard solution and calculation of the normality - 6 Marks

Discripancy	Standardization	Estimation
0.1 ml	10 Marks	10 Marks
0.2 ml	8 Marks	8 Marks
0.3 ml	6 Marks	6 Marks
Any other value	4 Marks	4 Marks
Calculation	2 Marks	2 Marks

PART C

Five questions 5x 3 = 15 Marks

IV SEMESTER PRACTICAL EXAMINATION
BIOCHEMICAL TECHNIQUES

PRACTICAL IV

SCHEME OF EXAMINATION

SCHEME OF EXAMINATION

DURATION: 3 Hours

Maximum Marks: 70

Practical proper: 60

Record marks: 10

NOTE:- Candidates are required to submit the records duly signed by the teacher-in charge and certified by the Head of the Department

PART A 15 Marks

The candidate has to write procedure with tabular column for one experiment in the first 15 min. Then the examiner has to put his/her signature and value the paper at the end of the examination

1. Identification of amino acids by circular paper chromatography.
2. Identification of amino acids by asending Paper chromatography
3. Separation of phospholipids by thin layer chromatography.
4. Separation of leaf pigments by column chromatography
5. Separation of proteins by PAGE

PART B 30

Marks

Any one of the following experiment may be set

1. Identification of amino acids by circular paper chromatography.
2. Identification of amino acids by asending Paper chromatography
3. Separation of phospholipids by thin layer chromatography.
4. Separation of leaf pigments by column chromatography

PART C 15

Marks

Viva

SCHEME OF VALUATION

(ASSESMENT OF EXPARIMENTAL RESULTS)

CLASS RECORDS :

i) For conducting and recording 5 experiments = 07 marks.
4 experiments = 06 marks
Less than 4 experiments = 04 marks

ii) For accuracy and neatness = 03 marks.

PART A

Principle- 7 Marks

Procedure- 8 Marks

PART B

1. Principle and Procedure writing……12 marks

2. For development of Chromatogram…… 12 marks

3. For correct identification……6marks

PART C

Viva- Five questions 5x 3 = 15 Marks

V SEMESTER PRACTICAL EXAMINATION

FOOD AND NUTRITION

PRACTICAL V

SCHEME OF EXAMINATION

SCHEME OF EXAMINATION

DURATION: 3 Hours

Maximum Marks: 70

Practical proper: 60

Record marks: 10

NOTE:- Candidates are required to submit the records duly signed by the teacher-in charge and certified by the Head of the Department

PART A 15 Marks

The candidate has to write procedure with tabular column for one experiment in the first 15 min. Then the examiner has to put his/her signature and value the paper at the end of the examination

1. Identification of Sugars in fruit juice using paper chromatography.
2. Proximate analysis of food samples- Moisture, fibre, protein fat and carbohydrate (by difference) (3 experiments)
3. Detection of adulterants in food.

PART B 30 Marks

Any one of the following experiment may be set

1. Estimation of haemoglobin in blood.
2. Determination of nature of inhibition of alkaline phosphatase by cysteine.
3. Determination of proteins by dye binding assay.
4. Estimation of Calcium in ragi.
5. Estimation of Vitamin – C in lemon or gooseberries by DPPH method

.

PART C 15 Marks

Viva

SCHEME OF VALUATION

(ASSESMENT OF EXPARIMENTAL RESULTS)

CLASS RECORDS :

i) For conducting and recording 5 experiments = 07 marks.
4 experiments = 06 marks
Less than 4 experiments = 04 marks

ii) For accuracy and neatness = 03 marks.

PART A

Principle- 7 Marks

Procedure- 8 Marks

PART B

Assessment of experimental results for colorimetric estimation

Preparation standard and working solution - 5 Marks

Distribution of marks for assay

1. Tabular column	5 Marks
2. For conduction of experiment	5 Marks
3. Graph	5 Marks
4. Result	
Up to 10% error	10 Marks
Up to 15% error	8 Marks
Up to 20% error	6 Marks
Any other value	4 Marks

Assessment of experimental results for Calcium and vitamin C estimation

Preparation of standard solution and calculation of the normality - 6 Marks

Discripancy	Standardization	Estimation
0.1 ml	10 Marks	10 Marks
0.2 ml	8 Marks	8 Marks
0.3 ml	6 Marks	6 Marks
Any other value	4 Marks	4 Marks
Calculation	2 Marks	2 Marks

PART C

Viva- Five questions 5 x 3 = 15 Marks

VI SEMESTER PRACTICAL EXAMINATION

APPLIED BIOCHEMISTRY
PRACTICAL VI

SCHEME OF EXAMINATION

SCHEME OF EXAMINATION

DURATION: 3 Hours

Maximum Marks: 70

Practical proper: 60

Record marks: 10

NOTE:- Candidates are required to submit the records duly signed by the teacher-in charge and certified by the Head of the Department

PART A 15 Marks

The candidate has to write procedure with tabular column for one experiment in the first 15 min. Then the examiner has to put his/her signature and value the paper at the end of the examination

1. Effect of temperature on the Viscosity of DNA using Oswald's viscometer.
2. Extraction of RNA from yeast.
3. Immobilization of enzymes/ cells by entrapment in alginate gel
4. Demonstration of ELISA

PART B 30

Marks

Any one of the following experiment may be set

1. Estimation of DNA by diphenylamine method.
2. Assays of SGPT and SGOT in serum.
3. Estimation RNA by Orcinol method.
4. Determination of total protein and A/G ratio in serum.
5. Estimation of serum phospholipids.
6.

PART C 15

Marks

Viva

SCHEME OF VALUATION

(ASSESMENT OF EXPARIMENTAL RESULTS)

CLASS RECORDS :

i) For conducting and recording 5 experiments = 07 marks.
4 experiments = 06 marks
Less than 4 experiments = 04 marks
ii) For accuracy and neatness = 03 marks.

PART A

Principle- 7 Marks

Procedure- 8 Marks

PART B

Assessment of experimental results for colorimetric estimation

Preparation standard and working solution - 5 Marks

Distribution of marks for assay

1. Tabular column 5 Marks
2. For conduction of experiment 5 Marks
3. Graph 5 Marks
4. Result
   - Up to 10% error 10 Marks
   - Up to 15% error 8 Marks
   - Up to 20% error 6 Marks
   - Any other value 4 Marks

PART C

Viva- Five questions 5 x 3 = 15 Marks

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DEPARTMENT OF MICROBIOLOGY

Revised Scheme of Instruction For B.Voc- Food Processing and Engineering 2016-17									
General Education Component									
NSQF/ NVE QF Level	**Vocational Qualification**	**Semester**	**Title**	**L:T:P**	**Theory Hours**	**Tutorial Hours**	**Practical Hours**	**Total Hours**	**Credits**
Level- IV	**Diploma**	Semester-I	Fundamentals of Microbiology	2:0:1	30	0	15	45	3
Level- V		Semester-II	Microbial Physiology And Metabolism	2:0:1	30	0	15	45	3
Level- VI	**Advanced Diploma**	Semester-III	Food Microbiology	2:0:1	30	0	15	45	3
		Semester-IV	Immunology	2:0:1	30	0	15	45	3
Level- VII	**Degree**	Semester-V	Pathogenic Microbiology	4:0:2	60	0	30	90	6
		Semester-VI	Medical Microbiology	4:0:2	60	0	30	90	6

Paper code: FPA520 **MICROBIOLOGY** **30hours-2 Credits**

I B.Voc., I Semester

TITLE: FUNDAMENTALS OF MICROBIOLOGY

Course outcome:

After successful completion of this course students are able to:

CO1: Gain basic knowledge about Microbiology starting from history to Microorganisms.

CO2: Various Culture media and their applications and also understand various physical and chemical means of sterilization.

CO3: Know about microbial techniques for isolation of pure cultures of bacteria.

CO4: To identify the bacteria based on staining and cultural characteristics.

CO5: Able to perform routine culture handling tasks safely and effectively.

CO6: The maintenance and preservation of cultures.

UNIT-I **10Hrs**

1. History: Contributions of - Antony van Leeuwenhoek,Edward Jenner, Louis Pasteur, Robert Koch, Dmitry Iwanowski, Alexander Fleming (in brief).
   Development and scope of Microbiology. Branches of Microbiology.
2. Microscopy: Types of Microscope, Construction and working principle of bright field microscope. Dark field, fluorescence and phase contrast microscopy(application). Electron microscopy- Types, applications and their limitations.
3. Staining technique: Types of stains, Principle of Simple, negative and differential staining techniques (gram's staining).

UNIT-II **06hrs**

Sterilization technique: Definition – Sterilization, disinfection, antiseptic, antibiosis, Fungicide, Bactericide.

A. Physical methods:

a) Heat – i) Dry heat – Hot air

ii) Moist heat method – Autoclave and Pressure cooker

b) Filtration–Types of filters: Membrane filter, Hepa filter (e.g., Laminar air flow)

c) Radiation methods – UV rays, Gamma rays and Cathode rays

B. Chemical method: Use and mode of action of- Alcohols, Aldehydes, Halogens and Phenols.

UNIT-III **06hrs**

Media – Types, Pure culture and Cultural characteristics: Serial dilution, pure culture by isolation – Pour plate, Spread plate, Streak plate and Micromanipulator techniques . Colony characteristics – plate cultures/solid media and broth cultures/liquid media. Maintenance and Preservation of pure cultures – Sub culturing, overlaying with mineral oil, Refigeration

(4^0C) Lyophilization and cryopreservation.

UNIT-IV **08hrs**

1. Comparative account of Prokaryotic and eukaryotic cell**.** Systems of classification: Haeckel's three-kingdom,Whittaker's five-kingdom and Cavalier-Smith's eight kingdom classification.
2. General characteristics of bacteria, fungi, actinomycete, virus, protozoa and algae. Organization of cell wall, cell membrane, flagella capsules and formation of spores in bacteria.
3. Bacteriophages : Morphology and multiplication(T-4 phage)

PRACTICALS **15 Hrs -1 Credit**

1. Staining and mounting of algae and fungi **3Hrs x1**
2. Simple,Negative and Gram's staining **3Hrs x1**
3. Preparation of culture media- Nutrient agar, PDA and NB **3Hrs x1**
4. Methods of obtaining pure cultures of microorganism-Spread plate, pour plate and streak plate and subculturing **3Hrs x1**
5. Isolation of microorganisms from soil by serial dilution technique (Bacteria and Fungi) **3Hrs x1**

Paper code: FPB520 **MICROBIOLOGY** **30hours-2 Credits**

I B.Voc.,II Semester

TITLE: MICROBIAL GROWTH AND METABOLISM

Enable the students to have sound knowledge about:

CO1. Inculcate the knowledge regarding microbial growth, functions, physiology and metabolism.

CO2. Understand the microbial transport systems and microbial metabolism

CO3. Know the microbial growth in response to environmental factors.

CO4. Get equipped with various methods of bacterial growth measurement.

CO5. Knowledge of properties, structure, function of enzymes, enzyme kinetics and their regulation.

UNIT: I **08Hrs**

1. Major nutritional type of Microorganisms.
2. Nutritional requirements of Microorganisms. Elementary nutrients: Carbon, Nitrogen, Sulphur, Oxygen and Energy sources, Vitamins and Growth factors.
3. Uptake of nutrients: Diffusion- Simple and Facilitated, Active transport (use of Proton motive force, ATP : ABC transporter), Group translocation, Iron uptake.

UNIT: II **07Hrs**

1. Definition, Growth rate and generation time. The growth curve in batch culture - Phases of growth and their significance.
2. Physical and chemical factors affecting growth-Temperature, pH, Oxygen and saline (water activity) Requirements. Measurement of growth by cell number (Haemocytometer) and cell mass (Turbidometer).

UNIT:III **05Hrs**

Microbial Enzymes: Definition, Nomenclature, Classification, Properties, Mode and Mechanism of enzyme action, Factors effecting enzyme action. Cofactors and Coenzymes.

UNIT:IV **10Hrs**

Aerobic respiration: Definition, Sugar degradation pathways - EMP, HMP and ED pathways. Ultra structure of Mitochondrion, Formation of acetyl CoA from pyruvate, TCA cycle, Electron transport system and Oxidative phosphorylation

Anaerobic respiration: Introduction, Anerobic respiration with special reference to dissimilatory Nitrate reduction. (Denitrification; nitrate /nitrite and nitrate/ammonia respiration; fermentative nitrate reduction) Fermentation - Alcohol fermentation and Pasteur effect; Lactate fermentation (homofermentative and heterofermentative pathways).

PRACTICALS

15 hours– 01 Credit

1. Effect of temperature and pH on growth of bacteria. **3Hrs x1**
2. Acid and gas production from carbohydrates- Demonstration of fermentation of lactose **3Hrs x1**
3. Turbidimetric/spectrophotometric monitoring of growth using liquid cultures **3Hrs x1**
4. Cell counting by Haemocytometer **3Hrs x1**
5. Starch hydrolysis **3Hrs x1**

Paper code: FPC520 MICROBIOLOGY 30hours-2 Credits

II B.Voc.,III Semester

TITLE: FOOD MICROBIOLOGY

Enable the students to get sufficient knowledge about:

CO1.Food related microorganisms, their contamination, spoilage and preservation

CO2. The significance and activities of microorganisms in food

CO3. Understand the food borne intoxication and infections.

CO4. Learn about food safety and quality control.

CO5. The principles involving various methods of food preservation.

UNIT:I 10Hrs

1. Introduction to Food Microbiology: Definition, Concept and Scope. Food as a substrate for microorganisms. **.**
2. Contamination, preservation and spoilage in various foods viz. – fruits and vegetables, canned foods, cereals and cereal product(cereal grains, flour, bread, pasta, macroni), sugars & sugars products (Honey, Candy), Meat (Fresh meat, fish), Milk and Milk products (cheese, butter).

UNIT:II 05Hrs

1. Methods of food preservation: Physical method – high temperature, low temperature, canning. Drying – solar drying, drum drying, spray drying. Radiation.
   Chemical methods – chemical preservatives – salient features of the chemical preservatives (propionates, benzoate, sorbates, nitrates and nitrites, sulphur dioxide and sulphates, sugar and salt)

UNIT:III 05Hrs

1. Food borne intoxication and infection:
   Bacterial intoxication- Botulism,
   Bacterial infection- Salmonellosis.
   Mycotoxin – Origin, types and importance of toxins with reference to Aflatoxins.

2.. Food safety and quality control. –A brief account on FPO, HACCP, Food laws and Food standards (in brief)

UNIT:IV 10Hrs

1. Microorganisms of industrial importance. Biology of industrial microorganisms: Isolation, Screening, Improvement and Preservation.
2. Raw materials-Molasses, corn steep liquor, sulphite waste liquor and whey. Buffers, Precursors, Inhibitors and Antifoam agents.

3. Fermenters and fermentation process: Design, types and basic function of fermenters, Fermentation process – Surface, Submerged and Solid state fermentation. Types- Batch and Continuous fermentation.

4.Yeasts (Baker's) and its uses, Production of : Wine , Alcohol and lactic acid.

PRACTICALS **3hrsX5 practicals**

1. Isolation and identification of fungi from spoiled fruits and vegetables **3hrsx1**
2. Isolation and enumeration of bacteria from spoiled fruits and vegetables **3hrsx1**
3. Production of citric acid using *Aspergillus niger*. **3hrsx1**
4. Estimation of lactic acid in milk **3hrsx1**
5. Preparation of alcohol using jaggery or molasses. **3hrsx1**

Paper code: FPD520 **MICROBIOLOGY** **30hours-2 Credits**

II B.Voc.,IV Semester

TITLE: IMMUNOLOGY

The course provides a solid foundation to understand:

CO1. Demonstrate and understanding the key concepts in immunology.

CO2. Understand the overall organization of the immune system.

CO3. To make them understand the salient features of antigen antibody reaction & its uses in diagnostics and various other studies.

CO4 .Learn about immunization , preparation and its importance.

UNIT-I **10 hrs**

Introduction and history of Immunology,

Innate immunity- Physical Barriers, Biochemical, Cellular, Genetic factors, Body temperature, inflammation and fever

Acquired Immunity- Active & Passive Immunity,

Immune organs and cells: Primary lymphoid organs (Thymus, Bone marrow) & Secondary Lymphoid organs (Lymphnodes, Spleen and tonsils). Mucosa Associated Lymphoid tissue (MALT).

Immune cells- Role of immune cells. Stem cells. Lymphocytes- B lymphocytes-lymphocytes and Null cells. Types of T-cells. Macrophages: Types and function of macrophages.

Immune Response: Humoral Immune Response, Cell Mediated Immune response and Mechanism of AMI and CMI

UNIT-II **05 hrs**

Antigens: Nature and types.

Antibodies: Basic structure of immunoglobulin-IgG, Biological properties of immunoglobulins, Monoclonal antibodies. Function and type of antibodies.

UNIT-III **08 hrs**

Antigen- Antibody reactions: Salient features of Antigen-Antibody reaction. Precipitation reaction**:** Immunodiffusion test, Wasserman's test, RPR Test. Agglutination reaction: Blood grouping, Widal test. Complement fixation tests, Opsonization, Immunotechniques: ELISA

UNIT-IV **07 hrs**

Immunoprophylaxis: Types of vaccines- Live and Attenuated (Bacterial and Viral) and Toxoid with an example each. National Immunization program (Tabular form).

PRACTICALS **3hrsX5=15 practicals**

1. Demonstration of Immune organs (through photographs).
2. Demonstration of Immune cells in the smears prepared from Immune organs. (through photographs)
3. Agglutination- Blood Grouping test
4. Precipitation: Immunodiffusion test –ODD

5. Precipitation: Immunodiffusion test –RID

Paper code: FPE520 MICROBIOLOGY 60 hours -4 Credits

III B.Voc., V Semester

TITLE: PATHOGENIC MICROBIOLOGY

The course provides a solid foundation to understand:

CO1. The human immune response towards microbes in medical microbiology

CO2. Knowledge is gained about the relationship between microorganism and human disease, pathogenicity, Laboratory diagnosis, treatment and prophylaxis.

UNIT-I 20 Hrs

Introduction to important diseases caused by Streptococcus, Pneumococcus, Neisseria, Corynebacterium, Bacillus, Clostridium, Enterobacteriaceae (Proteus, Shigella, Salmonella), Vibrio, Yersinia, Hemophilus, Mycobacterium, The operative pathogenic mechanisms, laboratory diagnosis, prevention and control of these diseases.

UNIT-II 15 Hrs

Morphology, pathogenesis, life cycle, laboratory diagnosis, prevention and control of viral diseases viz. Rabies, Polio, Small pox, Herpes, Measles, Influenza and AIDS.

UNIT-III 15 Hrs

Introduction to Human mycotic infections vizCryptococcosis, Dermatophytosis, Blastomycosis, Opportunisitc Mycosis; Candidiasis and Aspergillosis.

UNIT-IV 10 Hrs

Life cycle, pathogenic, mechanisms and control of parasitic infections viz. amoebiasis, Kala-azar, toxoplasmosis, ascariasis, filarasis, hook worm infections.

PRACTICALS 3 hrsX10 practicals

1- 4. Identification of both gram positive and gram negative microorganisms on the basis of :

(i) Morphology.

(ii) Bio-chemical characteristics.

(iii) Serological reactions.

5.Stainings – Alberts, ZNCF.

6-7. Demonstration of pathogens (Viruses, fungi, parasites) through photographs/ permanent mounted slides.

8-9. Demonstration of cysts/ovas of protozoa/Helminths through photographs.

10. Isolation of dermatophytes from human skin.

Paper code: FPF520 **MICROBIOLOGY** **60 hours -4 Credits**

III B.Voc., VI Semester

TITLE: MEDICAL MICROBIOLOGY

Course outcome

On successful completion of this course the student will gain knowledge about:

CO1. Health clinics such as examination, collection of clinical samples and diagnosis.

CO2. Beneficial and harmful effect of normal flora

CO3. Host pathogen interaction

CO4. Determining level of antimicrobial activity and Mechanism of action of antimicrobial agents

UNIT-I **15 Hrs**

Brief introduction to terminology of Infectious diseases, Frequency of disease- morbidity and mortality rate. Characteristics of infectious disease.

Infections – Classification, sources, mode of transmission and types of infections.

Disease cycle –Sources, reservoirs, carriers and transmission of pathogen. Emerging (HIV/AIDS, Avian influenza) and reemerging (Tuberculosis, Malaria) Infectious diseases, Global travel & Health considerations.

UNIT-II **15 Hrs**

Normal flora of human body –Resident flora and transient flora. Beneficial and harmful effect of Normal Flora. Distribution and occurrence of Normal Flora of Skin, Eye, Respiratory Tract, Mouth, Intestinal Tract & Genitourinary Tract. Germfree and Gnotobiotic Life.

UNIT-III **10 Hrs**

Host pathogen interaction –Factors predisposing to microbial pathogenicity- Virulence, Exaltation and attenuation. Determinants of virulence-transmissibility, adhesion, invasiveness, toxigenicity-exotoxins and endotoxins. Avoidance of host defence mechanism.

UNIT-IV **20 Hrs**

Development of chemotherapy, General characteristics of antimicrobial drugs, Determining level of antimicrobial activity, Mechanism of action of antimicrobial agents, factors influencing the effectiveness of antimicrobial drugs, Antibacterial drugs viz Sulfonamides,Streptomycin, Quinolones, Penicillins, Cephalosporins, Tetracyclines, Erythromycin, Chloramphenicol, Drug Resistance, Antifungal and Antiviral drugs.

PRACTICALS : 10X3Hrs **30 Hrs -2 Credits**

1. Sterilization – Introduction to autoclave, hot air oven, filter sterilization.
2. Microbial flora off mouth-teeth crevices
3. Estimation of urine bacteria by calibrated loop method-Direct streak method.
4. Normal flora of human skin
5. Antibiotic sensitivity test
6. Streptomycin resistant mutant strain isolation by gradient plate technique

7. Identification of enteric pathogens using triple sugar iron agar medium
8.Determination of susceptibility to dental caries by synder test
9.Evaluation of antiseptics by filter paper disk method
10.Study of antimicrobial drugs as per theory syllabus.

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PATTERN OF QUESTION PAPER FOR B.VOC
SUBJECT: MICROBIOLOGY
(THEORY:I SEMESTER TO VI SEMESTER)

Time: 3hours Max marks: 70

I. Define/Explain any ten in one/two sentences: 3X10=30
(Twelve questions to be given and ten to be answered)
1
2
3
4
5
6
7
8
9
10
11
12

II Answer any FOUR of the following: 4X4=16
(Six questions to be given and four to be answered)-short answer type

13
14
15
16
17
18

III (Three essay type questions- with all internal choices) 8X3=24
19
20
21

Test+ Assessment (C-1+C-2) = 30 (15+15)

SCHEME OF PRACTICAL EXAMINATION

I B.Voc., I SEMESTER: PRACTICAL- I

Time: 3hours **Max marks: 70**

I. Write critical notes on **A, B** and **C** 5X3=15

(Stains, Media, Pure culture plates) as per syllabus

II. Stain the given material D by…….method. Write the principle, procedure and leave the preparation for evaluation.

(Simple staining/Gram-staining/Wet mounting of Algae and fungi/Negative staining)

(Preparation-10marks; Principle and Procedure-10 marks) 20

III Demonstrate/ Perform the experiment E giving the principle and procedure. Record the result. 25

(Demonstration- 10 marks; principle-5mark; procedure-5marks; result-05)

(Serial dilution/ Pour plate/Spread plate/Streak plate/subculturing)

IV. Record. 10

……

……

SCHEME OF PRACTICAL EXAMINATION

I B.Voc.,II SEMESTER: PRACTICAL- II

Microbial physiology and Metabolism

Time: 3hours **Max marks: 70**

I. Write critical notes on **A, B** and **C** 5X3=15

(Haemocytometer, Effect of temperature and pH, Acid and gas production from carbohydrates, Turbidimetry/spectrophotometry, Starch hydrolysis.)

II. Demonstrate/ Perform the experiment **A** giving the principle and procedure. Record the result. 20

(Cell counting by Haemocytometer)

(Preparation-10marks; Principle and Procedure-10 marks)

III Demonstrate/ Perform the experiment **A** giving the principle and procedure. Record the result. 25

(Demonstration- 10 marks; principle-5mark; procedure-5marks; result-05)

(Acid and gas production from carbohydrates, Starch hydrolysis ,Effect of temperature and pH)

IV. Record. 10

SCHEME OF PRACTICAL EXAMINATION
II B.Voc.,III Semester
FOOD MICROBIOLOGY

Time: 3hours. **Max.marks:70**

I. Demonstrate / Perform the experiment **A**, giving principle and procedure.Record and interpret the result.

(Demonstration -10marks; principle-5marks;procedure-3marks;results and interpretation-2marks).

(Isolation of microorganisms from spoiled vegetables/spoiled fruits). 25

II. Conduct the test for **B**. Write the principle and procedure. Record and interpret the results.

(Demonstration -10 marks; principle-5marks; procedure-3marks; results and interpretation-2marks). (Estimation of lactic acid in milk,Estimation of citric acid) 20

III. Write critical notes on **C, D** and **E**. (Identification -1mark; critical comments-1marks).

(Citric acid production, Estimation of lactic acid in milk,alcohol from jaggarey) 5X3=15

IV Record 10

……..

SCHEME OF PRACTICAL EXAMINATION
II B.Voc.,IV Semester
IMMUNOLOGY

Time:3hours **Max.marks:70**

I. Demonstrate / Perform the experiment **A**, giving principle and procedure. Record and interpret the result.

(Demonstration -10marks; principle-5marks;procedure-5marks;results and interpretation-5marks).

(Determination of blood group and Rh factor /Demonstration of RID ,ODD). 25

II. Demonstrate the experiment **B.** write the principle and procedure. Record and interpret the results.

(Demonstration -10marks; principle-5marks;procedure-3marks;results and interpretation-2marks).

(Blood grouping, ODD, RID) 20

III. Write critical notes on **C, D**, and **E**. (Identification -1mark; critical comments-1marks)

(Immune organs and immune cells) as per syllabus 5x3=15

IV Record 10

SCHEME OF PRACTICAL EXAMINATION
III B.Voc.,V Semester
PATHOGENIC MICROBIOLOGY

Time:3hours **Max.marks:70**

I. Demonstrate / Perform the experiment **A**, giving principle and procedure.Record and interpret the result.
(Demonstration -10marks; principle-5marks; procedure-5marks;results and interpretation-5marks).
(Serological test, Biochemical test). 25

II. Stain the given material D by…….method. Write the principle, procedure and leave the preparation for evaluation.
(Morphology- Simple staining/Gram-staining/Negative staining)
(Preparation-10marks; Principle and Procedure-10 marks) 20

III. Write critical notes on **C, D**, and **E**. (Identification -1mark; critical comments-1marks)
(pathogens ,cysts,ovas of protozoa/helminths) as per syllabus 5x3=15

IV. Record 10

……

SCHEME OF PRACTICAL EXAMINATION
III B.Voc.,VI Semester
PATHOGENIC MICROBIOLOGY

Time:3hours **Max.marks:70**

I. Demonstrate / Perform the experiment **A**, giving principle and procedure.Record and interpret the result.
(Demonstration -10marks; principle-5marks;procedure-5marks;results and interpretation-5marks).
(Normal flora of skin, Antibiotic sensitivity test, Microbial flora off mouth-teeth crevices, Estimation of urine bacteria by calibrated loop method-Direct streak method, Evaluation of antiseptics by filter paper disk method, Determination of susceptibility to dental caries by synder test, TSIA test). 25

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II. Demonstrate the experiment **B.** write the principle and procedure. Record and interpret the results.
(Demonstration -10marks; principle-5marks;procedure-3marks;results and interpretation-2marks).
(Streptomycin resistant mutant strain isolation by gradient plate technique, Antibiotic sensitivity test,estimation of urine bacteria by calibrated loop method, Normal flora of skin, Antibiotic sensitivity test, Microbial flora off mouth-teeth crevices,TSIA test). 20

III. Write critical notes on **C, D**, and **E**. (Identification -1mark; critical comments-1marks)
(Results of Streptomycin resistant mutant strain isolation by gradient plate technique,Antibiotic sensitivity test,estimation of urine bacteria by calibrated loop method ,Normal flora of skin,mouth-teeth autoclave, hot air oven, filter sterilization, Antibiotics as per syllabus,TSIA test,Instruments) 5x3=15

IV .Report 10

Approved list of Paper setters

Sl No.	Name	College address
1.	Dr..M .Seema	Chairperson, Dept. of Microbiology JSS College, Ooty road, Mysore
2.	Dr..K.Sumana	Assistant prof. Dept. of Microbiology JSS College, Ooty road, Mysore
3	Dr.S.Mahadevamurthy	Associate Prof & HOD Dept. of Microbiology Yuvaraja's college Mysore.
4	Dr.Syeda Kauser Fathima	Associate Prof. of Microbiology Maharani's Science College for women JLB road Mysore.
5	Dr. H.S. Jayanth.	Asso.Prof.of Microbiology Dept. of Microbiology Yuvaraja's college Mysore.
6	Dr.Nagarathnamma	Asso. Prof. of Microbiology Government women college Mandya
7	Dr. Mashooda Begum	Asso.Prof.of Microbiology Maharani's Science College for women JLB road, Mysore.
8	Sri. M. Girish	Assistant prof. Dept. of Microbiology JSS College for Women Saraswathipuram,Mysore
9	Dr. P.K.Maheshwar	Assistant Prof. Dept. of Microbiology Dept. of Microbiology Yuvaraja's college,Mysore.
10	Smt. M.S.Shobha	Assistant Prof, Dept. of Microbiology Maharani's Science College Mysore
11	Sri. Shankaregowda	Asso.Prof.of Microbiology Government Science College Mandya
12	Sri. R.A. Manjunath	Assistant Prof. Dept. of Microbiology Saradavilas College,Mysore
13	Dr.M.P. Ragavendra	Assistant Prof. Dept. of Microbiology Maharani's Science College,Mysore
14	Dr.K.Girish	Assistant Prof.

		Dept. of Microbiology Maharani's Science College, Mysore
15	Sri. G.S. Siddegowda	Assistant Prof. Dept. of Microbiology Maharani's Science College Mysore
16	Smt. M.S. Poornima	Assistant Prof. Dept. of Microbiology Yuvaraja's College,Mysore
17	Dr.N.S.Devaki	Assistant Prof. Dept. of Molecular Biology Yuvaraja's College , Mysore
18	Syeda Farahna Parveen	Assistant Prof. Dept. of Microbiology St.Philomina's College, Mysore

19	Smt. Vanitha	Assistant Prof. Dept. of Microbiology Maharani's Science College,Mysore
20	Smt. Revanamba	Assistant Prof. Dept. of Microbiology Maharani's Science College,Mysore
21	Uzma Bathool	Assistant Prof. Dept. of Microbiology St.Philomina's College, Mysore
22	Mahadeva prasad	Assistant Prof. Dept. of Microbiology JSS College for Women Saraswathipuram,Mysore

DEPARTMENT OF COMPUTER SCIENCE

SEMESTER I

FPA 540 COMPUTER SCIENCE

PAPER - I

COMPUTER FUNDAMENTALS & DOS

(2 hrs theory / week) 30 hours - 2 Credits

CO1.Master the basic knowledge of applications of MS office package
CO2.Get the skill of office productivity tool
CO3.Learn the usage of internet
CO4.Skill to develop program using C language

SECTION- I **15 Hours**

INTRODUCTION

Computer, Characteristic of Computer, History of Computer, Generation of Computers, Components of Computer and Applications of Computers.

Key Factors of Computers: Hardware, Software - types of Software (Application and system), forms of software (firmware, shareware, freeware), Translator - Assembler, Compiler and Interpreters. Computer Application – Business, Scientific, Entertainment and educational.

CLASSIFICATION OF COMPUTERS

Mode of operations – Analog, Digital and hybrid Computers.

Size and capabilities – Micro, Mini, Main frame and Super computer.

MEMORY UNITS

Primary memory - RAM, ROM, PROM, EPROM, EEPROM, Flash memory, cache memory.

Secondary memory – Magnetic disk (Hard disk, Floppy disk, Zip disk, Jaz disk, Super disk), Optical disk (CD, CD – R, CD – RW, DVD).

COMPUTER PERIPHERALS DEVICES AND INTERFACES

Input devices – Working principle of Keyboard and mouse, Functional capabilities of Scanner, Digital Camera, OMR, OCR, touch pad, touch screen. Output Devices – Monitor, Printer, Plotter and projector.

PROGRAMMING LANGUAGES

Machine, Assembly language and High Level Language.

INFORMATION SYSTEM

Data and Information, types of information, what is an information System, Types of Information Systems — System development life cycle.

SECTION- II **15 Hours**

OPERATING SYSTEM AND THE USER INTERFACE

Operating System– Functions, services, Types-Batch, Single, Multiprogramming, and Multiprocessing.

Operating System – the user interface –running programs –managing hardware –enchaining the operating system with utility software- typical operating systems in use

COMPUTERS AND COMMUNICATION

Single user, multi-user, workstation, and client server systems. Computer networks, Types of Network LAN, WAN, Internet, Internet applications, WWW, Email, FTP, web browsers (Internet explorer, Google Chrome, Mozilla).

DISK OPERATING SYSTEM (DOS)

Introduction, History & version of DOS. DOS basics – physical structures of disk, drive, Name, FAT, File & Directory structure and Naming Rules, Booting Process, DOS System files, role of config.sys file.

DOS COMMANDS

Internal – DIR, MD, CD, RD, COPY, DEL REN, VOL, DATE, TIME, CLS, PATH, TYPE etc.

External – CHKDSK, XCOPY, PRINT, DISK COPY, DISKCOMP, DOSKEY, TREE, MOVE, LABEL, APPEND, FORMAT, SORT, FDISK, BACKUP, EDIT, MODE, ATTRIB, HELP, SYS, WILD CARD Characters etc.

Executable V/S Non executable Files in DOS.

TEXT BOOKS:

- Peter Norton's 'Introduction to Computers', Second Edition, TMH
- Computer Fundamentals – P K Sinha, BPB

REFERENCE BOOKS :

- Introduction to Computers – N Subramanian, TMH
- Understanding Computers – R Rajagopalan. TMH
- Computers Today – Donald Sanders, MGH

Practical

(1Hour per week X 15 Weeks = 15 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

SEMESTER II
COMPUTER SCIENCE
PAPER – II

FPB 550 **PROGRAMMING IN C**

(2 hrs theory / week) **30 hours - 2 Credits**

CO1.Master the basic knowledge of applications of MS office package

CO2.Get the skill of office productivity tool

CO3.Learn the usage of internet

CO4.Skill to develop program using C language

SECTION-I **15 Hours**

PROBLEM SOLVING TECHNIQUES

Problem Definition, Problem Analysis, Design of problem solutions and use of design tools, Algorithm, Flowcharts, Coding, Testing, Debugging, Program documentation.

INTRODUCTION TO C LANGUAGE

History Features and Applications of 'C ', Structure of C Program.

PROGRAMMING PRELIMINARIES

Character set, definitions and declarations of identifiers, Variables, Escape Sequence Characters.
Constants, Keywords, Data types with examples.

OPERATORS AND EXPRESSIONS

Various operators and expressions, Operator precedence with example programs.

INPUT-OUTPUT STATEMENTS

Various types of standard input output statements, standard mathematical functions, with example programs.

SECTION - II **15 Hours**

CONTROL STRUCTURES

Decision makes and branching statements, Decisions making and looping statements, break statement, continue statement and goto statement with example programs.

ARRAYS

Definitions and need of arrays, 1-d and 2-d arrays with example programs, introduction to multidimensional arrays.

STRING HANDLING

Declarations, Initialization, reading and writing of strings, operations and string functions with example programs, array of pointers to strings.

FUNCTIONS

Definitions and need of functions. Library functions, user defined functions in detail, function declaration and prototypes call by value, call by reference and functions and arrays, recursion, storage classes with example program.

STRUCTURE

Definition of structure, Array in Structures, Structure with Array, Difference between array and structure

TEXT BOOKS:

- Programming with ANSI C by: E. Balagurusamy

REFERENCE BOOKS :

- Let us C - Yashwanth kanetkar
- Computer concepts and C programming by - P. B. Kotur
- The Complete Reference C by Herbert Schildt

Practical

(1Hour per week X 15 Weeks = 15 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

Scheme of Examination

Sl. No	Semester	Paper	Marks for theory	Marks for internal assessment		Total
1	I	COMPUTER FUNDAMENTALS & DOS	70	C1 = 15 C2 = 15	30	100
2	II	PROGRAMMING IN C	70	C1 = 15 C2 = 15	30	100

Distribution of Internal assessment

1) **CLASS TEST (C1) -15 MARKS.**
2) **CLASS TEST (C2) -15 MARKS.**

} **= 30 marks**

Scheme of Practical Examination

Sl. No	Semester	Paper	Marks for Practical	Marks for Record	Marks for Viva	Total
1	I	COMPUTER FUNDAMENTALS & DOS	60	05	05	70
2	II	PROGRAMMING IN C	60	05	05	70

Pattern of Question Paper for B.Voc

Semester I
COMPUTER SCIENCE

Time : 2 Hrs 30 Mins Max Marks 70

1. Answer all the questions in one sentence or a word 5 X 1 = 5
   a. ----------
   b. ----------
   c. ----------
   d. ----------
   e. ----------

2. Tick the correct answer 5 X 1 = 5
   f. ----------
   g. ----------
   h. ----------
   i. ----------
   j. ----------

3. State whether the following statements are true or false 5 X 1 = 5
   a. ----------
   b. ----------
   c. ----------
   d. ----------
   e. ----------

4. Fill in the blanks with suitable answers 5 X 1 = 5
   a. ----------
   b. ----------
   c. ----------
   d. ----------
   e. ----------

5. Answer any ten of the following questions 10 X 3 = 30
   a. ----------
   b. ----------
   c. ----------
   d. ----------
   e. ----------
   f. ----------
   g. ----------
   h. ----------
   i. ----------
   j. ----------
   k. ----------

l. ----------

6. Answer any four questions of the following 4 X 5 = 20

a. ----------
b. ----------
c. ----------
d. ----------
e. ----------

Pattern of Question Paper for B.Voc
Semester II
COMPUTER SCIENCE

Time : 2 Hrs 30 Mins Max Marks 701. Answer all the questions in one sentence or a word 10 X 1 = 10

f. ----------
g. ----------
h. ----------
i. ----------
j. ----------
k. ----------
l. ----------
m. ----------
n. ----------
o. ----------

5. Answer any four of the following questions 4 X 5 = 20

f. ----------
g. ----------
h. ----------
i. ----------
j. ----------

6. Answer any four questions of the following 4 X 10 = 40

f. ----------
g. ----------
h. ----------
i. ----------
j. ----------
k. (Note- 10 Marks may be divided in to 6+4 or 5+5

FPA 020

FPA 020

I Semester

B.Voc Programme

Language kannada

Credits.3(45 hours)

¸Á»vÀå WÀlPÀ

12 UÀAmÉUÀ¼ÀÄ

1. PÁªÀå

1. AiÀiÁªÀ PÁ®zÀ ±Á¸ÀÛçªÉÃ£ÀÄ ºÉÃ½zÀgÉÃ£ÀÄ? - PÀÄªÉA¥ÀÄ
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1. ¤gÀAvÀgÀ ¤ÃjUÁV ¤AvÀ¯ÉèÃ Nl -£ÁUÉÃ±ï ºÉUÀqÉ
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¨sÁµÁ WÀlPÀ

3. DqÀ½vÀ ªÀÄvÀÄÛ ªÁtÂdÅå PÀ£ÀßqÀ 21 UÀAmÉUÀ¼ÀÄ

1. DqÀ½vÀ ¨sÁµÉAiÀiÁV PÀ£ÀßqÀ ¸ÀégÀÆ¥À ªÀÄvÀÄÛ ®PÀët
2. ¸ÀPÁðj ¥ÀvÀæ ¸ÀégÀÆ¥À – C¢üPÀÈvÀ eÁÕ¥À£À ªÀÄvÀÄÛ ¸ÀÄvÉÆÛÃ¯É
3. ««zsÀ jÃwAiÀÄ CfðUÀ¼ÀÄ - gÀeÉ, ªÉÃvÀ£À, §rÛ, ¥ÀzÉÆÃ£Àßw EvÀgÉ
4. ªÁtÂdå PÀ£ÀßqÀzÀ ¸ÀégÀÆ¥À ªÀÄvÀÄÛ ®PÀët
5. ªÁtÂdå ¥ÀvÀæzÀ ««zsÀ CAUÀUÀ¼ÀÄ
   ªÁtÂdå ¥ÀvÀæUÀ¼ÀÄ- «ZÁgÀuÁ ¥ÀvÀæ, DzÉÃ±À ¥ÀvÀæ, GzÀj¥ÀvÀæ, ªÀ¸ÀÆ° ¥ÀvÀæ, ¥ÀjZÀAiÀÄ ¥ÀvÀæ, ¥ÀgÁªÀÄ±Àð£À ¥ÀvÀæ, ªÀåªÀºÁgÉÆÃfÓªÀ£À ¥ÀvÀæ, ¥Àj¥ÀvÀæ

6. UÀtPÀzÀ°è PÀ£ÀßqÀ – PÀ£ÀßqÀzÀ CAvÀeÁð® vÁtUÀ¼ÀÄ- £ÀÄr, §gÀºÀ- ¥Áj¨sÁ¶PÀ ¥ÀzÀUÀ¼ÀÄ
7. ¨sÁµÁAvÀgÀ : ¸ÀégÀÆ¥À ªÀÄvÀÄÛ ®PÀët- PÀ£ÀßqÀ¢AzÀ EAVè¶UÉ- EAVè¶¤AzÀ PÀ£ÀßqÀPÉÌ

¥ÀgÁªÀÄ±Àð£À UÀæAxÀUÀ¼ÀÄ

1. ¸ÀªÀÄUÀæPÁªÀå - f J¸ï ²ªÀgÀÄzÀæ¥Àà
2. ©AzÀÄ ©A¢UÉ - ªÉÊzÉÃ»
3. ¥ÀQëPÁ² - PÀÄªÉA¥ÀÄ
4. ¸ÀªÀÄUÀæPÁªÀå - ¨ÉÃAzÉæ
5. ±ÀvÀÄæ«®èzÀ ¸ÀªÀÄgÀ - £ÁUÉÃ±ïºÉUÉØ
6. ªÁåªÀºÁjPÀ PÀ£ÀßqÀ - JZï J¸ï PÉ
7. DqÀ½vÀPÀ£ÀßqÀ - qÁ C±ÉÆÃPïPÀÄªÀiÁgï gÀAeÉÃgÀ

ªÀÄvÀÄÛ EvÀgÀgÀÄ

8. PÀbÉÃj PÉÊ¦r - PÀÄªÉA¥ÀÄ PÀ£ÀßqÀ CzsÀåAiÀÄ£À ¸ÀA¸ÉÜ
9. ¯ÉÃR£ÀPÀ¯É - J¸ï ¥ÀæºÁèzÀgÁªï
10. DqÀ½vÀ¨sÁµÉ PÉ®ªÀÅ «ªÀgÀUÀ¼ÀÄ - ¥ÀæzsÁ£À UÀÄgÀÄzÀvÀÛ

B.Voc Programme

Language kannada

I Semester

¥Àæ±Éß¥ÀwæPÉ ¸ÀégÀÆ¥À

3.00 UÀAmÉUÀ¼ÀÄ 70 CAPÀUÀ¼ÀÄ

«¨sÁUÀ-1

1. ¨sÁªÁxÀð §gÉ¬Äj : 1óó*5=5

C)

CxÀªÁ

D)

2. ¸ÀAzÀ¨sÀð ¸À»vÀ «ªÀj¹ 1óó*5=5

C)

CxÀªÁ

D)

3. PÉ¼ÀV£À ¥Àæ±ÉßUÉ GvÀÛj¹: 1*10=10

C)

CxÀªÁ

D)

«¨sÁUÀ-2

5. PÉ¼ÀV£À ¥Àæ±ÉßUÉ GvÀÛj¹: 1óó*10=10

C)

CxÀªÁ

D)

5. PÉ¼ÀV£À ¥Àæ±ÉßUÉ GvÀÛj¹: 1*10=10

C)

CxÀªÁ

D)

«¨sÁUÀ-3

6. LzÀPÉÌ n¥ÀàtÂ §gÉ¬Äj: 3*5=15

C)

CxÀªÁ

D)

7. PÉ¼ÀV£À ¥Àæ±ÉßUÉ GvÀÛj¹: 1*10=10

C)

CxÀªÁ

D)

9. PÀ£ÀßqÀPÉÌ ¨sÁµÁAvÀj¹: 1*5=5

10. EAVè¶UÉ ¨sÁµÁAvÀj¹: 1*5=5

FPB540

B.Voc- II Semester

Communicative English

No. of Credits : 3 No. of Instruction hrs : 3 / Week(45 hrs)

AIMS: 1) To familiarize students to basic English

2) To enable them to develop listening & speaking skills

OBJECTIVES: Students should be able to ___

1) Write English without grammatical errors
2) Speak English Language effectively and accurately
3) Listen and understand public announcements and news on TV & Radio

Module – 1 Grammar

		Marks	Hrs/ Week
1.	Subject and Verb Agreement	5	6
2.	Voice	5	5
3.	Articles	5	3
4.	Speech	5	6
5.	Question tag	5	5
6.	Framing of Questions	5	Q=05

Module – 2 Writing Skills

1.	Letter Writing Letter of Application/Letter of Grievances/Resume Preparation	10	4
2.	Comprehension	10	3
3.	Essay Writing	10	3

Module – 3 Speaking Skills

1.	Greeting		
2.	Requesting		
3.	Enquiring		
4.	Explaining	10	Q=05
5.	Reporting		
6.	Permission		
7.	Thanking		
		70	**45**

PAPER CODE **:FPB540**

B.Voc II SEMESTER

COMMUNICATIVE ENGLISH

MODEL QUESTION PAPER

TIME: 3 Hrs **MAX MARKS: 70**

Instructions to students: All sections are compulsory.

SECTION A

I Fill in the blanks with correct form of verbs: 5 X 1 = 05

a) Slow and Steady _____ the race.(to win)
b) Christians _____ to church on Sundays. (to go)
c) They have _____ the work. (to complete)
d) He _____ absent yesterday. (to be)
e) We _____ learning grammar now. (to be)

II Change the voice of the following sentences: 5 X 1 = 05

a) He is writing a poem.
b) We have won the match.
c) The poet took the second road.
d) A song will be sung by her.
e) Close the door.

III Fill in the blanks with suitable article: 5 X 1 = 05

a) My father is _____ MLA.
b) _____ earth moves round the sun.
c) The poet rejected ____ first road.
d) The Nyle is _____ long river.
e) Brutus was _____ honest man.

IV Change the speech of the following: 5 X 1 = 05

a) The King said to people," I am happy to be here".
b) Mother said to the child," Don't go near water".
c) Raju asked Rosie who she was.
d) Velan said to Venu," Why are you crying?"
e) The lady told the writer that he was very humorous.

V Add question tag to the following: 5 X 1 = 05

a) He is a good singer.
b) The poet observed the daffodils.
c) Behrman saves the life of Johnsy.
d) English is not a difficult language.
e) India has won the second test.

VI Frame questions so as to get the underlined words as answers: 5 X 1 = 05

a) <u>Shakespeare</u> wrote 'Macbeth'
b) Rama killed <u>Ravana</u>.
c) He goes to college <u>by car.</u>
d) The College starts <u>at 10.30 am</u>

e) Lear's daughters were selfish.

SECTION B P.T.O

VII Letter Writing: 10 X 1 = 10

a) Write a letter of application to the post of a Computer Programmer at SkillTec Ltd. Mysuru

OR

b) Prepare your resume.

VIII Read the following essay carefully and answer the questions set on it: 5 X 2 =10

I was wrong to think that city life is altogether unhealthy. Perhaps it was so at one time, now a days with proper roads, pavements and drainage systems, sickness is kept at bay. Cities are planned in such a way as to provide open space with parks and playgrounds for the benefit of the dwellers.

Even when sickness does strike, there are doctors and hospitals near at hand. This is not the case in the country where people frequently suffer and sometimes die for want of medical facilities.

1) What does the writer think of the city life?
2) What causes sickness?
3) Where do you find doctors and hospitals in plenty?
4) How does the passage distinguish between city and country life?
5) Give a suitable title to the passage.

IX Write an essay on one of the following: 10 X 1 = 10

a) Use and abuse of social media.
b) Role of students in nation building
c) Afforestation?

X Answer the following: 5 X 2 = 10

1. Write an imaginary conversation between a customer and Bank Manager regarding opening an account.
2. Write a dialogue between two friends who meet after a long time.

B.Voc II SEMESTER
COMMUNICATIVE ENGLISH
QUESTION PAPER SCHEME

TIME: 3 Hrs MAX MARKS: 70

Instructions to Students: All sections are compulsory.

SECTION A

I Fill in the blanks with correct form of verbs 5 X 1 = 05

a)
b)
c)
d)
e)

II Change the voice of the following sentences 5 X 1 = 05

a)
b)
c)
d)
e)

III Fill in the blanks with suitable article 5 X 1 = 05

a)
b)
c)
d)
e)

IV Change the speech of the following 5 X 1 = 05

a)
b)
c)
d)
e)

V Add question tag to the following 5 X 1 = 05

a)
b)
c)
d)
e)

VI Frame questions so as to get the underlined words as answers 5 X 1 = 05

a)
b)
c)
d)
e)

SECTION B

VII 10 X 1 = 10

1. Write a letter of application

OR

2. Prepare a Resume.

VIII Read the following essay carefully and answer the questions. 10 X 1 = 10

a)
b)
c)
d)
e)

IX Write an essay on one of the following: 10 X 1 = 10

a)
b)
c)

X Answer the following :(Dialogue writing) 5 X 2 = 10

1)
2)

FPC 550 INDIAN CONSTITUTION

COMMON PAPER TO ALL DEGREE CLASSES (FOR B.Voc 45 HOURS 3/WEEK)

70 MARKS

UNIT I **08 hrs**

a) Preamble of the Indian Constitution

b) Salient features of Indian Constitution

UNIT II **10 hrs**

a) Fundamental Rights

b) Fundamental Duties

c) Directive principles of State Policy

UNIT III **14 hrs**

a) President – Election Method, Powers and Functions

b) The Role of the Prime Minister

c) The Parliament – Structure, Power and Functions(Lok Sabha and Rajya Sabha)

d) Supreme Court – Organization and Jurisdiction

UNIT IV **13 hrs**

a) The Role of Governor in the Administration of State

b) Powers and Functions of the Chief Minister

c) Composition , Powers and Functions of both the Houses of State Legislature

d) High Court – Organization and Jurisdiction

TEXT BOOKS

- An introduction to the Constitution of India by M V Pylee
- Introduction to the Constitution of India by D D Basu
- Understanding the Constitution of India by Dr. H M Rajashekar
- Indian Constitution by Sommanna, Brahamananda, H B Mallikarjuna swamy,
- Indian Constitution by H T Ramakrishana, Rajiv

Sl. no.	Information Communication Technology	Hrs
1	The humanitarian supply chain – Definition, system of organizations, people, technology, activities, information and resources involved in moving a product or service from supplier to customer	5
2	Technology framework – Front-end services, Middleware services and Infrastructure services: Supporting the food assistance supply chain; Mapping technologies; Web portals	5
3	Mobile technologies - Combining hand-held and wireless communications technologies	5
4	Beneficiary identification - Challenges in food assistance to ensure that assistance goes to the right beneficiaries	5
5	ICT in emergencies – Requirement inputs of Food assistance interventions during emergencies	5
6	Linking the humanitarian supply chain - Ways in which WFP uses technology and technological techniques to fulfill its role as the provider of food assistance in development and emergencies	5

Sl. no.	Practical	Hrs
1.	Identification of software related to Food Processing and Engineering	3
2.	Practicing the use of software	6
3.	Requirement development for Food Processing Software	6

MODEL QUESTION PAPER

CODE NO: **FPC 570**

Semester - III

INFORMATION AND COMMUNICATION TECHNOLOGY

TIME: 3 hrs **Max marks: 70**

Instructions: Draw neat and labeled diagram wherever necessary.

PART-A

I. Write short notes for the following(any 5): (5x2=10)

1. ----------
2. ----------
3. ----------
4. ----------
5. ----------
6. ----------

PART-B

II. Answer any 4 of the following: (4x5=20)

1. ----------
2. ----------
3. ----------
4. ----------
5. ----------

PART –C

III. Answer any 4 of the following: (4x10=40)

IV.

1. ----------
2. ----------
3. ----------
4. ----------
5. ----------

INFORMATION AND COMMUNICATION TECHNOLOGY

PRACTICAL

SCHEME OF EXAMINATION

DURATION: 3 Hours

Maximum Marks: 70

Practical proper: 60

Record marks: 10

NOTE :- Candidates are required to submit the records duly signed by the teacher-in charge and certified by the Head of the Department

1. Identification of software related to Food Processing and Engineering.
2. Practicing the use of software.
3. Requirement development for Food Processing Software.

FPD 560 **DEPARTMENT OF ENVIRONMENTAL STUDIES**

(3 Hrs Theory / week) **3 Credits (45 Hrs)**

Environmental Studies (One-Semester Compulsory Core Module for B.Voc Programmes)

Unit 1: Environment and natural systems **4 hrs**

- Introduction to Environment and Environmental Studies
- Definition and Components of Environment, Relationship between the different components of Environment
- Man and Environment relationship
- Impact of technology on Environment, Environmental Degradation
- Multidisciplinary nature of the Environment studies
- Its scope and importance in the present day Education System

UNIT 2: Ecology and Ecosystems: **7 hrs**

- Introduction: Ecology- Objectives and Classification
- Concept of an ecosystem- structure and functions of ecosystem
- Components of ecosystem- Producers, Consumers, Decomposers
- Bio-Geo- Chemical Cycles- Hydrologic Cycle, Carbon cycle, Energy Flow in Ecosystem, Food Chains, Food webs ,Ecological Pyramids
- Major Ecosystems: Forest Ecosystem, Grassland Ecosystem, Desert Ecosystem, Aquatic Ecosystem, Estuarine Ecosystem**.**

Unit 3: Natural Resources **7 hrs**

Renewable and Nonrenewable resources, exploitation and conservation,

- Water resources: Surface and Ground water sources, Indian and Global scenario.
  Land as a resource, land use change and land degradation
- Forest resources: Definition and Classification of Forests
  Ecological and Economic importance and benefits of forest, Indian scenario,
  Deforestation: causes and effects, case studies remedial measures
- Food resources: Sources of food, Global and Indian food demand scenario,
  Limits of food production, Environmental effects of Agriculture
- Energy resources: Renewable and non renewable energy sources, use of alternate energy sources, growing energy needs, case studies
- Mineral resources: Definition and Classification of minerals, mining issues Case studies.
- Role of individual in conservation of natural resources.

Unit 4 : Biodiversity and its Conservation **6 hrs**

- Biodiversity : Definition, Levels of biological diversity : genetic, species and ecosystem diversity
- Biogeographic zones of India
- Hot spots of biodiversity
- Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational values
- Biodiversity patterns
- India as a mega-biodiversity nation

- Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions.
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT 5: Environmental pollution: 9 hrs

- Types of Environmental Pollution:
- Water Pollution: Introduction – Water Quality Standards, Sources of Water Pollution: Industrial Agricultural, Municipal; Classification of water pollutants, Effects of water pollutants, Eutrophication.
- b) Marine pollution: Causes, effects and control.
- c) Air Pollution: Composition of air, Structure of atmosphere, Ambient Air Quality Standards, Classification of air pollutants, Sources of common air pollutants like PM, SO2, NOX, Natural & Anthropogenic Sources, Effects of common air pollutants
- d) Soil Pollution: causes, effects and control.
- e) Noise Pollution: Introduction, Sound and Noise, Noise measurements, Causes and Effects
- f) Thermal Pollution: Causes, effects and control.
- g) Nuclear hazards and human health risks.
- Solid waste management: Control measures of urban and industrial waste.
- Role of individual in the prevention of pollution,Pollution case studies.

UNIT 6: Sustainable development and Environmental issues and Policies. 7 hrs

- Sustainable development: Meaning, changes in resource utilization, urbanization.
- Water conservation: watershed management and Rain water harvesting.
- Environmental issues: Climate change, global warming, acid rain, ozone layer depletion.
- Disaster management: floods, drought,earthquake, cyclones and landslides.
- Wasteland reclamation.
- Environment Protection Act: Air, Water, Wildlife (Prevention and Control of Pollution)
- Forest Conservation Act.
- Issues involved in enforcement of environmental legislation.
- Environment: rights and duties**.**

Unit 7 : Human Population and the Environment 5 hrs

- Population growth, Explosion, demographic variation among nations.
- Family welfare Program.
- Environment, human health and welfare; infectious and lifestyle diseases in contemporary world.
- Value Education: Environmental ethics.
- HIV/AIDS
- Women and Child welfare.
- Role of information technology in Environment and human health

Unit 8: Field visit 5 hrs

- Field work Visit to an area to document environmental assets :river/ forest/ grassland/ hill/ mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural.
- Visit to the solid waste treatment plant and water treatment plant.
- Video: The one degree • (Equal to 5 lectures)

REFERENCE BOOKS:

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha Second edition, 2013 Publisher: Universities Press (India) Private Ltd, Hyderabad.
2. Basics of Environmental Studies by Prof Dr N S Varandani, 2013 Publisher: LAP -Lambert Academic Publishing, Germany
3. Environmental Studies by Anindita Basak, 2009 Publisher: Drling Kindersley(India)Pvt. Ltd Pearson
4. Textbook of Environmental Studies by Deeksha Dave & S S Kateva , Cengage Publishers.
5. Environmental Sciences by Daniel B Botkin & Edward A Keller Publisher: John Wiley & Sons.
6. Environmental Studies by R. Rajagopalan, Oxford University Press
7. Environmental Studies by Benny Joseph, TMH publishers
8. Environmental Studies by Dr. Suresh K Dhameja, 2007 Published by : S K Kataria & Sons New Delhi
9. Basics of Environmental Studies by U K Khare, 2011 Published by Tata McGraw Hill.
10. Environmental Studies by N.Arumugam & V.Kumaresan, saras publication.

Scheme of Examination

Sl. No	Semester	Paper	Marks for theory	Marks for internal assessment	Total
1	Even sem	Environmental studies	70	30	100

ENVIRONMENTAL STUDIES (ONE-SEMESTER COMPULSORY CORE MODULE FOR B.VOC PROGRAMMES)

Scheme of examination

Question paper pattern

Sl.no	Types of questions	Marks	No. of questions	Total marks
1	Short notes	**2**	**5**	**10**
2	Medium type	**5**	**4**	**20**
3	Long answers	**10**	**4**	**40**
			Total	**70 marks**

Distribution of Internal assessment

3) **ASSIGNMENT/SEMINAR-15 MARKS.**
4) **CLASS TEST-15 MARKS.**

MODEL QUESTION PAPER

CODE NO: FPD 560 **COMMON TO EVEN SEMESTER**

ENVIRONMENTAL STUDIES

TIME: 3 hrs **Max marks: 70**

Instructions: Draw neat and labeled diagram wherever necessary.

PART-A

V. Write short notes for the following(any 5): **(5x2=10)**

7. ----------
8. ----------
9. ----------
10. ----------
11. ----------
12. ----------

PART-B

VI. Answer any 4 of the following: **(4x5=20)**

6. ----------
7. ----------
8. ----------
9. ----------
10. ----------

PART –C

VII. Answer any 4 of the following: **(4x10=40)**

6. ----------
7. ----------
8. ----------
9. ----------
10. ----------

FPD 580 **B.Voc Semester - IV**

Sl. no.	Biostatistics	Hrs
1.	Statistical concepts: Data structure, sampling methods, collection, classification and tabulation of data, graphical and diagrammatic representation, histogram, frequency polygon, frequency curve, bar graph, pie chart etc.	4
2.	Measure of Central Frequency: Mean, median, mode.	2
3.	Measure of dispersion of data: Range, semi-interquartile range, mean deviation, standard deviation, standard error, coefficient of variation, confidence limits.	5
4.	Types of distribution of data: Normal, Binomial, Poisson.	7
5.	Z-test, t-test, ANOVA, multiple comparisons, LSD and DMRT, Chi-square test.	4
6.	Regression estimate, correlation coefficient.	4
7.	Experimental designs, data transformation.	4

Sl. no.	Practical	Hrs
1.	Analytical Problems / calculations	15

MODEL QUESTION PAPER

Semester-IV

CODE NO: FPD 580

BIOSTATISTICS

TIME: 3 hrs **Max marks: 70**

Instructions: Draw neat and labeled diagram wherever necessary.

PART-A

VIII. Write short notes for the following(any 5): (5x2=10)

13. ----------
14. ----------
15. ----------
16. ----------
17. ----------
18. ----------

PART-B

IX. Answer any 4 of the following: (4x5=20)

11. ----------
12. ----------
13. ----------
14. ----------
15. ----------

PART –C

X. Answer any 4 of the following: (4x10=40)

XI.

11. ----------
12. ----------
13. ----------
14. ----------
15. ----------

IV SEMESTER PRACTICAL EXAMINATION

BIOSTATISTICS
PRACTICAL
SCHEME OF EXAMINATION

DURATION: 3 Hours
Maximum Marks: 70

Practical proper: 60

Record marks: 10

NOTE :- Candidates are required to submit the records duly signed by the teacher-in charge and certified by the Head of the Department

4. Analytical Problems / calculations.

Model Curriculum

Fruit Pulp Processing Technician

SECTOR: FOOD PROCESSING
SUB-SECTOR: FRUITS & VEGETABLES
OCCUPATION: PROCESSING
REF ID: FIC/Q0106, V1.0
NSQF LEVEL: 4

Skill India

FICSI

N·S·D·C National Skill Development Corporation
Transforming the skill landscape

Certificate

CURRICULUM COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

FOOD INDUSTRY CAPACITY AND SKILL INITIATIVE (FICSI)

for the

MODEL CURRICULUM

Complying to National Occupational Standards of
Job Role/ Qualification Pack: '**Fruit Pulp Processing Technician**' QP No. '**FIC/Q0106, NSQF Level 4**'

Date of Issuance: January 15, 2016
Valid up to: July 01, 2016
* Valid up to the next review date of the Qualification Pack

Authorised Signatory
(Food Industry Capacity and Skill Initiative)

TABLE OF CONTENTS

Fruit Pulp Processing Technician

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of a "Fruit Pulp Processing Technician", in the "Food Processing" Sector/Industry and aims at building the following key competencies amongst the learner

Program Name	**Fruit Pulp Processing Technician**		
Qualification Pack Name & Reference ID. ID	FIC/Q0106, v1.0		
Version No.	1.0	**Version Update Date**	12/01/2016
Pre-requisites to Training	Preferably Class 8 and 2-3 years' experience in a food processing unit		
Training Outcomes	The programme will help in building the following key competencies amongst the learner: • Process fruits to produce fruit pulps manually or through machine operation; • Plan, organize, prioritize, inspect, and calculate production requirements; • Maintain process parameters to achieve the desired quality and quantity; • Follow and maintain food safety and hygiene in the work environment		

This course encompasses 5 out of 5 National Occupational Standards (NOS) of "Fruit Pulp Processing Technician" Qualification Pack FIC/Q0106, Version 1.0 issued by Food Industry Capacity and Skill Initiative".

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1	**Introduction to the training program** **Theory Duration** (hh:mm) 00:30 **Practical Duration** (hh:mm) 00:00 **Corresponding NOS Code** Bridge Module	• Introduce each other and build rapport with fellow participants and the trainer.	White board/Chart papers, marker
2	**Overview of the "Fruit Pulp processing technician" Role** **Theory Duration** (hh:mm) 01:00 **Practical Duration** (hh:mm) 00:00 **Corresponding NOS Code**	• Understanding the roles and responsibilities of fruit pulp processing technician • Awareness of the nature and availability of job opportunities	Laptop/computer white board, marker, projector, chart papers
3	**Introduction to the Food Processing Industry** **Theory Duration** (hh:mm) 01:30 **Practical Duration** (hh:mm) 00:00 **Corresponding NOS Code**	• Define food processing • List the various sub sectors of food processing industry	Laptop, white/black board, marker, chart papers, projector ,Trainer's guide, Student manual
4	**Introduction to Fruit & Vegetable Processing** **Theory Duration** (hh:mm)	• State the need for fruit and vegetable processing • State the common methods of fruit and vegetable processing	Laptop, white/black board, marker, chart papers, projector, trainer's guide, student handbook, pictures/charts of

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	02:00 **Practical Duration** (hh:mm) 01:00 **Corresponding NOS Code**		different subsectors in fruit and vegetable processing e.g. pickle, jam and jelly, ketchup, juices, squashes, fruit pulp etc.
5.	**Overview of Fruit Pulp Processing** **Theory Duration** (hh:mm) 03:00 **Practical Duration** (hh:mm) 01:00 **Corresponding NOS Code** FIC/N0120 FIC/N0121 FIC/N0122 FIC/N0123	• Define fruit pulping • List the various fruits used for pulping • Describe the pulping process	Laptop/computer white board, marker, projector, chart papers, Trainer's guide , student handbook
6.	**Organizational standards and norms** **Theory Duration** (hh:mm) 05:00 **Practical Duration** (hh:mm) 01:00 **Corresponding NOS Code** FIC/N0120 FIC/N0121 FIC/N0122 FIC/N0123 FIC/N9001	• State the roles and responsibilities of a jam, jelly and ketchup processing technician • State how to conduct yourself at the workplace • State the personal hygiene and sanitation guidelines • State the food safety and hygiene standards to follow in an organization	Laptop, white board, marker, chart papers, projector, trainer's guide and student handbook, protective gloves, head caps, aprons, safety goggles, safety boots, mouth masks, sanitizer, safety manual
7.	**Prepare and Maintain Work Area and Process Machineries for pulp processing** **Theory Duration** (hh:mm)	• Identify different equipments used in fruit pulp processing • State the materials and equipments used in cleaning and maintenance of the work area and machineries • State the cleaning processes used to clean the work area	Laptop, white board, marker, chart papers, projector, trainer's guide and student handbook, authorized sanitizers, cleansers, all equipments for demonstration

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	08:00 **Practical Duration** (hh:mm) 15:00 **Corresponding NOS Code** FIC/N0120 FIC/N0121 FIC/N0122 FIC/N0123 FIC/N9001	• Demonstrate the use of different tools and machineries used for squash and juice • Demonstrate the appropriate method for cleaning and maintain a work area Ensure the work area is safe and hygienic for food processing • Identify and set the machines and tools required for production in working condition • Maintain cleanliness of the process machineries required for production using recommended sanitizers	
8.	**Food Microbiology** **Theory Duration** (hh:mm) 06:00 **Practical Duration** (hh:mm) 02:00 **Corresponding NOS Code**	• State the types of food microbes • State the causes of food spoilage • State the process of food spoilage state the criteria to check food spoilage • State the need for food preservation • State different types of food preservation processes • Explain the method of assessing the quality of produce based on physical parameters	Laptop, white board, marker, chart papers, projector, trainer's guide and student handbook, samples of fresh and spoiled food
9..	**Prepare for production of fruit pulp** **Theory Duration** (hh:mm) 06:00 **Practical Duration** (hh:mm) 12:00 **Corresponding NOS Code** FIC/N0121 FIC/N0122	• Use basic mathematics for various calculations in day-to-day processes • Plan the production schedule as per organizational standards and instructions • Organize for raw materials, packaging materials, manpower, equipment and machineries for the scheduled production • Identify the raw materials required for production as per production schedule and formation • State the methods for storing raw materials for later use • Plan the production sequence to maximize capacity, utilization of resources, manpower and machinery • Calculate batch size and prioritize urgent orders based on the production schedule and machine capacity	SOP; pH meter(Digital); Thermometer (Digital); Beakers; Measuring Cylinder; Measuring flask; Brinometer; Salinometer, Hydrometer; Weighing Balance (Digital); Brix Meter/ Refractometer; Deep fridge; refrigerator; Gas burner with cylinder; Fruit tray; Stainless steel mug; Pilfer proof capping machine; Cutting knives; mixer/electric mixer; water tank; fruit slicing machine; sealing machine; Vacuum gauge; pressure gauge; seam checking gauge or screw gauge; pressure cooker; coring Knives; Pitting knives;

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		• Check the conformance of raw material quality to company standards • Organize quality raw material as per production process and company standards • Check the raw material quality and grade • Prepare the raw material for production • List the effect on pulp of manhandling fruits	Juice extractor, crown corking machine; pulper; fruit mill; vacuum pan; mechanical peeler/ batch type of fruit and vegetable peeling; steam jacket kettle; baby boiler/ exhausting box; shredder for slicing of fruit and vegetable; liquid filling machine; Autoclaves S.S vessels with lids; micrometer; seam checking gauge; bottle brush washer;
10.	**Produce fruit pulp from various fruits** **Theory Duration** (hh:mm) 15:00 **Practical Duration** (hh:mm) 20:00 **Corresponding NOS Code** FIC/N0122	• Explain the process of pulping fruit Define ripening • Explain fruit ripening process • Demonstrate the process of ripening, sorting, and deseeding fruit • State the procedures used to create the fruit pulp • Demonstrate the process of fruit pulping • State the methods of sterilizing fruit pulp • List the quality control parameters for checking fruit pulp • State the basic categories of packing • State the various types of packaging materials used for packing fruit pulp • State the factors for selecting packaging materials • Explain aseptic packaging in fruit processing industry • Define canning and its purpose • State the process of canning • Demonstrate the canning process of fruit pulp • State the methods for storing raw materials for later use • Explain the process of storing packaged fruit pulp • State the process of maintaining storage conditions • Demonstrate the process of cleaning the work area and machineries after production organizational standards	SOP; pH meter(Digital); Thermometer (Digital); Beakers; Measuring Cylinder; Measuring flask; Brinometer; Salinometer, Hydrometer; Weighing Balance (Digital); Brix Meter/ Refractometer; Deep fridge; refrigerator; Gas burner with cylinder; Fruit tray; Stainless steel mug; Pilfer proof capping machine; Cutting knives; mixer/electric mixer; water tank; fruit slicing machine; sealing machine; Vacuum gauge; pressure gauge; seam checking gauge or screw gauge; pressure cooker; coring Knives; Pitting knives; Juice extractor, crown corking machine; pulper; fruit mill; vacuum pan; mechanical peeler/ batch type of fruit and vegetable peeling; steam jacket kettle; baby boiler/ exhausting box; shredder for slicing of fruit and

Sr. No.	Module	Key Learning Outcomes	Equipment Required
			vegetable; liquid filling machine; Autoclaves S.S vessels with lids; micrometer seam checking gauge; bottle brush washer; protective gloves, head caps, aprons, safety goggles, safety boots, mouth masks, sanitizer, safety manual
11.	**Complete documentation and record keeping** **Theory Duration** (hh:mm) 03:00 **Practical Duration** (hh:mm) 01:00 **Corresponding NOS Code** FIC/N0123	• State the need for documenting and maintaining records of raw materials, processes and finished products • State the method of documenting and recording the details of raw material to final finished product • Document daily records in the ERP system effectively	Laptop, white board, marker, chart papers, projector, trainer's guide and student handbook, logbooks, internal audit register, food safety manual, quality policy etc.
12.	**Food Safety, Hygiene and Sanitation** **Theory Duration** (hh:mm) 04:00 **Practical Duration** (hh:mm) 04:00 **Corresponding NOS Code** FIC/N9001	• State the importance of safety, hygiene and sanitation in the baking industry • Follow the industry standards to maintain a safe and hygiene workplace • Follow HACCP principles to eliminate food safety hazards in the process and products • Follow safety practices in the work area	Laptop, white board, marker, chart papers, projector ,trainer's guide and student handbook, protective gloves, head caps, aprons, safety goggles, safety boots, mouth covers, sanitizer, safety manual ,logbooks etc.
13.	**Professional and Core Skills** **Theory Duration** (hh:mm) 04:00 **Practical Duration** (hh:mm) 00:00	• Undertake a self-assessment test • Identify personal strengths and weaknesses • Plan and schedule the work order and manage time effectively to complete the tasks assigned • Prevent potential problems from occurring • Resolve issues and problems using acquired knowledge and realize the importance of decision making	Laptop, white/black board, marker, chart papers, projector ,Trainer's guide, Student manual

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Corresponding NOS Code	• Identify potential problems and make sound and timely decision • Improve your reading skills • State the importance of listening	
14.	**IT Skills** **Theory Duration** (hh:mm) 05:00 **Practical Duration** (hh:mm) 08:00 **Corresponding NOS Code**	• Identify parts of the computer • Use the computer keyboard effectively to type • Use computer applications effectively to record day-to-day activities • Use the word processor effectively • Use the spreadsheet application effectively • Use the computer to document day-to-day activities	Laptop, white/black board, marker, chart papers, projector, Trainer's guide, Student manual
15.	**Field Visits** **Theory Duration** (hh:mm) 05:00 **Practical Duration** (hh:mm) 19:00 **Corresponding NOS Code**	• Observe the factory location, layout and safety aspects of food processing • Observe the storage facilities for raw materials and finished products • Observe the various machineries used in pickle processing • Observe the various machineries used in pickle processing • Observe the cleaning methods and processes followed to maintain the process machineries and tools • Observe the raw materials used and their storage procedures • Observe the packaging and storage processes of raw material and finished product • Observe the post-production cleaning and maintenance process followed in the industry	All the tools and equipment listed above must be available at the site of field visit
16.	**Revision** **Theory Duration** (hh:mm) 05:00 **Practical Duration** (hh:mm) 01:00 **Corresponding NOS Code**	• Revised the knowledge gained so far	All the tools and equipment listed above must be available at the time of revision
17.	**Evaluation** **Theory Duration** (hh:mm) 08:00	• Assess the knowledge and skills acquired by the participants	All the tools and equipment listed above must be available for evaluation

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Practical Duration (hh:mm) 10:00 **Corresponding NOS Code**		
18.	**On-the-job Training** **Theory Duration** (hh:mm) 14:00 **Practical Duration** (hh:mm) 50:00 **Corresponding NOS Code**	• Apply the skills and knowledge acquired in the training program in the field	All the tools and equipment listed above must be available on the site at the time of OJT
	Total Duration **240:00** **Theory Duration** **95:00** **Practical Duration** **145:00**	**Unique Equipment Required**: SOP; pH meter(Digital); Thermometer (Digital); Beakers; Measuring Cylinder; Measuring flask; Brinometer; Salinometer, Hydrometer; Weighing Balance (Digital); Brix Meter/ Refractometer; Deep fridge; refrigerator; Gas burner with cylinder; Fruit tray; Stainless steel mug; Pilfer proof capping machine; Cutting knives; mixer/electric mixer; water tank; fruit slicing machine; sealing machine; Vacuum gauge; pressure gauge; seam checking gauge or screw gauge; pressure cooker; coring Knives; Pitting knives; Juice extractor, crown corking machine; pulper; fruit mill; vacuum pan; mechanical peeler/ batch type of fruit and vegetable peeling; steam jacket kettle; baby boiler/ exhausting box; shredder for slicing of fruit and vegetable; liquid filling machine; Autoclaves S.S vessels with lids; micrometer seam checking gauge; bottle brush washer	

Grand Total Course Duration: **240Hours, 0 Minutes**

*(This syllabus/ curriculum has been approved by **SSC: Food Industry Capacity and Skill Initiative)***

Trainer Prerequisites for Job role: "Fruit Pulp Processing Technician" mapped to Qualification Pack: "FIC/Q0106, v1.0"

Sr. No.	Area	Details
1	**Description**	To deliver accredited training service, mapping to the curriculum detailed above, in accordance with the Qualification Pack "FIC/Q0106", Version 1.0
2	**Personal Attributes**	An aptitude for conducting training, and pre/ post work to ensure competent, employable candidates at the end of the training, and pre/post work to ensure competent, employable candidates at the end of the training. Strong communication skills, ability to work as part of a team; a passion for quality and for developing others; well-organized and focused, eager to learn and keep oneself updated with the latest in the mentioned fields.
3	**Minimum Educational Qualifications**	• B.Sc/B.Tech/BE in Food Technology or Food Engineering with 2-3 years of hand on experience in a Pulping Unit or Fruits/Vegetables Processing Unit.
4a	**Domain Certification**	Certified for Job Role: "Fruit Pulp Processing Technician" mapped to QP: "FIC/Q0106, v1.0". Minimum accepted score is 80%
4b	**Platform Certification**	Recommended that the Trainer is certified for the Job Role: "Trainer", mapped to the Qualification Pack: "SSC/Q1402". Minimum accepted SCORE IS 80 % as per FICSI guidelines.
5	**Experience**	• B.Sc/B.Tech/BE in Food Technology or Food Engineering with 2-3 years of hand on experience in a Pulping Unit or Fruits/Vegetables Processing Unit.

Annexure: Assessment Criteria

Assessment Criteria	
Job Role	Fruit Pulp Processing Technician
Qualification Pack	FIC/Q0106, v1.0
Sector Skill Council	Food Processing

Sr. No.	Guidelines for Assessment
1	Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2	The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3	Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training centre(as per assessment criteria below)
4	Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training canter based on this criteria
5	To pass the Qualification Pack, every trainee should score a minimum of 70% (overall) in every QP
6	The marks are allocated PC wise; however, every NOS will carry a weight age in the total marks allocated to the specific QP

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
1. FIC/Q0120: Prepare and maintain work area and process machineries for pulp processing	PC.1 Prepare, clean and maintain the cleanliness of the work area using approved sanitizers and keep it free from dust, waste, flies and pests	**100**	25	10	15
	PC2. Ensure that the work area is safe and hygienic for food		10	3	7
	PC3. Dispose waste materials as per defined SOPs and industry requirements		15	5	10
	PC4. Check the working and performance of all machineries and tools used for the pickle making process such as washer, peeler, vegetable cutter/slicer, blender, packaging machines etc.		15	5	10
	PC5. Clean the machineries and tools used with approved sanitizers following SOP		15	5	10
	PC6. Place the necessary tools required for process		5	2	3
	PC7. Attend the minor repairs/ faults of all machines, if required		15	5	10
	Total		**100**	**35**	**65**
2. FIC/Q0121: Prepare for production of fruit pulp	PC1. Read and understand the production order from supervisor	**100**	10	4	6
	PC2. Check the availability of raw materials, packaging materials , equipment availability and manpower		5	2	3
	PC3. Support in planning production sequence		15	5	10
	PC4. Calculate the batch size based on the production order and machine capacity		5	2	3
	PC5. Calculate the raw material requirement (considering the process loss) to produce the required quantity of finished		5	2	3
	PC6. Calculate the raw materials, packaging materials and manpower requirement for completing the order.		5	2	3
	PC7. Ensure the working and performance of each equipment required for the process		7	2	5
	PC8. Calculate the process time for effective utilization of machineries		7	2	5
	PC9. Plan batch size considering full capacity utilization of machineries		3	1	2
	PC10. Plan to utilize machineries for multiple products without affecting the quality of		3	1	2

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	the finished products, and to optimize production and save energy				
	PC11.Allot responsibilities and help to assistants and workers		5	1.5	3.5
	PC12. Refer the process chart for products produced		3	1	2
	PC13. Weigh the raw materials required for the batch		3	1	2
	PC14. Check the conformance of raw material quality to organization standards, through physical analysis and by referring the quality analysis report from the supplier/ internal lab analysis report		10	4	6
	PC15. Sharpen cutter blades and change the cutter/slicer blades		2	0.5	1.5
	PC16. Fix, change, clean filters and sieves of processing machinerie		5	2	3
	PC17. Ensure working and performance of required machines and tools.		5	1	4
	PC18. Keep the tools assessable to repair in case of faults/ breakdown		2	0.5	1.5
	Total		**100**	**35**	**65**
3. FIC/Q0122: Produce fruit pulp from various fruits	PC1. Receive fruits from the supplier/vendor and check weight	**100**	1	0.5	0.5
	PC2. Check quality through physical parameters such as appearance, color, texture, maturity		1	0.5	0.5
	PC3. Load fruits in fruit ripening chamber, adjust controls to set required temperature, time, relative humidity to pre-cool the fruit, monitor temperature to ensure the fruit is cooled to required temperature		3	1	2
	PC4. Open and control the regulator of the ethylene generator or use PLC to introduce ethylene into the chamber to initiate ripening of fruit, monitor air circulation system for uniform ethylene flow for specified period, adjust controlling system to maintain required temperature, relative humidity, etc. for specified period, adjust ventilation system at periodic interval by controlling the speed of exhaust fan to remove carbon-di-oxide		3	1	2

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC5. Open ripening chamber after specified period, start fan to ventilate ethylene gas, stop fan after ventilation, unload the ripened fruit from the ripening chamber, check the quality of ripened fruit and transfer to processing area		2	0.5	1.5
	PC6. Open valves or start pump to fill water in washing tank and control water level, dump fruits into the washing tank for washing		2	0.5	1.5
	PC7. Switch on agitator of revolving screens/blades to immerse each fruit into water to remove dirt, soil, etc		2	0.5	1.5
	PC8. Start the ladder conveyor to lift fruits from the washing tank and transfer to the washing line conveyor		2	0.5	1.5
	PC9. Open valves of the high pressure spraying system for fresh water and adjust pressure to spray water on fruits for rinsing		2	0.5	1.5
	PC10. Adjust controls to transfer washed fruit to sorting/inspecting line, start and adjust speed of sorting/inspecting line conveyor to visually inspect and manually remove damaged, blemished and rotten fruits		2	0.5	1.5
	PC11. Dump sorted fruits in the peeler or corer (depending on the type of fruits), start machine , adjust speed to remove the peel or core of fruits (or) turn valves to introduce steam and adjust controls to maintain pressure for steam peeling		3	1	2
	PC12. Open valve or pump water or open spraying system to wash peeled fruits, observe fruits emerging from peeling /coring machine to ensure removal of peel/core		2	0.5	1.5
	PC13. Cut fruits manually (or) load the fruits in the chopper/cutter/slicer machine, adjust controls to cut fruits to required size, start machine, collect sliced fruits from the discharge chute		2	0.5	1.5
	PC14. In case of mangoes, start conveyor and control speed to allow washed mangoes to pass through mango tip cutting line, cut the mango tip manually, control conveyor speed to dump the tip cut mangoes into		2	0.5	1.5

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	destoner machine to remove seed and peel				
	PC15.Control speed of waste disposal conveyor to dispose waste following sop		1	0.5	0.5
	PC16.Adjust and maintain speed of pulper conveyor to allow fruits to pass through the pulper cum finisher/ pulper refiner machine for pulping fruits and sieving pulp to required fineness, adjust position of discharge outlet to collect refined pulp in collection tank, check collected pulp to ensure it is free from seeds and fiber		8	3	5
	PC17. Replace damaged or clogged filter screen of pulper cum finisher/ pulper refiner machine		2	0.5	1.5
	PC18.Start pump to transfer measured quantity of pulp from collection tank to steam jacketed kettle/ pre-cooking tank for cooking pulp, check pumped quantity through the level indicator and glass windows of the pre-cooking tank, adjust controls to set pressure, temperature, cooking time, stirrer speed, etc., open valve to allow steam to pass though kettle for pre-cooking/ pre-heating pulp to required temperature, examine pre-cooked fruits through feel/texture		8	3	5
	PC19. Open valves to allow pre-cooked pulp to pass through de-canter machine to remove black specks, set control of the machine such as speed of screw conveyor in machine and speed/ rotation and start machine to remove black specks (in case of mango)		5	2	3
	PC20.Collect the pre-cooked pulp in the collection tank/ holding tank, sample pulp and transfer to quality lab for analysis and conformance to organisation standards		2	0.5	1.5
	PC21. Set controls of de-aerator machine to remove air from pulp for extended shelf-life, start machine, open valves/start pump to transfer measured quantity of pre-cooked pulp into de-aeration tank to de-aerate pulp		5	2	3

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC22. Set controls of evaporator like flow rate of pulp, temperature, residence time etc to concentrate pulp (for processing concentrated pulp), switch on machine to transfer measured quantity of de-aerated pulp into continuous evaporator for concentrating pulp		5	2	3
	PC23. Open valves/start pump to transfer measured quantity of precooked(or)de-aerated and concentrated pulp into sterilization tank to sterilize pulp before aseptic packing, adjust controls to set temperature, pressure, time, etc. and open valves to allow steam to pass through sterilization tank, switch on machine to start sterilization, observe through glass windows of the sterilization tank, monitor and maintain steam pressure by adjusting gauges to sterilize fruit pulp to organisation standards		4	1	3
	PC24. Set controls to allow the sterilized pulp to pass to the aseptic surge tank for filling, maintain temperature of product surge tank until filling, set controls of the product filler of aseptic filling machine for filling volume, pressure, temperature, etc		4	1	3
	PC25. Place plastic liners in the container (drums, cartons etc), date code aseptic bags with details like date of manufacture, date of expiry etc and place inside the liner for filling pulp, start conveyor and control speed to move the drum with aseptic bags under the aseptic (product) filling machine		2	1	1
	PC26. Fix the spout of the aseptic bag to the filling nozzle of the machine, set controls like pressure, temperature, filling volume etc and start machine to fill hot sterile product and automatically seal/ close with sterile closures		2	0.5	1.5
	PC27. Start conveyor to move the container with filled aseptic bags to the weighing area, check the weight of the container, label the container with details like batch number, date of manufacture, date of expiry, volume/weight etc		2	0.5	1.5
	PC28. Cover the aseptic bags with liner, place lid on drums, close and seal lid,		1	0.5	0.5

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	transfer to the storage area and store by maintaining storage conditions and following SOP				
	PC29. Operate can reformer, flanger, seamer, can body beader and embossing machines to form cans		1	0.5	0.5
	PC30. Press button to activate machine-lift that raises stacked cans and transfers them onto mechanical conveyor (in mechanical units), observe passing cans and remove defective/ damaged cans from conveyor and discard following SOP		1	0.5	0.5
	PC31. Start machine that automatically feeds empty cans onto conveyors leading to washing, filling and sealing machines (or) set controls like temperature, pressure, conveyor speed of empty can machine, place empty cans in the conveyor and start machine to sterilize cans, collect sterilized cans from other end of the conveyor and transfer to the filling machine		1	0.5	0.5
	PC32. Start conveyor to allow sterilized cans to pass through the filling line (or) place sterilized cans manually in the filling line conveyor		1	0.5	0.5
	PC33. Start pump to fill pre-cooked/preheated pulp into the filling tank, set temperature, volume etc and start machine to fill pulp in cans, control speed of conveyor to transfer filled cans to the can seaming machine (or) manually place lid over the filled cans and seal in cans in can seamer machine		2	0.5	1.5
	PC34. Load the canned product manually in metal baskets, start motor to lower the basket with cans in lager tank with hot water, allow steam to pass through tank to heat continuously to sterilize can to specified temperature and time, mechanically lift basket with sterilised cans from hot water tank and place in cold water tank, open valves to circulate cold water in tanks to cool cans, dry cans manually		2	1	1

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC35. Load the canned product into the retort manually or mechanically through push trucks, close retort door or lid, and turn wheels or moves levers to seal chamber, adjust controls to set pressure, temperature and time of the retort chamber to sterilize canned product following sop		2	0.5	1.5
	PC36. Set process parameters like pressure, temperature, sterilization time etc in the retort following SOP, turns valves to admit steam to retort, observe dials and gauges and adjust controls to maintain process parameters, turn valves to release steam and allow cool water into chamber to prevent overcooking		1	0.5	0.5
	PC37. Open retort and move the canned product to the cooling line conveyor, open valves of the water spraying system and adjust pressure to spray cold water on cans passing though cooling line conveyor, transfer cooled cans to drying line conveyor and start conveyor, set and control temperature and air flow to dry adhering water from the cooled cans		2	1	1
	PC38. Load labels in the packaging machine and set date coding machine for batch number, date of manufacture, date of expiry etc, start labeling machine and date codling machine to label and date code cans, sample canned product and transfer to quality lab for analysis, pack labeled cans into cartons and transfer to storage area and store maintaining storage conditions following SOP		1	0.5	0.5
	PC39. Report discrepancies/concerns to department supervisor for immediate action		1	0.5	0.5
	PC40.Clean the work area, machineries, equipment and tools using recommended cleaning agents and sanitizers		2	0.5	1.5
	PC4. Attend minor repairs/faults of all machines (if any)		1	0.5	0.5
	PC42. Ensure periodic (daily/weekly/monthly/quarterly/half yearly/annual) maintenance of all machines		1	0.5	0.5

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	and equipment following the SOP or following suppliers instructions/manuals				
	Total		**100**	**35**	**65**
4. FIC/Q0123: Complete documentation and record keeping related to production of fruit pulp	PC1. Document and maintain records of details of raw materials and packaging materials as per organizational standards	**100**	10	6	4
	PC2. Document and maintain record on observations (if any) related to raw materials and packaging materials		5	3	2
	PC3. Load the raw material details in ERP for future reference		5	3	2
	PC4. Verify the documents and track from finished products to raw materials, in case of quality concerns and during quality management system audits		5	3	2
	PC5. Document and maintain records of production plan with details		10	6	4
	PC6. Document and maintain records of process details for entire production in process chart or production log for all products produced		15	9	6
	PC7. Document and maintain records of batch size, production yield, wastage of raw materials, energy utilization and final product produced		10	6	4
	PC8. Document and maintain record of observations or deviations		5	3	2
	PC9. Load the production plan and process details in ERP for future reference		5	3	2
	PC10. Verify documents and track from finished product to ingredients, in case of quality concerns and for quality management system audit		5	3	2
	PC11. Document and maintain records of finished products		3	2	1
	PC12. Document and maintain records of the finished product details as per organizational standards		7	4	3
	PC13. Document and maintain record on observations or deviations related to finished products		5	3	2
	PC14. Load the finished product details in ERP for future reference		5	3	2
	PC15. Verify the documents and track from finished product to ingredients, in case of quality concerns and for quality management system audits		5	3	2

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	Total		**100**	**60**	**40**
5. FIC/N9001: Food Safety, hygiene and sanitation for processing food products	PC1. Comply with food safety and hygiene procedures followed in the organization	**100**	5	2	3
	PC2. Ensure personal hygiene by use of gloves, masks ,hair net, ear plugs, boots etc.		6	1	5
	PC3. Ensure hygienic production of food by inspecting raw materials, ingredients, finished products etc for compliance to physical, chemical and microbiological procedures		5	2	3
	PC4. Pack products in appropriate packaging material, label and store them in designated area free from pests, flies etc.		10	4	6
	PC5. Clean, maintain and monitor food processing equipments periodically, using it only for the specified purpose		5	2	3
	PC6. Use safety equipment such as fire extinguisher, eye wash unit, first aid kit when required		10	4	6
	PC7. Follow housekeeping practices by having designated area for machines/tools		5	2	3
	PC8. Follow industry standards like GMP, HACCP and product recall		10	4	6
	PC9. Attend training on hazard management to understand type of physical, chemical and microbiological hazards		5	1	4
	PC10. Identify, document and report problems such as rodents and pests to management		5	1	4
	PC11. Conduct workplace checklist audit before and after work to ensure safety and hygiene		5	1	4
	PC12. Document and maintain raw material, process, packaging material to maintain the effectiveness of quality system		4	1	3
	PC13. Determine the quality of food using criteria such as odor, color, taste and best before date and take immediate measures to prevent spoilage		5	2	3
	PC14. Store raw materials, finished products and allergens separately to prevent cross contamination		5	2	3

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC15. Label raw materials and finished products and store them in different storage areas according to safe food practices		5	2	3
	PC16. Follow stock rotation based on FEFO/FIFO		10	4	6
	Total		**100**	**35**	**65**
	Grand Total	**500**	**500**	**300**	**200**
	Percentage Weightage		**100**	**60%**	**40%**
	Minimum Pass% to qualify (aggregate):			**70%**	

B.Voc (Food Processing and Engineering) Syllabus

Ist -B.Voc

NSQF Level: 5 – Semester II

Sub Sector: Fruits & Vegetables

Job Role: Supervisor -Fruit & vegetable processing

UNIT I		
Introduction to Food Engineering-PART II		
S.No.	**THEORY**	**Hrs**
1.	**Boiler:** Properties of steam; Steam tables; Boilers mountings and accessories; Boiler rating and steam calculation, Steam distribution, Fittings and insulation.	4
2.	**Basics of electrical:** Voltage, current and resistance; AC single phase, three phase systems, concepts of phase difference, starters and types of starters, power factor; KW and KVA.	4
3.	**Refrigeration and Air-conditioning:**Refrigeration and Basic Concepts; Basics of vapour compression cycles; Applications of Refrigeration in Fruit and Vegetable Processing Thermodynamics; Humidity and other Related Terms, definitions, units. Psychrometrics applied to air conditioning and drying	6
	TOTAL	**14**
PRACTICALS		
1.	**Operation** of Boiler and maintenance	10
2.	**Electrical** Laboratory, Instrumental Laboratory, Refrigeration unit, Boiler house and workshop	10
3.	**Working principle** and operation of cold storage	8
	TOTAL	28

UNIT II		
Fruit Pulp Processing – PART I		
S.No.	**THEORY**	Hrs
1.	Equipments & tools for pulp extraction: Washing equipment, sorting equipment, Roller type Press, Crusher, Pulping equipment, Straining & screening, filtration equipment, deareator & flash Pasteurizer	2
2.	Pre-processing operations: Quality requirements of raw materials for processing; sourcing and receiving at processing plants; primary processing: grading, sorting, cleaning, washing	2
3.	Canning operation for fruit pulp: canning, process flow diagram for canning, pretreatments before canning operations, pulping (hot & cold) cooking/pasteurization of fruit pulp, processing operations (exhausting and sealing), retorting, ultra high temperature processes, canning process time calculation, sterilizer and accessories used in canning industries, thermal process time calculations for canned foods, standard operating procedures followed in canning industry, CIP and COP for canning machineries: sanitizers and disinfectors used for cleaning processes, stacking and storing of cans, packaging operation followed for cans, GMP and GHP followed during canning of fruit pulp	5
4.	Aseptic processing operation for fruit pulp: contamination control, microbial environmental monitoring, microbiological testing of water, microbiological air testing, characterization of aseptic process, media and incubation condition, theoretical evaluation of aseptic operations, standard operating procedures followed for aspectic process, introduction to CIP and COP for aseptic	4

	machineries: sanitizers and disinfectors used for cleaning processes, stacking and storing of processed product, packaging operation followed for processed product, GMP and GHP followed in aseptic processing industry	
5.	Other preservation techniques of fruit pulp	1
	TOTAL	**14**
	PRACTICALS	
1.	Determination of fruit concentration	2
2.	Determination of moisture content	2
3.	Determination of titrable acidity	2
4.	Processing of fruit to pulp (Canning, Chemical, Freezing and Bottling)	2
5.	Physical examination of cans, bottles	2
6.	Determination of vacuum	2
7.	Determination of drained weight	2
8.	Determination of metallic contminations	2
9.	Determination of pesticide residues	2
10.	Microbial examination	2
11.	Visit to fruit pulp processing industry	8
	TOTAL	**28**

UNIT III		
Food safety, Hygiene, Sanitation in Food Processing Industry		
S.No.	**THEORY**	Hrs
1.	Critical control points of fruit pulp processing	2
2.	Sorting and first wash inspection of pulping fruits	2
3.	Approved sanitizers in fruit washing	2
4.	Mechanical operations, storage, transportation and distribution, plant design and safety location of processing plant, design of processing plant	4
5.	Effectiveness of sanitation programmes, sanitation rules and regulations, regulatory consideration for sanitizer use, cleaning and sanitation of processing plant (chlorine, chlorine-di-oxide, quaternary ammonium compounds)	4
	TOTAL	**14**
	PRACTICALS	
1.	Standard operating procedures (SOP) in fruit pulp industry (cleaning, water quality, storage and so on)	5
2.	Familiarisation with different cleaning tools, sanitizers and equipments	5
3.	Preparation of cleaning or sanitizing solutions	5
4.	Demonstration of methods of sanitation of work place, equipments	5
5.	Visit to food industry to learn food safety, hygiene and sanitation procedures followed	8
	TOTAL	**28**

UNIT IV		
Documentation and Record Keeping in Fruit Pulp Processing Industry		
S.No.	Theory	Credit Hrs
1.	Documentation and Record Keeping: Book-keeping - as fundamental rules of Double entry book keeping, ledger posting, trial balance, profit and loss account and balance Sheet, concept of gross profit, operating profit and Net profit – assets and Liabilities Analysis and interpretation	6

	of financial statements, measurements of performance Cost accounting as a science of cost ascertainment, importance and types of Costing-job costing, process costing, operation costing, Departmental costing Budget-Budgeting and budgetary control-kinds of Budgets-preparation of Budget and various analysis.	
2.	Methodology of food costing – Basic policy decisions- operational control Managing Production through basic operation activities like: Purchasing: essentials of purchasing – qualified purchaser, standard yield, yield testing, standard purchase specification, effective purchasing methods. Types of discounts. Purchasing procedure, effective control tools-levels of stock, purchase requisition, Purchase order, centralized purchasing, and decentralized purchasing. Receiving and Storing: tools of storeroom management, Goods receiving procedure, bin-card, stock book inventory control, FIFO, LIFO Issuing: stores requisition, Production: standardization, standardized recipe, recipe format, scaling up standardized recipe, Service: portion control Elements of cost: Material cost, labour cost and overhead relating costs and profit to volume of sales Cost dynamics and cost behaviour-fixed and variable cost-breakeven analysis Cost reduction techniques – substitution, scientific menu planning, marginal Costing, use of left over and recycling, centralized, buying, scheduling and Staggering of labour and cost benefit analysis.	6
3.	Introduction to ERP	2
	TOTAL	**14**
	PRACTICALS	
1.	Preparation of ledgers, manual and digital files	3
2.	Preparation of process manual for processing of fruit pulp	3
3.	Preparation of process manual cleaning and sanitization	3
4.	Preparation of process manual for sorting grading and ripening	3
5.	Preparation of process manual for washing	3
6.	Documentation and inventory management of raw materials and other ingredients	5
7.	Documentation of finished product	4
8.	Documentation of finished product quality	4
	TOTAL	**28**

UNIT V		
Food Quality Analysis		
S.No.	**THEORY**	Hrs
1.	Food quality testing and evaluation : Concept of food quality and its monitoring, The principles of quality assurance for the agro-industries, Establishment of decision-making processes using official, (government and industry) instrumental, chemical, and sensory procedures, the use of statistical tools in quality assurance and their applications; Food specifications, grades, and standards; Sensory test methods and procedures used to evaluate the flavor, color and texture of foods.	6
2.	Concept of quality: Quality attributes- physical, chemical, nutritional, microbial, and sensory; their measurement and evaluation; Sensory *vis-à- vis*instrumental methods for testing quality.	6
3.	Texture analysis of foods, Colour measurements in raw and processed foods, Viscosity measurements and its significance in food quality, Water activity measurements and its significance in food quality, Introduction to chromatographic	2

	methods in food analysis and separation,	
	TOTAL	**14**
	PRACTICALS	
1.	Testing and evaluation of quality attributes of raw and processed foods	2
2.	Physico chemical properties of fruits	2
3.	Estimation of moisture content of fruits	2
4.	Determination of soluble and insoluble solids	2
5.	Determination pH	2
6.	Determination of titrable acidity	2
7.	Determination of total sugars and reducing sugars	2
8.	Determination of textural properties	2
9.	Determination of colour	2
10.	Determination of viscocity/consistency	2
11.	Sensory evaluation of food	2
12.	Mini-project on preparation of a model laboratory manual	6
	TOTAL	**28**
	Hands on training	
1.	Hands on training in fruit pulp industry	60
	TOTAL	**270**

Model Curriculum

Food Regulatory Affairs Manager

SECTOR: FOOD PROCESSING

SUB-SECTOR: FRUIT & VEGETABLE, FOOD GRAIN MILLING (INCLUDING OILSEEDS), DAIRY PRODUCTS, MEAT & POULTRY, FISH & SEAFOOD, BREAD & BAKERY, ALCOHOLIC BEVERAGES, AERATED WATER/ SOFT DRINKS, SOYA FOOD, PACKAGED FOOD

OCCUPATION: QUALITY ASSURANCE

REF ID: FIC/Q9002, V1.0

NSQF LEVEL: 6

Certificate

CURRICULUM COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

FOOD INDUSTRY CAPACITY AND SKILL INITIATIVE (FICSI)

for the

MODEL CURRICULUM

Complying to National Occupational Standards of
Job Role/ Qualification Pack: 'Food Regulatory Affairs Manager'
QP No. 'FIC/Q9002, Version 1.0, NSQF Level 6'

Date of Issuance: February 1, 2016

Valid up to: March 30, 2019

* valid up to the next review date of the Qualification Pack

Authorised Signatory
(Food Industry Capacity and Skill Initiative)

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Food Regulatory Affairs Manager

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of a "Food Regulatory Affairs Manager", in the "Food Processing" Sector/Industry and aims at building the following key competencies amongst the learner

Program Name	**Food Regulatory Affairs Manager**		
Qualification Pack Name & Reference ID. ID	FIC/Q9002, v1.0		
Version No.	1.0	**Version Update Date**	23/02/2016
Pre-requisites to Training	Master's degree in food science with 8-10 years' experience in food processing unitor food regulatory matters		
Training Outcomes	**After completing this programme, participants will be able to:** Designing, developing, implementing and changing food regulatory systems in the organisation. Act as a liaison between organisation and government regulatory agencies Ensure that the products produced and distributed comply with regulatory standards.		

This course encompasses 3 out of 3 National Occupational Standards (NOS) of "Food Regulatory Affairs Manager" Qualification Pack issued by "Food Industry Capacity and Skill Initiative".

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1	**Introduction to the training program** **Theory Duration** (hh:mm) 01:30 **Practical Duration** (hh:mm) 00:00 **Corresponding NOS Code** Bridge Module	Introduce each other and build rapport with fellow participants and the trainer.	White board/Chart papers, marker
2	**Overview of the "Food Regulatory Affairs Manager" Role** **Theory Duration** (hh:mm) 01:00 **Practical Duration** (hh:mm) 00:00 **Corresponding NOS Code**	Understanding the roles and responsibilities of food regulatory affairs manager Awareness of the nature and availability of job opportunities	Laptop/computer white board, marker, projector, chart papers
3	**Introduction to the Food Processing Industry** **Theory Duration** (hh:mm) 01:00 **Practical Duration** (hh:mm) 00:00 **Corresponding NOS Code**	Define food processing List the various sub-sectors of food processing industry	Laptop, white/black board, marker, chart papers, projector ,Trainer's guide, Student manual
4	**Introduction to the food regulations and affairs** **Theory Duration** (hh:mm) 05:00 **Practical Duration**	List the terminology used in the food regulation process State various methods to ensure foos regulation State the processes to oversee for ensuring that the food regulations are in compliance	Laptop, white/black board, marker, chart papers, projector, trainer's guide, student handbook

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	(hh:mm) 30:00 **Corresponding NOS Code**	Understand what are regulatory policies of an organization and follow them	
5	**Design, develop and implement regulatory system** **Theory Duration** (hh:mm) 13:00 **Practical Duration** (hh:mm) 21:00 **Corresponding NOS Code** FIC/N9011	Understand food safety regulations and develop regulatory policies for the organisation with clear definitions to increase consistency, legal security and to provide high level of food safety Design regulatory system with focus on risk reduction, risk-based priorities, reflect integrated and economically feasible initiatives, and ensure high quality and transparency Design and develop regulatory system with intuitive approach to food safety such that problem are recognized, understood, dealt, and checked to ensure problem has been dealt efficiently and effectively Design regulatory system with contingency planning like product traceability and product recall in case of problems, procedures for handling containment, with clear attribution of roles like lines of authority and co-ordination mechanism across food chain (from procuring raw materials, production until product reaching consumers) Design regulatory system with improved communication on food safety information in marketing materials, product labels etc, providing science based information to clear up the unjustified fear among consumers Set food safety system involving food producers, processors, distributors, retailers and consumers to recognize their primary responsibility and to share a common goal of ensuring food safety at all stages Design food regulatory system involving GMP, GHP, and monitoring systems like HACCP Design regulatory system that improve efficiency and compliance, build consumer confidence in the safety and quality of food products	Laptop, white/black board, marker, chart papers, projector, trainer's guide, student handbook, quality manual, quality policy

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		produced, processed, marketed, distributed and sold Design and develop regulatory system ensuring food and health standards are followed in each stage of production and produce food products that meet national and international regulatory standards and protect the health of consumers Design regulatory system including provisions for the right of consumers to have access to accurate and sufficient information and make adequate choices Provide strategic advice and cost effective strategies on regulatory aspects/requirements to senior management and project managing teams throughout the development of a new product Interpret regulatory standards and develop organisation standards meeting national and international food safety regulations like FSSAI, FDA, EU food safety regulations, codex alimentarius etc for products produced, exported and imported, and labels of products packed by the organisation Develop and review standard operating procedures (SOPs) and ensure that they are in compliance with current regulatory requirements and provide regulatory support for corporate quality assurance efforts Develop organisation standards for labels of food products produced and packed, promotional marketing materials, products imported and exported by the organisation to meet national and international food regulatory Evaluate labels of packed food products to ensure it meets national and international food regulatory standards and provide approval or recommend changes Evaluate promotional and materials for regulatory impact and provide approval Provide support for review of essential documents, development and review of consent forms for submission to regulatory authorities for clearance	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		Initiate and contribute to process improvements which have an impact on regulatory affairs, quality assurance and other departments Conduct audits on food processing unit for compliance with regulatory, safety and hygiene standards implemented and followed in the organisation Conduct periodic audits to evaluate haccp plans and their implementation in the organisation and ensure it meets the regulatory standards Review internal and external audit reports to check the effectiveness of the present regulatory system and recommend necessary changes in the policies and procedures to reduce failures in the future Identify reason for consumer cases in court related to non-compliance of food products to regulatory standards, collect relevant information's and documents transmitting evidence to produce in court to assist prosecution Monitor company progress toward fulfillment of regulatory commitments Provide training to department managers on organisation policies on food and safety regulations, national and international food laws and regulations, methods and procedures for implementing regulations for procuring raw materials, producing food products, marketing and selling quality products to the consumers Provide training to all department managers on the importance of food regulatory standards and need for its compliance, statutory and regulatory requirements for the products produced, labels of packed products and promotional materials, and the consequences for not following the regulatory requirements Provide training on procedures for collecting evidence in case of problems/consumer complaints/consumer cases in court	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		and handling them with technical and scientific approach Provide training to all department managers on methods to implement and monitor regulatory system in their area of function, writing reports with relevant information and data to present to local food regulatory authorities for any concerns raised / clarification required, methods to approach and maintain relationship with food regulatory authorities Provide training on upgradation and changes in the food regulatory system and methods to implement, monitor and achieve them	
6	**Manage change in food regulatory system** **Theory Duration** (hh:mm) 14:00 **Practical Duration** (hh:mm) 20:00 **Corresponding NOS Code** FIC/N9012	• Identify procedures, systems, structures that need to be changed for effective implementation of food regulatory system • Assess gaps in the current policies and procedures and analyze the future requirements • Identify and assess barriers to change in regulatory system, develop strategies and plans to overcome those barriers • Assess risks and benefits associated with the strategies and plans, and develop contingency arrangements design new work processes, procedures, systems, structures and roles to achieve planned changes in regulatory system • Ensure plan for change in regulatory system include short-term as well as longer-term deliverables • Develop system for monitoring and assessing regulatory system to assess progress in changes implemented • Develop reporting and communicating system to review the effectiveness of the changes in regulatory system and to obtain feedback • Provide training and support to implement changes planned in regulatory system • Communicate reasons, importance and benefits of implementing change in regulatory system, future that can be achieved through	Laptop, white/black board, marker, chart papers, projector, trainer's guide, student handbook, quality manual, quality policy, regulatory policies

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		implementing and following the change, to management and concerned employees • Make the management and employees welcome change in regulatory system as an opportunity to deliver products of national and international quality • Make the management and employees understand the need and importance for change in regulatory system, result expected out of change and its effect on the organisation • Implement the strategies and plans for change in regulatory system with available resources • Make the managers responsible for implementing change in regulatory system understand their responsibilities and commitment, and use their influence and power over employees to implement change • Set and prioritize objectives for the change in regulatory system, identify and deal with obstacles to change, and support employees through the change process • Communicate progress achieved thorough change in regulatory system to everyone involved, and make them understand and enjoy achievement • Review reports on total quality management system to evaluate effectiveness of changes implemented in regulatory system of the organisation • Organize internal and external audit on total quality management system to evaluate effectiveness of the changes implemented in regulatory system • Monitor changes implemented in regulatory system , document and communicate the outcome of implemented change to the management • Recognize and reward employees and teams for implementing regulatory system and achieving results thorough new policies and procedures	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		• Monitor and ensure changes implemented in regulatory system are effective and meet the requirements of the organisation and regulatory system laid by national and international regulatory bodies	
7	**Prepare representations to regulatory authorities and for new product registrations** **Theory Duration** (hh:mm) 09:00 **Practical Duration** (hh:mm) 14:00 **Corresponding NOS Code** FIC/N9013	Prepare simple and complex regulatory documents in accordance with applicable FSSAI regulations by collecting, collating and evaluating scientific data that has been well researched on relevant aspects Review regulatory guidance and requirements pertaining to products produced in the organisation and prepare documents providing thoughtful and accurate comments Prepare regulatory documents to authorities that translate regulatory requirements into practical, workable plans with timelines for development and implementation Coordinate with food regulatory authorities to review disputed matters, negotiation and finalization on products and projects, and for comments and formal approvals Prepare documents that include check lists created and maintained to implement regulatory requirements, technical data, and declarations of conformity Interface with consultants, research organizations, partners, co-manufacturers etc. for preparation, review, compilation, finalization and submission of documents for regulatory approvals Prepare responses to communications and other requests from government food regulatory authorities Prepare safety reports and documents on raw materials, ingredients, additives, flavours etc used in the products produced and marketed by the organisation, for regulatory submissions and clearance Identify reasons related to non-compliance of food products to regulatory standards, collect relevant information's and data,	Laptop, white/black board, marker, chart papers, projector, trainer's guide, student handbook, quality manual, quality policy, audit documents, regulatory policies

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		prepare technical documents with scientific facts and supporting evidence, and submit to relevant authorities, respond to communications from government authorities, and follow up regularly to revoke product ban Interact with various regulatory authorities during concept, development and industrialization stages of projects for clarification and approvals Interact with the notified bodies and competent authorities for developing and reviewing regulatory standards Coordinate with regulatory authorities for reporting, to comment on proposed regulations, and to represent company's interest in the development of standards and guidelines Discuss on the differences that exist in the regulations laid down by different governments and their interpretation by the regulatory agencies and ensure that efficient and economical regulatory standards are planned Identify possible threats or opportunities from upcoming regulations under FSSAI, consumer affairs, other government food policies and regulations and liaise with industry associations to tackle/manage them effectively Participate in seminar, workshops, conferences and meetings organised by FSSAI and other industry association, representing the organisation to maintain, strengthen and expand contacts Work closely with regulatory and trade associations like CII (confederation of indian industries), FICCI (federation of indian chambers of commerce and industries), CIFTI (confederation of indian food trade and industry), AIFPA (all india food processors association), ASSOCHAM(the associated chambers of commerce of india) etc on national and international regulatory changes and challenges that have impact on food products produced in the	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		organisation and to manage them proactively Develop and write clear arguments and explanations for new product license Prepare and present registration documents to regulatory authorities and notified bodies for new product approvals Present written representation for new products and carry out negotiations with regulatory authorities to obtain necessary approvals for new product production and marketing Evaluate, prepare and submit new product registration applications and follow through the application during the evaluation phase to achieve favorable outcome Prepare responses to letter/e-mail communications and other requests from government food regulatory bodies on new product approval Provide regulatory and product compliance report in the area of advertising and label claims for new products	
8	**Field Visits** **Theory Duration** (hh:mm) 04:00 **Practical Duration** (hh:mm) 20:00 **Corresponding NOS Code**	Observe the location, layout and safety aspects of food processing Observe the storage facilities for raw materials and finished products Observe the various machineries used in process Observe the various machineries used in process Observe the cleaning methods and processes followed to maintain the process machineries and tools Observe the raw materials used and their storage procedures Observe the packaging and storage processes of raw material and finished product Observe the post-production cleaning and maintenance process followed in the industry	All the tools and equipment listed above must be available at the site of field visit
9	**Revision** **Theory Duration** (hh:mm) 01:00	Revised the knowledge gained so far	Allthe tools and equipment listed above must be available at the time of revision

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Practical Duration (hh:mm) 01:00 **Corresponding NOS Code**		
10	**Evaluation** **Theory Duration** (hh:mm) 06:00 **Practical Duration** (hh:mm) 28:00 **Corresponding NOS Code**	Assess the knowledge and skills acquired by the participants	All the tools and equipment listed above must be available for evaluation
11	**On-the-job Training** **Theory Duration** (hh:mm) 08:00 **Practical Duration** (hh:mm) 24:00 **Corresponding NOS Code**	Apply the skills and knowledge acquired in the training program in the field	All the tools and equipment listed above must be available on the site at the time of OJT
	Total Duration **240:00** **Theory Duration** **79:00** **Practical Duration** **161:00**	**Unique Equipment Required**: Laptop, white/black board, marker, chart papers, projector, trainer's guide, student handbook, quality manual, quality policy, audit documents, regulatory policies	

Grand Total Course Duration: **240 Hours, 0 Minutes**

*(This syllabus/ curriculum has been approved by **SSC: Food Industry Capacity and Skill Initiative)***

Trainer Prerequisites for Job role: "Food Regulatory Affairs Manager" mapped to Qualification Pack: "FIC/Q9002, v1.0"

Sr. No.	Area	Details
1	**Description**	To deliver accredited training service, mapping to the curriculum detailed above, in accordance with the Qualification Pack "FIC/Q9002", Version 1.0
2	**Personal Attributes**	An aptitude for conducting training, and pre/ post work to ensure competent, employable candidates at the end of the training, and pre/post work to ensure competent, employable candidates at the end of the training. Strong communication skills, ability to work as part of a team; a passion for quality and for developing others; well-organized and focused, eager to learn and keep oneself updated with the latest in the mentioned fields.
3	**Minimum Educational Qualifications**	B.Sc/B.Tech/BE in Food Process Engineering/ Food Safety and Quality Management in Food Process Engineering with 5-6 years of hand on experience in QA/regulations of a food Processing Industry or M.Sc/M.Tech/ME or in Food Process Engineering/ Food Safety and Quality Management in Food Safety/Food Process Engineering with 3-4- years of hand on experience in QA/regulations of a food Processing Industry
4a	**Domain Certification**	Certified for Job Role: "Food regulatory affairs Manager" mapped to QP: "FIC/Q9002, v1.0". Minimum accepted score is 80%
4b	**Platform Certification**	Recommended that the Trainer is certified for the Job Role: "Trainer", mapped to the Qualification Pack: "SSC/Q1402". Minimum accepted SCORE IS 80 % as per FICSI guidelines.
5	**Experience**	B.Sc/B.Tech/BE in Food Process Engineering/ Food Safety and Quality Management in Food Process Engineering with 5-6 years of hand on experience in QA/regulations of a food Processing Industry or M.Sc/M.Tech/ME or in Food Process Engineering/ Food Safety and Quality Management in Food Safety/Food Process Engineering with 3-4- years of hand on experience in QA/regulations of a food Processing Industry

Annexure: Assessment Criteria

Assessment Criteria	
Job Role	Food regulatory affairs manager
Qualification Pack	FIC/Q9002 v1.0
Sector Skill Council	Food Processing

Sr. No.	Guidelines for Assessment
1	Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2	The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3	Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training centre(as per assessment criteria below)
4	Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training canter based on this criteria
5	To pass the Qualification Pack, every trainee should score a minimum of 70% (overall) in every QP
6	The marks are allocated PC wise; however, every NOS will carry a weight age in the total marks allocated to the specific QP

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
1. FIC/N9011: Design, develop and implement regulatory system	PC.1 understand food safety regulations and develop regulatory policies for the organisation with clear definitions to increase consistency, legal security and to provide high level of food safety	**100**	4	1.5	2.5
	PC2. design regulatory system with focus on risk reduction, risk-based priorities, reflect integrated and economically feasible initiatives, and ensure high quality and transparency		4	1.5	2.5
	PC3. design and develop regulatory system with intuitive approach to food safety such that problem are recognized, understood, dealt, and checked to ensure problem has been dealt efficiently and effectively		4	1.5	2.5
	PC4. design regulatory system with contingency planning like product traceability and product recall in case of problems, procedures for handling containment, with clear attribution of roles like lines of authority and co-ordination mechanism across food chain (from procuring raw materials, production until product reaching consumers		4	1.5	2.5
	PC5. design regulatory system with improved communication on food safety information in marketing materials, product labels etc, providing science based information to clear up the unjustified fear among consumers		4	1.5	2.5
	PC6. set food safety system involving food producers, processors, distributors, retailers and consumers to recognize their primary responsibility and to share a common goal of ensuring food safety at all stages		4	1.5	2.5
	PC7. design food regulatory system involving gmp, ghp, and monitoring systems like haccp		4	1.5	2.5
	PC8. design regulatory system that improve efficiency and compliance, build consumer confidence in the safety and quality of food products produced, processed, marketed, distributed and sold		4	1.5	2.5
	PC9. design and develop regulatory system ensuring food and health standards are followed in each stage of production and		4	1.5	2.5

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	produce food products that meet national and international regulatory standards and protect the health of consumers				
	PC10. design regulatory system including provisions for the right of consumers to have access to accurate and sufficient information and make adequate choices		4	1.5	2.5
	PC11. provide strategic advice and cost effective strategies on regulatory aspects/requirements to senior management and project managing teams throughout the development of a new product		4	1.5	2.5
	PC12. interpret regulatory standards and develop organisation standards meeting national and international food safety regulations like fssai, fda, eu food safety regulations, codex alimentarius etc for products produced, exported and imported, and labels of products packed by the organisation		4	1.5	2.5
	PC13. develop and review standard operating procedures (sops) and ensure sops are in compliance with current regulatory requirements and provide regulatory support for corporate quality assurance efforts		4	1.5	2.5
	PC14. develop organisation standards for labels of food products produced and packed, promotional marketing materials, products imported and exported by the organisation to meet national and international food regulatory		4	1.5	2.5
	PC15. evaluate labels of packed food products to ensure it meets national and international food regulatory standards and provide approval or recommend changes		4	1	3
	PC16. evaluate promotional and materials for regulatory impact and provide approval		4	1	3
	PC17. provide support for review of essential documents, development and review of consent forms for submission to regulatory authorities for clearance		3	1	2
	PC18. initiate and contribute to process improvements which have an impact on		3	1	2

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	regulatory affairs, quality assurance and other departments				
	PC19. conduct audits on food processing unit for compliance with regulatory, safety and hygiene standards implemented and followed in the organisation		3	1	2
	PC20. conduct periodic audits to evaluate haccp plans and their implementation in the organisation and ensure it meets the regulatory standards		3	1	2
	PC21. review internal and external audit reports to check the effectiveness of the present regulatory system and recommend necessary changes in the policies and procedures to reduce failures in the future		3	1	2
	PC22. identify reason for consumer cases in court related to non-compliance of food products to regulatory standards, collect relevant information's and documents transmitting evidence to produce in court to assist prosecution		3	1	2
	PC23. monitor company progress toward fulfillment of regulatory commitments		3	1	2
	PC24. provide training to department managers on organisation policies on food and safety regulations, national and international food laws and regulations, methods and procedures for implementing regulations for procuring raw materials, producing food products, marketing and selling quality products to the consumers		3	1	2
	PC25. provide training to all department managers on the importance of food regulatory standards and need for its compliance, statutory and regulatory requirements for the products produced, labels of packed products and promotional materials, and the consequences for not following the regulatory requirements		3	1	2
	PC26. provide training on procedures for collecting evidence in case of problems/consumer complaints/consumer cases in court and handling them with technical and scientific approach		3	1	2

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC27. provide training to all department managers on methods to implement and monitor regulatory system in their area of function, writing reports with relevant information and data to present to local food regulatory authorities for any concerns raised / clarification required, methods to approach and maintain relationship with food regulatory authorities		3	1	2
	PC28. provide training on upgradation and changes in the food regulatory system and methods to implement, monitor and achieve them		3	1	2
			100	**35**	**65**
2. FIC/N9012: Manage change in food regulatory system	PC1. identify procedures, systems, structures that need to be changed for effective implementation of food regulatory system	**100**	5	1	4
	PC2. assess gaps in the current policies and procedures and analyze the future requirements		5	1	4
	PC3. identify and assess barriers to change in regulatory system, develop strategies and plans to overcome those barriers		5	1	4
	PC4. assess risks and benefits associated with the strategies and plans, and develop contingency arrangements		5	1	4
	PC5. design new work processes, procedures, systems, structures and roles to achieve planned changes in regulatory system		5	1	4
	PC6. ensure plan for change in regulatory system include shortterm as well as longer-term deliverables.		4	1.5	2.5
	PC7. develop system for monitoring and assessing regulatory system to assess progress in changes implemented		5	2	3
	PC8. develop reporting and communicating system to review the effectiveness of the changes in regulatory system and to obtain feedback		5	2	3
	PC9. provide training and support to implement changes planned in regulatory system		4	2	2
	PC10. communicate reasons, importance and benefits of implementing change in regulatory system, future that can be achieved through implementing and		5	2	3

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	following the change, to management and concerned employees				
	PC11. make the management and employees welcome change in regulatory system as an opportunity to deliver products of national and international quality		4	1.5	2.5
	PC12. make the management and employees understand the need and importance for change in regulatory system, result expected out of change and its effect on the organisation		5	2	3
	PC13. implement the strategies and plans for change in regulatory system with available resources		5	2	3
	PC14. make the managers responsible for implementing change in regulatory system understand their responsibilities and commitment, and use their influence and power over employees to implement change		5	2	3
	PC15. set and prioritize objectives for the change in regulatory system, identify and deal with obstacles to change, and support employees through the change process		5	2	3
	PC16. communicate progress achieved thorough change in regulatory system to everyone involved, and make them understand and enjoy achievement		4	1.5	2.5
	PC17. review reports on total quality management system to evaluate effectiveness of changes implemented in regulatory system of the organisation		5	2	3
	PC18. organize internal and external audit on total quality management system to evaluate effectiveness of the changes implemented in regulatory system		5	2	3
	PC19. monitor changes implemented in regulatory system , document and communicate the outcome of implemented change to the management		5	2	3
	PC20. recognize and reward employees and teams for implementing regulatory system and achieving results thorough new policies and procedures		4	1.5	2.5
	PC21. monitor and ensure changes implemented in regulatory system are		5	2	3

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	effective and meet the requirements of the organisation and regulatory system laid by national and international regulatory bodies				
			100	**35**	**65**
3. FIC/N9013: Prepare representations to regulatory authorities and for new product registrations	PC1. prepare simple and complex regulatory documents in accordance with applicable FSSAI regulations by collecting, collating and evaluating scientific data that has been well researched on relevant aspects	**100**	5	1	4
	PC2. review regulatory guidance and requirements pertaining to products produced in the organisation and prepare documents providing thoughtful and accurate comments		5	1	4
	PC3. prepare regulatory documents to authorities that translate regulatory requirements into practical, workable plans with timelines for development and implementation		5	1	4
	PC4. coordinate with food regulatory authorities to review disputed matters, negotiation and finalization on products and projects, and for comments and formal approvals		5	1	4
	PC5. prepare documents that include check lists created and maintained to implement regulatory requirements, technical data, and declarations of conformity		4	1.5	2.5
	PC6. interface with consultants, research organizations, partners, co-manufacturers etc for preparation, review, compilation, finalization and submission of documents for regulatory approvals		4	1.5	2.5
	PC7. prepare responses to communications and other requests from government food regulatory authorities		4	1.5	2.5
	PC8. prepare safety reports and documents on raw materials, ingredients, additives, flavours etc used in the products produced and marketed by the organisation, for regulatory submissions and clearance		4	1.5	2.5

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC9. Identify reasons related to noncompliance of food products to regulatory standards, collect relevant information's and data, prepare technical documents with scientific facts and supporting evidence, and submit to relevant authorities, respond to communications from government authorities, and follow up regularly to revoke product ban		4	1.5	2.5
	PC10.prepare simple and complex regulatory documents in accordance with applicable fssai regulations by collecting, collating and evaluating scientific data that has been well researched on relevant aspects		5	2	3
	PC11. review regulatory guidance and requirements pertaining to products produced in the organisation and prepare documents providing thoughtful and accurate comments		5	2	3
	PC12. prepare regulatory documents to authorities that translate regulatory requirements into practical, workable plans with timelines for development and implementation		5	2	3
	PC13. coordinate with food regulatory authorities to review disputed matters, negotiation and finalization on products and projects, and for comments and formal approvals		5	2	3
	PC14. prepare documents that include check lists created and maintained to implement regulatory requirements, technical data, and declarations of conformity		4	1.5	2.5
	PC15. interface with consultants, research organizations, partners, co-manufacturers etc for preparation, review, compilation, finalization and submission of documents for regulatory approvals		4	1.5	2.5
	PC16. prepare responses to communications and other requests from government food regulatory authorities		5	2	3
	PC17. develop and write clear arguments and explanations for new product license		5	2	3

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC18. prepare and present registration documents to regulatory authorities and notified bodies for new product approvals		5	2	3
	PC19. present written representation for new products and carry out negotiations with regulatory authorities to obtain necessary approvals for new product production and marketing		5	2	3
	PC20. evaluate, prepare and submit new product registration applications and follow through the application during the evaluation phase to achieve favorable outcome		4	1.5	2.5
	PC21. prepare responses to letter/e-mail communications and other requests from government food regulatory bodies on new product approval		4	1.5	2.5
	PC22.Provide regulatory and product compliance report in the area of advertising and label claims for new products		4	1.5	2.5
	Total		**100**	**35**	**65**
	Grand Total	**300**	**300**	**200**	**100**
	Percentage Weightage		**100**	**60%**	**40%**
	Minimum Pass% to qualify (aggregate):			**70%**	

Food Regulatory Affairs Manager

Model Curriculum

Production Manager

SECTOR: FOOD PROCESSING

SUB-SECTOR: FRUIT & VEGETABLE, FOOD GRAIN

OCCUPATION: MILLING (INCLUDING OILSEEDS), DAIRY PRODUCTS, MEAT & POULTRY, FISH & SEAFOOD, BREAD & BAKERY, ALCOHOLIC BEVERAGES, AERATED WATER/ SOFT DRINKS, SOYA FOOD, PACKAGED FOOD PROCESSING

REF ID: FIC/Q9003, V1.0

NSQF LEVEL: 7

Certificate

CURRICULUM COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

FOOD INDUSTRY CAPACITY AND SKILL INITIATIVE (FICSI)

for the

MODEL CURRICULUM

Complying to National Occupational Standards of
Job Role/ Qualification Pack: 'Production Manager'
QP No. 'FIC/Q9009, Version 1.0, NSQF Level 7'

Date of Issuance: March 30, 2018

Valid up to : March 30, 2019

* valid up to the next review date of the Qualification Pack

Authorised Signatory
(Food Industry Capacity and Skill Initiative)

TABLE OF CONTENTS

Production Manager

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of a "Production Manager", in the "Food Processing" Sector/Industry and aims at building the following key competencies amongst the learner

Program Name	**Production Manager**		
Qualification Pack Name & Reference ID. ID	FIC/Q9003, v1.0		
Version No.	1.0	**Version Update Date**	30/03/2016
Pre-requisites to Training	Preferably Class 12 and 2-3 years' experience in a food processing unit		
Training Outcomes	**After completing this programme, participants will be able to:** Production of food products through the process of production planning, coordinating and controlling production process to achieve quantity and quality product Reviewing production process to minimize production cost and optimizing production.		

This course encompasses 3 out of 3 National Occupational Standards (NOS) of "Production Manager" Qualification Pack issued by "Food Industry Capacity and Skill Initiative".

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1	**Introduction to the training program** **Theory Duration** (hh:mm) 00:30 **Practical Duration** (hh:mm) 00:00 **Corresponding NOS Code** Bridge Module	Introduce each other and build rapport with fellow participants and the trainer.	White board/Chart papers, marker
2	**Overview of the "Production Manager" Role** **Theory Duration** (hh:mm) 01:00 **Practical Duration** (hh:mm) 00:00 **Corresponding NOS Code**	Understanding the roles and responsibilities of production manager Awareness of the nature and availability of job opportunities	Laptop/computer white board, marker, projector, chart papers
3	**Introduction to the Food Processing Industry** **Theory Duration** (hh:mm) 01:30 **Practical Duration** (hh:mm) 00:00 **Corresponding NOS Code**	Define food processing List the various sub sectors of food processing industry	Laptop, white/black board, marker, chart papers, projector ,Trainer's guide, Student manual
4	**Introduction to food processing process** **Theory Duration** (hh:mm) 02:00 **Practical Duration** (hh:mm)	List the common machineries used in food processing Explain the process of testing food for accepted quality standards Demonstrate the test for checking the quality of food Describe the procedure for processing various food	Laptop, white board, marker, chart papers, projector, trainer's guide and student handbook

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	04:00 **Corresponding NOS Code**	Identify different equipment used in food industry	
5	**Organizational standards and norms** **Theory Duration** (hh:mm) 04:00 **Practical Duration** (hh:mm) 02:00 **Corresponding NOS Code**	State the roles and responsibilities of a production manager State how to conduct yourself at the workplace State the personal hygiene and sanitation guidelines State the food safety hygiene standards to follow in a work environment	Laptop, white board, marker, chart papers, projector, trainer's guide and student handbook, protective gloves, head caps, aprons, safety goggles, safety boots, mouth masks, sanitizer, safety manual
6	**Manage production process in food processing unit** **Theory Duration** (hh:mm) 15:00 **Practical Duration** (hh:mm) 11:40 **Corresponding NOS Code** FIC/N9014	• Communicate the organisation policies and goals clearly to the employees of production team, make them understand and commit their energy and expertise to achieve organisation goals • Achieve department targets and organisation goals by understanding the organisation and employees, developing a leadership style and applying them appropriately • Communicate with employees regularly and effectively, help them identify their strengths, provide support to overcome their weakness, listen to their grievances and provide appropriate solutions, and win their trust and support • Motivate and support employees to achieve their work and development objectives, and provide recognition when they are successful • Encourage employees to take responsibilities, to take own decisions within agreed boundaries, to take lead in their own areas of expertise for their development • Initiate personnel actions, such as promotions, transfers, discharges or disciplinary measures • Lead production department and team successfully through difficulties and challenges • Review the sales forecast for the week/month (or) monthly production	Laptop, white board, marker, chart papers, projector, trainer's guide and student handbook

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		plan discussed with plant manager (or) customer requirement (as applicable) and identify production priorities to meet market requirement • Identify and confirm resource availability such as raw materials, packing materials, equipment availability and capacity, production capacity, manpower requirement and availability, stock level, storage capacity, transport capacity etc • Plan details of production in terms of output quantity and quality, cost, time and manpower requirements • Analyze the consequences of failing to meet production/delivery timelines to meet the schedule, notify relevant authorities of any possibility that demand cannot be met within required timeframe • Develop production schedule to meet market demands/priorities and delivery timelines within budget and with available resources, consult production plan with inter department heads and production supervisor, instruct supervisor to allocate work to production team • Communicate the production schedule to cross function heads through communication system followed by the organisation such as e-mail or upload in the ERP system • Identify and confirm equipment requirements to meet production target, share production schedule with equipment requirement to maintenance manager/supervisor for maintenance plan that aligns with production plan • Co-ordinate with maintenance manager/supervisor to understand materials, consumables and manpower requirement and availability for maintenance activities, for uninterrupted production • Understand equipment maintenance process and procedure and co-ordinate for maintenance activities during breakdown, emergency response, routine cleaning and servicing, etc. • Analyze equipment maintenance data to interpret equipment	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		performance and arrive at production capability of each process equipment • Co-ordinate with maintenance team to ensure reliable equipment performance with minimal disruption to production, to minimize down time during equipment breakdowns, and to optimize equipment efficiency to achieve production target • Lead and build team spirit between production and maintenance personnel through effective communication to enhance equipment performance and to identify production improvement opportunities • Ensure maintenance procedures are followed meet food safety and environmental requirements • Monitor production process for usage of raw materials, packaging materials, manpower, wastage against production plan and identify reason for variances against plan • Address the reason for variation in achieving production schedule, production target within allocated budget • Adjust production schedule in response to variables affecting achievement of production target • Monitor production output and cost, adjust processes and resources to minimize cost and to achieve quantity and quality product • Reschedule production plan in case of urgent requirement or any unforeseen event, to minimize wastage and to utilize materials/utilities and resources efficiently, discuss and negotiate changes with inter department team on time for their support and team work • Review production schedule and process, consult /discuss with supervisor, team and cross function teams identify opportunities for improvement and develop recommendations for improvement on production process • Set polices, plans and procedures, and take initiative to implement the identified improvement opportunities	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		to control cost and to achieve better yield and quality • Monitor, review and ensure production details are documented to meet the documentation requirements of the organisation, and to meet audit requirements like ISO, HACCP, etc • Understand objective of trial production, trial product processing method and specification, select production team for trial, discuss with cross function team like planning, QA, maintenance etc, clarify roles and responsibilities and level of authority to the team and cross function • Prepare technical production procedures considering all engineering and process parameters for new product trial, educate and train supervisors and operators on trial procedure • Identify and consider all possible hazards, prepare plan and procedures to prevent and control hazards, provide training to trial team to handle hazards • Prepare detailed trial production schedule to manage production process without overlapping/affecting with regular production, and considering availability of raw materials and packaging materials, machine availability and capability, man power availability and competency etc • Monitor trial production against plan to identify variances and factors that need to be adjusted to achieve product of required specification within the planned time • Document and evaluate trial production data and identify process/parameters to be modified/changed to achieve product of required specification • Prepare trial production report with recommendations on improvement opportunities, and share with cross function heads and relevant authorities for suggestion and consideration	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
7	**Manage production optimization and cost efficiency** **Theory Duration** (hh:mm) 08:00 **Practical Duration** (hh:mm) 12:00 **Corresponding NOS Code** FIC/N9015	Review production reports and analyze equipment performance, process capability, change over time, maintenance, consumables, power etc, to identify factors that affect performance of production and recommend improvement opportunities Compile performance data on process and equipment to identify cause for lack of performance, evaluate opportunities to improve, identify cost saving options, propose changes in process, and implement proposal with proper approvals Review production process with supervisor and machine operators to identify reasons for slowdown or stop of production process, provide recommendations to overcome efficiency issues, take feedback, develop plans for implementing recommended changes, monitor changes implemented, and review changes and improvement Calculate utilities and energy usage in production area and for production process, identify methods to minimize usage Develop plans and procedures to minimize use of utilities and energy without affecting the production efficiency Identify energy and utility losses or sources of waste, analyze reason, recommend methods to improve efficient energy/utility application, ensure recommendations are implemented, and monitor improvement Identify areas where utilities and energy can be saved, and Identify methods to save energy like recycling energy and utilities such as steam, heat and water, following proper maintenance methods to avoid leaks and losses etc, and prepare efficient production schedule such that target is met with efficient utilization of energy and utility Analyze usage pattern of energy and other utilities in production area and process against budget allocation, identify cost effective options for	Laptop, white board, marker, chart papers, projector, trainer's guide and student handbook ,

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		minimizing wastage, and implement changes Identify system, production process that need to be changed, identify opportunities for implementing change in production process, analyze impact of change on product quality, impact on the team and present production process Communicate with relevant authorities/superiors the need for change, results and benefits expected our of change Design new processes, procedures, systems, structures with roles and responsibilities, key performance indicators, training needs, safety system, contingency plans, monitoring and reporting system to implement planned changes in production process Provide training and support to implement changes, develop a strategy to help teams implement change Monitor changes implemented in production process and ensure changes are effective and meet the organisation and regulatory requirements Document and communicate the progress achieved through implemented change to the management and everyone involved, and make them understand and enjoy achievement Recognize and reward employees and teams for implementing change in production system and achieving better efficiency Manage budget efficiently by managing production with available resource, by avoiding overtime and too many casual workers/helpers Plan effectively to secure, confirm and allocate required manpower to meet production target within budget, monitor resource utilization, to achieve production target within existing resource Identify situations where actual budget exceeds the approved budget, investigate reason for variance and take appropriate	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		corrective action to keep budget under control Identify the impact on budget of production-related decisions like scheduling holidays, adjusting production volume, scheduling equipment maintenance etc, before scheduling production, and identify opportunities to improve performance against budget Identify the causes for any significant variances in budget control, discuss with team and ensure prompt corrective action is taken to keep expenditure under control Encourage team to think and identify ways of reducing expenditure, analyse and pursue the suggested ideas	
8	**Manage documentation system and implement safety and environmental policies** **Theory Duration** (hh:mm) 07:00 **Practical Duration** (hh:mm) 09:00 **Corresponding NOS Code** FIC/N9016	• Establish to production team the importance of documentation, provide training on documentation system, and ensure all documents are maintained systematically • Ensure all relevant records and documents are complete, up-to-date and accessible for audits on production process • During audit provide the auditor with access to all relevant information, records and documents • Ensure corrective actions recommended and implemented are documented to assure production process is carried in accordance with organisation and regulatory standards • Establish methods to track production information from documented and maintained records • Establish to production team importance of safety and environment requirements related to food processing unit, communicate information about safety and environmental policies and related procedures to the team • Co-ordinate with quality team to prepare policies and sops on safety and environment requirements related to production function, and ensure those procedure are followed in production area and during production process	Laptop, white board, marker, chart papers, projector, trainer's guide and student handbook, logbooks, internal audit register, food safety manual, quality policy etc.

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		• Ensure safe work procedures are followed in production area and during production process • Ensure policies and standard operating procedures on safety and environment requirements are accessible to all employees of production team, and are followed to meet the regulatory requirements • Identify safety and environmental hazards relevant to production processes, implement system to handle risks • Provide or organize training through relevant authorities on safety and environmental management system, to understand methods to control and prevent hazards • Conduct inspections in work place on use of protective clothing and accessories, and to ensure safety system is followed during production process • Conduct audits and review records on safety and environmental system to monitor if control systems are followed by production team, and address non-compliance following organisation standards • Implement system on waste management in production area and process, monitor and confirm waste collection, treatment, recycling or disposal is carried out meeting industry requirements and environmental regulations • Respond to environmental management hazard identification and incidents in an appropriate and timely way • Review practice and procedures followed on safety, conduct risk assessments, identify non-compliance, and provide recommendations to address gaps and non-conformances • Review environmental records documents maintained, analyze data to evaluate effectiveness of the environmental management system and identify areas for improvement, plan and implement improvements to meet regulatory requirements	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
9	**Professional and Core Skills** **Theory Duration** (hh:mm) 03:00 **Practical Duration** (hh:mm) 05:00 **Corresponding NOS Code**	Undertake a self-assessment test Identify personal strengths and weaknesses Plan and schedule the work order and manage time effectively to complete the tasks assigned Prevent potential problems from occurring Resolve issues and problems using acquired knowledge and realize the importance of decision making Identify potential problems and make sound and timely decision Improve your reading skills State the importance of listening	Laptop, white/black board, marker, chart papers, projector ,Trainer's guide, Student manual
10	**IT Skills** **Theory Duration** (hh:mm) 05:00 **Practical Duration** (hh:mm) 07:00 **Corresponding NOS Code**	Identify parts of the computer Use the computer keyboard effectively to type Use computer applications effectively to record day-to-day activities Use the word processor effectively Use the spreadsheet application effectively Use the computer to document day-to-day activities	Laptop, white/black board, marker, chart papers, projector, Trainer's guide, Student manual
11	**Field Visits** **Theory Duration** (hh:mm) 04:00 **Practical Duration** (hh:mm) 30:00 **Corresponding NOS Code**	Observe the factory location, layout and safety aspects of food processing Observe the storage facilities for raw materials and finished products Observe the various machineries used in process Observe the various machineries used in process Observe the cleaning methods and processes followed to maintain the process machineries and tools Observe the raw materials used and their storage procedures Observe the packaging and storage processes of raw material and finished product Observe the post-production cleaning and maintenance process followed in the industry	All the tools and equipment listed above must be available at the site of field visit
12	**Revision** **Theory Duration** (hh:mm) 02:00	Revised the knowledge gained so far	All the tools and equipment listed above must be available at the time of revision

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Practical Duration (hh:mm) 02:00 **Corresponding NOS Code**		
13	**Evaluation** **Theory Duration** (hh:mm) 08:00 **Practical Duration** (hh:mm) 20:00 **Corresponding NOS Code**	Assess the knowledge and skills acquired by the participants	All the tools and equipment listed above must be available for evaluation
14	**On-the-job Training** **Theory Duration** (hh:mm) 30:00 **Practical Duration** (hh:mm) 65:00 **Corresponding NOS Code**	Apply the skills and knowledge acquired in the training program in the field	All the tools and equipment listed above must be available on the site at the time of OJT
	Total Duration **240:00** **Theory Duration** **88:00** **Practical Duration** **152:00**	**Unique Equipment Required:** Laptop, white board, marker, chart papers, projector, trainer's guide and student handbook , cleaning machines, destoner, pulverizer, kneader, mixer, roaster, dryer, oven, extruder, packaging machines flaker, machineries blender, Measurement Cane; Weighing balance, Timer, Gas with Burner; Knives, spatulas, packing wrap rolls, measuring cup and spoons, utensils, ladle, ladle with holes, digital hygrometer, Muslin Cloth; Weighing Machine; Milk Stirrer; Thermometer; Test Tube (Glass); Test Tube Holder; Gas with Burner,	

Grand Total Course Duration: **240Hours, 0 Minutes**

*(This syllabus/ curriculum has been approved by **SSC: Food Industry Capacity and Skill Initiative)***

Trainer Prerequisites for Job role: "Production Manager" mapped to Qualification Pack: "FIC/Q9003, v1.0"

Sr. No.	Area	Details
1	**Description**	To deliver accredited training service, mapping to the curriculum detailed above, in accordance with the Qualification Pack "FIC/Q9003", Version 1.0
2	**Personal Attributes**	An aptitude for conducting training, and pre/ post work to ensure competent, employable candidates at the end of the training, and pre/post work to ensure competent, employable candidates at the end of the training. Strong communication skills, ability to work as part of a team; a passion for quality and for developing others; well-organized and focused, eager to learn and keep oneself updated with the latest in the mentioned fields.
3	**Minimum Educational Qualifications**	M.Sc/M.Tech/ME in Food Technology or Food Engineering with 5-6 years of hands on experience in a food industry B.Sc (home Sc) /B.Tech/BE in Food Technology or Food Engineering with 7-8 years of hands on experience in a food industry
4a	**Domain Certification**	Certified for Job Role: "Production Manager" mapped to QP: "FIC/Q9003, v1.0". Minimum accepted score is 80%
4b	**Platform Certification**	Recommended that the Trainer is certified for the Job Role: "Trainer", mapped to the Qualification Pack: "SSC/Q1402". Minimum accepted SCORE IS 80 % as per FICSI guidelines.
5	**Experience**	M.Sc/M.Tech/ME in Food Technology or Food Engineering with 5-6 years of hands on experience in a food industry B.Sc (home Sc) /B.Tech/BE in Food Technology or Food Engineering with 7-8 years of hands on experience in a food industry

Annexure: Assessment Criteria

Assessment Criteria	
Job Role	Production Manager
Qualification Pack	FIC/Q9003, v1.0
Sector Skill Council	Food Processing

Sr. No.	Guidelines for Assessment
1	Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2	The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3	Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training centre(as per assessment criteria below)
4	Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training canter based on this criteria
5	To pass the Qualification Pack, every trainee should score a minimum of 70% (overall) in every QP
6	The marks are allocated PC wise; however, every NOS will carry a weight age in the total marks allocated to the specific QP

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
1. FIC/N9014: Manage production process in food processing unit	PC1. Communicate clearly the organisation policies and goals to the employees of production team, make them understand and commit their energy and expertise to achieve organisation goals	100	2.5	1	1.5
	PC2. Achieve department targets and organisation goals by understanding the organisation and employees, developing a leadership style and applying them appropriately		2.5	1	1.5
	PC3. Communicate with employees regularly and effectively, help them identify their strengths, provide support to overcome their weakness, listen to their grievances and provide appropriate solutions, and win their support		3	1	2
	PC4. Motivate and support employees to achieve their work and development objectives, and provide recognition when they are successful		2.5	1	1.5

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC5. Encourage employees to take responsibilities, to take own decisions within agreed boundaries, to take lead in their own areas of expertise for their development		2.5	1	1.5
	PC6. Initiate personnel actions, such as promotions, transfers, discharges or disciplinary measures		3	1	2
	PC7. Lead production department and team successfully through difficulties and challenges		3	1	2
	PC8. Review the sales forecast for the week/month (or) monthly production plan discussed with plant manager (or) customer requirement (as applicable) and identify production priorities to meet market requirement		3	1	2
	PC9. Identify and confirm resource availability like raw materials, packing materials, equipment availability and capacity, production capacity, manpower requirement and availability, stock level, storage capacity, transport capacity etc		3	1	2
	PC10. Plan details of production in terms of output quantity and quality, cost, time and manpower requirements		3	1	2
	PC11. Analyze the consequences of failing to meet production/delivery timelines to meet the schedule, notifying relevant authorities of any possibility that demand cannot be met within required timeframe		3	1	2
	PC12. Develop production schedule to meet market demands/priorities and delivery timelines within budget and with available resources, consult production plan with inter department heads and production supervisor, instruct supervisor to allocate work to production team		3	1	2
	PC13. Communicate the production schedule to cross function heads through communication system followed by the organisation like e-mail or upload in the erp system		**2.5**	**1**	**1.5**
	PC14. Identify and confirm equipment requirements to meet production target, share production schedule with equipment requirement to maintenance manager/supervisor for		**2.5**	**1**	**1.5**

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	maintenance plan that aligns with production plan				
	PC15. Co-ordinate with maintenance manager/supervisor to understand materials, consumables and manpower requirement and availability for maintenance activities, for uninterrupted production		3	1	2
	PC16. Understand equipment maintenance process and procedure and co-ordinate for maintenance activities during breakdown, emergency response, routine cleaning and servicing etc		2.5	1	1.5
	PC17. Analyze equipment maintenance data to interpret equipment performance and arrive at production capability of each process equipment		3	1	2
	PC18. Co-ordinate with maintenance team to ensure reliable equipment performance with minimal disruption to production, to minimize down time during equipment breakdowns, and to optimize equipment efficiency to achieve production target		3	1	2
	PC19. Lead and build team spirit between production and maintenance personnel through effective communication to enhance equipment performance and to identify production improvement opportunities		2.5	1	1.5
	PC20. Ensure maintenance procedures followed meet food safety and environmental requirements		2.5	1	1.5
	PC21. Monitor production process for usage of raw materials, packaging materials, manpower, wastage against production plan and identify reason for variances against plan		3	1	2
	PC22. Address the reason for variation in achieving production schedule, production target within allocated budget		3	1	2
	PC23. Adjust production schedule in response to variables affecting achievement of production target		3	1	2
	PC24. Monitor production output and cost, adjust processes and resources to minimize cost and to achieve quantity and quality product		3	1	2

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC25. Reschedule production plan in case of urgent requirement or any unforeseen event, to minimize wastage and to utilize materials/utilities and resources efficiently, discuss and negotiate changes with inter department team on time for their support and team work		3	1	2
	PC26. Review production schedule and process, consult /discuss with supervisor, team and cross function teams identify opportunities for improvement and develop recommendations for improvement on production process		3	1	2
	PC27. Set polices, plans and procedures, and take initiative to implement the identified improvement opportunities to control cost and to achieve better yield and quality		3	1	2
	PC28. Monitor, review and ensure production details are documented to meet the documentation requirements of the organisation, and to meet audit requirements like iso, haccp etc		3	1	2
	PC29. Understand objective of trial production, trial product processing method and specification, select production team for trial, discuss with cross function team like planning, qa, maintenance etc, clarify roles and responsibilities and level of authority to the team and cross function		3	1	2
	PC30. Prepare technical production procedures considering all engineering and process parameters for new product trial, educate and train supervisors and operators on trial procedure		3	1	2
	PC31. Identify and consider all possible hazards, prepare plan and procedures to prevent and control hazards, provide training to trial team to handle hazards		2.5	1	1.5
	PC32. Prepare detailed trial production schedule to manage production process without overlapping/affecting with regular production, and considering availability of raw materials and packaging materials,		3	1	2

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	machine availability and capability, man power availability and competency etc				
	PC33. Monitor trial production against plan to identify variances and factors that need to be adjusted to achieve product of required specification within the planned time		**3**	**1**	**2**
	PC34. Document and evaluate trial production data and identify process/parameters to be modified/changed to achieve product of required specification		**3**	**1**	**2**
	PC35. Prepare trial production report with recommendations on improvement opportunities, and share with cross function heads and relevant authorities for suggestion and consideration		**3**	**1**	**2**
2. FIC/N9015: Manage production optimization and cost efficiency in food processing unit	PC1. Review production reports and analyze equipment performance, process capability, change over time, maintenance, consumables, power etc, to identify factors that affect performance of production and recommend improvement opportunities	**100**	2	0.5	1.5
	PC2. Compile performance data on process and equipment to identify cause for lack of performance, evaluate opportunities to improve, identify cost saving options, propose changes in process, and implement proposal with proper approvals		3	0.5	2.5
	PC3. Review production process with supervisor and machine operators to identify reasons for slowdown or stop of production process, provide recommendations to overcome efficiency issues, take feedback, develop plans for implementing recommended changes, monitor changes implemented, and review changes and improvement		3	1	2
	PC4. Calculate utilities and energy usage in production area and for production process, identify methods to minimize usage		2	0.5	1.5
	PC5. Develop plans and procedures to minimize use of utilities and energy		2	0.5	1.5

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	without affecting the production efficiency				
	PC6. Identify energy and utility losses or sources of waste, analyze reason, recommend methods to improve efficient energy/utility application, ensure recommendations are implemented, and monitor improvement		2	0.5	1.5
	PC7. Identify areas where utilities and energy can be saved, and identify methods to save energy like recycling energy and utilities such as steam, heat and water, following proper maintenance methods to avoid leaks and losses etc, and prepare efficient production schedule such that target is met with efficient utilization of energy and utility		3	1	2
	PC8. Analyze usage pattern of energy and other utilities in production area and process against budget allocation, identify cost effective options for minimizing wastage, and implement changes		3	1	2
	PC9. Identify system, production process that need to be changed, identify opportunities for implementing change in production process, analyze impact of change on product quality, impact on the team and present production process		3	1	2
	PC10. Communicate with relevant authorities/superiors the need for change, results and benefits expected our of change		1	0.5	0.5
	PC11. Design new processes, procedures, systems, structures with roles and responsibilities, key performance indicators, training needs, safety system, contingency plans, monitoring and reporting system to implement planned changes in production process		1	0.5	0.5
	PC12. Provide training and support to implement changes, develop a strategy to help teams implement change		2	0.5	1.5
	PC13. Monitor changes implemented in production process and ensure		4	1.5	2.5

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	changes are effective and meet the organisation and regulatory requirements				
	PC14. Document and communicate the progress achieved through implemented change to the management and everyone involved, and make them understand and enjoy achievement		4	1.5	2.5
	PC15. Recognize and reward employees and teams for implementing change in production system and achieving better efficiency		5	2	3
	PC16. Manage budget efficiently by managing production with available resource, by avoiding overtime and too many casual workers/helpers		4	1.5	2.5
	PC17. Plan effectively to secure, confirm and allocate required manpower to meet production target within budget, monitor resource utilization, to achieve production target within existing resource		4	1.5	2.5
	PC18. Identify situations where actual budget exceeds the approved budget, investigate reason for variance and take appropriate corrective action to keep budget under control		1	0.5	0.5
	PC19. Identify the impact on budget of production-related decisions like scheduling holidays, adjusting production volume, scheduling equipment maintenance etc, before scheduling production, and identify opportunities to improve performance against budget		1	0.5	0.5
	PC20. Identify the causes for any significant variances in budget control, discuss with team and ensure prompt corrective action is taken to keep expenditure under control		3	1	2
	PC21. Encourage team to think and identify ways of reducing expenditure, analyze and pursue the suggested ideas		4	1	3
			100	**35**	**65**
3. FIC/N9016: Manage documentation system and implement	PC1. Establish to production team the importance of documentation, provide training on documentation system, and ensure all documents are maintained systematically	**100**	6	2	4

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
safety and environmental policies in food processing unit	PC2. Ensure all relevant records and documents are complete, up-todate and accessible for audits on production process		6	2	4
	PC3. During audit provide the auditor with access to all relevant information, records and documents		6	3	3
	PC4. Ensure corrective actions recommended and implemented are documented to assure production process is carried in accordance with organisation and regulatory standards		6	2	4
	PC5. Establish methods to track production information from documented and maintained records		5	2	3
	PC6. Establish to production team importance of safety and environment requirements related to food processing unit, communicate information about safety and environmental policies and related procedures to the team		6	2	4
	PC7. Co-ordinate with quality team to prepare policies and sops on safety and environment requirements related to production function, and ensure those procedure are followed in production area and during production process		6	2	4
	PC8. Ensure safe work procedures are followed in production area and during production process		6	2	4
	PC9. Ensure policies and standard operating procedures on safety and environment requirements are accessible to all employees of production team, and are followed to meet the regulatory requirements		5	2	3
	PC10. Identify safety and environmental hazards relevant to production processes, implement system to handle risks		6	2	4
	PC11. Provide or organize training through relevant authorities on safety and environmental management system, to understand methods to control and prevent hazards		6	2	4
	PC12. Conduct inspections in work place on use of protective clothing and accessories, and to ensure safety		6	2	4

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	system is followed during production process				
	PC13. Conduct audits and review records on safety and environmental system to monitor if control systems are followed by production team, and address non-compliance following organisation standards		6	2	4
	PC14. Implement system on waste management in production area and process, monitor and confirm waste collection, treatment, recycling or disposal is carried out meeting industry requirements and environmental regulations		6	2	4
	PC15. Respond to environmental management hazard identification and incidents in an appropriate and timely way		6	2	4
	PC16. Review practice and procedures followed on safety, conduct risk assessments, identify non-compliance, andprovide recommendations to address gaps and non-conformances		6	2	4
	PC17. Review environmental records documents maintained, analyze data to evaluate effectiveness of the environmental management system and identify areas for improvement, plan and implement improvements to meet regulatory requirements		6	2	4
	Total		**100**	**35**	**65**
	Grand Total	**400**	**400**	**300**	**100**
	Percentage Weightage		**100**	**60%**	**40%**
	Minimum Pass% to qualify (aggregate):			**70%**	

Production Manager

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE
(Autonomous)
B N ROAD, MYSURU- 570 025

DEPARTMENT OF CHEMISTRY

Syllabus

CHOICE BASED CREDIT SYSTEM

For B.Sc programmes

Physics, Chemistry, Mathematics
Chemistry, Zoology, Biotechnology
Chemistry, Botany, Zoology

2017-18

Programme - PCM

Scheme of Study for B.Sc. Chemistry under CBCS Scheme 2017-18

YR	SEM	COURSE CODE	TITLE OF THE PAPER	NO. OF CREDITS		LECTURE/PRACTICAL HOURS /WEEK		TOTAL TEACHING HOUIRS	
				THEORY	PRA	THEORY (Hrs)	PRA (Hrs)	THEORY (Hrs)	PRA (Hrs)
I	I	CMA24001	**ATOMIC STRUCTURE, BONDING, GENERAL ORGANIC CHEMISTRY & ALIPHATIC HYDROCARBONS**	04	02	04	04	60	60
	II	CMB24001	**CHEMICAL ENERGETICS,EQUILIBRIA,& FUNCTIONAL GROUP ORGANIC CHEMISTRY**	04	02	04	04	60	60
II	III	CMC24001	**SOLUTIONS & ORGANIC CHEMISTRY**	04	02	04	04	60	60
	IV	CMD24001	**CO-ORDINATION CHEMISTRY & PHYSICAL CHEMISTRY**	04	02	04	04	60	60
III	V	**Choose any one(DSE)**							
		CME24001	**INORGANIC MATERIALS OF INDUSTRIAL IMPORTANCE**	04	1	04	03	60	45
		CME24401	**INDUSTRIAL CHEMICALS AND ENVIRONMENT**	04	1	04	03	60	45
	VI	**Choose any one(DSE)**							
		CMF24001	**ORGANOMETALLICS, BIOINORGANIC CHEMISTRY, POLY NUCLEAR HYDROCARBONS AND UV,IR SPECTROSCOPY**	04	1	04	03	60	45
		CMF24201	**QUANTUM CHEMISTRY, SPECTOSCOPY AND PHOTOCHEMISTRY**	04	1	04	03	60	45
	V	**Choose any one(SEC)**							
		CME24201	**FUEL CHEMISTRY**	02	--	02	--	30	--
		CME24601	**BASIC ANALYTICAL CHEMISTRY**	02	--	02	--	30	--

Scheme of Assessment for B.Sc. Chemistry under CBCS Scheme 2017-18

Year	SEM	COURSE CODE	TITLE OF THE PAPER	CONTINUOUS ASSESSMENT					MAX MARKS			PERCENTAGE			DURATION OF EXAM	
				C1		C2		C 3	T H	PR	IA	T H	PR	IA	TH	PR
				T H	PR	T H	P R									
I	I	CMA24001	**ATOMIC STRUCTURE ,BONDING, GENERAL ORGANIC CHEMISTRY & ALIPHATIC HYDROCARBONS**	**10**	**5**	**10**	**5**	**70**	70	70	30	**50**	**20**	**30**	**3h**	**3h**
	II	CMB24001	**CHEMICAL ENERGETICS,EQUILIBRIA, & FUNCTIONAL GROUP ORGANIC CHEMISTRY**	**10**	**5**	**10**	**5**	**70**	70	70	30	**50**	**20**	**30**	**3h**	**3h**
II	III	CMC24001	**SOLUTIONS & ORGANIC CHEMISTRY**	**10**	**5**	**10**	**5**	**70**	70	70	30	**50**	**20**	**30**	**3h**	**3h**
	IV	CMD24001	**CO-ORDINATION CHEMISTRY & PHYSICAL CHEMISTRY**	**10**	**5**	**10**	**5**	**70**	70	70	30	**50**	**20**	**30**	**3h**	**3h**
III	V	**Choose any one(DSE)**														
		CME24001	**INORGANIC MATERIALS OF INDUSTRIAL IMPORTANCE**	**10**	**5**	**10**	**5**	**70**	70	70	30	**50**	**20**	**30**	**3h**	**3h**
		CME24401	**INDUSTRIAL CHEMICALS AND ENVIRONMENT**	**10**	**5**	**10**	**5**	**70**	70	70	30	**50**	**20**	**30**	**3h**	**3h**
	VI	**Choose any one(DSE)**														
		CMF24001	**ORGANOMETALLICS, BIOINORGANIC CHEMISTRY, POLY NUCLEAR HYDROCARBONS AND UV, IR SPECTROSCOPY**	**10**	**5**	**10**	**5**	**70**	70	70	30	**50**	**20**	**30**	**3h**	**3h**
		CMF24201	**QUANTUM CHEMISTRY, SPECTOSCOPY AND PHOTOCHEMISTRY**	**10**	**5**	**10**	**5**	**70**	70	70	30	**50**	**20**	**30**	**3h**	**3h**
	V	**Choose any one(SEC)**														
		CME24201	**FUEL CHEMISTRY**	**15**	**--**	**15**	**--**	**50**	50	--	30	**70**	**---**	**30**	**2h**	**--**
		CME24601	**BASIC ANALYTICAL CHEMISTRY**	**15**	**--**	**15**	**--**	**50**	50	--	30	**70**	**---**	**30**	**2h**	**--**

Core papers – Chemistry (Credit: 06 each)

Sl. No	SEM	Course Code	Title of the paper	Total credits	
				Th	Pr
1	I	CMA24001	**ATOMIC STRUCTURE ,BONDING, GENERAL ORGANIC CHEMISTRY & ALIPHATIC HYDROCARBONS**	04	02
2	II	CMB24001	**CHEMICAL ENERGETICS,EQUILIBRIA,&** FUNCTIONAL GROUP ORGANIC **CHEMISTRY**	04	02
3	III	CMC24001	**SOLUTIONS & ORGANIC CHEMISTRY**	04	02
4	IV	CMD24001	**CO-ORDINATION CHEMISTRY & PHYSICAL CHEMISTRY**	04	02

Discipline Specific Electives: DSE (Credit: 5 each)

Sl. No	SEM	Course Code	Title of the paper	Total credits	
				Th	Pr
	V	**Choose any one**			
1		CME24001	**INORGANIC MATERIALS OF INDUSTRIAL IMPORTANCE**	04	1
		CME24401	**INDUSTRIAL CHEMICALS AND ENVIRONMENT**	04	1
	VI	**Choose any one**			
2		CMF24001	**ORGANOMETALLICS, BIOINORGANIC CHEMISTRY, POLY NUCLEAR HYDROCARBONS AND UV,IR SPECTROSCOPY**	04	1
		CMF24201	**QUANTUM CHEMISTRY, SPECTOSCOPY AND PHOTOCHEMISTRY**	04	1

Skill Enhancement Course: SEC (Credit: 02 each)

Sl. No	Course Code	Title of the paper	Total credits
			Th
	Choose any one		
1	CME24201	**FUEL CHEMISTRY**	02
	CME24601	**BASIC ANALYTICAL CHEMISTRY**	02

Programme - CZBt

Scheme of Study for B.Sc. Chemistry under CBCS Scheme 2017-18

YR	SEM	COURSE CODE	TITLE OF THE PAPER	NO. OF CREDITS		LECTURE/PRACTICAL HOURS /WEEK		TOTAL TEACHING HOUIRS	
				THEORY	PRA	THEORY (Hrs)	PRA (Hrs)	THEORY (Hrs)	PRA (Hrs)
I	I	CMA24005	**ATOMIC STRUCTURE, BONDING, GENERAL ORGANIC CHEMISTRY & ALIPHATIC HYDROCARBONS**	04	02	04	04	60	60
	II	CMB24005	**CHEMICAL ENERGETICS,EQUILIBRIA,& FUNCTIONAL GROUP ORGANIC CHEMISTRY**	04	02	04	04	60	60
II	III	CMC24005	**SOLUTIONS & ORGANIC CHEMISTRY**	04	02	04	04	60	60
	IV	CMD24005	**CO-ORDINATION CHEMISTRY & PHYSICAL CHEMISTRY**	04	02	04	04	60	60
III	V	**Choose any one(DSE)**							
		CME24005	**INORGANIC MATERIALS OF INDUSTRIAL IMPORTANCE**	04	1	04	03	60	45
		CME24405	**INDUSTRIAL CHEMICALS AND ENVIRONMENT**	04	1	04	03	60	45
	VI	**Choose any one(DSE)**							
		CMF24005	**ORGANOMETALLICS, BIOINORGANIC CHEMISTRY, POLY NUCLEAR HYDROCARBONS AND UV,IR SPECTROSCOPY**	04	1	04	03	60	45
		CMF24205	**QUANTUM CHEMISTRY, SPECTOSCOPY AND PHOTOCHEMISTRY**	04	1	04	03	60	45
	V	**Choose any one(SEC)**							
		CME24205	**FUEL CHEMISTRY**	02	--	02	--	30	--
		CME24605	**BASIC ANALYTICAL CHEMISTRY**	02	--	02	--	30	--

Scheme of Assessment for B.Sc. Chemistry under CBCS scheme 2017-18

Year	SEM	COURSE CODE	TITLE OF THE PAPER	CONTINUOUS ASSESSMENT					MAX MARKS			PERCENTAGE			DURATION OF EXAM	
				C1		C2		C 3	T H	PR	IA	T H	PR	IA	TH	PR
				T H	PR	T H	P R									
I	I	CMA24005	**ATOMIC STRUCTURE, BONDING, GENERAL ORGANIC CHEMISTRY & ALIPHATIC HYDROCARBONS**	**10**	**5**	**10**	**5**	**70**	70	70	30	**50**	**20**	**30**	**3h**	**3h**
	II	CMB24005	**CHEMICAL ENERGETICS,EQUILIBRIA, & FUNCTIONAL GROUP ORGANIC CHEMISTRY**	**10**	**5**	**10**	**5**	**70**	70	70	30	**50**	**20**	**30**	**3h**	**3h**
II	III	CMC24005	**SOLUTIONS & ORGANIC CHEMISTRY**	**10**	**5**	**10**	**5**	**70**	70	70	30	**50**	**20**	**30**	**3h**	**3h**
	IV	CMD24005	**CO-ORDINATION CHEMISTRY & PHYSICAL CHEMISTRY**	**10**	**5**	**10**	**5**	**70**	70	70	30	**50**	**20**	**30**	**3h**	**3h**
III	V	**Choose any one(DSE)**														
		CME24005	**INORGANIC MATERIALS OF INDUSTRIAL IMPORTANCE**	**10**	**5**	**10**	**5**	**70**	70	70	30	**50**	**20**	**30**	**3h**	**3h**
		CME24405	**INDUSTRIAL CHEMICALS AND ENVIRONMENT**	**10**	**5**	**10**	**5**	**70**	70	70	30	**50**	**20**	**30**	**3h**	**3h**
	VI	**Choose any one(DSE)**														
		CMF24005	**ORGANOMETALLICS, BIOINORGANIC CHEMISTRY, POLY NUCLEAR HYDROCARBONS AND UV, IR SPECTROSCOPY**	**10**	**5**	**10**	**5**	**70**	70	70	30	**50**	**20**	**30**	**3h**	**3h**
		CMF24205	**QUANTUM CHEMISTRY, SPECTOSCOPY AND PHOTOCHEMISTRY**	**10**	**5**	**10**	**5**	**70**	70	70	30	**50**	**20**	**30**	**3h**	**3h**
	V	**Choose any one(SEC)**														
		CME24205	**FUEL CHEMISTRY**	**15**	**--**	**15**	**--**	**50**	50	--	30	**70**	**---**	**30**	**2h**	**--**
		CME24605	**BASIC ANALYTICAL CHEMISTRY**	**15**	**--**	**15**	**--**	**50**	50	--	30	**70**	**---**	**30**	**2h**	**--**

Core papers – Chemistry (Credit: 06 each)

Sl. No	SEM	Course Code	Title of the paper	Total credits	
				Th	Pr
1	I	CMA24005	**ATOMIC STRUCTURE ,BONDING, GENERAL ORGANIC CHEMISTRY & ALIPHATIC HYDROCARBONS**	04	02
2	II	CMB24005	**CHEMICAL ENERGETICS, EQUILIBRIA &** FUNCTIONAL GROUP ORGANIC **CHEMISTRY**	04	02
3	III	CMC24005	**SOLUTIONS & ORGANIC CHEMISTRY**	04	02
4	IV	CMD24005	**CO-ORDINATION CHEMISTRY & PHYSICAL CHEMISTRY**	04	02

Discipline Specific Electives: DSE (Credit: 5 each)

Sl. No	SEM	Course Code	Title of the paper	Total credits	
				Th	Pr
	V	**Choose any one**			
1		CME24005	**INORGANIC MATERIALS OF INDUSTRIAL IMPORTANCE**	04	1
		CME24405	**INDUSTRIAL CHEMICALS AND ENVIRONMENT**	04	1
	VI	**Choose any one**			
2		CMF24005	**ORGANOMETALLICS, BIOINORGANIC CHEMISTRY, POLY NUCLEAR HYDROCARBONS AND UV,IR SPECTROSCOPY**	04	1
		CMF24205	**QUANTUM CHEMISTRY, SPECTOSCOPY AND PHOTOCHEMISTRY**	04	1

Skill Enhancement Course: SEC (Credit: 02 each)

Sl. No	Course Code	Title of the paper	Total credits
			Th
	Choose any one		
1	CME24205	**FUEL CHEMISTRY**	02
	CME24605	**BASIC ANALYTICAL CHEMISTRY**	02

Programme - CBZ

Scheme of Study for B.Sc. Chemistry under CBCS Scheme 2017-18

YR	SEM	COURSE CODE	TITLE OF THE PAPER	NO. OF CREDITS		LECTURE/PRACTICAL HOURS /WEEK		TOTAL TEACHING HOUIRS	
				THEORY	PRA	THEORY (Hrs)	PRA (Hrs)	THEORY (Hrs)	PRA (Hrs)
I	I	CMA24008	**ATOMIC STRUCTURE, BONDING, GENERAL ORGANIC CHEMISTRY & ALIPHATIC HYDROCARBONS**	04	02	04	04	60	60
	II	CMB24008	**CHEMICAL ENERGETICS,EQUILIBRIA,& FUNCTIONAL GROUP ORGANIC CHEMISTRY**	04	02	04	04	60	60
II	III	CMC24008	**SOLUTIONS & ORGANIC CHEMISTRY**	04	02	04	04	60	60
	IV	CMD24008	**CO-ORDINATION CHEMISTRY & PHYSICAL CHEMISTRY**	04	02	04	04	60	60
III	V	**Choose any one(DSE)**							
		CME24008	**INORGANIC MATERIALS OF INDUSTRIAL IMPORTANCE**	04	1	04	03	60	45
		CME24408	**INDUSTRIAL CHEMICALS AND ENVIRONMENT**	04	1	04	03	60	45
	VI	**Choose any one(DSE)**							
		CMF24008	**ORGANOMETALLICS, BIOINORGANIC CHEMISTRY, POLY NUCLEAR HYDROCARBONS AND UV,IR SPECTROSCOPY**	04	1	04	03	60	45
		CMF24208	**QUANTUM CHEMISTRY, SPECTOSCOPY AND PHOTOCHEMISTRY**	04	1	04	03	60	45
	V	**Choose any one(SEC)**							
		CME24208	**FUEL CHEMISTRY**	02	--	02	--	30	--
		CME24608	**BASIC ANALYTICAL CHEMISTRY**	02	--	02	--	30	--

Scheme of Assessment for B.Sc. Chemistry under CBCS Scheme 2017-18

Year	SEM	COURSE CODE	TITLE OF THE PAPER	CONTINUOUS ASSESSMENT					MAX MARKS			PERCENTAGE			DURATION OF EXAM	
				C1		C2		C 3	T H	PR	IA	T H	PR	IA	TH	PR
				T H	PR	T H	P R									
I	I	CMA24008	**ATOMIC STRUCTURE, BONDING, GENERAL ORGANIC CHEMISTRY & ALIPHATIC HYDROCARBONS**	**10**	**5**	**10**	**5**	**70**	70	70	30	**50**	**20**	**30**	**3h**	**3h**
	II	CMB24008	**CHEMICAL ENERGETICS,EQUILIBRIA, & FUNCTIONAL GROUP ORGANIC CHEMISTRY**	**10**	**5**	**10**	**5**	**70**	70	70	30	**50**	**20**	**30**	**3h**	**3h**
II	III	CMC24008	**SOLUTIONS & ORGANIC CHEMISTRY**	**10**	**5**	**10**	**5**	**70**	70	70	30	**50**	**20**	**30**	**3h**	**3h**
	IV	CMD24008	**CO-ORDINATION CHEMISTRY & PHYSICAL CHEMISTRY**	**10**	**5**	**10**	**5**	**70**	70	70	30	**50**	**20**	**30**	**3h**	**3h**
III	V	**Choose any one(DSE)**														
		CME24008	**INORGANIC MATERIALS OF INDUSTRIAL IMPORTANCE**	**10**	**5**	**10**	**5**	**70**	70	70	30	**50**	**20**	**30**	**3h**	**3h**
		CME24408	**INDUSTRIAL CHEMICALS AND ENVIRONMENT**	**10**	**5**	**10**	**5**	**70**	70	70	30	**50**	**20**	**30**	**3h**	**3h**
	VI	**Choose any one(DSE)**														
		CMF24008	**ORGANOMETALLICS, BIOINORGANIC CHEMISTRY, POLY NUCLEAR HYDROCARBONS AND UV, IR SPECTROSCOPY**	**10**	**5**	**10**	**5**	**70**	70	70	30	**50**	**20**	**30**	**3h**	**3h**
		CMF24208	**QUANTUM CHEMISTRY, SPECTOSCOPY AND PHOTOCHEMISTRY**	**10**	**5**	**10**	**5**	**70**	70	70	30	**50**	**20**	**30**	**3h**	**3h**
	V	**Choose any one(SEC)**														
		CME24208	**FUEL CHEMISTRY**	**15**	**--**	**15**	**--**	**50**	50	--	30	**70**	**---**	**30**	**2h**	**--**
		CME24608	**BASIC ANALYTICAL CHEMISTRY**	**15**	**--**	**15**	**--**	**50**	50	--	30	**70**	**---**	**30**	**2h**	**--**

Core papers – Chemistry (Credit: 06 each)

Sl. No	SEM	Course Code	Title of the paper	Total credits	
				Th	Pr
1	I	CMA24008	**ATOMIC STRUCTURE ,BONDING, GENERAL ORGANIC CHEMISTRY & ALIPHATIC HYDROCARBONS**	04	02
2	II	CMB24008	**CHEMICAL ENERGETICS,EQUILIBRIA,&** FUNCTIONAL GROUP ORGANIC **CHEMISTRY**	04	02
3	III	CMC24008	**SOLUTIONS & ORGANIC CHEMISTRY**	04	02
4	IV	CMD24008	**CO-ORDINATION CHEMISTRY & PHYSICAL CHEMISTRY**	04	02

Discipline Specific Electives: DSE (Credit: 5 each)

Sl. No	SEM	Course Code	Title of the paper	Total credits	
				Th	Pr
	V	**Choose any one**			
1		CME24008	**INORGANIC MATERIALS OF INDUSTRIAL IMPORTANCE**	04	1
		CME24408	**INDUSTRIAL CHEMICALS AND ENVIRONMENT**	04	1
	VI	**Choose any one**			
2		CMF24008	**ORGANOMETALLICS, BIOINORGANIC CHEMISTRY, POLY NUCLEAR HYDROCARBONS AND UV,IR SPECTROSCOPY**	04	1
		CMF24208	**QUANTUM CHEMISTRY, SPECTOSCOPY AND PHOTOCHEMISTRY**	04	1

Skill Enhancement Course: SEC (Credit: 02 each)

Sl. No	Course Code	Title of the paper	Total credits
			Th
	Choose any one		
1	CME24208	**FUEL CHEMISTRY**	02
	CME24608	**BASIC ANALYTICAL CHEMISTRY**	02

SCHEME OF VALUATION FOR PRACTICAL EXAMINATION

- A candidate appearing for the first time should submit a duly signed and certified practical record
- Each candidate has to perform one experiment in the specified duration of three hours for ***FIFTY*** marks
- Practical record has to be valued for ***TEN*** marks by examiners at the time of examination
- IA for ***TEN*** marks in practical is awarded by continuous assessment in the lab

I. EVALUATION OF EXPERIMENTS:

Sl. no	Component	Marks
1	Procedure writing	05
2	Conducting experiment	40
3	Result	05
4	Viva-voce	10
5	Practical record	10
TOTAL		**70**

Programme Outcome for Bachelor of Science in Physics, Chemistry, Mathematics:

After completing the graduation in the Bachelor of Science the students are able to:

PO1. Demonstrate proficiency in Mathematics and the Mathematical concepts needed for a proper understanding of Physics.

PO2. Demonstrate the ability to justify and explain their thinking and/or approach.

PO3. Develop state-of-the-art laboratory skills and professional communication skills.

PO4. Apply the scientific method to design, execute, and analyze an experiment

PO5. Explain scientific procedure and experimental observations

PO6. Appreciate the role of chemistry in the society

PO7. Use this as a basis for ethical behaviour in issues facing chemists /drugs.

PO8. Understand chemistry as an integral part for addressing social, economic, and environmental problems.

PO9. Understand the value of Mathematical proof and

PO10. Demonstrate proficiency in writing and understanding proofs.

PO11. Apply mathematical problems and solutions in aspects of science and technology.

PO12. Gain experience to investigate the real world problems

PO13. Apply mathematical ideas and models to those problems.

Program Specific Outcome:

Bachelor of Science in Physics, Chemistry, Mathematics

After completing the graduation in Physics, Chemistry, Mathematics the students are able to:

PSO1. Find career opportunities

PSO2. Develop competence to write competitive examinations.

PSO3. Develop proficiency in the analysis of complex physical problems

PSO4. Use of mathematical or other appropriate techniques to solve problems.

PSO5. Apply appropriate techniques for the qualitative and quantitative analysis of chemicals laboratories and in industries.

PSO6. Create a hypothesis and appreciate how it relates to broader theories.

PSO7. Demonstrate skills in the use of Computers.

Programme Outcome for Bachelor of Science in Chemistry, Zoology, Biotechnology:

After completing the graduation in the Bachelor of Science the students are able to:

PO1. Demonstrate the ability to justify, explain, and/or approach the concept both in written and oral forms

PO2. Demonstrate the ability to present clear, logical and succinct arguments

PO3. Develop state-of-the-art laboratory skills and professional communication skills.

PO4. Apply the scientific method to design, execute, and analyze an experiment.

PO5. Appreciate the central role of chemistry in the society and use this as a basis for ethical behaviour in issues facing chemists/drugs.

PO6. Understand Chemistry as an integral part for addressing social, economic, and environmental problems.

PO7. Identify the major groups of organisms with an emphasis on animals and plants.

PO8. Compare and contrast the characteristics of animals that differentiate themselves from other living and non-living creatures.

PO9. Give specific examples of physiological adaptations.

PO10. Design and develop solution to Biotechnology problems keeping in mind the safety measures for environment and society.

PO11. Support Biotechnology research activity with strong technical background knowledge.

Programme Specific Outcome for Bachelor of Science in Chemistry, Zoology, Biotechnology:

After completing the graduation in Chemistry, Zoology, Biotechnology the students are able to:

PSO1. Find jobs at all level of chemical, pharmaceutical, food products and life oriented material Industries

PSO2. Apply appropriate techniques for the qualitative and quantitative analysis of chemicals in laboratories and in industries.

PSO3. Recognize the relationship between different structures and functions at different levels.

PSO4. Characterize the biological, chemical and physical features of environments that Animals inhabit.

PSO5. Demonstrate effectively the applications of biochemical and biological sciences.

PSO6. Know and apply appropriate tools and techniques in biotechnological manipulation

PSO7. Understand his or her responsibilities in biotechnological practices.

Programme Outcome for Bachelor of Science in Chemistry, Botany, Zoology:

After completing the graduation in the Bachelor of Science the students are able to:

PO1. Demonstrate the ability to justify, explain, and/or approach the concept

PO2. Demonstrate the ability to present clear, logical and succinct arguments

PO3. Develop state-of-the-art laboratory skills and professional communication skills.

PO4. Apply the scientific method to design, execute, and analyze an experiment.

PO5. Appreciate the role and use of chemistry for ethical issues facing chemists/drugs.

PO6. Identify the taxonomic position of plants using required principles and methods.

PO7. Understand the impact of the plant diversity in societal and environmental context,

PO8. Use interdisciplinary approaches with quantitative skills to work on biological problems.

PO9. Understand Chemistry as an integral part for addressing social, economic, and environmental problems.

PO10. Identify the major groups of organisms with an emphasis on animals and plants.

Programme Specific Outcome
Bachelor of Science in Chemistry, Botany, Zoology

After completing the graduation in the Bachelor of Science the students are able to:

PSO1. Find jobs at all level of chemical, pharmaceutical, food products, life oriented material industries,

PSO2. Apply appropriate techniques for the qualitative and quantitative analysis of chemicals in laboratories and in industries.

PSO3. Explicate ecological interconnectedness of life

PSO4: Analyze the avenues and remedies for burning environmental issues

PSO5. Recognize the relationship between different structures and functions at different levels.

PSO6. Characterize the biological, chemical and physical features of environment of Animal inhabits.

CMA24001/ CMA24005/ CMA24008

SEMESTER I

ATOMIC STRUCTURE, BONDING GENERAL ORGANIC CHEMISTRY & ALIPHATIC HYDROCARBONS

Theory: 60 Lectures

Course outcome:

After completion of the course the student is able to:

CO1: Learn in detail with examples quantum mechanics
CO2: Understand the details of periodicity, periodic table and chemical bonding
CO3: Understand in detail with examples stereochemistry and aliphatic hydrocarbons
.

CHEMISTRY-DSC 1:

Section A: Inorganic Chemistry-1 (30 Periods)

Atomic Structure: Review of: Bohr's theory and its limitations, dual behaviour of matter and radiation, de Broglie's relation, Heisenberg Uncertainty principle. Hydrogen atom spectra. Need of a new approach to Atomic structure.

What is Quantum mechanics? Time independent Schrodinger equation and meaning of various terms in it Significance of ψ and ψ^2, Schrödinger equation for hydrogen atom. Radial and angular parts of the hydrogen wave functions (atomic orbitals) and their variations for 1*s*, 2*s*, 2*p*, 3*s*, 3*p* and 3*d* orbitals (Only graphical representation) Radial and angular nodes and their significance. Radial distribution functions and the concept of the most probable distance with special reference to 1*s* and 2*s* atomic orbitals. Significance of quantum numbers, orbital angular momentum and quantum numbers *ml* and *ms* .Shapes of *s*, *p* and *d* atomic orbitals, nodal planes.Discovery of spin, spin quantum number (*s*) and magnetic spin quantum number (*ms*).
Rules for filling electrons in various orbitals, Electronic configurations of the atoms Stability of half-filled and completely filled orbitals, concept of exchange energy. Relative energies of atomic orbitals, Anomalous electronic configurations.

Periodic Table and Periodicity:
Classification of elements into s, p, d, and f-blocks, cause of periodicity. Detailed discussion of the following periodic properties of elements with examples
1). Atomic radius: Covalent, ionic, Vander Waal's and crystal radii. Additive nature of covalent radii., Determination of ionic radii by Lande's method. Variation of covalent radii in a group and in a period- explanation for the observed trends. Comparison of the size of the atoms with the corresponding anions and cations, Variation of ionic radii in isoelectronic ions.

2). Ionization enthalpy: Successive ionization enthalpy, factors affecting ionization enthalpy, applications of ionization enthalpy. Variation in a group and in a period-explanation for the observed trends.
3). Electron gain enthalpy: Successive electron gain enthalpy variation of electron gain enthalpy in period and in a group- explanation for the observed trends.
4). Electronegativity: Variation of electronegativity in a group and in a period-explanation for the observed trends. Factors determining electro negativity (charge on the atom and hybridization). Pauling and Mullikan methods (problems to be worked out). Allred-Rochow scale of electronegativity.Applications of electronegetivity.

(14 Lectures)

Chemical Bonding and Molecular Structure
Ionic Bonding*:* General characteristics of ionic bonding. Energy considerations inionic bonding, lattice energy and solvation energy and their importance in the context of stability and solubility of ionic compounds. Statement of Born-Landé equation for calculation of lattice energy, Born-Haber cycle and its applications, polarizing power and polarizability. Fajan's rules, ionic character in covalent compounds, bond moment, dipole moment and percentage ionic character.
Covalent bonding*:* VB Approach: Shapes of some inorganic molecules and ions on the basis of VSEPR and hybridization with suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonalbipyramidal and octahedral arrangements.

Concept of resonance and resonating structures of simple inorganic compounds
MO Approach: Rules for the LCAO method, bonding and antibonding MOs and their characteristics for *s-s*, *s-p* and *p-p* combinations of atomic orbitals, nonbonding combination of orbitals, MO treatment of homonuclear diatomic molecules of 1st and 2nd periods (including idea of *s-p* mixing) and heteronuclear diatomic molecules such as CO, NO and NO^+. Comparison of VB and MO approaches.Molecular orbital structures and bond orders of homo and hetero atomic molecules like H_2, He_2, He_2^+, N_2, O_2 HF, and CO, Prediction of magnetic properties of these species
Coordinate bond:Explanation by taking NH_3-BF_3 molecule as example.
Hydrogen bonding: Definition, inter and intra molecular Hydrogen bonding by taking HF, H_2O, and nitrophenols as examples. Anomalous properties like physical state, boiling point and solubility. Structure of ice Theories (or nature) of hydrogen bond (electrostatic approach, VBT and MOT treatments)

(16 Lectures)

Section B: Organic Chemistry-1 (30 Periods)

Fundamentals of Organic Chemistry

Physical Effects, Electronic Displacements: Inductive Effect, Electromeric Effect, Resonance and Hyperconjugation. Cleavage of Bonds: Homolysis and Heterolysis.

Basic Concepts of Organic reaction mechanism:-
Homolytic and heterolytic cleavages, electrophiles and nucleophiles(their nature with examples). Meaning of the terms with their illustration to show the formation of Carbocations, Carbanions, Free radicals. Stability and structure of primary, secondary and tertiary carbocations, carbanions, free radicalsStrength of organic acids and

bases:Comparative study with emphasis on factors affectingK_aOR pK values.(acetic acid,propionic acid,Butanoic acid) & (Methylamine, ethylamine and aniline)

(8 Lectures)

Stereochemistry: Types of stereoisomers.

Optical isomerism;Definition, Elements of symmetry(Plane, centre and alternate axis) Chirality, Optical activity. Optical isomerism in lactic acid, tartaric acid and biphenyls.Racemisation, Resolution, methods of resolution(Chemical and biochemical) Walden Inversion, Assymmetric synthesis(Partial and Absolute) Diastereomers, R/S Nomenclature- CIP rules(upto 2 carbon atoms)Geometrical isomerism-Definition with examples, Geometrical isomerism in aldoximesand ketoximes. Determination of configuaration–Beckmann rearrangement.). E / Z Nomenclature (for upto two C=C systems).Conformations with respect to ethane, butane and cyclohexane.Interconversion of Wedge Formula, Newmann, Sawhorse and Fischer representations.

(10 Lectures)

Aliphatic Hydrocarbons

Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure.

Alkanes: Preparation:Catalytic hydrogenation of alkenes, Wurtz reaction,Kolbe's synthesis, from Grignard reagent.Reactions: Free radical Substitution: Halogenation.

Alkenes: Preparation:Elimination reactions: Dehydration ofalcohols and dehydrohalogenation of alkyl halides (Saytzeff's rule); Reactions:cis-addition (alk. $KMnO_4$) and trans-addition (bromine), Addition of HX (Markownikoff's and anti-Markownikoff's addition), Hydration, Ozonolysis, oxymecuration-demercuration, Hydroboration-oxidation.

Dienes: Types, relative stabilities of dienes, 1,3 Butadiene, 1,2 and 1,4-addition reactions with H_2 and HBr, Diel's Alder reaction with an example

Alkynes:Preparation:Acetylene from $CaC_2$and conversion intohigher alkynes; by dehalogenation of tetra halides and dehydrohalogenation of vicinal-dihalides.

Reactions: formation of metal acetylides, Acidity of alkynes, addition of bromine, HCN, Aceticacid, water,oxidation with $KMnO_4$and ozonolysis

(12 Lectures)

Aromatic hydrocarbons; Aromaticity: Benzenoids and Hückel's rule

Preparation (Case benzene): from phenol, by decarboxylation of Carboxylic acids, from acetylene. **Reactions:** Electrophilic substitution: Mechanisms of nitration, halogenation andsulphonation. Friedel-Craft's reaction (alkylation and acylation) Orientation-Orienting influence of o-p and m- directing groups

(8 Lectures)

Reference:

- Lee, J.D. Concise Inorganic Chemistry ELBS, 1991.
- Cotton, F.A., Wilkinson, G. &Gaus, P.L. Basic Inorganic Chemistry, 3rd ed., Wiley.
- Douglas, B.E., McDaniel, D.H. & Alexander, J.J. Concepts and Models inInorganic Chemistry, John Wiley & Sons.
- Huheey, J.E., Keiter, E.A., Keiter, R.L. &Medhi, O.K. Inorganic Chemistry:Principles of Structure and Reactivity, Pearson Education India, 2006.
- Graham Solomon, T.W., Fryhle, C.B. &Dnyder, S.A. Organic Chemistry, John Wiley & Sons (2014).

- McMurry, J.E. Fundamentals of Organic Chemistry, 7th Ed. Cengage Learning India Edition, 2013.
- Sykes, P. A Guidebook to Mechanism in Organic Chemistry, Orient Longman, New Delhi (1988).
- Eliel, E.L. Stereochemistry of Carbon Compounds, Tata McGraw Hill education, 2000.
- Finar, I.L. Organic Chemistry (Vol. I & II), E.L.B.S.
- Morrison, R.T. & Boyd, R.N. Organic Chemistry, Pearson, 2010.
- Bahl, A. &Bahl, B.S. Advanced Organic Chemistry, S. Chand, 2010
- R D Madan, Inorganic Chemistry

CHEMISTRY LAB: DSC 1 LAB:

ATOMIC STRUCTURE AND ORGANIC CHEMISTRY

(60 Lectures)

Section A: Inorganic Chemistry – Volumetric Analysis

1. Estimation of sodium hydroxide using HCl and sodium carbonate crystals
2. Estimation of oxalic acid $KmnO_4$.And Mohr's salt.
3. Estimation of Mohr's salt using $KmnO_4$. and oxalic acid crystals
4. Estimation of Fe (II) ions by titrating it with $K_2Cr_2O_7$ using internal indicator.
5. Estimation of Cu (II) ions iodometrically using NaS_2O_3.
6. Estimation of Hydrogen peroxide using $KmnO_4$ and Sodium oxalate crystals
7. Estimation of oxalic acid and Sulphuric acid present in a given mixture.
8. Estimation of oxalic acid using NaOH solution and PHP crystals.

Section B: Organic Chemistry:

1. Detection of extra elements (N, S, Cl, Br, I) in organic compounds (containing upto two extra elements).
2. Separation of mixtures by Chromatography: Measure the Rf value in each case (combination of two compounds to be given)

a) Identify and separate the components of a given mixture of two amino acids (glycine, aspartic acid, glutamic acid, tyrosine or any other amino acid) by paper chromatography.

b) Identify and separate the sugars present in the given mixture by paper chromatography.

Reference:

- Svehla, G. Vogel's Qualitative Inorganic Analysis, Pearson Education, 2012.
- Mendham, J. Vogel's Quantitative Chemical Analysis, Pearson, 2009.
- Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., Textbook of Practical Organic Chemistry, Prentice-Hall, 5th edition, 1996.
- Mann, F.G. & Saunders, B.C. Practical Organic Chemistry Orient-Longman, 1960.

CMB24001/ CMB24005/ CMB24008

SEMESTER-II

CHEMICAL ENERGETICS, EQUILIBRIA & FUNCTIONAL GROUP ORGANIC CHEMISTRY

Theory: 60 Lectures

Course outcome:

After completion of the course the student is able to:

CO1: Learn the details of ionic equilibria and thermodynamics
CO2: Learn in detail with examples alkyl and aryl halides
CO3: Learn in detail with examples alcohols, phenols and carbonyl compounds

CHEMISTRY-DSC 2:

Section A: Physical Chemistry-1 (30 Lectures)

Chemical energetics
Laws of thermodynamics,Zeroth law of thermodynamics- statement
First law thermodynamics – statements, mathematical expressions internal energy and its significance.
Enthalpy; Calculation of bond energy, bond dissociation energy and resonance energy from thermochemical data.Variation of enthalpy of a reaction with temperature – Kirchhoff's equation
Second law of thermodynamics – spontaneous, non-spontaneous and equilibrium processes, different ways of stating second law – (clausius, spontaneity, entropy), heat engine, Carnot cycle and its efficiency(derivation). Concept of entropy and its significance in terms of randomness and probability
Free energy – Helmoltz and Gibb's free energy and their relationship, Giibb – Helmoltz's equation at constant pressure and volume(derivations). Thermodynamic criteria of equilibrium and spontaneity, variation of free energy with temperature and pressure.Clausius – Clapeyron'sequation(to be derived).Applications of integrated form of Clausius – Clapeyron equation and its applications. Van't Hoff's reaction isotherm and isochore equations.(derivation), Statement of third law of thermodynamics. (Numerical problems)
Statistical Thermodynamics: Introduction, types of statistics. Importance of each statistics.Expression for Bose-Einstein's Statistics (equation to be given) **(12 Lectures)**
Chemical Equilibrium:
Charecteristics of chemical equiulibrium,Law of mass action ,equilibrium constant,Freeenergy change in a chemical reaction.Thermodynamic derivation of the law of chemical equilibrium.Distinction between G and G^{o}, Le Chatelier'sprinciple.effect of change in concentration.and temperature. Application of law of mass action for the

formation of ammonia,dissociation of phosphorous pentachloride, Relationships between *Kp, Kc* and*Kx* for reactions involving ideal gases.

(6Lectures)

Ionic Equilibria:

Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization,Arrhenius theory of electrolytic dissociation,merits and demerits,Kohlrausch's law of independent migration of ions and applications. Transport number by moving boundary method, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect.Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and effect of temperature on degree of hydrolysis ,pH for different salts.Buffersolutions.Solubility and solubility product of sparingly soluble salts – applications of solubility product principle.Activity and activity co-efficients, definition and their relation, ionic strength and its calculation. Debye Huckel theory of strong electrolytes (relaxation time effect, electrophoteric effect and viscous effect). Debye-Huckel Onsager equation (no derivation),Debye-Huckel limiting equation for activity co-efficients (no derivation).Role of solvents in altering the strengths of acids and bases. **(12 Lectures)**

Section B: Organic Chemistry-2 (30 Lectures)

Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure.

Alkyl and Aryl Halides

Alkyl Halides: Nomenclature-Preparation: from alkenes and alcohols.Reactions- Types of Nucleophilic Substitution (SN^1, SN^2 andSN^i) reactions.Mechanisms, Energy profile diagram for SN^1 and SN^2 reactions.Reactions:,Elimination reactions-$E_1$and E_2, Mechanisms and hydrolysis

Aryl Halides: Preparation:(Chloro, bromo and iodo-benzene case): fromphenol,Sandmeyer & Gattermann reactions.Reactions (Chlorobenzene): Aromatic nucleophilic substitution (replacement by –OHgroup) and effect of nitro substituent. Benzyne Mechanism: KNH_2/NH_3 (or $NaNH_2/NH_3$).

Reactivity and Relative strength of C-Halogen bond in alkyl, allyl, benzyl, vinyl and aryl halides.

(8 Lectures)

Alcohols, Phenols and Ethers

Alcohols: Preparation:Preparation of 1^o, $2^o$and 3^oalcohols: using Grignard reagent,Ester hydrolysis, Reduction of aldehydes, ketones, carboxylic acid and esters.

Reactions: With sodium, HX (Lucas test), esterification, oxidation (alk.KMnO4, acidic dichromate,).Oppeneauer oxidation, Interconversions among primary, secondary and tertiary alcohols.

Diols: Oxidation of diols. Pinacol-Pinacolone rearrangement.

Trihydric alcohols- Glycerol-Synthesis from propene, Reactions of glycerol with HI, oxalic acid, HNO_3 and dehydrating agent(P_2O_5or H_2SO_4).

Phenols: (Phenol case)Preparation:Cumenehydroperoxide method, from diazonium salts.Reactions: Electrophilic substitution: Nitration, halogenation and sulphonation. Reimer-Tiemann Reaction, Gattermann-Koch Reaction, Schotten – Baumann Reaction.Acidity of phenols.Effect of substitution on acidity of phenols.

Ethers: Nomenclature, Williamson ether synthesis, reactions of ethers-Cleavage .Ziesel's method of estimation .Epoxides:- Synthesis, Acid and Base catalyzed opening of epoxides.Crown ethers: Introduction and applications

Aldehydes and ketones (aliphatic and aromatic): (Formaldehyde, acetaldehyde, acetone and benzaldehyde) Preparation: from acid chlorides and from alcohols.

Reactions – Reaction with HCN, ROH, $NaHSO_3$, NH_2-G derivatives. Iodoform test. Mechanisms of Aldol Condensation, Cannizzaro's reaction, perkins reaction and , Benzoin condensation.

Illustrations of Clemensen reduction , Wolff Kishner reduction,.Meerwein-PondorffVerley reduction, Gattermann-Koch reaction and Baeyer-Villiger oxidation.

(14 Lectures)

Carboxylic acids and their derivatives ; Preparation: From Nitriles and by Arndt-Eiestert reaction Acidic and Alkaline hydrolysis of esters. Reactions: Hell – Vohlard–ZelinskyReaction..Acidity of carboxylic acids.Resonance structure of carboxylate ion and its stability. Effect of substitution on acidity of carboxylic acids

Carboxylic acid derivatives (aliphatic): Preparation of Acid chlorides, Anhydrides,Esters and Amides from acids.

Hydroxy acids:- Synthesis of Lactic, Tartaric and citric acids. Effect of heat on α,β,γ-hydroxyl acids **(8 Lectures**)

Reference:

- Graham Solomon, T.W., Fryhle, C.B. &Dnyder, S.A. Organic Chemistry, John Wiley & Sons (2014).
- McMurry, J.E. Fundamentals of Organic Chemistry, 7th Ed. Cengage Learning India Edition, 2013.
- Sykes, P. A Guidebook to Mechanism in Organic Chemistry, Orient Longman, New Delhi (1988).
- Finar, I.L. Organic Chemistry (Vol. I & II), E.L.B.S.
- Morrison, R.T. & Boyd, R.N. Organic Chemistry, Pearson, 2010.
- Bahl, A. &Bahl, B.S. Advanced Organic Chemistry, S. Chand, 2010.
- Barrow, G.M. Physical Chemistry Tata McGraw-Hill (2007).
- Castellan, G.W. Physical Chemistry 4th Ed. Narosa (2004).
- Kotz, J.C., Treichel, P.M. & Townsend, J.R. General ChemistryCengage Learning India Pvt. Ltd., New Delhi (2009).
- Mahan, B.H. University Chemistry 3rd Ed. Narosa (1998).
- Petrucci, R.H. General Chemistry 5th Ed. Macmillan Publishing Co.: New York (1985).

CHEMISTRY LAB- DSC 2 LAB:

CHEMICAL ENERGETICS AND ORGANIC CHEMISTRY

60 Lectures

Section A: Physical Chemistry

Conductance

I. Determination of cell constant
II. Determination of equivalent conductance, degree of dissociation and

dissociation constant of a weak acid.

III. Perform the following conductometric titrations:
   i. Strong acid vs strong base
   ii. Weak acid vsstrong base

Potentiometry

Perform the following potentiometric titrations:
   i. Strong acid vs. strong base
   ii. Weak acid vs. strong base
   iii. Potassium dichromate vs. Mohr's salt

Colorimetric estimation of Cu^{2+} /Fe^{3+}

Determination of refractive index of the mixture

Ionic equilibria

pH measurements

a) Measurement of pH of different solutions like aerated drinks, fruit juices, shampoos and soaps (use dilute solutions of soaps and shampoos to prevent damage to the glass electrode) using pH-meter.

b) PH titration of strong acid with strong base.

c) Determination of pKa of weak acid by potentiometric titration.

d) Preparation of buffer solutions:
   I. Sodium acetate-acetic acid.
   II. Ammonium chloride-ammonium hydroxide

Measurement of the pH of buffer solutions and comparison of the values with theoretical values

Section B: Organic Chemistry

1. Purification of organic compounds by crystallization (from water and alcohol) and distillation.
2. Criteria of Purity: Determination of melting and boiling points.
3. Preparations: Mechanism of various reactions involved to be discussed. Recrystallisation, determination of melting point and calculation ofquantitative yields to be done.
   (a) Bromination of Phenol/Aniline
   (b) Benzoylation of amines/phenols
   (c) Oxime and 2,4-dinitrophenylhydrazone of aldehyde/ketone.
   (d) Preparation of acetanilide from aniline.
   (e) Preparation of p-bromo acetanilide
   (f) Preparation of benzoic acid from benzaldehyde by oxidation.

Reference :

- Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., Textbook of Practical Organic Chemistry, Prentice-Hall, 5th edition, 1996.
- Mann, F.G. & Saunders, B.C. Practical Organic Chemistry Orient-Longman, 1960.
- Khosla, B. D.; Garg, V. C. &Gulati, A. Senior Practical Physical Chemistry, R. Chand & Co.: New Delhi (2011)

CMC24001/ CMC24005/ CMC24008

SEMESTER-III
SOLUTIONS AND ORGANIC CHEMISTRY

Theory: 60 Lectures

Course outcome:

After completion of the course the student is able to:

CO1: Understand the classification and characteristics of solutions
CO2: Understand the details of electrochemistry
CO3: Understand in detail organometallic compounds and biomolecules
CO4: Understand in detail the concept of carbohydrates

CHEMISTRY-DSC -3

Theory: 60 Lectures

Section A: Physical Chemistry-2 (30 Lectures)

Solutions

Concentrations-different ways of expression, solutions of gases in gases,Henry's law,Thermodynamics of ideal solutions: Ideal solutions and Raoult's law, deviations from Raoult's law – non-ideal solutions. Vapour pressure-composition and temperature-composition curves of ideal and non-ideal solutions. Distillation of solutions.Lever rule.Azeotropes. Chemical potential of ideal and non ideal solution: Gibbs Duhem-Morgules equation. Entropy change of mixing for an ideal solution

Liquid mixtures:

Classification of binary mixtures into partially miscible, completely miscible and immiscible pairs of liquids. Principle of steam distillation Raoult's law, Critical solution temperature, partially miscible liquids: phenol water system, triethyl-amine water system and nicotine water system, Binary mixtures of completely miscible liquids, vapour pressure – composition diagrams and vapour pressure – temperature diagram. Classification into types- obeying Raoult's law (type I), positive deviation (type II),negative deviation (type III)from Raoult's law.Principles of fractional distillation, fractional distillation type I, type II and type III liquid mixtures, azeotropic mixtures. Binary mixtures of completely miscible liquids, principles of steam distillation – applications.(to be briefed)

Colligative properties

Introduction: vapour pressure, variation of vapour pressure with temperature(explanation with graph). Definition of boiling point and freezing point.Effect of dissolution of solute, vapour pressure of the solvent, lowering of vapour pressure, Raoult's law – relation between relative lowering of vapour pressure and molar mass.Determination of molar mass of solute by dynamic method, problems.

Elevation of boiling point:– definition and its relation to lowering of vapour pressure and molar mass (to be derived). Ebullioscopic constant of the solvent and its relation to

the boiling point (only equation). Determination of molar mass of the solute by Walker-Lumsden's method,

Depression in freezing point:– definition. Relation to lowering of vapour pressure and molar mass (to be derived).Cryoscopic constant, its relation to the melting point (only equation). Determination of molar mass of non-volatile solute by Beckmann's method. Abnormal molecular weights – causes - vant Hoff's factor, evaluation of degree of dissociation and association.Problems pertaining to all the colligative properties

(12 Lectures)

Phase Equilibrium

Phases, components and degrees of freedom of a system, criteria of phase equilibrium.Gibbs Phase Rule and its thermodynamic derivation. Phase diagrams of one-component systems (water and sulphur) and two component systems involving eutectics, congruent and incongruent melting points (lead-silver, FeCl3-H2O and Na-K only).

(5 Lectures)

Conductance and Electrochemistry

Introduction, conductance (specific, equivalent and molar conductance – definition and SI unit), conductance cell and cell constant, determination of equivalent conductance by meter-bridge method, variation of Λ and k with dilution, ionic mobility, ionic conductance and their relationship. Kohlrausch's law and its significance, transport number – definition and explanation, anomalous transport number, relationship between ionic conductance and transport number (to be derived). Determination of transport number by Hittorff's and moving boundary method (transport number of H^+ using $CdCl_2$ as supporting electrolyte) (Numerical problems to be worked out).

Application of conductance measurement:

a) Solubility and solubility product of sparingly soluble salt.
b) Ionic product of water
c) degree of ionization of weak electrolyte
   I. conductometric titration (strong acid Vs strong base, weak acid Vs strong base, strong acid Vs weak base, weak acid and weak base with examples)
   II. hydrolysis constant (taking aniline hydrochloride as an example)

Electromotive force:

Electrolytic and electro chemical cells,.Single electrode potential, sign of electrode potential (reduction potential to be adopted) convention of representing a cell, electrode reaction of a daniellcell.EMF and standard EMF of a cell, cell reaction, reversible and irreversible cells. Nernst equation (to be derived) and calculation of electrode potential, primary reference electrode – standard hydrogen electrode, secondary reference electrode – calomel and Ag - AgCl electrode – construction and working, electro-chemical series, equilibrium constant and free energy of a cell reaction, and its derivation, concentration cells with and without transference, EMF of concentration cells, liquid junction potential and salt bridge.Numerical problems on Nernst equation and EMF calculation.Fuel cells – working of H_2O_2 fuel cell and its importance.

Application of EMF measurements:

a)Determination of pH of a solution using quinhydrone electrode and glass electrode using dip type calomel electrode – principles and procedure.

b)Potentiometric titration – principle, location of end points in neutralization reactions (NaOH Vs HCl), Oxidation – reduction reactions ($K_2Cr_2O_7$ Vs FAS), precipitation reaction (KCl Vs $AgNO_3$) and complex reactions ($ZnSO_4$ Vs $K_3[Fe(CN)_6]$

(13 Lectures)

Section B:Organic Chemistry-2 (30 Lectures)

Organometallic compounds:-

Definition with example.Organo magnesium compounds (Grignard reagents) Formation ethyl magnesium bromide and its synthetic applications(synthesis of alcohols, acids, aldehydes, ketones and carboxylic acids)

Organo zinc compounds:- Preparation of diethyl zinc and its applications

Organolithium Compounds:- Preparation and synthetic applications of LDA

Amines and Diazonium Salts

Amines:-Definition, classification with example. Synthesis by Gabriel phthalimide method, reduction of amides.Separation of amine mixture by Hinsberg's method. Distinction tests for 1°,2°, 3° amines (acetylation and Hoffmann's exhaustive methylation). Action of nitrous acid on different amines(Both aliphatic and aromatic 1°,2°, 3° amines), basicity of amines, effect of substituent on basicity of aliphatic and aromatic amines. Hoffmann-Martius rearrangement.

Diazonium Compounds: Preparation, mechanism of preparation and synthetic applications of benzene diazonium chloride. Conversion to phenol, halobenzene, phenyl hydrazine and coupling reaction.

(10Lectures)

Amino Acids, Peptides and Proteins:

Preparation of Amino Acids: Strecker synthesis using Gabriel's Phthalimidesynthesis.Zwitterion, Isoelectric point and Electrophoresis.

Reactions of Amino acids: ester of –COOH group, acetylation of NH_2group,complexation with Cu^{2+} ions,

Elementary account of Primary, Secondary, Structure of proteins. Peptides(Amides)Synthesis of simple peptides (upto dipeptides) by N-protection (t-butyloxycarbonyl and Carbobenzoxy carbonyl) **(4 Lectures)**

Carbohydrates: Definition and importance, classification based on composition with examples-reducing and non-reducing sugars. Monosaccharides:- Glucose- reactions of glucose (with H_2N-OH, HCN, $C_6H_5NHNH_2$, Br_2 water, Conc.HNO_3, reductions with HI/red P , Methanol(dry HCl), acetic anhydride and reduction reactions. Mutarotation. Structural elucidation of glucose and fructose :- open chain structure, ring structure-Fisher and Haworth structure. Determination of ring size by methylation method. Fischer and Haworth structures of fructose, galactose and mannose Interconversions reactions-1) Ascending (Killiani's synthesis) 2) Descending (Wohl's degradation) 3) Aldose to Ketose 4) Ketose to Aldose 5) Epimerization

Disaccharides:- structural elucidation of sucrose, structural formulae of maltose and lactose (Haworth structure).Polysaccharides:- Partial structural formulae of starch and Cellulose. **(8 Lectures)**

Alkaloids:- definition, classification based on heterocyclic rings-isolation, synthesis and structural elucidation of nicotine .Structure of Morphine, Atropine, Cocaine & physiological importance of alkaloids.

Vitamins:- Definition, classification, structural elucidation and synthesis of vit-A, Synthesis of vit-C, Sources & importance of Vitamin-B, calciferol, E ,D & K

Hormones:- definition, classification, synthesis and functions of adrenaline and thyroxine.

Terpenes:- definition, isoprene rule, Classification, isolation (Solvent extraction and Steam distillation), structural elucidation of citral and it's synthesis, structural formulae of α-terpeneol, Camphor and menthol. **(8 Lectures)**

Reference:

- Barrow, G.M. Physical Chemistry Tata McGraw-Hill (2007).
- Castellan, G.W. Physical Chemistry 4th Ed. Narosa (2004).
- Kotz, J.C., Treichel, P.M. & Townsend, J.R. General Chemistry, Cengage Learning India Pvt. Ltd.: New Delhi (2009).
- Mahan, B.H. University Chemistry, 3rd Ed. Narosa (1998).
- Petrucci, R.H. General Chemistry, 5th Ed., Macmillan Publishing Co.: New York (1985).
- Morrison, R. T. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Finar, I. L. Organic Chemistry (Volume 2), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Nelson, D. L. & Cox, M. M. Lehninger's Principles of Biochemistry 7thEd., W. H. Freeman.
- Berg, J.M., Tymoczko, J.L. &Stryer, L. Biochemistry, W.H. Freeman, 2002.

- Puri & Sharma,A Textbook of Chemistry

CHEMISTRY LAB-DSC 3 LAB:
SOLUTIONS AND ORGANIC, CHEMISTRY

60 Lectures

Section A: Physical Chemistry

Section A: Physical Chemistry
Thermo chemistry

1. Determination of heat capacity of calorimeter for different volumes.
2. Determination of enthalpy of neutralization of hydrochloric acid with sodium hydroxide.
3. Determination of enthalpy of ionization of acetic acid.
4. Determination of Transition temperature of the given salt hydrate.
5. Determination of enthalpy of hydration of copper sulphate.
6. Determination of CST OF phenol water system
7. Determination of % of NaCl

Section B: Organic Chemistry

I Systematic Qualitative Organic Analysis of Organic Compounds possessingmonofunctional groups (-COOH, phenolic, aldehydic, ketonic, amide, nitro, amines) and preparation of one derivative.

II

1. Separation of amino acids by paper chromatography
2. Determination of the concentration of glycine solution by formylation method.
3. Titration curve of glycine
4. Action of salivary amylase on starch

5. Effect of temperature on the action of salivary amylase on starch.
6. Differentiation between a reducing and a nonreducing sugar.

Reference:

- Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., Textbook of Practical Organic Chemistry, Prentice-Hall, 5th edition, 1996.
- Mann, F.G. & Saunders, B.C. Practical Organic Chemistry Orient-Longman, 1960.
- Khosla, B. D.; Garg, V. C. &Gulati, A. Senior Practical Physical Chemistry, R. Chand & Co.: New Delhi (2011).
- Ahluwalia, V.K. &Aggarwal, R. Comprehensive Practical Organic Chemistry, Universities Press.

CMD24001/ CMD24005/ CMD24008

SEMESTER-IV

COORDINATION CHEMISTRY AND PHYSICAL CHEMISTRY

Theory: 60 Lectures

Course outcome:

After completion of the course the student is able to:

CO1: Understand in depth transition elements and coordination chemistry
CO2: Learn the details of kinetic theory of gases and chemical kinetics
CO3: Learn in detail the properties of solids, liquids and gases

CHEMISTRY-DSC 4

Chemistry of transition elements:

Position in the periodic table, electronic configuration, general characteristics-atomic and ionic radii, ionization energy, variable oxidation states, (Latimer diagrams) spectral properties, redox potentials, colour and magnetic properties, catalytic activity, complex formation and interstitial compounds formation (3d, 4d and 5d series).

Chemistry of inner transition elements: Lanthanides: Electronic configuration and position in the periodic table, oxidation states, spectral properties, colour and magnetic properties, complex formation and ionic radii, lanthanide contraction – cause & its consequences and solvent extraction method.

General survey of actinides – comparison with lanthanides, transuranic elements. Action of ion exchange resins – cation exchange and anion exchange resins, exchange of inorganic ions, ion exchange capacity, separation of lanthanides by ion- exchange method. Comparison of d and f block elements.

(12 Lectures)

Coordination Chemistry

Ligands, classification of ligands and chelation, nomenclature of co-ordination compounds, physical methods in the study of complexes – change in conductance, colour and pH.Stability of complexes – stability constant, a brief outline of thermodynamic stability of metal complexes, factors affecting the stability of complexes.Polynuclear complexes, inner metallic complexes.Sidwick-EAN rule

Isomerism in co-ordination complexes: Stereo-isomerism – Geometrical and optical isomerism exhibited by co-ordination compounds of co-ordination number 4 and 6.

Metal-ligand bonding in transition metal complexes:

Valence bond theroy: Salient features, formation of octahedral complexes on the basis of VBT, outer and inner orbital octahedral complexes- $[Fe(CN)_6]^{4-}$, $[Fe(CN)_6]^{3}$-, $[Co(CN)_6]^{3-}$, [CoF6]3- $[Cr(H_2O)_6]^{3+}$ and $[Fe(H_2O)_6]^{2+.}$ Formation of tetrahedral and square planner complexes on the basis of VBT – $[Ni(CN)4]^{2-}$, $[Cu(NH3)]^{2+}$, $[Zn(NH3)4]^{2+}$and $[Ni(CO)_4]$, limitations of VBT.

Crystal field theory: Important features of crystal field theory, crystal field splitting of d-orbitals in tetrahedral, octahedral and square planar complexes, crystal field stabilization energy (CFSE), factors affecting the magnitude of Δo, (nature of ligand, oxidation state of the metal ion, size of the orbitals, geometry of the complex), high spin

(HS) and low spin (LS) complexesSpectrochemical series, magnetic properties of metal complexes based on crystal field theory-[Co(NH3)6]3+, [CoF6]3-, [Fe(CN)6]4-, [Fe(CN)6]3- and [Ni(CN)4]2-. Magnetic susceptibility, measurement of magnetic moment by Gouy's method.Tetragonal distortion of octahedral geometry.Jahn-Teller distortion.Applications of complex formation in biological systems

(18 Lectures)

Section B: Physical Chemistry-3 **(30 Lectures)**

Kinetic Theory of Gases

Postulates of Kinetic Theory of Gases and derivation of the kinetic gas equation.Deviation of real gases from ideal behaviour, compressibility factor, causes of deviation. van der Waals equation of state for real gases. Boyle temperature (derivation not required). Critical phenomena, critical constants and their calculation from van der Waals equation.Andrews isotherms of CO2.

Maxwell Boltzmann distribution laws of molecular velocities and molecular energies (graphic representation – derivation not required) and their importance.

Temperature dependence of these distributions.Most probable, average and root mean square velocities (no derivation). Collision cross section, collision number, collision frequency, collision diameter and mean free path of molecules. Viscosity of gases and effect of temperature and pressure on coefficient of viscosity (qualitative treatment only)

(8 Lectures)

Liquids

Properties of liquids

Viscosity : Definition of co-efficient of viscosity, factors affecting viscosity – temperature, size, mass, shape of molecules, intermolecular forces, determination of viscosity of liquids by Ostwald's method**..**

Surface tension : Definition, effect of temperature and solute on surface tension.Determination of surface tension of liquids using stalagmometer. Effect of temperature on surface tension and coefficient of viscosity of a liquid (qualitative treatment only).

Parachor : Definition, sudgen equation, calculation of parachor and its application w.r.t. the elucidation of structures- of benzene, quinine and isocyanide ion(Numerical problems).

Polarization- induced, orientation and molar polarization – definitions, clausius-Mossotiz equation (no derivation) and its application. **(8 Lectures)**

Solids :

Introduction, laws of crystallography - law of constancy of interfacial angles, law of rational indices- weiss and miller indices. Unit cell, Space lattices and lattice planes, seven crystal systems, lattice planes in cubic crystals (Simple cubic, body centered cubic and face centered cubic).

Elements of symmetry – plane, axis and centre, elements of symmetry in cubic system, types of lattices, Bragg's equation and its derivation. X-ray diffraction and determination of crystal structure of rock salt by rotating crystal method. Application of X-ray studies – distance between lattice planes, density of crystals, determination of Avogadro number. (Numerical problems) Defects in crystals.

Liquid crystals:
Mesomorphic state – definition, classification of liquid crystals smectic and nematic with examples, molecular arrangement in the two types and uses. Nano materials – definition, properties and application **(8 Lectures)**

Chemical Kinetics:
The concept of reaction rates.Effect of temperature, pressure, catalyst and other factors on reaction rates.Order and molecularity of a reaction.Derivation of integrated rate equations for zero, first and second order reactions (both for equal and unequal concentrations of reactants).Half–life of a reaction. General methods for determination of order of a reaction (Differential method, integration, halflife period and isolation methods) Concept of activation energy and its calculation from Arrhenius equation.
Theories of Reaction Rates: Collision theory based on hard sphere model and Activated Complex theory of bimolecular reactions. Comparison of the two theories (qualitative treatment only). **(6Lectures)**

Reference:

- Barrow, G.M. Physical Chemistry Tata McGraw-Hill (2007).
- Castellan, G.W. Physical Chemistry 4th Ed. Narosa (2004).
- Kotz, J.C., Treichel, P.M. & Townsend, J.R. General ChemistryCengage Learning India Pvt. Ltd., New Delhi (2009).
- Mahan, B.H. University Chemistry 3rd Ed. Narosa (1998).
- Petrucci, R.H. General Chemistry 5th Ed. Macmillan Publishing Co.: New York (1985).

- Cotton, F.A. & Wilkinson, G. Basic Inorganic Chemistry, Wiley.
- Shriver, D.F. & Atkins, P.W. Inorganic Chemistry, Oxford University Press.
- Wulfsberg, G. Inorganic Chemistry, Viva Books Pvt. Ltd.
- Rodgers, G.E. Inorganic & Solid State Chemistry,Cengage Learning India Ltd., 2008.
- R D Madan,Textbook of Chemistry
- Madan, Malik Tuli,Comprehensive Chemistry
- Satyaprakash, Text book of Chemistry

CHEMISTRY LAB-DSC 4 LAB:
COORDINATION CHEMISTRY AND PHYSICAL CHEMISTRY

60 Lectures

Section A: Inorganic Chemistry

Semi-micro qualitative analysis (using H2S or other methods) of mixtures - not more than four ionic species (two anions and two cations, excluding insoluble salts) out of the following:

Cations : NH_4^+, Pb^{2+}, Bi^{3+}, Cu^{2+}, Cd^{2+}, Fe^{3+}, Al^{3+}, Co^{2+}, Ni^{2+}, Mn^{2+}, Zn^{2+}, Ba^{2+}, Sr^{2+}, Ca^{2+}, Na^+, K^+

Anions : CO_3^{2-} , S^{2-}, SO^{2-}, $S_2O_3^{2-}$, NO_3^-, CH_3COO^-, Cl^-, Br^-, I^-, SO_4^{2-}, PO_4^{3-}, BO_3^{3-}, C_2O4^{2-}, F^-

(Spot tests should be carried out wherever feasible)

1. Estimate the amount of nickel present in a given solution as bis(dimethylglyoximato) nickel(II) or aluminium as oximate in a given solution gravimetrically.
2. Estimation of (i) Mg^{2+} or (ii) Zn^{2+} by complexometric titrations using EDTA.
3. Estimation of total hardness of a given sample of water by complexometric titration.

Section B: Physical Chemistry

I. Surface tension measurement (use of organic solvents excluded).

a) Determination of the surface tension of a liquid or a dilute solution using a stalagmometer.

b) Study of the variation of surface tension of a detergent solution with concentration.

II. Viscosity measurement (use of organic solvents excluded)

a. Determination of the relative and absolute viscosity of a liquid or dilute solution using an Ostwald's viscometer.

b. Study of the variation of viscosity of an aqueous solution with concentration of solute.

III Determination molecular weight of the given non volatile solute by Walker Lumbsden method.

(III) Chemical Kinetics

Study the kinetics of the following reactions.

1. Initial rate method: Iodide-persulphate reaction
2. Integrated rate method:
   a. Acid hydrolysis of methyl acetate with hydrochloric acid.
   b. Saponification of ethyl acetate.
   c. Kinetics of rate of decomposition of H_2O_2catalysed by $FeCl_3$

Reference:

- Svehla, G. *Vogel's Qualitative Inorganic Analysis*, Pearson Education, 2012.
- Mendham, J. *Vogel's Quantitative Chemical Analysis*, Pearson, 2009.
- Khosla, B. D.; Garg, V. C. &Gulati, A. *Senior Practical Physical Chemistry,* R. Chand & Co.: New Delhi (2011).

CME24001/ CME24005/ CME24008

DSE-1A **SEMESTER-V**

INORGANIC MATERIALS OF INDUSTRIAL IMPORTANCE

Theory: 60 Lectures

Course outcome:

After completion of the course the student is able to:

CO1: Identify in detail with examples inorganic polymers and Non aqueous solvents
CO2: Understand the details of silicate industry and batteries
CO3: Learn in detail about alloys catalysis and explosives

CHEMISTRY-DSE:

Silicate Industries

Glass*:* Rawmaterials, Glassy state and its properties, classification (silicate and non-silicate glasses).Manufacture and processing of glass. Composition and properties of the following types of glasses: Soda lime glass, lead glass, armoured glass, safety glass, borosilicate glass, fluorosilicate, coloured glass, photosensitive glass.

Ceramics:Important clays and feldspar, ceramic, their types and manufacture. Hightechnology ceramics and their applications, superconducting and semiconducting oxides, fullerenes carbon nanotubes and carbon fibre.

Cement:*:*Classification of cement, ingredients and their role, Manufacture of cementand the setting process, quick setting cements.

Abrasives: Definition, classification with examples – hardness, manufacture and applications of carborundum, alundum and tungsten carbide.

Refractories: Definition, properties, classification with examples. Different steps involved in the manufacture of refractories. Applications of refractories.

Inorganic polymers:

Definition – examples, general properties, comparison with organic polymers, glass transition temperature Silicones: Definition, nomenclature, preparation (linear, cross-linked and cyclic). Factors affecting the nature of silicon polymers, properties (chemical and thermal stabilities(chemical properties) uses of silicon polymers, silicon fluids/oils – uses, silicon elastomers / rubbers, silicon resins (preparation and uses)

Phosphazenes: Definition, types, structures, preparation, properties and uses. Crystalline polymetaphosphates – Maddrell's and Kuroll's salts – properties and uses.Nature of bonding in phosphazenes.

Fluorocarbons: Definition, examples, preparation, properties and uses of Freon-12, Freon-22, PTFE and poly per fluorovinyl chloride.

Non-aqueous solvents:

Liquid ammonia- Reasons for the solvent properties, typical reactions- solubility of alkali metals; acid-base, precipitation, ammonolysis, Ionization of weak acids, advantages and disadvantages.

Liquid SO_2- Reasons for the solvent properties, typical reactions-acid-base, solvolysis, precipitation, amphoteric and redox reactions **(25 Lectures)**

Fertilizers:
Different types of fertilizers. Manufacture of the following fertilizers: Urea, ammonium nitrate, calcium ammonium nitrate, ammonium phosphates; polyphosphate, superphosphate, compound and mixed fertilizers, potassium chloride, potassium sulphate. **(5 Lectures)**

Surface Coatings:
Objectives of coatings surfaces, preliminary treatment of surface, classification of surface coatings.Paints and pigments-formulation, composition and related properties. Oil paint, Vehicle, modified oils, Pigments, toners and lakes pigments, Fillers, Thinners, Enamels, emulsifying agents. Special paints (Heat retardant, Fire retardant, Eco-friendly paint, Plastic paint), Dyes, Wax polishing, Water and Oil paints, additives, Metallic coatings (electrolytic and electroless), metal spraying and anodizing.

(10 Lectures)

Batteries:
Primary and secondary batteries, battery components and their role, Characteristics of Battery.Working of following batteries: Pb acid, Li-Battery, Solid state electrolyte battery.Fuel cells, Solar cell and polymer cell.

(4 Lectures)

Alloys:
Classification of alloys, ferrous and non-ferrous alloys, Specific properties of elements in alloys.Properties and applications of steel. Manufacture of Steel (removal of silicon decarbonization, demanganization, desulphurization dephosphorisation) and surface treatment (argon treatment, heat treatment, nitriding, carburizing). Composition and properties of different types of steels.
Production of Ferro alloys: Ferro chrome and Ferro manganese.

(8 Lectures)

Catalysis:
General principles and properties of catalysts, homogenous catalysis (catalytic steps and examples) and heterogenous catalysis (catalytic steps and examples).Theories of catalysis, Auto catalyst.Industrial applications, Deactivation or regeneration of catalysts.Phase transfer catalysts, application of zeolites as catalysts.

(4 Lectures)

Chemical explosives:
Origin of explosive properties in organic compounds, Classification with examples, preparation and explosive properties of lead azide, PETN, cyclonite (RDX).Introduction to rocket propellants.

(4 Lectures)

Reference:

- E. Stocchi: Industrial Chemistry, Vol-I, Ellis Horwood Ltd. UK.
- R. M. Felder, R. W. Rousseau: Elementary Principles of Chemical Processes, Wiley Publishers, New Delhi.
- W. D. Kingery, H. K. Bowen, D. R. Uhlmann: Introduction to Ceramics, Wiley Publishers, New Delhi.
- J. A. Kent: Riegel'sHandbook of Industrial Chemistry, CBS Publishers, New Delhi.
- P. C. Jain & M. Jain: Engineering Chemistry,DhanpatRai& Sons, Delhi.
- R. Gopalan, D. Venkappayya, S. Nagarajan: Engineering Chemistry,Vikas Publications, New Delhi.
- B. K. Sharma: Engineering Chemistry, Goel Publishing House, Meerut

CHEMISTRY PRACTICAL – DSE 1A LAB:
INORGANIC MATERIALS OF INDUSTRIAL IMPORTANCE

60 Lectures

Section A: Gravimetric estimations

1. Gravimetric estimation of Barium as barium sulphate.
2. Gravimetric estimation of Iron as Iron oxide
3. Gravimetric estimation of Copper as Copper thiocyanate
4. Gravimetric estimation of Nickel as nickeldimethylglyoximate
5. Gravimetric estimation of magnesium as Magnesiumhydroxyquenolate
6. Gravimetric estimation of Sulphate as barium sulphate
7. Gravimetric estimation of Manganese from pyrolusite ore

Section B: Volumetric estimations

1. Determination of Iodine value of edible oil
2. Determination saponification value of edible oil
3. Separation of Green leaf pigments by TLC
4. Determination of amount of acetic cid in a given wine sample
5. Determination of total acidity of vineger
6. Determination of vitamin C in orange juice.

Reference:

- E. Stocchi: Industrial Chemistry, Vol-I, Ellis Horwood Ltd. UK.
- R. M. Felder, R. W. Rousseau: Elementary Principles of Chemical Processes, Wiley Publishers, New Delhi.
- W. D. Kingery, H. K. Bowen, D. R. Uhlmann: Introduction to Ceramics, Wiley Publishers, New Delhi.
- J. A. Kent: Riegel'sHandbook of Industrial Chemistry, CBS Publishers, New Delhi.
- P. C. Jain, M. Jain: Engineering Chemistry,DhanpatRai& Sons, Delhi.
- R. Gopalan, D. Venkappayya, S. Nagarajan: Engineering Chemistry,Vikas Publications, New Delhi.
- Sharma, B.K. & Gaur, H. Industrial Chemistry,Goel Publishing House, Meerut (1996).

CME24401/ CME24405/ CME24408

DSE:1B **SEMESTER V**

INDUSTRIAL CHEMICALS AND ENVIRONMENT

Theory: 60 Lectures

Course outcome:

After completion of the course the student is able to:

CO1: Understand in depth environment and energy
CO2: Specify the classification and characteristics of industrial gases metallurgy and inorganic chemicals

Industrial Gases and Inorganic Chemicals

Industrial Gases: Large scale production, uses, storage and hazards in handling of the following gases: oxygen, nitrogen, argon, neon, helium, hydrogen, acetylene, carbon monoxide, chlorine, fluorine, sulphur dioxide and phosgene.

Inorganic Chemicals: Manufacture, application, analysis and hazards in handling the following chemicals: hydrochloric acid, nitric acid, sulphuric acid, caustic soda, common salt, borax, bleaching powder, sodium thiosulphate, hydrogen peroxide, potash alum, chrome alum, potassium dichromate and potassium permanganate.

(10 Lectures)

Industrial Metallurgy

Preparation of metals (ferrous and nonferrous) and ultrapure metals for semiconductor technology

(4 Lectures)

Environment and its segments

Ecosystems. Biogeochemical cycles of carbon, nitrogen and sulphur.

Air Pollution: Major regions of atmosphere. Chemical and photochemical reactions in atmosphere. Air pollutants: types, sources, particle size and chemical nature; Photochemical smog: its constituents and photochemistry. Environmental effects of ozone, Major sources of air pollution

Pollution by SO_2, CO_2 , CO, NO_x, H_2S and other foul smelling gases. Methods of estimation of CO, NO_x, SO_x and control procedures

Effects of air pollution on living organisms and vegetation.Greenhouse effect and Global warming, Ozone depletion by oxides of nitrogen, chlorofluorocarbons and Halogens, removal of sulphur from coal.Control of particulates

Water Pollution: Hydrological cycle, water resources, aquatic ecosystems, Sourcesand nature of water pollutants, Techniques for measuring water pollution, Impacts of water pollution on hydrological and ecosystems

Water purification methods: Effluent treatment plants (primary, secondary and tertiary treatment). Industrial effluents from the following industries and their treatment: electroplating, textile, tannery, dairy, petroleum and petrochemicals, agro, fertilizer, etc. Sludge disposal.

Industrial waste management, incineration of waste.Water treatment and purification (reverse osmosis, electro dialysis, ion exchange). Water quality parameters for waste water, industrial water and domestic water

(30 Lectures)

Energy & Environment

Sources of energy: Coal, petrol and natural gas. Nuclear Fusion / Fission, Solar energy, Hydrogen, geothermal, Tidal and Hydel, etc.

Nuclear Pollution: Disposal of nuclear waste, nuclear disaster and its management.

(10 Lectures)

Biocatalysis

Introduction to biocatalysis: Importance in "Green Chemistry" and Chemical Industry.

(6 Lectures)

Reference:

- E. Stocchi: *Industrial Chemistry*, Vol-I, Ellis Horwood Ltd. UK.
- R.M. Felder, R.W. Rousseau: *Elementary Principles of Chemical Processes*, Wiley Publishers, New Delhi.
- J. A. Kent: *Riegel's Handbook of Industrial Chemistry, CBS Publishers, NewDelhi.*
- *S. S. Dara: A Textbook of Engineering Chemistry*, S. Chand & Company Ltd.New Delhi.
- K. De, *Environmental Chemistry*: New Age International Pvt., Ltd, New Delhi.
- S. M. Khopkar, *Environmental Pollution Analysis*: Wiley Eastern Ltd, New Delhi.
- S.E. Manahan, *Environmental Chemistry*, CRC Press (2005).

- G.T. Miller, *Environmental Science* 11th edition. Brooks/ Cole (2006).
- A. Mishra, *Environmental Studies*. Selective and Scientific Books, New Delhi (2005).

CHEMISTRY PRACTICAL - DSE 1B, LAB: INDUSTRIAL CHEMICALS & ENVIRONMENT **60 Lectures**

1. Determination of dissolved oxygen in water.
2. Determination of Chemical Oxygen Demand (COD)
3. Determination of Biological Oxygen Demand (BOD)
4. Percentage of available chlorine in bleaching powder.
5. Measurement of chloride, sulphate and salinity of water samples by simple titration method ($AgNO_3$ and potassium chromate).
6. Estimation of total alkalinity of water samples (CO_3^{2-}, HCO_3^-) using double titration method.
7. Measurement of dissolved CO_2.
8. Study of some of the common bio-indicators of pollution.
9. Estimation of SPM in air samples.
10. Preparation of borax/ boric acid.

Reference:

- E. Stocchi: *Industrial Chemistry*, Vol-I, Ellis Horwood Ltd. UK.
- R.M. Felder, R.W. Rousseau: *Elementary Principles of Chemical Processes*, Wiley Publishers, New Delhi.
- J. A. Kent: Riegel's*Handbook of Industrial Chemistry*, CBS Publishers, New Delhi.
- S. S. Dara: *A Textbook of Engineering Chemistry*, S. Chand & Company Ltd. New Delhi.
- K. De, *Environmental Chemistry*: New Age International Pvt. Ltd, New Delhi.
- S. M. Khopkar, *Environmental Pollution Analysis*: Wiley Eastern Ltd, New Delhi.

CMF24001/ CMF24005/ CMF24008

DSE-1A SEMESTER-VI

ORGANOMETALLICS, BIOINORGANIC CHEMISTRY, POLYNUCLEAR HYDROCARBONS AND UV, IR SPECTROSCOPY

Theory: 60 Lectures

Course outcome:

After completion of the course the student is able to:

CO1: Learn in depth metallurgy, organometallic compounds and bioinorganic chemistry
CO2: Understand in depth heteronuclear aromatic compounds, active methylene compounds
CO3: Learn in detail with examples spectroscopy

DSE-1A:

Section A: Inorganic Chemistry-4 **(30 Lectures)**

Metallurgy: Terms and principles involved in metallurgy, Ellingam'sdiagram,Types of metallurgy: Pyro metallurgy- extraction of Nickel by sulphide ore- generall metallurgy followed by Monds process (purification, Manganese from oxides ores- Reduction by the Alumino Thermite process- refininmg by electrolytic process.

Hydro metallurgy: Extraction of Gold from native ore by cyanide process, and refining by quartation process.

Electro metallurgy: Extraction of Lithium by fusion method Followed by electrolysis of lithium chloride.

Powder metallurgy: Importance, metal powder production &applications. Production of Tungsten powder.Principles of Electroplationg. **(10 Lectures)**

Organometallic Compounds

Definition and Classification with appropriate examples based on nature of metal-carbon bond (ionic, s, p and multicentre bonds). Structures of methyl lithium, Zeiss salt and ferrocene.. Preparation , properties , boding and appliations of alkyle and aryls of Li, Al, Hg,Sn and Ti.

Nature of M-CO bonding in carbonyls. Preparation, properties and structures of mono nuclear and binuclear metal carbonyls-Ni(CO)4, Cr(CO)6, Fe(CO)5, Mn2(CO)10, Co2(CO)8. Applications of EAN rule to mononuclear metalcarbonyls.

Behaviour of carbon monoxide. Synergic effects (VB approach)- (MO diagram of CO can be referred to for synergic effect to IR frequencies). **(10 Lectures)**

Chemistry of nonmetallics:

Boron : Boron hydrides – Diborane – preparation, properties, uses and structure Carbon: Fullerenes- Production, structure of C60 and C70. Diamond and Graphite-Properties and structure.

Silicon: Structure of silica. Silicates-types of silicates with examples.

Nitrogen: Preparation (any two methods), properties, uses, structure of hydrazine, hydroxyl amine and hydrazoic acid.

Sulphur: Preparation, properties, structures and applications of thionyl chloride, sulphuryl chloride and SF6.

Halogens: Preparation, properties and structure of bleaching powder.

Pseudo halogens: preparation, properties and structure of cyanogens, thiocyanogen, tellurocyanogen and oxocyanogen.(any one method of preparation and any three properties to be discussed). **(5 Lectures)**

Bio-Inorganic Chemistry

A brief introduction to bio-inorganic chemistry.Essential and trace elements in biological process. Role of metal ions present in biological systems with special reference to Na^+, K^+ and Ca2+, Mg^{2+} ions: Na/K pump; Role of Mg^{2+} ions in energy production and chlorophyll. Role of Ca^{2+} in blood clotting, Enzymatic role of Iron in Hemoglobin and myoglobin, Magnesium in Chlorophyll, Cobalt in Vitamin B12.

Stabilization of protein structures and structural role (bones).

Biological functions and toxicity of Cr, Mn, Co, Ni, I, Hg, Mo, and Se. **(5 Lectures)**

Section B: Organic Chemistry-4 **(30 Lectures)**

Polynuclear and heteronuclear aromatic compounds:

Polynuclear Hydrocarbons: Resonance structures of Naphthalene, anthracene and Phenanthracene.

Structural elucidation of naphthalene. Reactions of naphthalene- oxidation, reduction and electrophilic substitution reactions

HetrocyclicCompounds:Definition, classification with examples, synthesis of Furan, thiophene, pyrrole, pyridine, indole (Fischer method), quinoline (Skrup's synthesis), isoquinoline, pyrimidine (one method each). Aromaticity and basicity of pyrrole and pyridine.Electrophillic substitution reactions of pyrrole and pyridine.

Uric acid- Structure, Synthesis. Conversion of uric to purine and caffeine

Dyes: Colour and Constitution, Witt's theory, Classification of dyes based on structures with examples, synthesis of Methyl orange, Bismark brown, indigo and malachite green, structural elucidation of alizarin and it's synthesis**.**

Drugs: Chemotherapy and chemotherapeutic agents, definition of drugs, types of drugs, antipyretics, analgesics, anaesthetics, sedatives, narcotics, antiseptics, antibacterials, antibiotics, antimalarials and sulpha drugs with examples. Synthesis of paracetamol, sulphanilamide, sulphaguanidine **(13 lectures)**

Active methylene compounds: Definition, Ethyl acetoacetate and diethyl malonatepreparation, Mechanism of Claisen condensation, keto-enoltautomerism and its evidence.Synthetic applications of EAA and DEM:- Synthesis of mono carboxylic acids, dicarboxylic acids-succinic acid, adipic acid, antipyrine,Barbituric acid, acetyl acetone, Crotonic acid and Cinnamic acid**.** **(4 lectures)**

Application of Spectroscopy to Simple Organic Molecules

Application of visible, ultraviolet and Infrared spectroscopy in organic molecules. Electromagnetic radiations, electronic transitions, $\lambda_{max,}$ chromophore, auxochrome, bathochromic and hypsochromic shifts. Woodward rules for calculating λmax of conjugated dienes

IR-Spectroscopy: Introduction,functional group region and finger print region stretching frequency, Graphical representation of IR spectra of benzoic acid and methyl benzoate . Absorption frequencies of Simple functional groups

NMR Spectroscopy: Basic principles of proton magnetic resonance , nuclear magnetic spin quantum number I, influence of the magnetic field on the spin of nuclei, magnetic resonance-chemical shift (δ value), use of TMS as reference, nuclear shielding effects, equivalent and non-equivalent protons, spin-spin splitting.

NMR spectra of Simple organic molecules (like ethyl alcohol, ethane, propane, benzene, toluene, acetone, and methyl chloride) to be discussed.. **(13 Lectures)**

Reference:

- James E. Huheey, Ellen Keiter& Richard Keiter: Inorganic Chemistry:Principles of Structure and Reactivity, Pearson Publication.
- G.L. Miessler& Donald A. Tarr: Inorganic Chemistry, Pearson Publication.
- J.D. Lee: A New Concise Inorganic Chemistry, E.L.B.S.
- F.A. Cotton & G. Wilkinson: Basic Inorganic Chemistry, John Wiley & Sons.
- I.L. Finar: Organic Chemistry (Vol. I & II), E.L.B.S.
- John R. Dyer: Applications of Absorption Spectroscopy of OrganicCompounds, Prentice Hall.
- R.M. Silverstein, G.C. Bassler& T.C. Morrill: Spectroscopic Identification ofOrganic Compounds, John Wiley & Sons.
- R.T. Morrison & R.N. Boyd: Organic Chemistry, Prentice Hall.
- Peter Sykes: A Guide Book to Mechanism in Organic Chemistry, Orient Longman.
- ArunBahl and B. S. Bahl: Advanced Organic Chemistry, S. Chand

CHEMISTRY PRACTICAL – DSE 1A LAB

60 lectures

Section A: Inorganic Chemistry

1. Separation of mixtures by chromatography: Measure the Rf value in each case. (Combination of two ions to be given)
   Paper chromatographic separation of Fe^{3+}, $A1^{3+}$ and Cr^{3+} or Paper chromatographic separation of Ni^{2+}, Co^{2+}, Mn^{2+} and Zn^{2+}
2. Preparation of any two of the following complexes and measurement of their conductivity:

   (i) tetraamminecarbonatocobalt (III) nitrate
   (ii) tetraamminecopper (II) sulphate
   (iii) potassium trioxalatoferrate (III) trihydrate

Compare the conductance of the complexes with that of M/1000 solution of NaCl, $MgCl_2$ and $LiCl_3$.

Section B: Volumetric analysis

1. Estimation of iron in the given sample of Hematite by dichromate method
2. Estimation of % of calcium in lime stone by oxalate method
3. Estimation of manganese in the given sample of pyrolusite
4. Estimation of magnesium in the given sample of Dolomite by EDTA method
5. Determination of % purity of copper in tha given sample of copper wire
6. Determination of COD of water.
7. Estimation of available chlorine in bleaching powder
8. Estimation of total hardness of different samples of water using EDTA & $ZnSO_4$.

Reference:

- A.I. Vogel: Qualitative Inorganic Analysis, Prentice Hall, 7th Edn.
- A.I. Vogel: Quantitative Chemical Analysis, Prentice Hall, 6th Edn.
- Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., *Textbook of Practical Organic Chemistry*, Prentice-Hall, 5th edition, 1996.
- Mann, F.G. & Saunders, B.C. *Practical Organic Chemistry* Orient-Longman, 1960.

CMF24201/ CMF24205/ CMF24208
DSE-1B

SEMESTER VI

QUANTUM CHEMISTRY, SPECTROSCOPY & PHOTOCHEMISTRY

Theory: 60 Lectures

COURSE OUTCOME:

After completion of the course the student is able to:

CO1: Identify the details of quantum chemistry
CO2: Learn the details of molecular spectroscopy
CO3: Understand the details of photochemistry

Quantum Chemistry

Postulates of quantum mechanics, quantum mechanical operators, Schrödinger equation and its application to free particle and "particle-in-a-box" (rigorous treatment), quantization of energy levels, zero-point energy and Heisenberg Uncertainty principle; wavefunctions, probability distribution functions, nodal properties, Extension to two and three dimensional boxes, separation of variables, degeneracy.

Qualitative treatment of simple harmonic oscillator model of vibrational motion: Setting up of Schrödinger equation and discussion of solution and wavefunctions. Vibrational energy of diatomic molecules and zero-point energy.

Angular momentum: Commutation rules, quantization of square of total angular momentum and z-component.

Rigid rotator model of rotation of diatomic molecule. Schrödinger equation, transformation to spherical polar coordinates. Separation of variables. Spherical harmonics. Discussion of solution.

Qualitative treatment of hydrogen atom and hydrogen-like ions: setting up of Schrödinger equation in spherical polar coordinates, radial part, quantization of energy (only final energy expression). Average and most probable distances of electron from nucleus.

Setting up of Schrödinger equation for many-electron atoms (He, Li). Need for approximation methods. Statement of variation theorem and application to simple systems (particle-in-a-box, harmonic oscillator, hydrogen atom).

Chemical bonding: Covalent bonding, valence bond and molecular orbital approaches, LCAO-MO treatment of H_2^+. Bonding and antibonding orbitals. Qualitative extension to H_2. Comparison of LCAO-MO and VB treatments of H_2 (only wavefunctions, detailed solution not required) and their limitations. Refinements of the two approaches (Configuration Interaction for MO, ionic terms in VB). Qualitative description of LCAO-MO treatment of homonuclear and heteronuclear diatomic molecules (HF, LiH). Localised and non-localised molecular orbitals treatment of triatomic (BeH_2, H_2O) molecules. Qualitative MO theory and its application to AH_2 type molecules.

(24 Lectures)

Molecular Spectroscopy:

Interaction of electromagnetic radiation with molecules and various types of spectra; BornOppenheimer approximation.

Rotation spectroscopy: Selection rules, intensities of spectral lines, determination of bond lengths of diatomic and linear triatomic molecules, isotopic substitution.

Vibrational spectroscopy: Classical equation of vibration, computation of force constant, amplitude of diatomic molecular vibrations, anharmonicity, Morse potential, dissociation energies, fundamental frequencies, overtones, hot bands, degrees of freedom for polyatomic molecules, modes of vibration, concept of group frequencies. Vibration-rotation spectroscopy: diatomic vibrating rotator, P, Q, R branches.

Raman spectroscopy: Qualitative treatment of Rotational Raman effect; Effect of nuclear spin, Vibrational Raman spectra, Stokes and anti-Stokes lines; their intensity difference, rule of mutual exclusion.

Electronic spectroscopy: Franck-Condon principle, electronic transitions, singlet and triplet states, fluorescence and phosphorescence, dissociation and predissociation, calculation of electronic transitions of polyenes using free electron model.

Nuclear Magnetic Resonance (NMR) spectroscopy: Principles of NMR spectroscopy, Larmor precession, chemical shift and low resolution spectra, different scales, spin-spin coupling and high resolution spectra, interpretation of PMR spectra of organic molecules.

Electron Spin Resonance (ESR) spectroscopy: Its principle, hyperfine structure, ESR of simple radicals. **(24 Lectures)**

Photochemistry

Characteristics of electromagnetic radiation, Lambert-Beer's law and its limitations, physical significance of absorption coefficients. Laws, of photochemistry, quantum yield, actinometry, examples of low and high quantum yields, photochemical equilibrium and the differential rate of photochemical reactions, photosensitised reactions, quenching. Role of photochemical reactions in biochemical processes, photostationary states, chemiluminescence. **(12 Lectures)**

Reference:

- Banwell, C. N. & McCash, E. M. Fundamentals of Molecular Spectroscopy 4th Ed. Tata McGraw-Hill: New Delhi (2006).
- Chandra, A. K. Introductory Quantum Chemistry Tata McGraw-Hill (2001).
- House, J. E. Fundamentals of Quantum Chemistry 2nd Ed. Elsevier: USA (2004).
- Lowe, J. P. & Peterson, K. Quantum Chemistry, Academic Press (2005).
- Kakkar, R. Atomic & Molecular Spectroscopy: Concepts & Applications, Cambridge University Press (2015).

DSE-1B LAB 60 Lectures

UV/Visible spectroscopy

I. Study the 200-500 nm absorbance spectra of KMnO4 and K2Cr2O7 (in 0.1 M H2SO4) and determine the λmax values. Calculate the energies of the two transitions in different units (J molecule-1, kJ mol-1 , cm -1, eV).

II. Study the pH-dependence of the UV-Vis spectrum (200-500 nm) of K2Cr2O7.

III. Record the 200-350 nm UV spectra of the given compounds (acetone, acetaldehyde, 2-propanol, acetic acid) in water. Comment on the effect of structure on the UV spectra of organic compounds.

Colourimetry

I. Verify Lambert-Beer's law and determine the concentration of CuSO4/KMnO4/K2Cr2O7 in a solution of unknown concentration

II. Determine the concentrations of KMnO4 and K2Cr2O7 in a mixture.
III. Study the kinetics of iodination of propanone in acidic medium
IV. Determine the amount of iron present in a sample using 1,10-phenathroline.
V. Determine the dissociation constant of an indicator (phenolphthalein).
VI. Study the kinetics of interaction of crystal violet/ phenolphthalein with sodium hydroxide.
VII. Analyse the given vibration-rotation spectrum of HCl(g)

Reference :

- Mendham, J. Vogel's Quantitative Chemical Analysis, Pearson, 2009.
- Khosla, B. D.; Garg, V. C & Gulati, A., Senior Practical Physical Chemistry, R. Chand & Co.: New Delhi (2011).
- Garland, C. W.; Nibler, J. W & Shoemaker, D. P. Experiments in Physical Chemistry 8th Ed.; McGraw-Hill: New York (2003).
- Halpern, A. M & McBane, G. C. Experimental Physical Chemistry 3rd Ed.; W.H. Freeman & Co.: New York (2003).

CME24201/ CME24205/ CME24208

V SEMESTER

SEC-1A FUEL CHEMISTRY

SKILL ENHANCEMENT COURSE-SEC

30 Lectures

Course outcome:

After completion of the course a student is able to:

CO1: Understand the characteristics of coal and lubricants with examples
CO2: Specify the characteristics of petroleum and petrochemical industries

Review of energy sources (renewable and non-renewable). Classification of fuels and their calorific value

Coal: Uses of coal (fuel and nonfuel) in various industries, its composition, carbonization of coal. Coal gas, producer gas and water gas—composition and uses. Fractionation of coal tar, uses of coal tar bases chemicals, requisites of a good metallurgical coke, Coal gasification (Hydro gasification and Catalytic gasification), Coal liquefaction and Solvent Refining.

Petroleum and Petrochemical Industry: Composition of crude petroleum, Refining and different types of petroleum products and their applications.

Fractional Distillation (Principle and process), Cracking (Thermal and catalytic cracking), Reforming Petroleum and non-petroleum fuels (LPG, CNG, LNG, bio-gas, fuels derived from biomass), fuel from waste, synthetic fuels (gaseous and liquids), clean fuels Petrochemicals: Vinyl acetate, Propylene oxide, Isoprene, Butadiene, Toluene and its derivatives Xylene.

Lubricants: Classification of lubricants, lubricating oils (conducting and non-conducting) Solid and semisolid lubricants, synthetic lubricants.
Properties of lubricants (viscosity index, cloud point, pore point) and their determination.

Reference :

- Stocchi, E. Industrial Chemistry, Vol-I, Ellis Horwood Ltd. UK (1990).
- Jain, P.C. & Jain, M. Engineering ChemistryDhanpatRai& Sons, Delhi.
- Sharma, B.K. & Gaur, H. Industrial Chemistry,Goel Publishing House, Meerut (1996).

CME24601/ CME24605/ CME24608

SEC-1B V SEMESTER

BASIC ANALYTICAL CHEMISTRY

30 Lectures

Course outcome:

After completion of the course a student is able to:

CO1: Understand in detail, the analysis of soil, water and food
CO2: Understand the details of chromatography

Introduction: Introduction to Analytical Chemistry and its interdisciplinary nature. Concept of sampling. Importance of accuracy, precision and sources of error in analytical measurements. Presentation of experimental data and results, from the point of view of significant figures.

Analysis of soil: Composition of soil, Concept of pH and pH measurement, Complexometric titrations, Chelation, Chelating agents, use of indicators

a. Determination of pH of soil samples.
b. Estimation of Calcium and Magnesium ions as Calcium carbonate by complexometric titration.

Analysis of water: Definition of pure water, sources responsible for contaminatingwater, water sampling methods, water purification methods.

a. Determination of pH, acidity and alkalinity of a water sample.
b. Determination of dissolved oxygen (DO) of a water sample.

Analysis of food products: Nutritional value of foods, idea about food processingand food preservations and adulteration.

a. Identification of adulterants in some common food items like coffee powder, asafoetida, chilli powder, turmeric powder, coriander powder and pulses, etc.
b. Analysis of preservatives and colouring matter.

Chromatography: Definition, general introduction on principles of chromatography, paper chromatography, TLC etc.

a. Paper chromatographic separation of mixture of metal ion (Fe^{3+} and Al^{3+}).
b. To compare paint samples by TLC method. **Ion-exchange:** Column, ion-exchange chromatography etc.

Determination of ion exchange capacity of anion / cation exchange resin (using batch procedure if use of column is not feasible).

Analysis of cosmetics: Major and minor constituents and their function

a. Analysis of deodorants and antiperspirants, Al, Zn, boric acid, chloride, sulphate.
b. Determination of constituents of talcum powder: Magnesium oxide, Calcium oxide, Zinc oxide and Calcium carbonate by complexometric titration.

Suggested Applications (Any one):

a. To study the use of phenolphthalein in trap cases.
b. To analyze arson accelerants.
c. To carry out analysis of gasoline.

Suggested Instrumental demonstrations:

a. Estimation of macro nutrients: Potassium, Calcium, Magnesium in soil samples by flame photometry.

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b. Spectrophotometric determination of Iron in Vitamin / Dietary Tablets.
c. Spectrophotometric Identification and Determination of Caffeine and Benzoic Acid in Soft Drink.

Reference:

- Willard, H.H., Merritt, L.L., Dean, J. &Settoe, F.A. *Instrumental Methods ofAnalysis*. 7thEd. Wadsworth Publishing Co. Ltd., Belmont, California, USA,1988.
- Skoog, D.A. Holler F.J. &Nieman, T.A. *Principles of Instrumental Analysis*, Cengage Learning India Ed.
- Skoog, D.A.; West, D.M. & Holler, F.J. *Fundamentals of AnalyticalChemistry 6th Ed.,* Saunders College Publishing, Fort Worth (1992).
- Harris, D. C. *Quantitative Chemical Analysis*, W. H. Freeman.
- Dean, J. A. *Analytical Chemistry Notebook*, McGraw Hill.
- Day, R. A. & Underwood, A. L. *Quantitative Analysis*, Prentice Hall of India.
- Freifelder, D. *Physical Biochemistry 2ndEd.,* W.H. Freeman and Co., N.Y. USA (1982).
- Cooper, T.G. *The Tools of Biochemistry,* John Wiley and Sons, N.Y. USA. 16 (1977).
- Vogel, A. I. *Vogel's Qualitative Inorganic Analysis 7thEd.,* Prentice Hall.
- Vogel, A. I. Vogel's *Quantitative Chemical Analysis 6thEd.,* Prentice Hall.
- Robinson, J.W. *Undergraduate Instrumental Analysis 5thEd.,* Marcel Dekker, Inc., New York (1995).

Pattern of question paper
I to VI semesters

Time :3.00hrs **Max marks: 70**

PART-A

I. Answer the following questions 1x10=10

a)
b)
c)
d)
e)
f)
g)
h)
i)
j)

PART-B

II Answer any three questions
(Questions carrying 4,4,2- 3,3,4- 6,4 and 5,5 marks may be given) 3x10=30

2)
3)
4)
5)

PART-C

III Answer any three questions
(Questions carrying 4,4,2- 3,3,4- 6,4 and 5,5 marks may be given) 3x10=30

6)
7)
8)
9)

Pattern of question paper for SEC

Time :2.30.00hrs **Max marks: 50**

PART-A

I. Answer the following questions 1x10=10

a)
b)
c)
d)
e)
f)
g)
h)
i)
j)

PART-B

II Answer any four questions
(Questions carrying 4,4,2- 3,3,4- 6,4 and 5,5 marks may be given) 4x10=40

2)
3)
4)
5)

JSS COLLEGE OF ARTS COMMERCE & SCIENCE

(Autonomous)

BN Road, Mysuru – 25

DEPARTMENT OF COMMERCE AND MANAGEMENT

Syllabus

CHOICE BASED CREDIT SYSYTEM

B.COM. PROGRAMME

2017-18

Scheme of Study for B.COM. under CBCS Scheme 2017-18

Year	SEM	COURSE CODE	TITLE OF THE PAPER	CONTINUOUS ASSESSMENT					MAX MARKS			PERCENTAGE			DURATION OF EXAM	
				C1		C2		C3	TH	PR	IA	TH	PR	IA	TH	PR
				Test	SDR	Test	VIVA									
I	I	DNA21011	FINANCIAL ACCOUNTING	**10**	**05**	**10**	**05**	**70**	70	70	30	**50**	**20**	**30**	**3h**	**3h**
		DNA22011	BUSINESS ORGANIZATION AND MANAGEMENT	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		DNA23011	PRINCIPLES OF MARKETING	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
	II	DNB21011	BUSINESS LAW	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		DNB22011	BUSINESS MAHEMATICSAND STATISTICS	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		DNB23011	BANKING AND INSURANCE	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
II	III	DNC21011	CORPORATE ACCOUNTING	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		DNC22011	INCOME TAX LAW AND PRACTICE	**10**	**05**	**10**	**05**	**70**	70	70	30	**50**	**20**	**30**	**3h**	**3h**
		DNC23011	COMPUTER APPLICATIONS IN BUSINESS	**10**	**05**	**10**	**05**	**50**	50	70	30	**35**	**35**	**30**	**2h**	**3h**
	IV	DND21011	COST ACCOUNTING	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		DND22011	COMPANY LAW	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		DND23011	E-COMMERCE	**10**	**05**	**10**	**05**	**70**	70	70	30	**50**	**20**	**30**	**3h**	**2h**
III	V		**ANY ONE OF THE FOLLOWING**													
		DNE21001	5.2a QUANTITATIVE TECHNIQUES	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		DNE22001	5.2b AUDITING AND CORPORATE GOVERNANCE	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		DNE23001	5.2c SECURITY AND COMMIDTY MARKET	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		DNE24001	5.2d BUSINESS DECISIONS	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
			ANY ONE OF THE FOLLOWING													
		DNE25001	5.3a HUMAN RESOURCE MANAGEMENT	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		DNE26001	5.3b GST AND CUSTOMS DUTY	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		DNE27001	5.3C PRINCIPLES OF EVENT MANAGEMENT	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		DNE28001	5.3d SECURITY ANALYSIS AND PORTFOLIO MANAGMENT	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
			ANY ONE OF THE FOLLOWING													
		DNE29001	5.4a BUSINESS RESEARCH METHODOLOGY	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		DNE30001	5.4b INTRODUCTION TO ACCOUNTING	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		DNE31001	5.4c INTRODUCTION TO INCOME TAX	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		DNE32001	5.4d PERSONAL SELLEING AND SALESMANSHIP	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**

Year	SEM	COURSE CODE	TITLE OF THE PAPER	CONTINUOUS ASSESSMENT					MAX MARKS			PERCENTAGE			DURATION OF EXAM	
				C1		C2		C3	TH	PR	IA	TH	PR	IA	TH	PR
				TH	SDR	TH	VIVA									
III	VI	DNF21001	6.1 INDIAN FINANCIAL SYSTEM	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
			ANY ONE OF THE FOLLOWING													
		DNF22001	6.2a CORPORATE TAX PLANNING	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		DNF23001	6.2b SERVICES MANAGEMENT	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		DNF24001	6.2c MANAGEMENT ACCOUNTING	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		DNF25001	6.2d COMPUTERISED ACCOUNTING SYSTEM	**10**	**05**	**10**	**05**	**70**	70	70	30	**50**	**20**	**30**	**3h**	**3h**
			ANY ONE OF THE FOLLOWING													
		DNF26001	6.3a INTERNATIONAL BUSINESS	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		DNF27001	6.3b OFFICE MANAGMENT AND SECRETARIAL PRACTICE	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		DNF28001	6.3c FUNDAMENTAL OF INVESTMENT	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		DNF29001	6.3d CONSUMER PROTECTION	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
			ANY ONE OF THE FOLLOWING													
		DNF30001	6.4a MARKETING MANAGEMENT	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		DNF31001	6.4b HUMAN RESOURCE MANAGEMENT	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		DNF32001	6.4c ENTREPRENEURSHIP DEVELOPMENT	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		DNF33001	6.4d PROJECT WORK						-	70	30	**-**	**70**	**30**	**-**	**-**

SCHEME OF VALUATION FOR INTERNAL ASSESSMENT

- A candidate appearing for the first time should submit a duly signed skill development record
- Skill Development records have to be prepared by the concerned students on the basis of Field visit
- Skill Development record has to be valued for ***FIVE* marks** by Internal and external examiners at the time of vivo-voce examination
- ***FIVE marks*** for viva-voce.
- Computer Lab exams are conducted for 70 marks for each candidate for the subjects having L: T: P models 4:1:1,2:0:2

EVALUATION OF PROJECT WORK:

Sl No	Component	Marks
1	SUBMISSIONE OF SYNOPSIS	10
2	PPT PRESENTATION	10
3	DRAFT REPORT SUBMISSION	10
TOTAL		**30**

Sl No	Component	Marks
1	PROJECTREPORT EVALUATION	50
2	VIVA- VOCE	20
	TOTAL	**70**

Discipline Specific Course

Sl. No	Sem	Course Code	Title of the paper	Total credits		
				L	T	P
1	I	DNA21011	FINANCIAL ACCOUNTING	4	1	1
2		DNA22011	BUSINESS ORGANIZATION AND MANAGEMENT	5	1	0
3		DNA23011	PRINCIPLES OF MARKETING	3	1	0
4	II	DNB21011	BUSINESS LAW	5	1	0
5		DNB22011	BUSINESS MAHEMATICSAND STATISTICS	5	1	0
6		DNB23011	BANKING AND INSURANCE	3	1	0
7	III	DNC21011	CORPORATE ACCOUNTING	5	1	0
8		DNC22011	INCOME TAX LAW AND PRACTICE	4	1	1
9	IV	DND21011	COST ACCOUNTING	5	1	0
10		DND22011	COMPANY LAW	5	1	0

Discipline Specific Electives:

Sl. No	Sem	Course Code	Title of the paper	Total credits		
				L	T	P
	V		**ANY ONE OF THE FOLLOWING**			
1		DNE21001	5.2a QUANTITATIVE TECHNIQUES	5	1	0
2		DNE22001	5.2b AUDITING AND CORPORATE GOVERNANCE	5	1	0
3		DNE23001	5.2c SECURITY AND COMMIDTY MARKET	5	1	0
4		DNE24001	5.2d BUSINESS DECISIONS	5	1	0
			ANY ONE OF THE FOLLOWING			
5		DNE25001	5.3a HUMAN RESOURCE MANAGEMENT	5	1	0
6		DNE26001	5.3b GST AND CUSTOMS DUTY	5	1	0
7		DNE27001	5.3C PRINCIPLES OF EVENT MANAGEMENT	5	1	0
8		DNE28001	5.3d SECURITY ANALYSIS ANDPORTFOLIO MANAGMENT	5	1	0
	VI		**ANY ONE OF THE FOLLOWING**			
9		DNF22001	6.2a CORPORATE TAX PLANNING	5	1	0
10		DNF23001	6.2b SERVICES MANAGEMENT	5	1	0
11		DNF24001	6.2c MANAGEMENT ACCOUNTING	5	1	0
12		DNF25001	6.2d COMPUTERISED ACCOUNTING SYSTEM	4	0	2
			ANY ONE OF THE FOLLOWING			
13		DNF26001	6.3a INTERNATIONAL BUSINESS	5	1	0
14		DNF27001	6.3b OFFICE MANAGMENT AND SECRETARIAL PRACTICE	5	1	0
15		DNF28001	6.3c FUNDAMENTAL OF INVESTMENT	5	1	0
16		DNF29001	6.3d CONSUMER PROTECTION	5	1	0

Generic Electives:

Sl. No	Sem	Course Code	Title of the paper	Total credits		
				L	T	P
	V		**ANY ONE OF THE FOLLOWING**			
1		DNE29001	5.4a BUSINESS RESEARCH METHODOLOGY	5	1	0
2		DNE30001	5.4b INTRODUCTION TOACCOUNTING	5	1	0
3		DNE31001	5.4c INTRODUCTION TO INCOME TAX	5	1	0
4		DNE32001	5.4d PERSONAL SELLEING AND SALESMANSHIP	5	1	0
	VI		**ANY ONE OF THE FOLLOWING**			
5		DNF30001	6.4a MARKETING MANAGEMENT	5	1	0
6		DNF31001	6.4b HUMAN RESOURCE MANAGEMENT	5	1	0
7		DNF32001	6.4c ENTREPRENEURSHIP DEVELOPMENT	5	1	0
8		DNF33001	6.4d PROJECT WORK	1	1	4

Skill Enhancement Course:

Sl. No	Sem	Course Code	Title of the paper	Total credits		
				L	T	P
1	III	DNC23011	COMPUTER APPLICATIONS IN BUSINESS	2	0	2
2	IV	DND23011	E-COMMERCE	3	0	1
3	VI	DNF21001	INDIAN FINANCIAL SYSTEM	4	0	0

Note:

L –Lecture

T – Tutorial

P - Practical

Programme code: BCO11

PROGRAM SPECIFIC OUTCOME:

Programme Outcome

This program could provide well trained dynamic personnel and professionals for

PO1: Industries and Multinational companies

PO2: Banking Sectors and Insurance Companies

PO3: Financing and Leasing Companies

PO4: Transport Agencies and Warehousing

PO5: Stock Markets and Foreign Trade

This program could provide well trained professionals to practice and work as

PO6: Chartered accountants, advocates, cost accountants and company secretaries

PO7: Financial Analysts, Tax consultants, Tax Practitioners and Investment consultants

PO8: Financial and management accountants

PO9: Marketing Manager, Store manager, Purchase Manager and Sales Manager

PO10: Human Resource Manager, Counsellor

PO11: Retail Manager, Middle men and Customer relation manager

PO12: Decision Maker

PO13: Stock broker,

PO14: Official receiver and Liquidator

PO15: Market researcher, supply chain manger and Franchisee

PO16: Administrator of the different types of Business and Non-business organizations

Programme Specific Outcome

The students at the end of the B.Com programme can become a

PSO1: Business Administrator
PSO2: Financial, Cost and Management Accountant
PSO3: Business Researcher
PSO4: Bank Manager
PSO5: Personal Secretary
PSO6: Project Manager
PSO7: Legal adviser
PSO8: Stock Broker
PSO9: Business Entrepreneur

DNA21011

SEMESTER I

FINANCIAL ACCOUNTING – DSC 1

(Credits: Lecture – 04, Tutorial – 01, Practical – 01) Lectures: 64hrs,
Tutorial: 16hrs
Practical: 32 hrs

Course Outcome:

On successful completion of this course the students are able to:

CO1: Understand in details with application of accounting software and generate financial statement

CO2: Write down the characteristics of special types of accounting transactions and able to prepare financial statement

CO3: Understand in details with application of principles of accounting

CO4: Learn the characteristic of financial statement and can prepare financial statements of all types of organisation

CO5: Learn in depth and able to work as financial accountant

Unit 1: (a) Theoretical Framework

i. Accounting as an information system, the users of financial accounting information and their needs. Qualitative characteristics of accounting, information. Functions, advantages and limitations of accounting. Branches of accounting. Bases of accounting; cash basis and accrual basis

ii. The nature of financial accounting principles – Basic concepts and conventions: entity, money measurement, going concern, cost, realization, accruals, periodicity, consistency, prudence (conservatism), materiality and full disclosures.

iii. Financial accounting standards: Concept, benefits, procedure for issuing accounting standards in India. Salient features of First-Time Adoption of Indian Accounting Standard
(Ind-AS) 101. International Financial Reporting Standards (IFRS-Need and procedures.

(b) Accounting Process

From recording of a business transaction to preparation of trial balance including adjustments

Unit -2 (A) Business Income

a) Measurement of Business Income – Net Income: the accounting period, the continuity doctrine and matching concept. Objectives of measurement.
b) Revenue recognition: Recognition of expenses.
c) Nature of Depreciation: Concept of depreciation, factors in the measurement of depreciation. Methods of computing depreciation: Straight Line Method and Diminishing Balance Method – Change of method.
d) Inventories **:**Meaning, Significance of Inventory Valuation. Inventory record systems: Periodic and perpetual. Methods – FIFO and LIFO. Salient features of Indian Accounting Standard (IND-AS) : 2.

(B) Final Accounts

Capital and revenue expenditures and receipts: general introduction only. Preparation of financial statements of non-corporate business entities

Unit -3 Computerised Accounting Systems32Hrs **Practical Lab**

Computerised Accounting Systems: Computerized Accounts by using any popular accounting software: Creating a Company; Configure and Features settings; Creating Accounting Ledgers and Groups; Creating Stock Items and Groups; Vouchers Entry; Generating Reports – Cash Book, Ledger Accounts, Trial Balance, Profit and Loss Account, Balance Sheet, Funds Flow Statement, Cash Flow Statement. Selecting and shutting a Company; Backup and Restore data of a Company.

Unit – 4 Consignments, Hire Purchase & Joint Venture

(a) Consignment Features, Accounting treatment in the books of the consignor and consignee.
(b) Accounting for Hire-Purchase Transactions, Journal entries and ledger accounts in the books of Hire Vendor and Hire purchaser including Default and repossession. Instalment system – Transactions and Journal entries in the books of seller and Purchaser
(c) Joint Venture: Accounting procedures: Joint Bank Account, Records Maintained by Co-venturer of (a) all transactions (b) only his own transactions (Memorandum joint venture account).

Unit 5: Accounting for Inland Branches

Dependent branches – concept, accounting aspects; debtors system, stock and debtors system, branch final accounts system and whole sale basis system. Independent branches: concept accounting treatment: important adjustment entries and preparation of consolidated profit and loss account and balance sheet.

Note:

1. The relevant Indian Accounting Standards in line with the IFRS for all the above topics should be covered.
2. Any revision of relevant Indian Accounting Standard would become applicable immediately.

Reference:

1. Robert N Anthony, David Hawkins, Kenneth A. Merchant, *Accounting: Text and Cases*. McGraw-Hill Education, 13th Ed. 2013.
2. Charles T. Horngren and Donna Philbrick, *Introduction to Financial Accounting,* Pearson Education.
3. J.R. Monga, *Financial Accounting: Concepts and Applications*. Mayur Paper Backs, New Delhi.
4. M.C.Shukla, T.S. Grewal and S.C.Gupta. *Advanced Accounts. Vol.-I. S.* Chand & Co., New Delhi.
5. S.N. Maheshwari, and. S. K. Maheshwari. *Financial Accounting*.Vikas Publishing House, New Delhi.
6. Deepak Sehgal. *Financial Accounting.*Vikas Publishing H House, New Delhi.
7. Bhushan Kumar Goyal and HN Tiwari, *Financial Accounting,* International Book House
8. Goldwin, Alderman and Sanyal, *Financial Accounting,* Cengage Learning.
9. Tulsian, P.C. *Financial Accounting,* Pearson Education.
10. *Compendium of Statements and Standards of Accounting*. The Institute of Chartered Accountants of India, New Delhi

Note: Latest edition of the text books should be used.

DNA22011

SEMESTER I

BUSINESS ORGANISATION AND MANAGEMENT –DSC2

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80hrs
Tutorial: 16 hrs

Course Outcome:

CO1: Identify the details of entrepreneurs and become themselves entrepreneurs

CO2: Understand the characteristics and classifications of leadership and able be become a good business leader

CO3: Learn in depth to work as a managers at top level or middle level Management

CO4: Write down long term as well as short term plans for the organisation

CO5: Understand and apply the principles of management for effective functioning of the organisation

CO6: Learn in depth and apply the theories of Motivation to motivate the workers for better performance

Unit 1: Foundation of Indian Business

Manufacturing and service sectors; Small and medium enterprises; Problems and government policy. India's experience of liberalisation and globalisation. Technological innovations and skill development.' Make in India' Movement. Social responsibility and ethics Emerging opportunities in business; Franchising, Outsourcing, and E-commerce

Unit 2: Business Enterprises

Forms of Business Organisation: Sole Proprietorship, Joint Hindu Family Firm, Partnership firm, Joint Stock Company, Cooperative society; Limited Liability Partnership; Choice of Form of Organisation. Government – Business Interface; Rationale and Forms of Public Enterprises .International Business. Multinational Corporations.

Unit 3: Management

The Process of Management: Planning; Decision-making; Strategy Formulation.
Organizing: - Types of Organisational Structure - Departmentasion – Kinds. Delegation and Decentralisation of Authority – Groups and Teams

Unit 4: Leadership, Motivation and Control

Leadership: Concept and Styles; Trait and Situational Theory of Leadership.
Motivation: Concept and Importance; Maslow Need Hierarchy Theory; Herzberg Two Factors Theory. Communication: Process and Barriers; Control: Concept and Process.

Unit 5: Functional Areas of Management

Marketing Management:- Meaning & Definitions, Marketing Concepts, Functions, Elements of Marketing Mix..
Financial Management: Concept and Objectives – Scope, Finance Manager- Role & Functions. Sources of Finance, Financial Decisions
Human Resource Management: Concept and Functions. Role, Status and Competencies of HR Manager

Reference:

1. Kaul, V.K., *Business Organisation and Management*, Pearson Education, New Delhi
2. Chhabra, T.N., *Business Organisation and Management*, Sun India Publications, New Delhi,
3. Gupta CB, *Modern Business Organisation*, Mayur Paperbacks, New Delhi
4. Koontz and Weihrich, *Essentials of Management*, McGraw Hill Education.
5. Basu, C. R., *Business Organization and Management*, McGraw Hill Education.
6. Jim, Barry, John Chandler, Heather Clark; *Organisation and Management*, Cengage Learning.
7. B.P. Singh and A.K.Singh, *Essentials of Management*, Excel Books
8. Buskirk, R.H., et al; *Concepts of Business: An Introduction to Business System*, Dryden Press, New York.
9. Burton Gene and Manab Thakur; Management Today: Principles and Practice; Tata McGraw Hill, New Delhi.

Note: Latest edition of the text books should be used.

DNA23011

SEMESTER I

PRINCIPLES OF MARKETING–DSC3

(Credits: Lecture – 03, Tutorial – 01, Practical – 0) Lectures: 48 Hrs
Tutorials: 16 Hrs

Course Outcome:

On successful completion of the course students can:

CO1: Learn in depth characteristics of marketing managers
CO2: Write down the characteristics of a new product and able to launch a new product
CO3: Learn in depth and apply the strategies for market segmentation
CO4: Deliberate and decide effective channels of distribution.
CO5: Understand the characteristics of online marketing and able to practice online marketing
CO6: Identify the future prospect and able to forecast demand for the products

Unit 1: Introduction:
Nature, scope and importance of marketing; Evolution of marketing; Selling v/s Marketing; Marketing environment: concept, importance, and components (Economic, Demographic, Technological, Natural, Socio-Cultural and Legal).

Unit 2: Consumer Behaviour & Market Segmentation
a. Consumer Behaviour**:** Nature and Importance**,** Consumer buying decision process; Factors influencing consumer buying behaviour.
b. Market segmentation: concept, importance and bases; Target market selection; Positioning concept, Product differentiation vs. Market segmentation.

Unit 3: Product:
Concept and importance, Product classifications; Concept of product mix Branding, packaging and labelling.

Unit 4: Pricing & Place
a. Pricing: Significance. Factors affecting price of a product. Methods of pricing
b. Physical Distribution: Channels of distribution – meaning and importance; Types of distribution channels; Functions of middle man; Factors affecting choice of distribution channel; Wholesaling and retailing; Types of Retailers;

Unit 5 Promotion
a. Promotion: Nature and importance of promotion;; Types of promotion: advertising, personal selling, public relations & sales promotion, and their distinctive characteristics; Promotion mix and factors affecting promotion mix decisions;
b. Recent developments in marketing: Social Marketing, online marketing, services marketing, green marketing, Rural marketing; Consumerism.

Reference:

1. Kotler, Philip, Gary Armstrong, PrafullaAgnihotri and EhsanulHaque. *Principles of Marketing*.13th edition.Pearson Education.
2. Michael, J. Etzel, Bruce J. Walker, William J Stanton and Ajay Pandit. *Marketing: Concepts and Cases.* (Special Indian Edition)., McGraw Hill Education
3. William D. Perreault, and McCarthy, E. Jerome., *Basic Marketing*. Pearson Education.
4. Majaro, Simon. *The Essence of Marketing*. Pearson Education, New Delhi.
5. The Consumer Protection Act 1986.
6. Iacobucci and Kapoor, *Marketing Management: A South Asian Perspective*. Cengage Learning..

Note: Latest edition of text books may be used.

DNB21011

SEMESTER II

BUSINESS LAW– DSC4

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80hrs
Tutorials: 16 hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Understand in details various laws related to business and able to work as legal adviser of business enterprises

CO2: Understand the characteristics of legal environment and practice business ethics

CO3: Learn in depth and apply the basic legal knowledge to business enterprises

CO4: Understand the characteristics of different intellectual properties and protect them

CO5: Deliberate and solve disputes among partners and also create awareness about their rights and duties of each partner

CO6: Identify and appointed as member of various commerce and legal boards / committee

Unit 1: The Indian Contract Act, 1872: General Principles of Contract

a) Contract – meaning, characteristics and kinds.
b) Essentials of a valid contract – Offer and acceptance, consideration, contractual capacity, free consent, legality of objects.
c) Void agreements
d) Discharge of a contract – modes of discharge, breach and remedies against breach of contract.
e) Contingent contracts
f) Quasi – contracts

Unit 2: The Indian Contract Act, 1872: Specific Contracts

a) Contract of Indemnity and Guarantee
b) Contract of Bailment
c) Contract of Agency

Unit 3: The Sale of Goods Act, 1930

a) Contract of sale, meaning and difference between sale and agreement to sell.
b) Conditions and warranties
c) Transfer of ownership in goods including sale by a non-owner
d) Performance of contract of sale
e) Unpaid seller – meaning, rights of an unpaid seller against the goods and the buyer.

Unit 4: Partnership Laws

A) The Partnership Act, 1932

a. Nature and Characteristics of Partnership
b. Registration of Partnership Firm
c. Types of Partners
d. Rights and Duties of Partners

e. Implied Authority of a Partner
f. Incoming and outgoing Partners
g. Mode of Dissolution of Partnership

B) The Limited Liability Partnership Act, 2008

a) Salient Features of LLP
b) Differences between LLP and Partnership, LLP and Company
c) LLP Agreement,
d) Partners and Designated Partners
e) Incorporation Document
f) Incorporation by Registration
g) Partners and their Relationship

Unit – 5 Intellectual Property Rights Act

Patents, Copy Rights, Trade Mark, Geographical TRIPS – GAT Agreement – Indicators (Brief) .

Reference:

1. M.C. Kuchhal, and VivekKuchhal, *Business Law*, Vikas Publishing House, New Delhi.
2. Avtar Singh, *Business Law*, Eastern Book Company, Lucknow.
3. Ravinder Kumar, *Legal Aspects of Business*, Cengage Learning
4. SN Maheshwari and SK Maheshwari, *Business Law*, National Publishing House, New Delhi.
5. Aggarwal S K, *Business Law*, Galgotia Publishers Company, New Delhi.
6. Bhushan Kumar Goyal and Jain Kinneri, *Business Laws*, International Book House
7. SushmaArora, *Business Laws*, TaxmannPulications.
8. AkhileshwarPathak, *Legal Aspects of Business*, McGraw Hill Education, 6th ed.
9. P C Tulsian and Bharat Tulsian, *Business Law*, McGraw Hill Education
10. Sharma, J.P. and SunainaKanojia, *Business Laws*, Ane Books Pvt. Ltd., New Delhi.

Note: Latest edition of text books may be used.

DNB22011

SEMESTER II

BUSINESS MATHEMATICS AND STATISTICS – DSC5

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80hrs
Tutorials: 16 hrs

Course Outcome:

On successful completion of this course the students can:
CO1: Understand in depth the classification and operation of matrices
CO2: Learn in details with applications of calculus to solve business problems
CO3: Understand in detail the characteristics and application of regression
CO4: Learn in depth the classification and characteristics of Trend analysis and able to determine future trend
CO5: Understand in details the classification and application of correlation

Part – A: Business Mathematics

Unit 1: Matrices

Definition of a matrix. Types of matrices; Algebra of matrices. Calculation of values of determinants up to third order; Adjoin of a matrix; Finding inverse of a matrix through ad joint; Applications of matrices to solution of simple business and economic problems.

Unit 2: Differential Calculus

Mathematical functions and their types – linear, quadratic, polynomial; Concepts of limit and continuity of a function; Concept of differentiation; Rules of differentiation – simple standard forms. Applications of differentiation – elasticity of demand and supply; Maxima and Minima of functions (involving second or third order derivatives) relating to cost, revenue and profit.

Unit 3: Basic Mathematics of Finance

Simple and compound interest Rates of interest – nominal, effective and continuous – their interrelationships; Compounding and discounting of a sum using different types of rates.

Part – B: Business Statistics

Unit 1: Uni-variate Analysis

Measures of Central Tendency including arithmetic mean, geometric mean and harmonic mean: properties and applications; mode and median. Measures of Variation: absolute and relative. Range, quartile deviation and mean deviation; Variance and Standard deviation: calculation and properties.

Unit 2: Bi-variate Analysis

Simple Linear Correlation Analysis: Meaning, and measurement. Karl Pearson's co-efficient and Spearman's rank correlation Simple Linear Regression Analysis: Regression equations and estimation. Relationship between correlation and regression coefficients

Unit 3: Time-based Data: Index Numbers and Time-Series Analysis

Meaning and uses of index numbers; Construction of index numbers: Aggregative and average of relatives – simple and weighted, Tests of adequacy of index numbers, Construction of consumer price indices.

Components of time series; additive and multiplicative models; Trend analysis: Finding trend by moving average method and Fitting of linear trend line using principle of least squares.

Reference:

1. Mizrahi and John Sullivan. *Mathematics for Business and Social Sciences*.Wiley and Sons.
2. Budnick, P. *Applied Mathematics.* McGraw Hill Publishing Co.
3. N. D. Vohra, *Business Mathematics and Statistics*, McGraw Hill Education (India) Pvt Ltd
4. J.K. Thukral, *Mathematics for Business Studies,* Mayur Publications
5. J. K. Singh, *Business Mathematics,* Himalaya Publishing House.
6. J. K. Sharma, *Business Statistics,* Pearson Education.
7. S.C. Gupta, *Fundamentals of Statistics,* Himalaya Publishing House.
8. S.P. Gupta and Archana Gupta, *Elementary Statistics,* Sultan Chand and Sons, New Delhi.
9. Richard Levin and David S. Rubin, *Statistics for Management,* Prentice Hall of India, New Delhi.
10. M.R. Spiegel, *Theory and Problems of Statistics,* Schaum's Outlines Series, McGraw Hill Publishing Co.

Note: Latest edition of text books may be used.

DNB23011

SEMESTER II

BANKING AND INSURANCE – DSC6

(Credits: Lecture – 03, Tutorial – 01, Practical – 0) Lectures: 48hrs
Tutorials: 16 hrs

Course Outcome:

On successful completion of this course the students can:
CO1: Identity and analyse in depth risk and returns in banking sector
CO2: Understand in detail the banking and insurance laws and build their career
CO3: Learn in depth the functions of banking and insurance sector and able to become an adviser
CO4: Write down the classification and characteristics of digital transactions and adopt them effectively

Unit-1. Introduction to Banking

Definition, evolution and development of banking, role and importance of banks in national economy. Origin and growth of banks in India, structure of Indian banking system. Types of banks – Scheduled banks, nationalized banks, private sector banks, Regional Rural Banks, cooperative banks, foreign banks. Functions and modern services of commercial banks

Central bank- Introduction, role and functions. Reserve Bank of India- role and functions under Indian context

UNIT-2. Banker and Customer

Relationship between banker and a customer – general and special relationship. Special type of bank customers. Types of bank accounts. Cheques- requisites, difference between cheque and bill of exchange, dating of cheques, crossing, endorsements, holders and holder in due course, dishonour of cheques .The paying banks and the collecting banks. Standing instructions pass book, other banking services. NRI A/C'S, Foreign exchange.

UNIT- 3. Loans and Advances

Principles of bank lending- liquidity, profitability, safety and security, purpose, social responsibility- recommendations of the Talwar Committee. Types of advances- loans, cash credits, overdrafts, bill discounting and purchasing, bank guarantee, letter of credit. Secured loans- forms of securities, mortgages, Pledge, distinction between pledge and mortgage. Hypothecation – detach loans to property sector, types of loans under priority sector, loans to MSMES and agricultural sector. Educational loans, lead bank scheme to weaker section unsecured loans, personal loans.

UNIT-4 CHANGED BANKING SCENARIO IN INDIA

Core Banking – Introduction, elements, features and advantages. Net Banking - Definition, features, services offered, advantages, virtual banking , E- payments, ATM card, debit / credit cards, SVEFT, RTGS, ECS (credit / debit) E- money, electronic purse, digital cash. Cheque transaction system- definition of electronic cheque, process, advantages. Challenges faced by

Indian banking human resources, technological up gradation, cyber crimes, competition from foreign banks.

UNIT-5 RISK AND INSURANCE

Risk – basic concept of risk, types of business risks, rationale for risk management. Risk management process, objectives, guidelines and responsibilities
Insurance- Definition, costs and benefits of insurance, elements of insurable risk, kinds of insurance. Principles of insurance, life and non life insurance
Life insurance- Meaning and Definition- Benefits, life insurance players in India- group insurance. Non life insurance- introduction to general insurance, - players in India, issue of policies- rating procedure – claim settlements. Fire insurance, marine insurance, motor insurance, project and engineering insurance, liability insurance, rural and social insurance , health insurance, livestock insurance, crop insurance, aviation insurance, on line insurance, IRDA - Functions and role.

Reference :

1. Agarwal, O.P, Banking and Insurance, Himalaya Publishing House.
2. Satyadevi. C, Financial Services Banking and Insurance, S Chand publications.
3. Suneja H.R, Practical and Law of Banking, Himalaya Publishing House.
4. Chabra T.N, Elements of Banking Law, Dhanpatrai& Sons.
5. Arthur C James & C Williams J.R, Risk Management and Insurance, Mc. Graw Hill.
6. Sexena G.S, Legal Aspects of Banking Operations, Sultan Chand and Sons.
7. Varshney P.N, Banking Law and Practice, Sultan Chand and Sons.
8. JyotsnaSethi&Nishwan Bhatia, Elements of Banking & Insurance, PHI Learning.

Note: Latest edition of text books may be used.

DNC21011

SEMESTER III

CORPORATE ACCOUNTING – DSC7

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80hrs

Tutorials: 16 hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Learn in depth different sources of finance and become an corporate accountant

CO2: Understand the characteristics and classification of shares and able to determine value of Shares and goodwill

CO3: Identify the characteristics of intermediate in stock exchange and start career as stock Broker

CO4: Identify and analyse the flow of funds into and from the business

CO5: Understand the details of NPA in banking

CO6: Learn in depth about Holding and Subsidiary company and play a vital role in preparation In consolidated Balance Sheet

Unit 1. Accounting for Share Capital & Debentures

Issue, forfeiture and reissue of forfeited shares: concept & process of book building; Issue of rights and bonus shares; Buy back of shares; Issue and Redemption of preference shares. Issue of Debentures with conditions for redemption.

Unit 2. (a) Final Accounts

Preparation of profit and loss account and balance sheet of corporate entities, excluding Calculation of managerial remuneration, Disposal of company profits.

(b) Amalgamation of Companies

Concepts and accounting treatment as per Accounting Standard: 14 (ICAI).
Internal reconstruction.

Unit 3. Valuation of Goodwill and Valuation of Shares

Concepts, Methods and valuation of Goodwill and Shares.

Unit 4. Accounts of Holding Companies/Parent Companies

Preparation of consolidated balance sheet with one subsidiary company; Relevant provisions of Accounting Standard: 21 (ICAI).

Unit 5. Accounts of Banking Companies

Difference between balance sheet of banking and non-banking companies; Prudential norms; Asset structure of a commercial bank; Non-performing assets (NPA)

Unit 6. Cash Flow Statement

Concept of funds, Preparation of cash flow statement as per Indian Accounting Standard (Ind-AS): 7.

Note:

1. The relevant Indian Accounting Standards in line with the IFRS for all the above topics should be covered.

2. Any revision of relevant Indian Accounting Standard would become applicable immediately.

Reference:

1. J.R. Monga, *Fudamentals of Corporate Accounting*. Mayur Paper Backs, New Delhi.
2. M.C. Shukla, T.S. Grewal, and S.C. Gupta.*Advanced Accounts*. Vol.-II. S. Chand & Co., New Delhi.
3. S.N. Maheshwari, and S. K. Maheshwari. *Corporate Accounting*.Vikas Publishing House, New Delhi.
4. Ashok Sehgal, Fundamentals of *Corporate Accounting*. Taxman Publication, New Delhi.
5. V.K. Goyal and RuchiGoyal**,**.*Corporate Accounting*.PHI Learning.
6. Jain, S.P. and K.L. Narang. *Corporate Accounting*.Kalyani Publishers, New Delhi.
7. Bhushan Kumar Goyal, *Fundamentals of Corporate Accounting,* International Book House
8. P. C. Tulsian and Bharat Tulsian, Corporate Accounting, S.Chand
9. Amitabha Mukherjee, Mohammed Hanif, Corporate Accounting, McGraw Hill Education
10. Compendium of Statements and Standards of Accounting. The Institute of Chartered Accountants of India, New Delhi.

Note: Latest edition of text books may be used.

DNC22011

SEMESTER III

INCOME TAX LAW AND PRACTICE – DSC8

(Credits: Lecture – 04, Tutorial – 01, Practical – 01) Lectures: 64hrs,
Tutorials: 16 hrs
Practical: 32hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Learn in depth Income Tax Act of 1961 and able to practice as Tax Consultant and Tax Practitioner

CO2: Learn in depth online filing of Income tax returns

CO3: Identify the different heads of income and able to compute tax liability

CO4: Identify in detail different sections of IT Act to reduce tax liability

CO5: Deliberate in details with examples and appear before IT tribunal on behalf of his clients

CO6: Understand in details with examples IT Authorities and able to work in different position of CBDT

Unit 1: Introduction

Basic concepts: Income, agricultural Income, person, sessee, assessment year, previous year, gross total income, total income, maximum marginal rate of tax; Permanent Account Number (PAN) Residential status; Scope of total income on the basis of residential status, Meaning of Double Tax avoidance agreement. Exempted income under section 10

Unit 2: Computation of Income under different heads – 1

Income from Salaries; Income from house property

Unit 3: Computation of Income under different heads – 2

Profits and gains of business or profession; Capital gains; Income from other sources

Unit 4: Computation of Total Income and Tax Liability

Income of other persons included in assessee's total income; Deductions from gross total income; u/s 80 C, 80 D, 80E, 80G, , 80GG , 80U. Computation of total income for individuals. Computation of Tax liability of individuals and firms. Two leading cases decided by the Supreme Court.

Unit 5: Preparation of Return of Income Practical Lab 26

Filing of returns: Manually, On-line filing of Returns of Income & TDS; Provision & Procedures of Compulsory On-Line filing of returns for specified assesses.

Reference:

1. Singhania, Vinod K. And Monica Singhania.*Students' Guide to Income Tax, University Edition.*Taxmann Publications Pvt. Ltd., New Delhi.
2. Ahuja, Girish and Ravi Gupta. *Systematic Approach to Income Tax.*Bharat Law House, Delhi.

Journals

1. *Income Tax Reports*. Company Law Institute of India Pvt. Ltd., Chennai.
2. *Taxman*. Taxman Allied Services Pvt. Ltd., New Delhi.
3. *Current Tax Reporter*. Current Tax Reporter, Jodhpur.

Note: Latest edition of text books may be used.

SEMESTER III

COMPUTER APPLICATIONS IN BUSINESS – SEC1

(Credits: Lecture – 02, Tutorial – 0, Practical – 02) Lectures: 32hrs,
Tutorials: 0hrs
Practical: 64hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Learn in depth and create business document by using MS Word and Excel

CO2: Learn in details with application of Power Point and present business information through PPTs

CO3: Identify the characteristics of projects and develop projects using computer

CO4: Learn the classification and characteristics of charts and graphs using computer

CO5: Write down the characteristics of BPOs and KPOs and able to work in BPOs and KPOs

Unit 1: Word Processing 3 Lectures, Practical Lab 6

Introduction to word Processing, Word processing concepts, Use of Templates, Working with word document: Creating and Editing Text, Find and replace text, Formatting, spell check, Autocorrect, Autotext; Bullets and numbering, Tabs, Paragraph Formatting, Indent, Page Formatting, Header and footer, Tables: Inserting/Drawing, filling and formatting a table; OLE concepts (Object Linking and Embedding) Inserting Pictures and Video; Mail Merge: including linking with Database; Printing documents

Creating Business Documents using the above facilities

Unit 2: Presentation Graphics 3 Lectures, Practical Lab 6

Presentation-Basic concepts, Creating/Editing slides, Formatting slides, Inserting drawings, Charts, Tables, Images, Symbols. Embedding media and animation. Preparing and presenting a slide show..

Creating Business Presentations using above facilities

Unit 3: Spreadsheets and its Business Applications 10 Lectures, Practical Lab 20

Spreadsheet concepts, Managing worksheets; Formatting, Entering data, Editing, and Printing a worksheet; Handling operators in formula, Project involving multiple spreadsheets, Organizing Charts and graphs

Generally used Spreadsheet functions: Mathematical, Statistical, Financial, Logical, Date and Time, Lookup and reference, Database, and Text functions.

Unit 4: Creating Business Spreadsheet 10 Lectures, Practical Lab 20

Creating spreadsheet in the area of: Loan and Lease statement; Ratio Analysis; Payroll Processing and statements; Capital Budgeting; Depreciation Accounting; Graphical representation of data; Frequency distribution and its statistical parameters; Correlation and Regression.

Note:
The General Purpose Software referred in this course will be notified by the University Departments every three years. If the specific features, referred in the detailed course above, is not available in that software, to that extent it will be deemed to have been modified.
2. Teaching arrangement need to be made in the computer Lab

Reference:

The suggested readings and guidelines shall be notified by the university department at least once in three years based on the selected software.

Note: Latest edition of text books may be used.

DND21011

SEMESTER IV

COST ACCOUNTING – DSC9

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80hrs
Tutorials: 16hrs

Course Outcome:

On successful completion of this course the students can:

CO 1: Identify and classify different elements of cost and able to prepare cost sheet, estimation, tender and quotation

CO 2: Learn in depth characteristics of a cost accountant and help the management in decision making

CO 3: Deliberate in depth cost minimization and profit maximization

CO 4: Deliberate the details of reconciliation of cost and financial statement

CO5: Write down the characteristics of inventory, labour and overhead control techniques and apply the same in manufacturing concern

Unit -1: Introduction

Meaning, objectives and advantages of cost accounting; Difference between cost accounting and financial accounting; Cost concepts and classifications; Elements of cost; Installation of a costing system; Role of a cost accountant in an organisation

Unit -2 : Material & Labour

a) **Materials**: Material/inventory control techniques. Accounting and control of purchases, storage and issue of materials. Methods of pricing of materials issues — FIFO, LIFO, Simple Average, Weighted Average, Replacement, Standard Cost. Treatment of Material Losses.

b) **Labour**: Accounting and Control of labour cost. Time keeping and time booking. Concept and treatment of idle time, over time, labour turnover and fringe benefits. Methods of wage payment and the Incentive schemes- Halsey, Rowan, Taylor's Differential piece wage.

Unit 3 : Overheads

Classification, allocation, apportionment and absorption of overheads; Under- and over-absorption; Capacity Levels and Costs; Treatments of certain items in costing like interest on capital, packing expenses, bad debts, research and development expenses; Activity based cost allocation.

Unit 4 : Methods of Costing

Unit costing, Job costing, Contract costing, Process costing (process losses, valuation of work in progress), Service costing (only transport).

Unit 5: Book Keeping in Cost Accounting

Integral and non-integral systems; Reconciliation of cost and financial accounts

Reference:

1.Charles T. Horngren, Srikant M. Datar, Madhav V. Rajan**,*Cost Accounting: A Managerial Emphasis*, Pearson Education.**
2. JawaharLal, *Cost Accounting*. McGraw Hill Education
3. Nigam, B.M. Lall and I.C. Jain. *Cost Accounting: Principles and Practice*. PHI Learning
4. Rajiv Goel, *Cost Accounting*. International Book House
5. Singh, Surender. *Cost Accounting,* Scholar Tech Press, New Delhi.
6. Jain, S.P. and K.L. Narang. *Cost Accounting: Principles and Methods*. Kalyani Publishers
7. Arora, M.N. *Cost Accounting – Principles and Practice.* Vikas Publishing House, New Delhi.
8. Maheshwari, S.N. and S.N. Mittal. *Cost Accounting: Theory and Problems*. ShriMahavir Book Depot, New Delhi.
9. Iyengar, S.P. Cost Accounting. Sultan Chand & Sons
10. H.V. Jhamb, *Fundamentals of Cost Accounting,* Ane Books Pvt. Ltd.

Note: Latest edition of text books may be used.

DND22011

SEMESTER IV

COMPANY LAW – DSC10

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80hrs
Tutorials: 16hrs

Course Outcome:

On successful completion of this course the students can:
CO1: Understand in depth Memorandum and Articles of Association and able to draft them
CO2: Learn in details the promotion of a Joint Stock Company
CO3: Write down the details of conducting the Board of Directors and Subcommittee meetings
CO4: Identify the provisions relating to payment of dividend to shareholders
CO5: Learn in details different modes of winding up of a Company
CO6: Write down the characteristics of official receiver and appointed as official receiver on liquidation of a company through the court

Unit 1 Introduction
Company- Meaning & Definition –Characteristics. Types of Companies including one person company, small company and dormant company. Association not for profit-Lifting of Corporate veil.
Formation of a company-Stages-Online filing of documents-Online registration, Promoters and their legal position.

Unit 2 Documents
Memorandum of Association, Articles of Association-Prospectus-Statement in Lieu of Prospectus-Mis-statement in prospectus and its consequences
Legal provisions relating to Issue of capital; Issue of shares, allotment, forfeiture, transfer and transmission of shares- Share certificates- Demat -Buy back and issue of bonus shares, Rights issue, and Employees stock option

Unit 3 Management & Meetings
a) Management – Board of Directors-Rights and Responsibilities of Directors collectively and severally. Types of Directors-Women, independent- Appointment, disqualifications, legal position, powers and duties, provisions for removal of directors. Directors' Identity Number (DIN) Key Managerial personnel (Managing Director only). Company Secretary – Definition, appointment, Rights and Duties.

b) Meetings - Board of Directors Meetings. , Sub-Committee Meetings; Audit, Nomination and Remuneration, CSR Committee. Share Holders Meeting, AGM and EGM – Convening and Conduct of Meetings- Requisites of a valid Meeting.

Unit 4 Dividends, Accounts and Audit
Provisions relating to; payment of dividend, books of accounts and Audit.

Unit 5 Winding up
Modes of Winding up- Amalgamation, Merger and Demerger.

Provisions relating to insider trading-Whistle blowing

Reference:

1. M.C. Kuchhal, and VivekKuchhal, *Business Law*, Vikas Publishing House, New Delhi.
2. Avtar Singh, *Business Law*, Eastern Book Company, Lucknow.
3. Ravinder Kumar, *Legal Aspects of Business*, Cengage Learning
4. SN Maheshwari and SK Maheshwari, *Business Law*, National Publishing House, New Delhi.
5. Aggarwal S K, *Business Law*, Galgotia Publishers Company, New Delhi.
6. Bhushan Kumar Goyal and Jain Kinneri, *Business Laws*, International Book House
. SushmaArora, *Business Laws*, TaxmannPulications.

8. AkhileshwarPathak, *Legal Aspects of Business*, McGraw Hill Education, 6th ed.
9. P C Tulsian and Bharat Tulsian, *Business Law*, McGraw Hill Education
10. Sharma, J.P. and SunainaKanojia, *Business Laws*, Ane Books Pvt. Ltd., New Delhi.

Note: Latest edition of text books may be used.

DND23011

SEMESTER IV

E-COMMERCE – SEC2

(Credits: Lecture – 03, Tutorial – 0, Practical – 01)

Lectures: 48hrs
Tutorials: 0hrs
Practical: 64hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Specify the classification and characteristics of online transactions

CO2: Learn in details with examples and pursue careers in analyzing characteristics such as website traffic, sales conversion, abandonment rates, search engine optimization and web traffic drivers

CO3: Understand the details of job in information technology, business or marketing

CO4: Deliberate the characteristics of Impact of E-Commerce on traditional marketing

CO5: Understand in detail the technological environment of the business

.

Unit 1: Introduction:

Meaning, nature, concepts, advantages, disadvantages and reasons for transacting online, types of E-Commerce, e-commerce business models (introduction , key elements of a business model and categorizing major E-commerce business models), e-commerce drivers.

Technology used in E-commerce: The dynamics of world wide web and internet- meaning, evolution and features ; Designing, building and launching e-commerce website (A systematic approach involving decisions regarding selection of hardware, software, outsourcing vs. In-house development of a website)

Unit 2: Security and Encryption

Need and concepts, the e-commerce security environment: (dimension, definition and scope of security), security threats in the E-commerce environment (security intrusions and breaches, attacking methods like hacking, sniffing, cyber-vandalism etc.), technology solutions (Encryption, secure channels of communication, protecting networks and protecting servers and clients)

Unit 3: IT Act 2000 and Cyber Crimes

IT Act 2000: Definitions, Digital signature, Electronic governance, Attribution, acknowledgement and dispatch of electronic records, Regulation of certifying authorities, Digital signatures certificates, Duties of subscribers,

Penalties and adjudication, Appellate Tribunal, Offences and Cyber-crimes

Unit 4: E-payment System **8 Lectures, 4 Practical Lab**

Models and methods of e–payments (Debit Card, Credit Card, Smart Cards, e-cash, e-cheque), digital signatures (procedure, working and legal position), payment gateways, net banking – meaning, concepts, importance, electronic fund transfer, automated clearing house, automated ledger posting., risks involved in e-payments.

Unit 5: On-line Business Transactions 8 Lectures, 4 Practical Lab

Meaning, purpose, advantages and disadvantages of transacting online, E-commerce applications in various industries like {banking, insurance, payment of utility bills, online marketing, e-tailing (popularity, benefits, problems and features), online services (financial, travel and career), auctions, online portal, e- learning, publishing and entertainment} Online shopping (Amazon, snap deal, alibaba, flip kart, etc.)

Unit 6: Web Designing 18 Practical Lab

Introduction to HTML; tags and attributes: Text Formatting, Fonts, Hypertext Links, Tables, Images, Lists, Forms, Frames, Cascading Style Sheets.

Note:

There shall be 3 Credit Hrs. For lectures + One Credit hr. (2 Practical periods per week per batch) for Practical Lab

Reference:

1. Kenneth C. Laudon and Carlo GuercioTraver, *E-Commerce*, Pearson Education.
2. David Whiteley, *E-commerce: Strategy, Technology and Applications*, McGraw Hill Education.
3. Bharat Bhaskar, *Electronic Commerce: Framework, Technology and Application, 4th Ed.,* McGraw Hill Education.

4. PT Joseph, *E-Commerce: An Indian Perspective*, PHI Learning
5. KK Bajaj and Debjani Nag, *E-commerce,* McGraw Hill Education
6. TN Chhabra, *E-Commerce,* DhanpatRai& Co.
7. SushilaMadan, *E-Commerce,* Taxmann
8. TN Chhabra, Hem Chand Jain, and Aruna Jain, *An Introduction to HTML*, DhanpatRai& Co.

Note: Latest edition of text books may be used.

DNE21001

SEMESTER V

QUANTITATIVE TECHNIQUES – DSE1

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80hrs
Tutorials: 16hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Understand in depth and solve business problems using OR Techniques

CO2: Understand in details with application to convert business problems into mathematical model for optimum utilization of scarce resources

CO3: Deliberate in details with examples and make effective decisions by using permutation and combination

CO4: Learn in detail with application and apply different techniques to maximize profit and minimize cost

CO5: Learn the details of conducting quantitative research

CO6: Learn the details of Decision Theory

Unit 1 Set Theory

Set Theory-Meaning-Types and operations on sets, Applications on Venn Diagram to represent problems on sets , Cartesian products.

Unit 2 Permutations and Combinations

Permutations and Combinations-Fundamental Principles of Counting, Factorial (N), Permutations- Linear, Circular.

Combination-Meaning-Applications- Application Problems using Permutations and Combinations.

Unit 3 Linear Programming

Linear Programming: Formulation of L.P. Problems, Graphical Solutions (Specialcases: Multiple optimal solution, infeasibility, unbounded solution); Simplex Methods

Unit 4 Elementary Transportation

Elementary Transportation: Formulation of Transport Problem, Solution by N.W.Corner Rule, Least Cost method, Vogel's Approximation Method (VAM), ModifiedDistribution Method. (Special cases: Multiple Solutions, Maximization case, Unbalancedcase, prohibited routes)

Unit 5 Sequencing Model

a) Sequencing Model- Introduction- Problems of Sequencing, Terminology, Notations and Assumptions.

Problems with n jobs and two machines-

Problems with n jobs and three machines-

Problems with n jobs and m machines-

Problems with two jobs and m machines

b) Decision Theory-Pay off Table-Opportunity Loss Table, Expected Monetary Value, Expected opportunity Loss, Expected value of Perfect information and Sample information.

Reference:

1. Business Mathematics, Madappa&SreedharaRao
2. Business Mathematics, Sanchethi&Kapoor
3. Business Mathematics, S.P Guptha
4. Business Mathematics, Rajagopalan
5. Business Mathematics, S.C Guptha
6. Quantitative Techniques, Dr. B.H Suresh

Note: Latest edition of text books may be used.

DNE22001

SEMESTER V

AUDITING AND CORPORATE GOVERNANCE – DSE1

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80hrs
Tutorials: 16hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Deliberate in depth to uphold ethics and morality in business

CO2: Learn the details of practicing good corporate governance

CO3: Learn the characteristics of errors and frauds and minimize them in maintenance of books of accounts

CO4: Learn in depth to practice as an Auditor

CO5: Identify in details the importance of Internal Control and Internal Check

Unit 1: Introduction

Auditing: Introduction, Meaning, Objectives, Basic Principles and Techniques; Classification of Audit, Audit Planning, Internal Control – Internal Check and Internal Audit; Audit Procedure – Vouching and verification of Assets & Liabilities**.**

Unit 2: Auditor's responsibility

Auditor's responsibility to consider frauds and errors in financial statements .Recognizing errors and frauds- Responsibility-Prevention of frauds and errors. Professional code and ethics (in brief). Computer based audit procedures.

Unit 3: Special Areas of Audit

Special Areas of Audit: Special features of Cost audit, Tax audit, and Management audit; Recent Trends in Auditing: Basic considerations of audit in EDP Environment; Auditing Standards; Relevant Case Studies/Problems;

Unit 4: Corporate Governance

Conceptual framework of Corporate Governance: Theories & Models, Broad Committees; Corporate Governance Reforms. Major Corporate Scandals in India and Abroad: Common Governance Problems Noticed in various Corporate Failures. Codes & Standards on Corporate Governance

Unit 5: Business Ethics

Morality and ethics, business values and ethics, approaches and practices of business ethics, corporate ethics, ethics program, codes of ethics, ethics committee; Ethical Behaviour: Concepts and advantages; Rating Agencies; Green Governance; Clause 49 and Listing Agreement.

Unit 6: Corporate Social Responsibility (CSR):
Concept of CSR, Corporate Philanthropy, Strategic Planning and Corporate Social Responsibility; Relationship of CSR with Corporate Sustainability; CSR and Business Ethics, CSR and Corporate Governance; CSR provisions under the Companies Act 2013; CSR Committee; CSR Models, Codes, and Standards on CSR.

Reference:

1. Ravinder Kumar and Virender Sharma, *Auditing Principles and Practice*, PHI Learning
2. ArunaJha, *Auditing*.Taxmann Publication.
3. A. K. Singh, and Gupta Lovleen. *Auditing Theory and Practice*.Galgotia Publishing Company.
4. Anil Kumar, *Corporate Governance: Theory and Practice*, Indian Book House, New Delhi
5. MC Kuchhal, *Modern Indian Company Law*, ShriMahavir Book Depot. (Publishers). (Relevant Chapters)
6. KV Bhanumurthy and Usha Krishna, *Politics, Ethics and Social Responsibility of Business,* Pearson Education
7. N Balasubramanian, A Casebook on Corporate Governance and Stewardship, McGraw Hill Education
8. B.N. Ghosh, Business Ethics and Corporate Governance, McGraw Hill Education
9. S K Mandal*, Ethics in Business and Corporate Governance*, McGraw Hill Education
10. Bob Tricker, *Corporate Governance-Principles, Policies, and Practice* (Indian Edition), Oxford University Press
11. Christine Mallin, *Corporate Governance (Indian Edition*), Oxford University Press
12. Relevant Publications of ICAI on *Auditing* (CARO).
13. Sharma, J.P., *Corporate Governance, Business Ethics, and CSR*, Ane Books Pvt Ltd, New Delhi

Note: Latest edition of text books may be used.

DNE23001

SEMESTER V

SECURITY AND COMMODITY MARKETS – DSE1

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80hrs
Tutorials: 16hrs

Course Outcome:

On successful completion of this course the students can:

CO1:Understand in depth formalities and procedure of listing shares in stock exchange

CO2:Understand in detail the required knowledge to practice as a consultant in Security and commodity Market

CO3: Understand the characteristics of trade in e capital market

CO4:Learn in detail with examples to act as a speculator

CO5:Understand in depth and identify legal issues that impact financial and other risks affecting the business

UNIT-I Securities Market

Meaning of securities, investment & portfolio – Investment v/s Speculation, Investment Avenues – Classes of Investment, legal frame work for securities market in India – Investors and stock exchange. Primary market – Factors for investment in primary market – listing formalities and procedure – Secondary Market – Meaning- Secondary market structure – SEBI and its legal position – Trading and Settlement.

UNIT – 2Stock Exchange

a) Stock Exchange - Meaning, recognition, service, organization of stock exchanges in India. Listing of securities –advantage, drawbacks and listing procedure. On- line trading- meaning, history, growth and development, advantages of stock exchange in India.

b) participants – trading and settlements- buying and selling shares- stock markets quotation- stock market indices – stock market abroad- government securities market- debt market. 15 Lectures

UNIT-3 SEBI

a) Objectives, function, powers, organization-SEBI and guidelines, SEBI and future challenges.

b) Stock exchange institutions- OTCEI, NSE and BSE- features and participants.

UNIT- 4 Credit Rating

Definition and meaning- function- organization- credit rating agencies in india; ICRA,CRISIL,CARE- meaning objectives , rating symbol , international credit rating agencies in brief

UNIT –5 Commodities Market

History, membership, objectives functions, structure and role, governing body, types of transaction, physical markets, futures markets, options in commodities exchange- differences between securities market and commodity markets.

UNIT- 6 Trading In Commodity Market

Parties- mechanism – trading and settlement-, efficiency of commodity market- commodity market in India- origin, growth in terms of size and volume - online trading

Reference:

1. Bharti V. Pathak, "The Indian Financial System", Pearson Education [India] Ltd. 2 nd Edition, Year 2006.
2. V. K. Bhalla, "Investment Management", New-Delhi, Sultanchand& Sons Publication, 10th Edition, Year 2004.
3. Prasanna Chandra, "Investment analysis & Portfolio Management", New-Delhi, The McGraw Hill Company Ltd. 6th edition, year 2006.
4. Gordon &Natarajan, "The Financial Markets & Services", New-Delhi, Himalya Publishing House, year 2007.
5. Dr. G. Ramesh Babu, "The Financial services in India", New-Delhi, Concept Publishing Company. Year 2005 .
6. B. S. Bhatia and G. S. Batra, "Management of Capital Markets, Financial Services and Institutions", New-Delhi, Deep & Deep Publication Pvt Ltd. Year 2001.
7. Meir Kohn, Financial Institutions and Market, Tata MC Graw-Hill Publication, Year-1999.
8. E. Philip Davis, Benn Steil, Institutional Investors, MIT Press, Year- 2004.

Note: Latest edition of text books may be used.

DNE24001

SEMESTER V

BUSINESS DECISIONS – DSE1

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80hrs
Tutorials: 16hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Understand in detail the economic theories to analyse situations and solve problems in business settings

CO2: Learn in detail with examples the economic environment to make appropriate business decisions

CO3: Deliberate the characteristics of consumers behaviour and able to analyse to take effective decisions

CO4: Write down the characteristics of forecast the demand for products

CO5: Understand in details with application, if applicable, of impact of cost on income

Unit 1: Market Dynamics:
Individual demand, market demand, individual supply, market supply, market equilibrium; Elasticity of demand and supply : Price elasticity of demand, income elasticity of demand, cross price elasticity of demand, elasticity of supply.

Unit 2: Theory of Consumer Behaviour:
Cardinal utility theory, ordinal utility theory (indifference curves, budget line, consumer choice, price effect, substitution effect, income effect for normal, inferior and Giffen goods), revealed preference theory.

Unit 3: Producer and optimal production choice:
Optimizing behaviour in short run (geometry of product curves, law of diminishing margin productivity, three stages of production), optimizing behaviour in long run (isoquants, iso-cost line, optimal combination of resources) Costs and scale: traditional theory of cost (short run and long run, geometry of cost curves, envelope curves), modern theory of cost (short run and long run), economies of scale, economies of scope.

Unit 4: **Theory of firm and market organization:**
perfect competition (basic features, short run equilibrium of firm/industry, long run equilibrium of firm/industry, effect of changes in demand, cost and imposition of taxes) ; monopoly (basic features, short run equilibrium, long run equilibrium, effect of changes in demand, cost and imposition of taxes, comparison with perfect competition, welfare cost of monopoly), price discrimination, multi plant monopoly ; monopolistic competition (basic features, demand and cost, short run equilibrium, long run equilibrium, excess capacity) ; oligopoly (Cournot's model, kinked demand curve model, dominant price leadership model, prisoner's dilemma.

Unit 5: Factor Market:
Demand for a factor by a firm under marginal productivity theory (perfect competition in the product market, monopoly in the product market), market demand for a factor, supply of l about, market supply of labour, factor market equilibrium.

Reference:
1. Dominick Salvatore (2009). Principles of Microeconomics 5th ed.) Oxford University Press
2. Lipsey and Chrystal. (2008). Economics.(11th ed.) Oxford University Press
3. Koutosyannis (1979). Modern Micro Economics. Palgrave Macmillan
4. Pindyck, Rubinfeld and Mehta. (2009). Micro Economics. (7th ed.). Pearson.

Note: Latest edition of text books may be used.

DNE25001

SEMESTER V

HUMAN RESOURCE MANAGEMENT– DSE2

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80hrs
Tutorials: 16hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Understand in depth the techniques to manage Human Resources at work place and able to occupy a position of H R Manager

CO2: Specify the details of identifying causes and able to settle problems

CO3: Deliberate the methods and techniques of training to train the Human Resources and create assets for the organisation

CO4: Identify methods of wage payment and incentives and able to adopt different methods of wage payments and incentive plans

CO5: Understand the details of becoming a motivator and counsellor

Unit 1: Introduction

Human Resource Development – Definition, Nature, Objectives &Benefits. Evolution of HRM, HRM vs HRD, HR Policies. Emerging Challenges of Human Resource Management; Workforce diversity; Empowerment; Downsizing; VRS; Human Resource Information System.

Unit 2: Acquisition of Human Resource

Human Resource Planning- Quantitative and Qualitative dimensions; job analysis – job description and job specification; Recruitment – Concept and sources; Selection – Concept – Steps involved in Selection.

Unit 3: Training and Development

Concept and Importance; Identifying Training and Development Needs; Methods. Role-Specific and Competency-Based Training; Evaluating Training Effectiveness; Training Process Outsourcing; Management Development; Career Development.

Unit 4: Performance Appraisal

Meaning, objectives and importance; Modern techniques of performance appraisal; job changes – transfers and promotions; Compensation: concept and policies; methods of wage payments and incentive plans; fringe benefits; performance linked compensation.

.

Unit 5: HR Maintenance

Employee health and safety; employee welfare; social security; Employer-Employee relations- an overview; grievance-handling and redressal; Industrial Disputes: causes and settlement machinery.

Reference:

1. Gary Dessler. *A Framework* for *Human Resource Management*.Pearson Education.
2. DeCenzo, D.A. and S.P. Robbins, *Personnel/Human Resource Management*, Pearson Education.
3. Bohlendar and Snell, *Principles of Human Resource Management,* Cengage Learning
4. Ivancevich, John M. *Human Resource Management*. McGraw Hill.
5. Wreather and Davis. *Human Resource Management*.Pearson Education.
6. Robert L. Mathis and John H. Jackson.*Human Resource Management*.Cengage Learning.
7. TN Chhabra, *Human Resource Management,* DhanpatRai& Co., Delhi
8. BiswajeetPatttanayak, *Human Resource Management, PHI Learning*
9. NeeruKapoor*, Human Resource Management,* Taxmann Publication

Note: Latest edition of text books may be used.

DNE26001

SEMESTER V

GST AND CUSTOMS DUTY – DSE2

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80hrs
Tutorials: 16hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Understand the technology and flow of return filing under GST

CO2: Learn in details and gain knowledge to practice as GST Consultant

CO3: Learn in details provisions of GST to handle TDS and POS online and off line more efficiently

CO4: Understand in depth tax provisions to make managerial decisions effectively in various tax related matters

CO5: Learn in detail the procedure to be followed to assess the value and determine customs duty

Unit 1: **Introduction to GST**- Indirect tax Structure in India, Constitutional requirements, GST Council, Issues in Indirect Tax, Rationale for Transition to GST. GST- Meaning, Definition of GST – Structure of GST –Types of GST- Features of GST, Benefits of GST. Difficulties in implementation of GST.

GST Compliance requirement. Definitions of Dealer, Manufacturer and Trader. Registration under GST-Persons liable for registration, compulsory registration, Procedure for Registration, Rejection of application for registration, cancellation of Registration,

Unit 2: a) **GST Definitions** – Aggregate Turnover, Agriculturist, Business, Credit note and Debit note, Exempt Supplies, Input, Input service, Input Service Distributor, Intra-state supply of Goods, Job work, Invoice. Composition Levy, Mixed Supply, outward supply, Person, Turnover in State

b)Levy and Collection of Tax: Introduction, Supply- meaning and scope of supply, treatment of mixed and composite supply, Liability of tax payable person, Rate and value of tax, transactions without considerations, list of transactions for supply of goods and services and list of transactions for non-supply of goods and services, Reverse charge mechanism,.

Unit 3: **Time of supply and Value of taxable supply**

Time of Supply Introduction, time of supply-forward charge, reverse charge, residuary, special charges Time of supply of service- forward charge, reverse charge, Vouchers, Residuary, Special charges. Problems on determination of time of supply.

Value of taxable Supply-conditions, inclusions, Consideration not wholly in money, Supply between two related persons, Supply through agent, cost based value, Residual

valuation, specific supplies, Service of pure agent. Problems on determination of value of supply.

Unit 4 **: Input tax credit and Returns**

Input tax credit- Meaning, conditions for taking credit, ineligible input tax credit, availability of credit in special circumstances, Input tax credit and change in constitution of registered person, Taking input tax credit in respect of inputs and capital goods sent for job work, Manner of Distribution of Credit by Input Service Distributor (ISD)

Returns-Furnishing details of outward supplies and inward supplies, a brief introduction to GST forms-1 to 8, Steps for filing forms, Levy of late fee.

Unit 5: **Customs Act 1962**

Meaning-Notified Goods-Specified goods-Prohibition of Importation and Exportation under section 11-Types of Customs duty. Computation of Assessable Value and Customs duty.

Reference

1. Goods and service tax and customs duty-A P Philip
2. Goods and service tax and customs duty-Dr Mannel and Dr Therese Pereira
3. GST Master Guide- Vivek Laddha

DNE27001

SEMESTER V

PRINCIPLES OF EVENT MANAGEMENT – DSE2

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80hrs
Tutorials: 16hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Learn in detail and application of techniques for conducting brain storming sessions

CO2: Identify in depth the techniques of effective event management

CO3: Understand the characteristics of public relation officer and can pursue the profession of PRO

CO4: Learn the details to start their own event management enterprise

CO5: Understand and acquire the required knowledge to conduct corporate event

Unit: 1 INTRODUCTION TO EVENT MANAGEMENT

Event- Meaning- Why Event Management- Analysis of Event, Scope of Event, Decision Makers- Event Manager Technical Staff- Establishing of Policies & Procedure- Developing Record Keeping Systems.

Unit: 2 EVENT MANAGEMENT PROCEDURES

Principles for holding an Event, General Details, Permissions- Policies, Government and Local Authorities, - Phonographic Performance License, Utilities- Five Bridge Ambulance Catering, Electricity, Water Taxes Applicable.

Unit: 3 CONDUCT OF AN EVENT

Preparing a Planning Schedule, Organizing Tables, Assigning Responsibility, Communication and Budget of Event- Checklist, Computer aided Event Management– Roles & Responsibilities of Event Managers for Different Events.

Unit: 4 PUBLIC RELATIONS

Introductions to Public Relations- Concept- Nature- Importance- Limitations- Media- Types of Media- Media Management, Public Relation Strategy & Planning. Brain Storming Sessions- Writings for Public Relations.

Unit: 5 CORPORATE EVENTS

Planning of Corporate Event, Job Responsibility of Corporate Events Organizer, Arrangements, Budgeting, Safety of Guests and Participants, Creating Blue Print, Need for Entertainment in Corporate Events And Reporting.

Reference:

1. Event Entertainment and Production – Author: Mark Sonderm CSEP Publisher: Wiley & Sons, Inc. ISBN: 0-471-26306-0
2. GhouseBasha – Advertising & Media Mgt
3. Anne Stephen – Event Management
4. K. Venkataramana, Event Management, SHBP.
5. Special Event Production – Doug Matthews – ISBN 978-0-7506-8523-8
6. The Complete Guide to successful Event Planning – Shannon Kilkenny
7. Human Resource Management for Events – Lynn Van der Wagen (Author)
8. Successful Team Management (Paperback) – Nick Hayed (Author)
9. Event Management & Public Relations by Savita Mohan – Enkay Publishing House
10. Event Management & Public Relations By Swarup K. Goyal – Adhyayan Publisher – 2009

Note: Latest edition of text books may be used.

DNE28001

SEMESTER V

SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT – DSE2

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80hrs

Tutorials: 16hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Learn in depth various financial models to analyse the risk and return

CO2: Understand in detail required skill to start his own vocation as financial analyst and investment consultant

CO3; Identify and use the different models for portfolio Management

CO4: Learn in details with application, if applicable, to do SWOC analysis

Unit 1: Basics of risk and return:

Concept of returns, application of standard deviation, coefficient of variation, beta, alpha. Bonds : present value of a bond, yield to maturity, yield to call, yield to put, systematic risk, price risk, interest rate risk, default risk. Yield curve and theories regarding shape of yield curve. Unsystematic risk and non-risk factors that influence yields. Duration and modified duration, immunization of a bond portfolio. Fundamental analysis: EIC framework; Economic analysis: Leading lagging & coincident macro-economic indicators, Expected direction of movement of stock prices with macroeconomic variables in the Indian context; Industry analysis: stages of life cycle, Porter's five forces model, SWOT
analysis, financial analysis of an industry; Company analysis.

Unit 2: Share valuation:

Dividend discount models- no growth, constant growth, two stage growth model, multiple stages; Relative valuation models using P/E ratio, book value to market value. Technical analysis: meaning, assumptions, difference between technical and fundamental analysis; Price indicators- Dow Theory, advances and declines, new highs and lows- circuit filters. Volume indicators- Dow Theory, small investor volumes. Other indicators- futures, institutional activity. Trends: Resistance, support, consolidation, momentum- Charts: line chart, bar chart, candle chart. Efficient market hypothesis; Concept of efficiency: Random walk, Three forms of EMH..

Unit 3: Portfolio analysis:

Portfolio risk and return, Markowitz portfolio model: risk and return for 2 asset portfolios, concept of efficient frontier & optimum portfolio. Market Model: concept of beta systematic
and unsystematic risk. Investor risk and return preferences: Indifference curves and the efficient frontier. Asset allocation: Asset allocation pyramid, investor life cycle approach, Portfolio management services: Passive – Index funds, systematic investment plans. Active – market timing, style investing.

Unit 4: Capital asset pricing model (CAPM):
Efficient frontier with a combination of risky and risk free assets. Assumptions of single period classical CAPM model. Characteristic line, Capital Market Line, Security market Line. Expected return, required return, overvalued and undervalued assets.

Unit 5: Mutual Funds:
Introduction, calculation of Net Asset Value (NAV) of a Fund, classification of mutual fund schemes by structure and objective, advantages and disadvantages of investing through mutual funds. Performance Evaluation using Sharpe's Treynor'sand Jensen's measures and Fame's Decomposition.

Reference:
1.Fischer, D.E. & Jordan, R.J. : Security Analysis & Portfolio Management ; Pearson Education.

2. PrasannaChandra : Investment Analysis and Portfolio Management ;Tata Mcgraw Hill Education Private Limited

Note: Latest edition of text books may be used.

DNE29001

SEMESTER V

BUSINESS RESEARCH METHODOLOGY– GE1

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80hrs
Tutorials: 16hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Learn in depth different methods of research, methodology, data collection, analysis and interpretation of data to become a good business researcher

CO2: Understand and able to report about various issues of different organisations through research report

CO3: Learn in depth and able to suggest remedial measures for various business issues

CO4: Identify and contribute to the discipline of commerce and management though the research

Unit 1

Meaning, Nature and Scope of Business Research – Role of Business Research in decision making. Applications of Business Research; The Research process – Steps in the research process; the research proposal; Problem Formulation: Management decision problem vs. Business Research problem. Research Design: Exploratory, Descriptive & Causal.

Unit 2

Primary Data Collection: Survey Vs. Observations. Random sample collection methods. Comparison of self-administered, telephone, mail, emails techniques. Qualitative Research Tools: Depth Interviews focus groups and projective techniques.

Unit 3

Measurement & Scaling: Primary scales of Measurement-Nominal, Ordinal, and Interval &Ratio. Scaling techniques-paired comparison, rank order, constant sum, semantic differential, itemized ratings, Likert Scale; Questionnaire-form & design. Sampling: Sampling techniques, determination of sample size using statistical techniques, Cronbach's Alpha test for reliability (using software).

Unit 4

Data and the Methods of Analysis: Analysis of Variance (ANOVA) One-Way & Two-Way, Chi square test (goodness of Fit). Multivariate Data Analysis: Factor Analysis (Principal Component Analysis), Discriminant Analysis. Above statistical test also to be explained using statistical software package. Report writing: Contents of a Research Report. Plagiarism in Business Research – Meaning & Effects; Plagiarism detection software

Reference:

1.Chawla, D, &Sondhi,N. (2011) Research Methodology Concepts and Cases (1st ed.). Vikas Publishing House

2. Malhotra, N & Dash. S (2010) Marketing Research An Applied Orientation (6th ed.). Pearson, Prentice Hall of India.

3. Zikmund, W.G., Babin, B.J., Carr, J.C. & Griffin, M. (2013). Business Research Methods (9thed.). Cengage Learning.

4. Johnson, R.A. &Wichern, D.W. (1997) Business Statistics-Decision Making with Data (1sted.). John Wiley & Sons.

5. Cooper, D.R. & Schindler, P.S. (2008) Business Research Methods (10thed.). McGraw Hill Education. Education Private Limited

Note: Latest edition of text books may be used.

DNE30001

SEMESTER V

INTRODUCTION TO ACCOUNTING – GE1

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80hrs
Tutorials: 16hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Understand in detail the application of accounting principles and able to work as financial accountant of any organisation

CO2: Understand in detail the applications of accounting soft ware and generate financial statements

CO3: Identify and follow ethical dilemmas that occur in accounting

CO4: Understand and apply accounting principles in preparation of financial statements of all types of organisations

CO5: Learn in detail the characteristics of Financial Statement and can prepare the financial statements of special types of transactions

Unit 1: INTRODUCTION TO FINANCIAL ACCOUNTING:
Introduction – Meaning, Objectives and Branches of Accounting – Definition& Functions of financial Accounting – Accounting Process: Rules of accounting – Classification of accounts (traditional accounting equation approach) Journalizing business transaction, posting them to ledger accounts. Subsidiary books – meaning & types – recording of cash & bank transactions (single column, double column & three column cash book)

Unit 2 : FINANCIAL ACCOUNTING PRINCIPLES:
GAAPS in India– Accounting concepts & conventions – Relative view of accounting standards in India on different issues (Basic Knowledge)

Unit 3: Preparation of Trial Balance.
Objectives, Advantages, Limitations, Methods of preparing Trial Balance

Unit – 4: FINAL ACCOUNTS FOR SOLE TRADING CONCERN:
Components & Objectives – preparation of Trading and Profit & Loss Account, Balance Sheet.

Unit 5: DEPRECIATION ACCOUNTING:
Meaning, causes, objectives and factors considered for providing depreciation – Various methods of calculation of depreciation – Original cost method, written down method & sinking fund method.

Unit 6: ACCOUNTING FOR CONSIGNMENT:
Meaning – Difference between consignment and sales –Proforma invoice – Account sales – Types of commission – Consignment of goods at cost price & at invoice price – Normal loss & abnormal loss

Reference:

1. Accounting– by Ashok sehgal&Sehgal
2. Advanced Accounting – by Arulanandam& Raman.
3. Advanced Accounting – by Jain &Narang.
4. Financial Accounting – by S N Maheshwari.
5. Financial Accounting – by Kadkol.

Note: Latest edition of text books may be used.

DNE31001

SEMESTER V

INTRODUCTION TO INCOME TAX – GE1

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80hrs
Tutorials: 16hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Identify in detail different sections of IT Act to reduce tax liability

CO2: Identify the different heads of income and able to compute tax liability

CO3: Learn in depth Income Tax Act of 1961 and able to practice as Tax Consultant and Tax Practitioner

CO4: Learn in depth online filing of Income tax returns

CO5: Understand in details with examples IT Authorities and able to work in different position of CBDT

CO6: Deliberate in details with examples and appear before IT tribunal on behalf of his clients

Unit – 1 (a) Introduction : Basic concepts – Income – Agriculture , Person, Assesses, Assessment Year, Previous Year, Gross Total Income, Rates of Tax for Individuals, Taxable Total Income, PAN, TAN.
(b) Residential Status, Scope of Total Income on the basis of Residential scope – Meaning of Double Taxation Avoidance Agreements.
(c) Incomes exempt u/s 10.

Unit – 2 Computation of Income from different heads;
a) Salary.
b) House Property
c) Business and Profession
d) Capital Gains
e) Other sources

Unit – 3

a) Deductions under Chapter VI A.
b) Computation of total income and tax liability of an individual

Practical

Unit – 4 Preparation and filing of Returns- Manual and e-filing- Due dates for filing – Obligation of employer to deduct and remit tax at source.

Collection of Income Tax Return Forms,
Filling of PAN Application
Filling of ITR 1
Collection of specimen of PAN card.

Reference:
1.Singhania, Vinod K. And Monica Singhania.*Students' Guide to Income Tax, University Edition.*
Taxmann Publications Pvt. Ltd., New Delhi.
2. Ahuja, Girish and Ravi Gupta. *Systematic Approach to Income Tax.*Bharat Law House, Delhi.Journals
1. *Income Tax Reports*. Company Law Institute of India Pvt. Ltd., Chennai.
2. *Taxman*. Taxman Allied Services Pvt. Ltd., New Delhi.
3. *Current Tax Reporter*. Current Tax Reporter, Jodhpur.

Software
1. Vinod Kumar Singhania, *e-filing of Income Tax Returns and Computation of Tax*, Taxmann Publication Pvt. Ltd, New Delhi. Latest version
2. 'Excel Utility' available at *incometaxindiaefiling.gov.in*

Note: Latest edition of text books may be used.

DNE32001

SEMESTER V

PERSONAL SELLING AND SALESMANSHIP – GE1

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80hrs
Tutorials: 16hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Understand in details with examples and apply ethical issues in direct marketing

CO2: Understand in detail tastes and preferences of customers

CO3: Identify and maintain good relationship with present and prospective customers

CO4: Deliberate the details of preparation of sales budget

CO5: Learn in depth direct selling

Unit 1 : Direct Marketing:
Benefits of direct Marketing, direct mail, catalogue marketing – Tele Marketing, other media for direct response marketing, public and ethical issues in direct marketing.

Unit 2: Introduction to Personal Selling:
Nature and importance of personal selling, myths of selling, Features of Personal Selling, Salesmanship and Sales Management, Characteristics of a good salesman, types of selling situations, types of salespersons, Career opportunities in selling, Measures for making selling an attractive career.

Unit 3 Buying Motives:
Rational Motives – Price, quality, quantity, value for money and other post buying services. Irrational motives – Emotional, personal relation. Concept of motivation, Maslow's theory, McGregger theory. Buying motives and their uses in personal selling.

Unit 4: Selling Process:
Prospecting and qualifying; Pre-approach; Approach; Presentation and demonstration; handling of objections; Closing the sale; Post sales activities.

Unit 5: Sales Force Management
Recruitment and Selection of sales personnel-Sales Force Training methods, Compensating Sales personnel- Types and Fringe Benefits.

Unit 6: Sales Reports:
Reports and documents; sales manual, Order Book, Cash Memo; Tour Diary, Daily and Periodical Reports; Ethical aspects of Selling.

Reference:

1. *Spiro,* Stanton, *and Rich, Management of the Sales force,* McGraw Hill.
2. Rusell, F. A. Beach and Richard H. Buskirk, *Selling: Principles and Practices,* McGraw Hill
3. Futrell, Charles, *Sales Management: Behaviour, Practices and Cases,* The Dryden Press.
4. Still, Richard R., Edward W. Cundiff and Norman A. P. Govoni, *Sales Management: Decision Strategies and Cases,* Prentice Hall of India Ltd., New Delhi,
5. Johnson, Kurtz and Schueing, *Sales Management,* McGraw Hill
6. Pedesson, Charles A. Wright, Milburn d. And Weitz, Barton A., *Selling: Principles and Methods,* Richard, IrvinKapoorNeeru, *Advertising and personal Selling,* Pinnacle, New Delhi.

Note: Latest edition of text books may be used.

DNF21001

SEMESTER VI

INDIAN FINANCIAL SYSTEM – SEC3

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80hrs
Tutorials: 16hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Learn in depth the functions of stock exchange and able to become an inter-mediator in Stock Exchange

CO2: Learn the characteristics of Indian Financial System and able to set up own Finance Company

CO3: Understand in detail the functioning o Indian Financial Marketing activities and participate actively

CO4: Identify in detail the Government policies and apply them in investment

CO5: Learn in depth and able to analyse and explain the components of financial statements

Unit 1: Financial System

Introduction – Meaning & Significance – Classification and Structure of Financial System. Financial Markets – Functions and Significance of Primary Market, Secondary Market, Capital Market, & Money Market. Recent Trends in Indian Financial Markets.

Unit 2: Financial Institutions

Types of Banking and Non-Banking Financial Institutions. Constitution, objectives & functions of IDBI, SFCs, SIDCs, LIC, EXIM Bank. Mutual Funds – features and types.

Unit 3: Commercial Banks

Introduction – Role of Commercial Banks – Functions of Commercial Banks – Primary, Secondary and Modern Services– Investment Policy of Commercial Banks. Banking Sector Reforms – Post LPG.

Unit 4: Regulatory Institutions

Reserve Bank of India (RBI) – Organization – Objectives – Role and Functions. The Securities Exchange Board of India (SEBI) – Organization and Objectives.

Unit 5: Financial Services

Meaning& Definition – Features – Importance. Types of Financial Services – factoring, leasing, venture capital, Consumer finance – housing & vehicle finance.

Reference:

1. Vasantha Desai: The Indian Financial System, HPH
2. G. Ramesh Babu; Indian Financial System. HPH
3. Dr.BharatishRao, B.R. Bharghavi – Indian Financial System, HPH
4. Meir Kohn: Financial Institutions and Markets, Tata McGraw Hill
5. L M Bhole: Financial Institutions and Markets, Tata McGraw Hill
6. M Y Khan: Indian Financial System, TMH
7. A Datta ; Indian Financial System, Excel Books
8. D.K. Murthy and Venugopal : Indian Financial System I.K. International Publishers
9. P N Varshney& D K Mittal: Indian Financial System, Sulthan Chand & Sons
10. E Gardon& K Natarajan: Financial Markets & Services, HPH
11. S.C. Sharma and Monica : Indian Financial System I.K. International Publishers
12. K. Venkatramana, Indian Financial System, SHBP.

Note: Latest edition of text books may be used.

DNF22001

SEMESTER VI

CORPORATE TAX PLANNING – DSE3

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80hrs
Tutorials: 16hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Learn in depth and specify the tax saving strategies for decision making

CO2: Understand in depth the provisions and laws of tax and able to become tax consultant

CO3: Identify the tax provisions and deductions and able to become tax planner with reference to
business restructuring

CO4: Write down the details and identify special provisions relating to international transactions

CO5: Understand and identify the entities subject to tax and reporting requirements

Unit 1: Introduction

Tax planning, tax evasion, tax avoidance; Types of Companies. Assessment of income, MAT, Tax on distributed profits

Unit 2: Tax planning-1

Tax planning with reference to setting up of a new business: Locational aspect, nature of business, form of organization; Tax planning with reference to financial management decision – Capital structure, dividend including deemed dividend and bonus shares; Tax planning with reference to sale of scientific research assets

Unit 3: Tax planning-2

Tax planning with reference to specific management decisions – Make or buy; own or lease; repair or replace Tax planning with reference to employees' remuneration. Tax planning with reference to receipt of insurance compensation. Tax planning with reference to distribution of assets at the time of liquidation

Unit 4: Special provisions relating to International transactions.

Provisions regulating transfer pricing; Advance rulings; Advance pricing agreement

Unit 5: Tax Planning with reference to business restructuring.

Amalgamation, demerger, slump sale, conversion of sole proprietary concern / Partnership firm into company, conversion of company into LLP, transfer of assets between holding and subsidiary companies..

Reference:

1. Vinod K. Singhania and Monica Singhania, *Corporate Tax Planning.* Taxmann Publications Pvt.Ltd., New Delhi.
2. GirishAhuja and Ravi Gupta.*Corporate Tax Planning and Management*. Bharat Law House,Delhi.
3. ShuklendraAcharya and M.G. Gurha.*Tax Planning under Direct Taxes*. Modern Law Publication, Allahabad.
4. D.P. Mittal, *Law of Transfer Pricing*. Taxmann Publications Pvt. Ltd., New Delhi.
5. IAS – 12 and AS – 22.
6. *Income Tax Reports*, Company Law Institute of India Pvt. Ltd., Chennai.
7. *Taxman,* Taxmann Allied Services Pvt. Ltd., New Delhi.
8. *Current Tax Reporter***,** Current Tax Reporter, Jodhpur

9. Websites

a) Incometaxindia.gov.in
b) Incometaxindiaefiling.gov.in
c) Cbdt website
d) Itatonline.org

Note: Latest edition of text books may be used.

DNF23001

SEMESTER VI

SERVICE MANAGEMENT – DSE3

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80hrs
Tutorials: 16hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Understand in detail and identify the requirements to start Tours and Travels Agency and able to manage effectively

CO2: Learn in depth to manage a retail business efficiently

CO3: Learn in depth the procedure to prepare advertisement copy and able to start advertisement agency

CO4: Understand the required characteristics to become an event manager and able to manage effectively

CO5: Specify in depth the required tools and techniques pertaining to management of transaction based service process

Unit 1: Services

Meaning, importance, types. Services management –meaning, definitions, objectives and importance.

Unit 2: Travel and Tourism Management

Meaning- motives- types- impact of tourism- tourism industry in India, impact of tourism on India's economic development- meaning and features of a tour operator- types of tour operator. Tourism marketing; need for marketing in tourism – tourism promotion – travel agency operation and services- national tourism organizations- challenges of tourism industry – future of tourism industry in India.

Unit 3: Retail Management

Meaning, nature, classification- functions of retailing- retail formats and types- factors influencing retail consumer- retail operations; stores administration, premises management, inventory management, customer service, space management-POP displays, visual merchandising. Importance of retailing industry and challenges of retailing industry.

Unit 4: Hospital Management

Meaning and objectives- types of hospitals- inventory control and purchase management- services by hospitals: laundry, dietary, dispensary, security and ambulance services. Management of blood bank and donated organs.

Unit 5: Advertisement and Event Management

Meaning, definition and importance of advertising – Types of advertising–Advertisement copy and layouts- social and economic effects of advertising-. Event Management – Meaning,

definition, concepts and Principles, advantages and disadvantages. Event managers – roles and responsibilities, events organizing procedure.

Unit 6: HOTEL MANAGEMENT

Meaning of hotels- types of hotels- hotel chains- services provided by hotels- functional areas of hotels- types of rooms- tariff structure and plans. Food – types of food, food organization department and its importance- differences between large and small hotels- hotel industry in India.

Reference:

1. Managing Customer Relationships: A Strategic Framework by **Don Peppers and Martha** Rogers, 2011

2. Perfecting the Art of Customer Service *by the Disney Institute and Theodore Kinni, 2011*

3. The Amazement Revolution: Seven Customer Service Strategies to Create an Amazing Customer (and Employee) Experience *by ShepHyken, 2011*

4. Powerful Phrases for Effective Customer Service: Over 700 Ready-to-Use Phrases and Scripts That Really Get Results *by Renee Evenson, 2012*

5. Customer Service: Career Success Through Customer Loyalty, Fifth Edition *by Paul R. Timm, 2010.*

Note: Latest edition of text books may be used.

DNF24001

SEMESTER VI

MANAGEMENT ACCOUNTING – DSE3

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80hrs
Tutorials: 16hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Learn in depth the characteristics to become a management accountant and able to work effectively

CO2: Understand in detail the required characteristics to become a good decision maker and able to make effective decisions

CO3: Understand in depth the accounting for management and able to occupy key position in an organisation

CO4: Learn in depth the financial analysis and able to choose a vocation as a financial analyst

CO5: Identify the characteristics to become a financial consultant and able to provide consultancy services

Unit 1: Introduction

Meaning, Objectives, Nature and Scope of management accounting, Differences between cost accounting and management accounting, Cost control and Cost reduction, Cost management.

Unit 2: Budgetary Control

Budgeting and Budgetary Control: Concept of budget, budgeting and budgetary control, objectives, merits, and limitations. Budget administration .Functional budgets. Fixed and flexible budgets. Zero base budgeting. Programme and performance budgeting.

Unit 3: Standard Costing

Standard Costing and Variance Analysis: Meaning of standard cost and standard costing, advantages, limitations and applications. Variance Analysis – material, labour, overheads and sales variances..

Unit 4: Marginal Costing

Meaning and importance of marginal costing. Absorption versus Variable Costing: Cost-Volume-Profit Analysis, Profit / Volume ratio. Break-even analysis-algebraic and graphic methods. Angle of incidence, margin of safety, Key factor, determination of cost indifference point.

Unit 5: Decision Making

Steps in Decision Making Process, Concept of Relevant Costs and Benefits, Various short term decision making situations – profitable product mix, Acceptance or Rejection of special/export offers, Make or buy, Addition or Elimination of a product line, sell or process further, operate or shut down. Pricing Decisions: Major factors influencing pricing decisions, various methods of pricing

Unit 6: Contemporary Issues

Responsibility Accounting: Concept, Significance, Different Responsibility Centres, and Divisional Performance Measurement: Financial and Non-Financial measures. Transfer Pricing.

Reference:

1. Charles T. Horngren, Gary L. Sundem, Dave Burgstahler, Jeff O. Schatzberg**.** ***Introduction toManagementAccounting*** , Pearson Education.
2. Anthony A. Atkinson, Robert S. Kaplan, Ella Mae Matsumura, S. Mark Young. *Management Accounting*. Dorling Kindersley(India) Pvt. Ltd.
3. Singh, Surender. *Management Accounting,* Scholar Tech Press, New Delhi.
4. Garrison H., Ray and Eric W. Noreen*. Managerial Accounting*.McGraw Hill.
6. Arora, M.N. *Management Accounting.* Vikas Publishing House, New Delhi.
7. Maheshwari, S.N. and S.N. Mittal. *M a n a g e m e n t Accounting*. Shree Mahavir Book Depot, New Delhi.

Note: Latest edition of text books may be used.

DNF25001

SEMESTER VI

COMPUTERISED ACCOUNTING SYSTEM – DSE3

(Credits: Lecture – 04, Tutorial – 0, Practical – 2) Lectures: 64hrs
Practical: 64hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Understand in detail with examples the preparation of query and report and able to prepare them

CO2: Learn in depth about modules to create efficiently DBMS modules

CO3: Understand in detail with examples the pay roll and able to design payroll system for accounting

CO4: Write down the details of preparing voucher entry form and ledgers to prepare them accurately

CO5: Learn the details of creating a sample data base and able to create efficiently

Unit-1: Computerized Accounting: Using Generic Software (12 Lectures, 12 Practical Lab)

Taxation: TDS, VAT and Service Tax Auditing in Computerized Accounting system: Statutory Audit, Voucher verification, Verification of related party transaction, CAAT: Various Tools.

Unit-2: Introduction to DBMS **(10 Lectures, 10 Practical Lab)**

DBMS – concepts-DBMS Modules – Table, Form, View, Query and Report. Familiarising with SQL. Creating a sample data base and using view, query and report modules.

Unit -3 Designing Computerised Accounting System (14 Lectures, 14 Practical La)

Requirement Analysis, Designing Main Tables. Creating Voucher entry form, populating the data base, Processing and preparing ledgers, Trial Balance using SQL query and report modules,

Unit-4 : Designing Accounting Support System (16 Lectures, 16 Practical Lab)

Designing Bills Payable and Bills Receivable Systems for Accounting using Form, Query and Report Modules. Designing Payroll System for Accounting using Form, Query and Report Modules.

Note:

1. The General Purpose Software referred in this course will be notified by the University Departments every three years. If the specific features, referred in the detailed course above, is not available in that software, to that extent it will be deemed to have been modified.
2. Teaching arrangements need to be made in the computer Lab.

Reference:

The suggested readings and guidelines shall be notified by the university department at least once in three years based on the selected software.

Note: Latest edition of text books may be used.

DNF26001

SEMESTER VI

INTERNATIONAL BUSINESS– DSE4

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80hrs
Tutorials: 16hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Learn in detail about import and export and able to become an importer and exporter

CO2: Specify in detail the application of foreign trade policies and analyse how international factors affect domestic concern

CO3: Learn in depth and analyse legal issues related to international business

CO4: Identify and analyse various social culture and responsibility awareness on global issues

CO5: Understand in detail and identify sources of trade finance and forms of payment

Unit 1: International Business:

a. Introduction to International Business: International business vs. Domestic business: Complexities of international business; Modes of entry into international business. Globalisation and its importance in world economy; Impact of globalization.

b. International Business Environment: National and foreign environments and their components – economic, cultural and political-legal environments

Unit 2 : Theories of International Trade:

a. Theories of International Trade– an overview (Classical Theories, Product Life Cycle theory, Theory of National Competitive Advantage); Commercial Policy Instruments – tariff and nontariff measures – difference and Impact on trade, types of tariff and non-tariff barriers (Subsidy, Quota and Embargo in detail) ; Balance of payment account and its components.

b. *International Organizations and Arrangements*: WTO – Its objectives, principles, organizational structure and functioning; An overview of other organizations – UNCTAD,; Commodity and other trading agreements (OPEC).

Unit 3 : Regional Economic Co-operation:

a. *Regional Economic Co-operation*: Forms of regional groupings; Integration efforts among countries in Europe, North America and Asia (NAFTA, EU , ASEAN and SAARC) .

b. *International Financial Environment*: International financial system and institutions (IMF and World Bank – Objectives and Functions) ; Foreign exchange markets and risk management; Foreign investments – types and flows; Foreign investment in Indian perspective.

Unit 4: Organisational structure for international business operations:

a. Organisational structure for international business operations; International business negotiations.

b. *Developments and Issues in International Business*: Outsourcing and its potentials for India; Role of IT in international business; International business and ecological considerations.

Unit 5 Foreign Trade Promotion Measures and Organizations in India:

a) Foreign Trade Promotion Measures and Organizations in India; Special economic zones (SEZs) and export oriented units (EOUs), ; Measures for promoting foreign investments into and from India; Indian joint ventures and acquisitions abroad.

b)Financing of foreign trade and payment terms – sources of trade finance (Banks, factoring, forfeiting, Banker's Acceptance and Corporate Guarantee) and forms of payment (Cash in advance, Letter of Credit, Documentary Collection, Open Account)

Reference:

1. International Business – P. SubbaRao
2. International Business - Francis Cherunilam
3. International Business – C.B Gupta
4. International Business – K.S Ashwathappa.

Note: Latest edition of text books may be used.

DNF27001

SEMESTER VI

OFFICE MANAGEMENT AND SECRETARIAL PRACTICE – DSE4

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80hrs
Tutorials: 16hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Understand in detail the required characteristics of company secretary and able to become company secretary

CO2: Specify in detail with examples the techniques of managing modern office and manage modern office more effectively

CO3: Understand in detail with application of modern equipment and use modern equipment to index the files and communicate

CO4: Understand and analyse in depth to prepare different types of budgets of a business organisation

CO5: Learn the characteristics of good communication and able to communicate effectively

CO6: Learn in depth fundamentals of investment

Unit 1: Office and Office Management:
Meaning of office. Functions of office – primary and administrative management functions, importance of office. Office manager – essential qualifications. Qualities and duties.
Filing and Indexing: Filing – Meaning and importance, essentials of good filing, centralized vs. Decentralized filing, system of classification, methods of filing and filing equipment, Weeding of old records, Indexing – Meaning and need for indexing, various types of indexing.

Unit 2: Mailing Procedures & Office Forms:
Mailing Procedures – Meaning and importance of mail, centralization of mail handling work, its advantages, room equipment and accessories, sorting tables and rack, letter opener, time and date stamps, postal franking machine, addressing machine, mailing scales, mailing through post, courier, email, appending files with email. Inward and outward mail – receiving, sorting, opening, recording, making, distributing, folding of letters sent, maintenance of peon book, dispatching, courier services, central receipt and dispatch.

Unit 3: Office Forms and stationeries:
Office forms –Introduction, meaning, importance of forms, advantages of using forms, disadvantages of using forms, type of forms, factors affecting forms design, principles of form design, form control.
Office stationeries- Introduction, Types of stationeries used in office, importance of managing Stationeries, selection of stationery, essential requirements for a good system of dealing with stationery, purchasing principles, purchase procedure, standardisation of stationery.

Unit 4: Modern Office Equipments:

Modern Office Equipment – Introduction, meaning and Importance of office automation, objectives of office mechanization, advantages, disadvantages, factors determining office mechanization. Kind of office machines: personal computers, photocopier, fax, telephone, telephone answering machine, dictating machines, Audio Visual Aids.

Office Budget: Budget – Annual, revised and estimated. Recurring and non-recurring heads of expenditure

Audit: Audit process- Vouching, verification and valuation (in brief). Consumables/ Stock register and Asset register. Procedure for disposal of records and assets.

Unit 5: Modern technology and office communication

Modern technology and office communication, email, voice mail, internet, multimedia, scanner, video-conferencing, web-casting. Agenda and Minutes of Meeting. Drafting, fax-messages, email. Maintenance of appointment diary.

Office Secretary

Definition; Appointment; Duties and Responsibilities of a Personal Secretary; Qualifications for appointment as Personal Secretary .Qualities of Secretary. Role of Secretary – Before, during and after Meeting,

Reference:

1. Bhatia, R.C. *Principles of Office Management*, Lotus Press, New Delhi..
2. Leffingwell and Robbinson: *Text book of Office Management*, Tata McGraw-Hill.
3. Terry, George R: *Office Management and Control*.
4. Ghosh, EvamAggarwal: *KaryalayaPrabandh*, Sultan Chand & Sons.
5. Duggal, B: *Office Management and Commercial Correspondence*, KitabMahal.

Note: Latest edition of text books may be used.

DNF28001

SEMESTER VI

FUNDAMENTALS OF INVESTMENT – DSE4

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80hrs
Tutorials: 16hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Learn and analyse the techniques of investment and able to become a wise investor

CO2: Understand in detail the tools and techniques adopted to analyse financial transactions and able to become financial consultant and adviser

CO3: Deliberate in detail with application of different techniques to manage portfolio and financial derivatives

CO4: Understand in depth and analyse different investment alternatives in the ,market

CO5: Identify the reasons for grievances to handle investor's grievances and protect them

Unit 1: The Investment Environment

The investment decision process, Types of Investments – Commodities, Real Estate and Financial Assets, the Indian securities market, the market participants and trading of securities, security market indices, sources of financial information, Concept of return and risk, Impact of Taxes and Inflation on return.

Unit 2: Fixed Income Securities

Bond features, types of bonds, estimating bond yields, Bond Valuation types of bond risks, default risk and credit rating.

Unit 3: Approaches to Equity Analysis

Introductions to Fundamental Analysis, Technical Analysis and Efficient Market Hypothesis, dividend capitalisation models, and price-earnings multiple approach to equity valuation.

Unit 4: Portfolio Analysis and Financial Derivatives

Portfolio and Diversification, Portfolio Risk and Return; Mutual Funds; Introduction to Financial Derivatives. Origin of Derivatives in India-Classification of Derivatives-Features of Derivatives-Financial Derivatives Markets in India.

Unit 5: Investor Protection

Role of SEBI and stock exchanges in investor protection; Investor grievances and their redressal system, insider trading, investors' awareness and activism.

Reference:

1. C.P. Jones, *Investments Analysis and Management*, Wiley, 8th ed.
2. Prasanna Chandra, *Investment Analysis and Portfolio Management*, McGraw Hill Education
3. R.P. Rustogi, *Fundamentals of Investment,* Sultan Chand & Sons, New Delhi.
4. N.D. Vohra and B.R. Bagri, *Futures and Options*, McGraw Hill Education
5. Mayo, *An Introduction to Investment,* Cengage Learning.

Note: Latest edition of text books may be used.

SEMESTER VI

CONSUMER PROTECTION – DSE4

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80hrs
Tutorials: 16hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Identify the rights of consumers and able to create awareness about consumer's rights

CO2: Specify the details and analyse unfair trade practice and restrictive trade practice

CO3: Write down in depth and identify the causes for complaint

CO4: Learn in depth the Government policies and the application of Government policies to protect consumers

CO5: Identify the reasons for grievances and able to handle consumer grievances

Unit 1: Conceptual Framework

Consumer and Markets: Concept of Consumer, Nature of markets, Concept of Price in Retail and Wholesale, Maximum Retail Price (MRP) and Local Taxes, Fair Price, labelling and packaging

Experiencing and Voicing Dissatisfaction: Consumer Satisfaction/dissatisfaction-Grievances complaint, Consumer Complaining Behaviour: Alternatives available to Dissatisfied Consumers; Internal and External Complaint handling: Corporate Redress Systems and Public Redress Systems.

Unit 2: The Consumer Protection Act, 1986 (CPA)

Objectives and Basic Concepts: Consumer, goods, service, defect in goods, deficiency in service, spurious goods and services, unfair trade practice, restrictive trade practice.

Organizational set-up under the Consumer Protection Act: Advisory Bodies: Consumer Protection Councils at the Central, State and District Levels, Basic Consumer Rights; Adjudicatory Bodies: District Forums, State Commissions, National Commission: Their Composition, Powers, and Jurisdiction (Pecuniary and Territorial), Role of Supreme Court under the CPA.

Unit 3: Grievance Redress Mechanism under the Consumer Protection Act, 1986:13 lectures

Who can file a complaint? Grounds of filing a complaint; Limitation period; Procedure for filing and hearing of a complaint; Disposal of cases, Relief/Remedy to be provided; Temporary Injunction, Enforcement of order, Appeal, frivolous and vexatious complaints; Offences and penalties. **Seven Leading Cases decided under Consumer Protection Act**: Medical Negligence; Banking; Insurance; Housing & Real Estate; Electricity, Water, and Telecom Services; Education; Defective Product; Unfair Trade Practice.

Unit 4: Industry Regulators and Consumer Complaint Redress Mechanism

i. Banking: RBI and Banking Ombudsman
ii. Insurance: IRDA and Insurance Ombudsman
iii. Telecommunication: TRAI

iv. Food Products: FSSAI (an overview)
v. Electricity Supply: Electricity Regulatory Commission
vi. Advertising: ASCI

Unit 5: Consumerism in India

Consumer Movement in India: Evolution of Consumer Movement in India. Formation of consumer organizations and their role in consumer protection, Recent developments in Consumer Protection in India, National Consumer Helpline, Citizens Charter, Product testing.

Quality and Standardization: Voluntary and Mandatory standards; Role of BIS, Indian Standards Mark (ISI), Ag-mark, Hallmarking, Licensing and Surveillance; ISO: An overview.

Reference:

1. Khanna, Sri Ram, SavitaHanspal, SheetalKapoor, and H.K. Awasthi. *Consumer Affairs"* (2007) Delhi University Publication.
2. Aggarwal, V. K. (2003). *Consumer Protection: Law and Practice*. 5th ed. Bharat Law House, Delhi, or latest edition.
3. Girimaji, Pushpa (2002). *Consumer Right for Everyone* Penguin Books.
4. Nader, Ralph (1973). *The Consumer and Corporate Accountability*. USA, Harcourt Brace Jovanovich, Inc.
5. Sharma, Deepa (2011).*Consumer Protection and Grievance-Redress in India: A Study of Insurance Industry* (LAP LAMBERT Academic Publishing GmbH & Co.KG, Saarbrucken, Germany.
6. RajyalaxmiRao, *Consumer is King,* Universal Law Publishing Company
7. Empowering Consumers e-book, www.consumeraffairs.nic.in
8. ebook, www.bis.org
9. *The Consumer Protection Act, 1986*
10. Consumer Protection Judgments (CPJ) (Relevant cases reported in various issues)
11. Recent issues of magazines: *Insight*, published by CERC, Ahmedabad '*Consumer Voice*', Published by VOICE Society , New Delhi.
12*UpbhoktaJagran*, Ministry of Consumer Affairs, Govt, of India.New Delhi.

Note: The Latest edition of text books and Acts should be used.

DNF30001

SEMESTER VI

MARKETING MANAGEMENT – GE2

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80hrs
Tutorials: 16hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Understand in detail the functions of marketing and able to become marketing manager
CO2: Learn in depth and analyse tastes and preferences of customers and able to launch a new product
CO3: Understand in detail the requirements of customers and able to forecast the demand for the products
CO4: Learn in depth the procedure to conduct market survey and able to understand buyer behaviour
CO5: Identify the benefits of various distribution channels and able to make comparative analysis of different channels of distribution

Unit 1: Introduction to Marketing Management
Meaning & Definition of marketing management– Goals – Concepts of Marketing – Approaches to Marketing.
Recent trends in Marketing Introduction, E-business – Tele-marketing – M-Business – Green Marketing – Relationship Marketing – Retailing – Concept Marketing and Virtual Marketing (Meaning Only).

Unit 2: Marketing Environment
Meaning – Demographic – Economic – Natural – Technological – Political – Legal – Socio – Cultural Environment

Unit 3: Marketing Mix
Meaning – Elements Product – Product Mix – Product Line – Product Lifecycle – Product Planning –New Product Development – Failure of New Product.
Branding – branding decisions- brand development- brand valuation– Pricing Policy and pricing strategies.
Promotion- promotion mix and factors affecting promotion mix decisions.

Unit 4: Customer Relationship Management
Meaning and Definition – Role of CRM – Advantages and Disadvantages.

Unit 5: Marketing Research & Ethics
a) Marketing Research – Meaning and Importance
b) A brief study of Logistics Management
c) Ethics and social responsibility in marketing.

REFERENCE
1. P N Reddy &Appanniah, Marketing Management, HPH.
2. Kuranakaran, Marketing Management, Himalaya Publishers.

3. Rekha&Vibha, Marketing Management, VBH.
4. Philip Kotler, Marketing Management, Prentice Hall.
35. Bose Biplab, Marketing Management, Himalaya Publishers.
6. J.C. Gandhi, Marketing Management, Tata McGraw Hill.
7. Ramesh &Jayanti Prasad: Marketing Management, I.K. International
8. William J. Stanton, Michael J.Etzel, Bruce Jwalker, Fundamentals of Marketing, McGraw HillEducation.
9. Sontakki, Marketing Management, Kalyani Publishers.
10. K. Venkataramana, Marketing Management, SHBP.

Note: The Latest edition of text books and Acts should be used.

DNF31001

SEMESTER VI

HUMAN RESOURCE MANAGEMENT – GE2

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80 hrs
Tutorials: 16 hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Learn the techniques of HRD for effective recruitment and training

CO2: Specify the characteristics of HR Manager and able to work as HR Manager

CO3: Identify the reasons for employees grievances and able to solve their problems

CO4: Learn in details the knowledge required to manage his own training Institute to train the prospective employees

CO5: Understand in detail the tools used to measure level performance employees.

Unit 1: Introduction

Human Resource Development – Definition, Nature, Objectives &Benefits. Evolution of HRM, HRM vs HRD, HR Policies. Emerging Challenges of Human Resource Management; Workforce diversity; Empowerment; Downsizing; VRS; Human Resource Information System.

Unit 2: Acquisition of Human Resource

Human Resource Planning- Quantitative and Qualitative dimensions; job analysis – job description and job specification; Recruitment – Concept and sources; Selection – Concept – Steps involved in Selection.

Unit 3: Training and Development

Concept and Importance; Identifying Training and Development Needs; Methods. Role-Specific and Competency-Based Training; Evaluating Training Effectiveness; Training Process Outsourcing; Management Development; Career Development.

Unit 4: Performance Appraisal

Meaning, objectives and importance; Modern techniques of performance appraisal; job changes – transfers and promotions; Compensation: concept and policies; methods of wage payments and incentive plans; fringe benefits; performance linked compensation.

Unit 5: HR Maintenance

Employee health and safety; employee welfare; social security; Employer-Employee relations-an overview; grievance-handling and redressal; Industrial Disputes: causes and settlement machinery.

Reference:

1. Gary Dessler. *A Framework* for *Human Resource Management*.Pearson Education.
2. DeCenzo, D.A. and S.P. Robbins, *Personnel/Human Resource Management*, Pearson Education.

3. Bohlendar and Snell, *Principles of Human Resource Management,* Cengage Learning
4. Ivancevich, John M. *Human Resource Management*. McGraw Hill.
5. Wreather and Davis. *Human Resource Management*.Pearson Education.
6. Robert L. Mathis and John H. Jackson.*Human Resource Management*.Cengage Learning.
7. TN Chhabra, *Human Resource Management,* DhanpatRai& Co., Delhi
8. BiswajeetPatttanayak, *Human Resource Management, PHI Learning*

Note: Latest edition of text books may be used.

DNF32001

SEMESTER VI

ENTREPRENEURSHIP DEVELOPMENT– GE2

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80hrs
Tutorials: 16hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Understand in depth the required characteristics and procedure to become an young entrepreneur

CO2: Specify in details with application, if applicable, easily accessd different financial schese

CO3: Identify in detail with examples to easily different financial schemes offered by Banks and Government Agencies

CO4: Understand in depth and identify secure customers

CO5: Learn in depth the behaviour of customers and identify the changed customer needs

UNIT- 1 Entrepreneurial Development Prospective

Concept of entrepreneurship development and their dynamics. Importance of skill, knowledge and motivation in ED. Entrepreneurial Competition, generation of business, ideas and final selection of an activity. Market survey report and business plan preparation. Pooling of resources, forms enterprise ownership and their details.

UNIT- 2 Enterprise Management

Logistics and launching formalities, probable pitfalls, managing money, men, machinery, material and marketing. Support organization, entrepreneurial growth, following the law of the land and social obligation. Managing organisation for innovation and creativity. Importance of leadership, business ethics and business skills on good team building

UNIT- 3 Running a Family Business

Concept, structure and kinds of family firms. Understanding its reputation and brand. Enhancing the knowledge and skill. Managing family and shareholders relationship. Managing leadership succession and understanding the group dynamics, encouraging family women into business. Identifying the changed customer needs and encouraging growth and change in the family business.

UNIT- 4 Social Entrepreneurship

Introduction, Role and Characteristics of Social Entrepreneurs, Starting of a Non-profits Organization innovatively through local resources in a social context, sustainability, Business Strategies and Scaling up.

UNIT- 5 Role of Government and Financial Institution

Role of Central and State Government in promoting entrepreneurship. Types of schemes, loans, incentives, grants and subsidies. Different types of financial institutions, role of commercial banks, types loans for MSME's, schemes, appraisal, sanctions, repayment.

Reference:

1. Entrepreneurship – Tata MC Graw hill
2. Entrepreneurship and Small Business – New Jersey: Palgrave
3. Creativity and Entrepreneurship – Jhon Kao
4. Corporate Creativity Tata MC Graw hill
5. Innovative Entrepreneurship – Practice and Principles – Drucker P.F.

Note: The Latest edition of text books and Acts should be used.

DNF33001

SEMESTER VI

PROJECT WORK – GE2

(Credits: Lecture – 01, Tutorial – 01, Practical – 04)

Lectures: 16hrs
Tutorials: 16hrs
Practical: 128hrs

Course Outcome:

On successful completion of the project work the students are able to:

CO1: Understand in depth the gap between theory and practical through internship

CO2: Understand in detail with examples the procedure and able to write a report on the various issues of an organisation

CO3: Specify the details in depth and able to communicate effectively

CO4: Learn in detail and able to absorb as an employee by the employer

CO5: Specify and analyse the components of project report and prepare the report effectively

JSS COLEGE OF ARTS COMMERCE & SCIENCE
(Autonomous)
BN Road, Mysuru – 25
Department of Commerce and Management

Model Question Paper -2017-18(CBCS)
(for all courses except QT, Computer Applications in Business, Computerised Accounting System, E-Commerce)

B.Com. Programme

Time 3 hrs **Maximum marks: 70**

Allocation of marks and Model Question Paper Commerce

I. The question paper carries 70 marks.

II. It is divided into 3 Parts, Part A, Part B and Part C

III. Part A carries 30 marks…….. … …..... 2x15=30

IV. Part B, carries 20 marks……2x10=20

V. Part C, carries 20 marks……4x5=20

B.COM.

Question Paper Pattern

(For all courses except Business Mathematics & Statistics, QT, Computer Applications in Business, Computerized Accounting System, E-Commerce)

PART-A

Answer the following. Each question carries 15 marks. 2X15=30

1. …… ……

OR

2. ……..…….

3. ……..……..

OR

4. ……..…….…….

PART-B

Answer the following. Each question carries 10 marks. 2X10=20

5. …….…….

OR

6. …….……..……

7. …….…….

OR

8. …….…….

PART-C

Answer any four of the following. Each question carries 5 marks.4X5=20

9. …….……

10. …….…….…….

11. …….…….…….

12. …….…….…….

13. …….…….…….

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B.COM

Question Paper Pattern
2.5 Business Mathematics & Statistics / 5.2a Quantitative Techniques

Time: 3hrs **Max. Marks:70**

Part-A

Answer the following. Each question carries two marks **10X2=20**

1. a. …….
   b. …….
   c.……..
   d. ……......
   e.……..
   f.…….
   g.…….
   h. …….
   i. ……..
   j. ……..

Part-B

Answer any four of the following. Each question carries five marks **4X5=20**

2. ……...

3. ……..……..

4. ……..……..

5. ……

6. ……...……

Part-C

Answer any three of the following. Each question carries ten marks **3X10=30**

7. ….……

8. …….

9. ……..……

10. ……..…….

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B.COM.

Question Paper Pattern
3.6 Computer Application in Business

Time: 2 hrs **Max. Marks: 50**

Part-A

Answer the following. Each question carries two marks. **10X2=20**

1. a. ……..……..
   b. ……..……..
   c. ……..……..
   d. ……..……..
   e. ……..……..
   f. ……..……..
   g. ……..……..
   h. ……..……..
   i. ……..……..
   j. ……..……..

Part-B

Answer any two of the following. Each question carries five marks. **2X5=10**

2. ……..……..

3. ……..……..

4. ……..……..

Part-C

Answer any two of the following. Each question carries ten marks **2X10=20**

5. ….……

6. …….

7. ……..……

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JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE

(Autonomous)

B N ROAD, MYSURU- 570 025

DEPARTMENT OF COMPUTER SCIENCE

Syllabus

CHOICE BASED CREDIT SYSTEM

For B.Sc PROGRAMME

Physics, Mathematics, Computer Science

2017-18

PROGRAMME: BSc PMCs, PROGRAMME CODE: BSc-02 (2017-18)

Year	Sem	Corse Code	Title	Hours / Week		Credits	Maximum Marks			Exam Duration	Total
							IA		Exam		
				L	T/ P	L:T:P	C1	C2			Marks
I Year	I	CMA 25002	**DSC 3A - Computer Science – I**								
			Problem Solving Using Computer	4	4	4:0:2	15	15	70	3 Hours	**100**
	II	CMB 25002	**DSC 3B - Computer Science – II**								
			Computer System Organization and Architecture	4	4	4:0:2	15	15	70	3 Hours	**100**
II Year	III	CMC 25002	**DSC 3C - Computer Science – III**								
			Data Structures and File Processing	4	4	4:0:2	15	15	70	3 Hours	**100**
	IV	CMD 25002	**DSC 3D - Computer Science – IV**								
			Operating Systems	4	4	4:0:2	15	15	70	3 Hours	**100**
III Year	V		**DSE 3 - Computer Science – V (Choose Any One)**								
		CME 25002	A - Database Management Systems	4	0	4:0:1	15	15	70	3 Hours	**100**
		CME2 5202	B - Computer Networks	4	0	4:0:1	15	15	70	3 Hours	**100**
		CME 25402	C - Software Engineering	4	0	4:0:1	15	15	70	3 Hours	**100**
			SEC 3# - Computer Application(Choose Any One)								
		CME 38002	A - Office Automation	0	2	0:0:1	15	15	70	2 Hours	**100**
		CME 38202	B - XML Programming	0	2	0:0:1	15	15	70	2 Hours	**100**
		CME 38402	C - R Programming	0	2	0:0:1	15	15	70	2 Hours	**100**

 # introducing this paper is only after Approvals of AC / GB

Year	Sem	Corse Code	Title	Hours / Week		Credits	Maximum Marks			Exam Duration	Total
							IA		Exam		
				L	T/ P	L:T:P	C1	C2			Marks
III Year	VI		**DSE 6 - Computer Science –VI(Choose Any One)**								
		CMF 25002	A - Internet Technology	4	0	4:0:1	15	15	70	3 Hours	**100**
		CMF 25202	B - Mobile Applications	4	0	4:0:1	15	15	70	3 Hours	**100**
		CMF 25402	C - Cloud Computing	4	0	4:0:1	15	15	70	3 Hours	**100**
			SEC 4 - Computer Science –VII(Choose Any One)								
		CMF 38002	A - Android Programming	1	2	1:0:1	15	15	70	2 Hours	**100**
		CMF 38202	B - PHP Programming	1	2	1:0:1	15	15	70	2 Hours	**100**
		CMF 38602	C - System Administration & Maintenance	1	2	1:0:1	15	15	70	2 Hours	**100**

AssessmentMaximum marks - 100

Course type	C1		C2		C3 Exam Marks		Assigned Marks (Percentage)			Total
	Theory	Lab	Theory	Lab	Theory	Lab	Theory	Lab	IA	
DSC	**10**	**05**	**10**	**05**	**70**	**70**	**50**	**20**	**30**	**100**
DSE	**10**	**05**	**10**	**05**	**70**	**70**	**50**	**20**	**30**	**100**
DSE (non practical)	**15**	**-**	**15**	**-**	**70**	**-**	**70**	**--**	**30**	**100**
SEC	**15**	**-**	**15**	**-**	**50**	**-**	**70**	**--**	**30**	**100**

Note:

1. C1 will be conducted for 20 Marks (Theory) with onehour duration - 10 Marks (Lab) with continuous assessment and it will be reduced to assigned marks.
2. C2 will be conducted for 20 Marks (Theory) with onehour duration - 10 Marks (Lab) with continuous assessment and it will be reduced to assigned marks.
3. C3 will be conducted for 70 Marks (Theory) with three hours duration - 70 Marks (Lab) with 3 hours duration and to be reduced to assigned marks.
4. For non-practical course C3 will be conducted for 70 Marks (Theory) with three hours duration.
5. In case of SEC, C1 and C2 will be conducted for 15 Marks each with one hour duration and C3 will be conducted for 50 Marks with 2 hours duration.

Programme Outcome for Bachelor of Science in Physics, Mathematics, Computer Science:

After completing the graduation in the Bachelor of Science the students are able to:

PO1. Demonstrate proficiency in Mathematics and the Mathematical concepts needed for a proper understanding of Physics.

PO2. Demonstrate the ability to justify and explain their thinking and/or approach.

PO3. Develop state-of-the-art laboratory and professional communication skills.

PO4. Apply the scientific method to design, execute, and analyze an experiment

PO5. Explainscientific procedures and experimental observations.

PO6. Understand the value of Mathematical proof

PO7. Demonstrate proficiency in writing and understanding proofs.

PO8. Apply mathematical problems and solutions in aspects of science and technology.

PO9. Gain experience to investigate the real world problems

PO10. Apply mathematicalideas and models to those problems.

PO11. Apply Mathematical principles for computing and logical design.

PO12. Design, implement, and evaluate a computational system to meet desired needs within realistic constraints.

PO13. Use the System principles in the design and development of software for systems of varying complexity.

Programme Specific Outcome

Bachelor of Science in Physics, Mathematics, Computer Science

After completing the graduation in the Bachelor of Science the students are able to:

PSO1. Find career opportunities

PSO2. Develop competence to write competitive examinations.

PSO3. Develop proficiency in the analysis of complex physical problems

PSO4. Use of mathematical or other appropriate techniques to solve problems

PSO5. Create a hypothesis and appreciate how it relates to broader theories.

PSO6. Demonstrate skills in the use of Computers

PSO7. Join as Entry level Technical job role for an IT Industry

PSO8. Build small database ERP software/ web applications.

SEMESTER I

Course code: CMA25002

DSC 3A: Computer Science-I

Problem Solving Using Computer

Credits: Theory – 04, Practical – 02 **Theories: 60 Lectures**

COURSE OUTCOME:

After successful completion of the course, the student is able to

CO1. Deliberate in depth Computer Fundamentals
CO2. Understand in details with features Computer Organization
CO3. Learn the details of Problem Solving Techniques
CO4. Deliberate the characteristics of Programming Languages
CO5. Understand in details with examples - Python Programming Languages
CO6. Specify in depth OOPs, Event Driven and GUI features in Python

Unit - 1 **(15Lectures)**

Computer Fundamentals: Introduction to Computers: Characteristics of Computers, Uses of computers, Types and generations of Computers.

Basic Computer Organization: Units of a computer, CPU, ALU, memory hierarchy, registers, I/O devices.

Techniques of Problem Solving: Concept of problem solving, Problem definition, Program design, Debugging, Types of errors in programming, Documentation,Flowcharting, decision table, algorithms, Structured programming concepts, Programming methodologies viz. top-down and bottom-up programming.

Unit - 2 **(15 Lectures)**

Overview of Programming: Structure of a Python Program, Elements of Python

Introduction to Python: Python Interpreter, Using Python as calculator, Python shell, Indentation. Atoms, Identifiers and keywords, Literals, Strings, Operators (Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, Increment or

Decrement operator).Input and Output Statements, Control statements (Looping-while Loop, for Loop, Loop Control)

Unit - 3 **(15 Lectures)**

Creating Python Programs: Conditional Statement- if...else, Difference between break, continue and pass.

Structures: Numbers, Strings, Lists, Tuples, Dictionary, Date & Time, Modules, Defining Functions, Exit function, default arguments.

Unit - 4 **(15 Lectures)**

Introduction to Advanced Python: Objects and Classes, Inheritance, Regular Expressions, Event Driven Programming, GUI Programming.

Reference:

1. P. K. Sinha&PritiSinha , "Computer Fundamentals", BPB Publications, 2007.
2. Dr. Anita Goel, Computer Fundamentals, Pearson Education, 2010.
3. T. Budd, Exploring Python, TMH, 1st Ed, 2011
4. Python Tutorial/Documentation www.python.or 2010
5. Allen Downey, Jeffrey Elkner, Chris Meyers , How to think like a computer scientist : learning with Python , Freely available online.2012

Problem Solving Using ComputerLab

Software Lab using Python

Section: A (Simple programs)

1. Write a menu driven program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice.
2. WAP to calculate total marks, percentage and grade of a student. Marks obtained in each of the three subjects are to be input by the user. Assign grades according to the following criteria

   Grade A: Percentage >=80
   Grade B: Percentage>=70 and <80
   Grade C: Percentage>=60 and <70
   Grade D: Percentage>=40 and <60
   Grade E: Percentage<40

3. Write a menu-driven program, using user-defined functions to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user.
4. WAP to display the first n terms of Fibonacci series.
5. WAP to find factorial of the given number
6. WAP to find sum of the following series for n terms: 1 – 2/2! : 3/3! - - - - - n/n!
7. WAP to calculate the sum and product of two compatible matrices.

Section: B (Visual Python)

All the programs should be written using user defined functions, wherever possible.

1. Write a menu-driven program to create mathematical 3D objects
    I. Curve
    II. Sphere
    III. Cone
    IV. Arrow
    V. Ring
    VI. Cylinder.
2. WAP to read n integers and display them as a histogram.
3. WAP to display sine, cosine, polynomial and exponential curves.
4. WAP to plot a graph of people with pulse rate p vs. height h. The values of p and h are to be entered by the user.
5. WAP to calculate the mass m in a chemical reaction. The mass m (in gms) disintegrates according to the formula m=60/(t:2), where t is the time in hours. Sketch a graph for t vs. m, where t>=0.
6. A population of 1000 bacteria is introduced into a nutrient medium. The population p grows as follows:

P(t) = (15000(1:t))/(15: e)

Where the time t is measured in hours. WAP to determine the size of the population at given time t and plot a graph for P vs t for the specified time interval.

7. Input initial velocity and acceleration, and plot the following graphs depicting equations of motion:

I. Velocity wrt time (v=u:at)
II. Distance wrt time (s=u*t:0.5*a*t*t)
III. Distance wrt velocity (s=(v*v-u*u)/2*a)

SEMESTER II

Course code: CMB25002

DSC 3B: Computer Science-II

Computer System Organization and Architecture

Credits: Theory – 04, Practical – 02 **Theories: 60 Lectures**

Course Outcome:

After successful completion of the course, the student is able to

CO1. Deliberate in details with examples Boolean algebra and logic circuits
CO2. Learn the details of Data Representation and Computer Arithmetic
CO3. Learn in depth Computer Organization and Design
CO4. Learn the details of architecture of CPU
CO5. Deliberate the classification and characteristics of Basic Computer Programming Concepts
CO6. Write down in depth Basic Computer Programming Concepts
CO7. Learn the classification and characteristics of Input -Output organization

Unit - 1 (15 Lectures)

Introduction: Logic gates, Boolean algebra, combinational circuits, circuit simplification, flip-flops and sequential circuits, decoders, multiplexors, registers, counters and memory units.

Data Representation and basic Computer Arithmetic: Number systems, complements.

Unit - 2 (15 Lectures)

Fixed and floating point representation, character representation, addition, subtraction, magnitude comparison.

Basic Computer Organization and Design: Computer registers, bus system, instruction set.

Unit - 3 **(15 Lectures)**

timing and control, instruction cycle, memory reference, input-output and interrupt.

Central Processing Unit: Register organization, arithmetic and logical micro-operations, stack organization, micro programmed control.

Unit - 4 **(15 Lectures)**

Programming the Basic Computer: Instruction formats, addressing modes, instruction codes, machine language, assembly language, input output programming.

Input-output Organization: Peripheral devices, I/O interface, Modes of data transfer, direct memory access.

Reference:

1. M. Mano, Computer System Architecture, Pearson Education 1992.
2. A. J. Dos Reis, Assembly Language and Computer Architecture using C:: and JAVA, Course Technology, 2004
3. W. Stallings, Computer Organization and Architecture Designing for Performance, 8th Edition, Prentice Hall of India ,2009
4. Digital Design, M.M. Mano, Pearson Education Asia, 1979

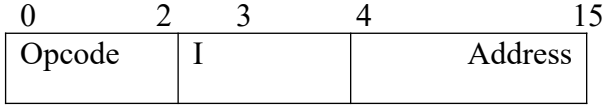
Computer System Organization and Architecture Lab

1. Verification of Basic gates(AND,OR,NOT)
2. Verification of Universal gates(NAND,NOR,EX-OR)
3. Verification of NAND gate as a Universal gate
4. Verification of NOR gate as a Universal gate
5. Verification of Demorgon's theorem
6. Verification of Half adder & Full Adder
7. Verification of Half subtractor & Full Subtractor
8. Verification of Half adder & Half subtractor using NAND gate
9. Conversion of Binary to Gray &gray to Binary Code
10. Simplification of Boolean Expressions
11. Simplification of Boolean Expressions using K-Map
12. Flip-Flops:SR FF(clock, without clock)
13. JK FF
14. Toggle FF
15. Delay FF
16. Multiplexer
17. De-multiplexer
18. Simulate the machine for the following memory-reference instructions with I= 0 and address part = 082. The instruction to be stored at address 022 in RAM. Initialize thememory word at address 082 with the operand B8F2 and AC with A937. Determine thecontents of AC, DR, PC, AR and IR in hexadecimal after the execution.

a. ADD f. BSA
b. AND g. ISZ
c. LDA
d. STA
e. BUN

19. Simulate the machine for the memory-reference instructions referred in above question with I= 1 and address part = 082. The instruction to be stored at address 026 in RAM. Initialize thememory word at address 082 with the value 298. Initialize the memory word at address 298 with operand B8F2 and AC with A937. Determine the contents of AC, DR, PC, AR and IR in hexadecimal after the execution.
20. Modify the machine created in Practical 1 according to the following instruction format:

Instruction format



a. The instruction format contains a 3-bit opcode, a 1-bit addressing mode and a 12-bit Address. There are only two addressing modes, I = 0 (direct addressing) and I = 1(indirect addressing).
b. Create a new register I of 1 bit.

C. Create two new microinstructions as follows:

i. Check the opcode of instruction to determine type of instruction (Memory Reference/Register Reference/Input-Output) and then jump accordingly.

ii. Check the I bit to determine the addressing mode and then jump accordingly.

SEMESTER III

Course code: CMC25002

DSC 3C:Computer Science-III

Data Structures and File Processing

Credits: Theory – 04, Practical – 02 **Theories: 60 Lectures**

Course Outcome:

After successful completion of the course, the student is able to

CO1. Learn the classification, characteristics and understanding of Data structures

CO2. Specify the details of Searching Techniques

CO3. Deliberate in details with examples Basic Concepts of Memory Management Techniques

CO4. Understand in depth File System Operations

CO5. Specify the characteristics of File Organization Methods

CO6. Deliberate in details with examples of Storage Devices

Unit - 1 (15 Lectures)

Basic Data Structures: Introduction, Abstract data structures- stacks, queues, linked lists and binary trees. **Sets:**Dictionary implementation, use of priority queues, hashing, binary trees, balanced trees, setswith merge-find operations.

Unit - 2 (15 Lectures)

Searching: Internal and external searching, use of hashing and balancing techniques.

Memory Management: Garbage collection algorithms for equal sized blocks, storage allocationfor objects with mixed size, buddy systems.

Unit - 3 (15 Lectures)

Physical Devices: Characteristics of storage devices such as disks and tapes, I/O buffering.

BasicFile System Operations: Create, open, close, extend, delete, read-block, write-block, protectionmechanisms.

Unit - 4 **(15 Lectures)**

File Organizations: Sequential, indexed sequential, direct, inverted, multi-list, directory systems,Indexing using B-tree, B: tree and their variants, hashing – hash function, collision handlingmethods, extendible hashing.

Reference:

1. M.T. Goodrich, R. Tamassia and D. Mount, Data Structures and Algorithms in C::, John
2. Wiley and Sons, Inc., 2004.
3. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, Introduction to Algorithms, 2nd Ed.,Prentice-Hall of India, 2006.
4. Robert L. Kruse and A.J. Ryba, Data Structures and Program Design in C::, Prentice Hall, Inc., NJ, 1998.
5. B. Stroupstrup, The C:: Programming Language, Addison Wesley, 2004
6. D.E. Knuth, Fundamental Algorithms (Vol. I), Addison Wesley, 1997

Data Structures and File Processing Lab

Part - A

1. Program to find lower triangular and upper triangular matrices for the given matrix.
2. Write an interactive program to insert an element at the given position and delete an element at the specified position in the given array.
3. Program to search an element identify the number of occurrences with locations in linear array.
4. Program to sort the given M x N matrix row-wise and column-wise using bubble sorting technique.
5. Write an interactive program to search an element in the given linear array using linear and binary searching technique.
6. Write a program to Merge two sorted arrays.

Part – B

7. Write an interactive program to implement the following operations on stack using arrays
   a.PUSH
   b.POP
8. Program to implement Tower of Hanoi problem.
9. Write an interactive program to perform insertion and deletion operations in Linear Queue using arrays.
10. Write an interactive program to perform insertion and deletion operations in Circular Queue usingarrays.
11. Write an interactive program to insert a node in a linked list at the front, delete a node from the rear and display.
12. Write an interactive program to implement preorder, post order and in order traversal of a binary tree using linked list.

SEMESTER IV

Course code: CMD25002

DSC 3D - Computer Science – IV

Operating Systems

Credits: Theory – 04, Practical – 02 **Theories: 60 Lectures**

Course Outcome:

After successful completion of the course, the student is able to

CO1. Learn in details with examples system software

CO2. Learn the details of Operating System organization

CO3. Understand the classification and characteristics of Process Management and Scheduling mechanisms

CO4. Understand in depth Memory Management and allocation strategies

CO5. Learn in details with examples basic concepts of shell scripting

CO6. Understand in depth basic Linux environment

Unit - 1 (15 Lectures)

Introduction: System Software, Resource Abstraction, OS strategies.Types of operating systems - Multiprogramming, Batch, Time Sharing, Single user and Multiuser, Process Control & Real Time Systems

Operating System Organization: Factors in operating system design, basic OS functions, implementation consideration; process modes, methods of requesting system services – system calls and system programs.

Unit - 2 (15 Lectures)

Process Management: System view of the process and resources, initiating the OS, process address space, process abstraction, resource abstraction, process hierarchy, Thread model

Unit - 3 **(15 Lectures)**

Scheduling: Scheduling Mechanisms, Strategy selection, non-pre-emptive and pre-emptive strategies.

Memory Management: Mapping address space to memory space.

Unit - 4 **(15 Lectures)**

Memory allocation strategies, fixed partition, variable partition, paging, virtual memory

Shell introduction and Shell Scripting: What is shell and various type of shell, Various editors present in Linux, Different modes of operation in vi editor, What is shell script, Writing and executing the shell script, Shell variable (user defined and system variables), System calls, Using system calls, Pipes and Filters, Decision making in Shell Scripts (If else, switch), Loops in shell, Functions, Utility programs (cut, paste, join, tr, uniq utilities), Pattern matching utility (grep)

Reference:

1. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8th Edition, John Wiley Publications 2008.
2. A.S. Tanenbaum, Modern Operating Systems, 3rd Edition, Pearson Education 2007.
3. G. Nutt, Operating Systems: A Modern Perspective, 2nd Edition Pearson Education 1997.
4. W. Stallings, Operating Systems, Internals & Design Principles , 5th Edition, Prentice Hall of India. 2008.
5. M. Milenkovic, Operating Systems- Concepts and design, Tata McGraw Hill 1992.

Operating Systems Lab

Software Lab based on Operating Systems

Note: Following exercises can be performed using Linux or Unix

1. Usage of following commands: ls, pwd, tty, cat, who, who am I, rm, mkdir, rmdir, touch, cd.
2. Usage of following commands: cal, cat(append), cat(concatenate), mv, cp, man, date.
3. Usage of following commands: chmod, grep, tput (clear, highlight), bc.
4. Write a shell script to check if the number entered at the command line is prime or not.
5. Write a shell script to modify "cal" command to display calendars of the specified months.

6. Write a shell script to modify "cal" command to display calendars of the specified range of months.
7. Write a shell script to accept a login name. If not a valid login name display message – "Entered login name is invalid".
8. Write a shell script to display date in the mm/dd/yy format.
9. Write a shell script to display on the screen sorted output of "who" command along with the total number of users .
10. Write a shell script to display the multiplication table any number,
11. Write a shell script to compare two files and if found equal asks the user to delete the duplicate file.
12. Write a shell script to find the sum of digits of a given number.
13. Write a shell script to merge the contents of three files, sort the contents and then display them page by page.
14. Write a shell script to find the LCD(least common divisor) of two numbers.
15. Write a shell script to perform the tasks of basic calculator.
16. Write a shell script to find the power of a given number.
17. Write a shell script to find the factorial of a given number.
18. Write a shell script to check whether the number is Armstrong or not.
19. Write a shell script to check whether the file have all the permissions or not.
20. Program to show the pyramid of special character "*".

SEMESTER V

Course code: CME25002

DSE 3A: Elective: Computer Science – V

Database Management Systems

Credits: Theory – 04, Practical – 01 **Theory: 60 Lectures**

Course Outcome:

After successful completion of the course, the student is able to

CO1. Understand the characteristics of DBMS with examples
CO2. Deliberate the details of types of database languages with examples
CO3. Learn the details of ER- Diagrams and Relationship
CO4. Understand in depth Basic concepts of Relational Model
CO5. Learn in details with examples MYSQL Commands
CO6. Learn in details with examples in PL-SQL

Unit - 1 **(15 Lectures)**

Introduction to Database Management Systems: Definition of Data, Information, DBMS, Data base system application, Purpose of database systems, Characteristics of DB – Self describing nature, Insulation between programs, data and data Abstraction (data Independence), support of multiple views of the data, sharing of data and multiples transaction processing, Storage management, Database language – DDL, DML,DCL.

File processing system v/s DBMS, Data models, Levels of Abstraction in a DBMS, Three Schema architecture,Characteristics of database approach,, data models,DBMS architecture and data independence.

Unit - 2 **(15 Lectures)**

Entity Relationship and Enhanced ER Modeling: Entity types,Entity Sets, Attributes, and Keys, Relationships, Relationship Types, Roles, and Structural Constraints,Weak Entity Types, ER Diagrams, Naming Conventions ,SQL99:Schema Definition, constraints, and object modeling

Unit - 3 **(15 Lectures)**

Relational Data Model: Basic concepts, Relational Constraints and Relational Database Schemas, Update Operations and Dealing with Constraint Violations, Basic Relational Algebra Operations.

Database design: ER and EER to relational mapping, functional dependencies,normal forms-first normal form ,second normal forms.third normal form BCNF

Unit - 4 **(15 Lectures)**

MYSQL (SQL/PL-SQL) :SQL VS. SQL * PLUS: SQL COMMANDS ANDDATA TYPES, OPERATORS AND EXPRESSIONS, INTRODUCTION TO SQL * PLUS.

MANAGING TABLES AND DATA:

- CREATING AND ALTERING TABLES (INCLUDING CONSTRAINTS)
- DATA MANIPULATION COMMAND LIKE INSERT, UPDATE, DELETE
- SELECT STATEMENT WITH WHERE, GROUP BY AND HAVING, ORDER BY, DISTINCT, SPECIAL OPERATOR LIKE IN, ANY, ALL BETWEEN, EXISTS, LIKE
- JOIN, BUILT IN FUNCTIONS OTHER DATABASE OBJECTS
- VIEW • SYNONYMS, INDEX TRANSACTION CONTROL STATEMENTS
- COMMIT, ROLLBACK, SAVEPOINT INTRODUCTION TO PL/SQL
- SQL V/S PL/SQL • PL/SQL BLOCK STRUCTURE
- LANGUAGE CONSTRUCT OF PL/SQL (VARIABLES, BASIC AND COMPOSITE DATA TYPE, CONDITIONS LOOPING ETC.)
- % TYPE AND % ROWTYPE
- USING CURSOR (IMPLICIT, EXPLICIT)

Reference:

1. R. Elmasri, S.B. Navathe, Fundamentals of Database Systems 6th Edition, Pearson Education, 2010.
2. R. Ramakrishanan, J. Gehrke, Database Management Systems 3rd Edition, McGraw-Hill, 2002.
3. A. Silberschatz, H.F. Korth, S. Sudarshan, Database System Concepts 6th Edition, McGraw Hill, 2010.
4. R. Elmasri, S.B. Navathe Database Systems Models, Languages, Design and application Programming, 6th Edition, Pearson Education,2013.

Database Management SystemsLab

Software Lab based on Database Management Systems

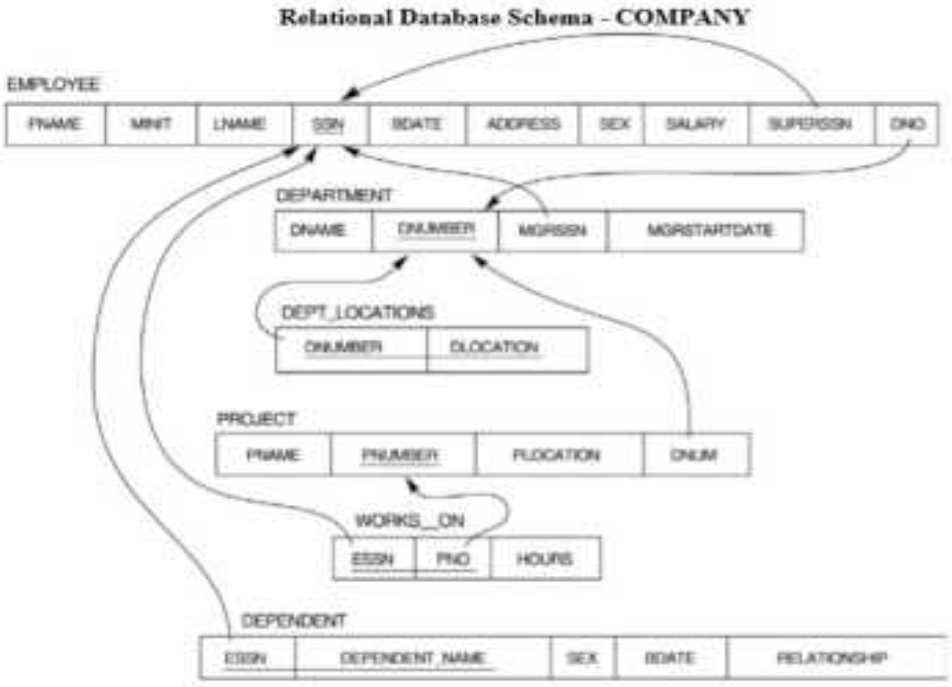
The following concepts must be introduced to the students:**Note:** MS Access/MySQL may be used.

DDL Commands

- Create table, alter table, drop table

DML Commands

- Select, update, delete, insert statements
- Condition specification using Boolean and comparison operators (and, or, not,=,<>,>,<,>=,<=)
- Arithmetic operators and aggregate functions(Count, sum, avg, Min, Max)
- Multiple table queries (join on different and same tables) • Nested select statements
- Set manipulation using (any, in, contains, all, not in, not contains, exists, not exists, union, intersect, minus, etc.)
- Categorization using group by……..having
- Arranging using order by



1. Create tables with relevant foreign key constraints
2. Populate the tables with data
3. Perform the following queries on the database :
   a. Display all the details of all employees working in the company.
   b. Displayssn, lname, fname, address of employees who work in department no 7.

c. Retrieve the birthdate and address of the employee whose name is 'Franklin T. Wong'

4. Retrieve the name and salary of every employee
5. Retrieve all distinct salary values
6. Retrieve all employee names whose address is in 'Bellaire'
7. Retrieve all employees who were born during the 1950s
8. Retrieve all employees in department 5 whose salary is between 50,000 and 60,000(inclusive)
9. Retrieve the names of all employees who do not have supervisors
10. Retrieve SSN and department name for all employees
11. Retrieve the name and address of all employees who work for the 'Research' department 12. For every project located in 'Stafford', list the project number, the controlling department number, and the department manager's last name, address, and birthdate.
13. For each employee, retrieve the employee's name, and the name of his or her immediate supervisor.
14. Retrieve all combinations of Employee Name and Department Name
15. Make a list of all project numbers for projects that involve an employee whose last name is 'Narayan' either as a worker or as a manager of the department that controls the project. 16. Increase the salary of all employees working on the 'ProductX' project by 15%. Retrieve employee name and increased salary of these employees.
17. Retrieve a list of employees and the project name each works in, ordered by the employee's department, and within each department ordered alphabetically by employee first name.
18. Select the names of employees whose salary does not match with salary of any employee in department.
19. Retrieve the name of each employee who has a dependent with the same first name and same sex as the employee.
20. Retrieve the employee numbers of all employees who work on project located in Bellaire, Houston, or Stafford.
21. Find the sum of the salaries of all employees, the maximum salary, the minimum salary, and the average salary. Display with proper headings.
22. Find the sum of the salaries and number of employees of all employees of the 'Marketing' department, as well as the maximum salary, the minimum salary, and the average salary in this department
23. Select the names of employees whose salary is greater than the average salary of all employees in department 10.
24. For each department, retrieve the department number, the number of employees in the department, and their average salary.
25. For each project, retrieve the project number, the project name, and the number of employees who work on that project.
26. Change the location and controlling department number for all projects having more than 5 employees to 'Bellaire' and 6 respectively. 27. For each department having

more than 10 employees, retrieve the department no, no of employees drawing more than 40,000 as salary.

28. Insert a record in Project table which violates referential integrity constraint with respect to Department number. Now remove the violation by making necessary insertion in the Department table.
29. Delete all dependents of employee whose ssn is '123456789'.
30. Delete an employee from Employee table with ssn = '12345'(make sure that this employee has some dependents, is working on some project, is a manager of some department and is supervising some employees). Check and display the cascading effect on Dependent and Works on table. In Department table MGRSSN should be set to default value and in Employee table SUPERSSN should be set to NULL 31. Perform a query using alter command to drop/add field and a constraint in Employee table.

SEMESTER V

Course code: CME25202

DSE3B: Elective:Computer Science - V
Computer Networks

Credits: Theory – 04, Practical – 01 **Theory: 60 Lectures**

Course Outcome:

After successful completion of the course, the student is able to

CO1. Understand the Elements of Data Communications and network Systems

CO2. Learn in depth Transmission Media

CO3. Understand in details with examples Network Models

CO4. Understanding the various classifications and characteristics of Protocols

CO5. Learn in depth Error Detection and Corrections Algorithms

CO6. Learn in detail of Network Security

Unit - 1 (15 Lectures)

Basic concepts: Components of data communication, standards and organizations, Network Classification, Network Topologies ; network protocol; layered network architecture; overview of OSI reference model; overview of TCP/IP protocol suite.

Unit - 2 (15 Lectures)

Physical Layer: Cabling, Network Interface Card, Transmission Media Devices-Repeater, Hub, Bridge, Switch, Router, Gateway.

Data Link Layer: Framing techniques; Error Control; Flow Control Protocols; Shared media protocols - CSMA/CD and CSMA/CA.

Unit - 3 (15 Lectures)

Network Layer: Virtual Circuits and Datagram approach, IP addressing methods – Subnetting; Routing Algorithms (adaptive and non-adaptive)

Transport Layer: Transport services, Transport Layer protocol of TCP and UDP

Unit - 4 **(15 Lectures)**

Application Layer: Application layer protocols and services – Domain name system, HTTP, WWW, telnet, FTP, SMTP

Network Security: Common Terms, Firewalls, Virtual Private Networks.

Reference:

1. B.A. Forouzan: Data Communication and Networking, 4th Edition, Tata McGraw Hill, 2007.
2. D.E. Comer, Internetworking with TCP/IP, Vol. I, Prentice Hall of India, 1998.
3. W. Stalling, Data & Computer Communication, 8th edition, Prentice Hall of India, 2006.
4. D. Bertsekas, R. Gallager, Data Networks, 2nd edition, Prentice Hall of India, 1992.

Computer Networks Lab

Software Lab based on Computer Networks:

Implement the concepts of Computer Networks such as:

1. Simulate Checksum Algorithm.
2. Simulate CRC Algorithm
3. Simulate Stop & Wait Protocol.
4. Simulate Go-Back-N Protocol.
5. Simulate Selective Repeat Protocol.and so on….

SEMESTER V

Course code: CME25402

DSE 3C: Elective: Computer Science - V
Software Engineering

Credits: Theory – 04, Practical – 01 **Theory: 60 Lectures**

Course Outcome:

After successful completion of the course, the student is able to

CO1. Understand in details with examples Concepts of Software process

CO2. Specify the details of Software requirements and analysis

CO3. Learn in depth Design concepts and principles of software engineering

CO4. Understand in depth software Configuration Management and Project Management

CO5. Learn in details with examples Software Testing

CO6. Specify in depth trends in software engineering

Unit - 1 (15 Lectures)

Software Process: Introduction ,S/W Engineering Paradigm , life cycle models (water fall, incremental, spiral, evolutionary, prototyping, object oriented) , System engineering, computer based system, verification, validation, life cycle process, development process, system engineering hierarchy.

Software requirements: Functional and non-functional, user, system, requirement engineering process, feasibility studies, requirements, elicitation, validation and management, software prototyping, prototyping in the software process, rapid prototyping techniques, user interface prototyping, S/W document.

Unit - 2 (15 Lectures)

Analysis and modeling, data, functional and behavioral models, structured analysis and data dictionary.

Design Concepts and Principles: Design process and concepts, modular design, design heuristic, design model and document, Architectural design, software architecture, data design, architectural design, transform and transaction mapping, user interface design, user interface design principles. Real time systems, Real time

software design, system design, real time executives, data acquisition system, monitoring and control system.

Unit - 3 **(15 Lectures)**

Software Configuration Management: The SCM process, Version control, Change control, Configuration audit, SCM standards.

Software Project Management: Measures and measurements, S/W complexity and science measure, size measure, data and logic structure measure, information flow measure. Estimations for Software Projects, Empirical Estimation Models, Project Scheduling.

Unit - 4 **(15 Lectures)**

Testing: Taxonomy of software testing, levels, test activities, types of s/w test, black box testing,testing boundary conditions, structural testing, test coverage criteria based on data flow, mechanisms, regression testing, testing in the large. S/W testing strategies, strategic approach and issues, unit testing, integration testing, validation testing, system testing and debugging.

Trends in Software Engineering: Reverse Engineering and Re-engineering – wrappers – Case Study of CASE tools.

Reference:

1. Roger S.Pressman, Software engineering- A practitioner's Approach, McGraw-Hill
2. Ian Sommerville, Software engineering, Pearson education Asia, 6th edition, 2000.
3. PankajJalote- An Integrated Approach to Software Engineering, Springer Verlag, 1997.
4. James F Peters and WitoldPedryez, "Software Engineering – An Engineering Approach", John Wiley and Sons, New Delhi, 2000.
5. Ali Behforooz and Frederick J Hudson, "Software Engineering Fundamentals", Oxfor University Press, New Delhi, 1996.
6. Pfleeger, "Software Engineering", Pearson Education India, New Delhi, 1999.
   Carlo Ghezzi, Mehdi Jazayari and Dino Mandrioli, "Fundamentals of Software Engineering", Prentice Hall of India, New Delhi, 1991.

Software Engineering Lab

Lab based on Software Engineering

1. Practical Title
   - Problem Statement,
   - Process Model
2. Requirement Analysis
   - Creating a Data Flow
   - Data Dictionary,
   - Use Cases
3. Project Management
   - Computing FP
   - Effort
   - Schedule, Risk Table, Timeline chart

1 Design Engineering
   - Architectural Design
   - Data Design, Component Level Design

5. Testing
   - Basis Path Testing

Sample Projects

- DTC Route Information: Online information about the bus routes and their frequency and fares
- Car Pooling: To maintain a web based intranet application that enables the corporate employees within an organization to avail the facility of carpooling effectively.
- Patient Appointment and Prescription Management System
- Organized Retail Shopping Management Software
- Parking Allocation System
- Wholesale Management System

SEMESTER V

Course code: CME38002

SEC 4A: Elective: Computer Application (Practical) Office Automation

Credits: Theory – 00, Practical – 01

Course Outcome:

After successful completion of the course, the student is able to

CO1. Understand the details of fundamentals of Computer
CO2. Learn in depth Hardware and Software
CO3. Learn the details of Computer Peripherals
CO4. Understand the details of Programming Languages
CO5. Deliberate in details with examples office automation Tools
CO6. Deliberate in depth Operating System and the User Interface
CO7. Understand in details of Internet and its usages

Practical List for WORD:

1. Create a **telephone directory**.
   - The heading should be 16-point Arial Font in bold
   - The rest of the document should use 10-point font size
   - Other headings should use 10-point Courier New Font.
   - The footer should show the page number as well as the date last updated.
2. Design a time-table form for your college.
   - The first line should mention the name of the college in 16-point Arial Font and should be bold.
   - The second line should give the course name/teacher's name and the department in 14-point Arial.
   - Leave a gap of 12-points.
   - The rest of the document should use 10-point Times New Roman font.
   - The footer should contain your specifications as the designer and date of creation.
3. Create the following document: A newsletter with a headline and 2 columns in portrait orientation, including at least one image surrounded by text.

Practical List for EXCEL:

1. Create a student worksheet containing roll numbers, names and total marks. Open a document in Word and insert the excel worksheet using:-

   i) Copy/Paste
   ii) Embedding

iii) Linking

2. The term wise marks for APS class of 20 students are stored in 3 separate sheets named term1, term2 and term3. Create 4th worksheet that contains student names and their total and average marks for the entire year. Give proper headings using headers. Make the column headings bold and italic. The 4th worksheet should contain college name as the first line. Make it bold, italic and center it.

3. Consider the following employee worksheet:-

Full Name (First Last)	Grade 1/2/3	Basic Salary	HRA	PF	Gross	Net	(VA)VehicleAllowance

HRA is calculated as follows:

Grade	HRA %(of Basic)
1	40%
2	35%
3	30%

Gross = Basic : HRA : VA
Net = Gross –PF
PF is 8% for all Grades
VA is 15000, 10000 and 7000 for Grades 1, 2 and 3.

i) Find max, min and average salary of employees in respective Grade
ii) Count no. of people where VA>HRA
iii) Find out most frequently occurring grade.
iv) Extract records where employee name starts with “A” has HRA>10000
v) Print Grade wise report of all employees with subtotals of net salary and also grand totals. Use subtotal command.
vi) Extract records where Grade is 1 or 2 and salary is between 10000 and 20000 both inclusive.

4. In a meeting of a marketing department of an organization it has been decided that price of selling an item is fixed at Rs40. It was resolved to increases the sell of more of more items and getting the profit of Rs40,000/.Use Goal Seek of find out how many items you will have to sell to meet your profit figure.

5. Consider the following worksheet for APS 1st year students:-

S.No.	Name	PH	CH	BY	MT	CS	Total Marks	%	Grade
1									
2									

Grade is calculated as follows:-

If % >=90 Grade A
If % >=80 &<90 Grade B
If % >=70 &<80 Grade C
If % >=60 &<70 Grade D
Otherwise students will be declared fail.

i) Calculate Grade using if function
ii) Sort the data according to total marks
iii) Apply filter to display the marks of the students having more than 65% marks.
iv) Draw a pie chart showing % marks scored in each subject by the topper of the class.
v) Draw the doughnut chart of the data as in (iv)
vi) Enter the S.No. of a student and find out the Grade of the student using VLOOKUP.
vii) Extract all records where name
    a) Begins with "A"
    b) Contains "A"
    c) Ends with "A"

Practical List for Power Point:

2 Create five Power point slides. Each slide should support different format. In these slides Explain areas of applications of IT. Make slide transition time as 10 seconds.

3 Create five Power Point slides to give advantages/disadvantages of computer, application of computers and logical structure of computer.

4 Create five Power Point slides detailing the process of internal assessment. It should be a self-running demo.

SEMESTER V

Course code: CME38202

SEC 4B: Elective: Computer Application (Practical)
Elective:XML Programming

Credits: Theory – 00, Practical – 01

Course Outcome:

After successful completion of the course, the student is able to

CO1. Understand the details of Elements of XML Programming
CO2. Write down in details with examples DTD
CO3. Deliberate in details with examples XML Schemas
CO4. Deliberate the characteristics of CSS
CO5. Learn in details with application CSS
CO6. Deliberate in details with examples XSL
CO7. Learn the details of XML Security
CO8. Learn in details with examples XML and JAVA
CO9. Learn in details with examples XML and ASP.Net

Software Lab Based on XML:

Exercise #1 – Information Structure

In this exercise, student will practice identifying the structure of an information object.
For the sample document provided below:
Label the information structures you see, including containing structures.
12. Draw a tree representation of the structure.

Exercise 2# Deconstructing an XML Document

In this exercise, student will practice identifying the explicit structure within an XML document. In a sense, this is the reverse of what you did in Exercise #1. For the sample XML markup below, create a document-like representation (or a simple drawing) for the content contained within the XML tags:

<book>
<coverInfo>
<title>The XML Handbook</title>
<author>Charles F. Goldfarb</author>
<author>Paul Prescod</author>
<edition>Second</edition>
<description>The definitive XML resource: applications, products, and technologies. Revised and expanded—over 600 new pages.
</description>
</coverInfo>
</book>

Exercise #3 – Creating XML Markup

In this exercise, create some XML markup based on the tree representation from Exercise #1 above, and the content from the original sample document.

Exercise #4 – Well-Formedness

This exercise checks your understanding of the constraints for well-formedness. Are the following document instances well-formed? Explain any NO answers.

<list><title>The first list</title><item>An item</list>
<item>An item</item><item>Another item</item>
<para>Bathing a cat is a <emph>relatively</emph> easy task as long as the cat is willing.</para>
<bibl><title>How to Bathe a Cat<author></title>Merlin Bauer<author></bibl>

Exercise #5-Well Formedness

This exercise is a bit more challenging than the previous example. Here is a fragment of an XML document instance. Identify all the places where it fails to match the constraints for well-formedness.

<PROCEDURE><TITLEHow to Bathe a Cat</TITLE>
<OVERVIEW>
This procedure tells you how to bathe a cat. <WARNING></OVERVIEW>Cats don't like to take baths. You could get hurt doing this. Be sure to obtain all the required protective gear before you start. </WARNING><EQUIPEMENT><ITEM>Hockey Mask <ITEM>Padded Full-

body Kevlar Armor</ITEM><ITEM>Tub full of warm water</ITEM><ITEM>Towels </ITEM><ITEM>First Aid kit</ITEM><ITEM>Cat Shampoo</ITEM><EQUIPMENT><INSTRUCTIONS><STEP> Locate the cat, who by now is hiding under the bed.</STEP><STEP>Place the cat in the tub of water.</STEP><ITEM>Using the First Aid kit, repair the damage to your head and arms.</STEP><STEP>Place the cat back in the tub and hold it down.</STEP><STEP>Wash it really fast, then make an effort to dry it with the towels.</STEP><STEP>Decide not to do this again. </STEP></INSTRUCTIONS>

Note: Cover more exercises based on XML Programming theory concepts.

SEMESTER V

Course code: CME38402

SEC 4C: Elective: Computer Application (Practical)
R Programming

Credits: Theory – 00, Practical – 01

Course Outcome:

After successful completion of the course, the student is able to

CO1. Learn in depth Elements of R Programming
CO2. Understand the details of R programming Packages
CO3. Understand in details with examples of Data Management
CO4. Deliberate the characteristics of Data Management
CO5. Understand in depth Graphical Procedures
CO6. Deliberate in depth Portability Distribution
CO7. Software Lab Based on R Programming

1. Write a program that prints 'Hello World' to the screen.

2. Write a program that asks the user for a number n and prints the sum of the numbers 1 to n

3. Write a program that prints a multiplication table for numbers up to 12.

4. Write a function that returns the largest element in a list.

5. Write a function that computes the running total of a list.

6. Write a function that tests whether a string is a palindrome.

7. Implement the following sorting algorithms: Selection sort, Insertion sort, Bubble Sort

8. Implement linear search.

9. Implement binary search.

10. Implement matrices addition, subtraction and Multiplication

SEMESTER VI

Course code: CMF25002

DSE6A: Elective:Computer Science - VII
Internet Technologies

Credits: Theory – 04, Practical – 01 **Theory: 60 Lectures**

Course Outcome:

After successful completion of the course, the student is able to

CO1. Learn the details of HTML tags

CO2. Understand the details of Basic CSS and implements

CO3. Understand the details of Basic Concepts of Java Scripts

CO4. Learn the Core Java Programming

CO5. Write down in details with application and Usage of JDBC

CO6. Learn in detail of JSP Environment

Unit - 1 **(15 Lectures)**

Introduction to Web Design: Introduction to hypertext markup language (html) document type definition, creating web pages, graphical elements, lists, hyperlinks, tables, web forms, inserting images, frames.

Customized Features: Cascading style sheets, (css) for text formatting and other manipulations.

JavaScript: Data types, operators, functions, control structures

Unit - 2 **(15 Lectures)**

Java Script events and event handling.

Java: Use of Objects, Array and Array List class, Designing classes, Inheritance, Input/Output, Exception Handling.

Unit - 3 **(15 Lectures)**

JDBC: JDBC Fundamentals, Establishing Connectivity and working with connection interface,Working with statements, Creating and Executing SQL Statements, Working with Result Set Objects.

JSP: Introduction to JavaServer Pages, HTTP and Servlet Basics, The Problem with Servlets, The Anatomy of a JSP Page, JSP Processing, JSP Application Design with MVC

Unit - 4 **(15 Lectures)**

Setting Up the JSP Environment, Implicit JSP Objects, Conditional Processing, Displaying Values, Using an expression to Set an Attribute, Declaring Variables and Methods, Error Handling and Debugging, Sharing Data Between JSP Pages, Requests, and Users, Database Access.

Reference Books:

1. Web Enabled Commercial Application Development Using Html, Dhtml, javascript, Perl CgiBy Ivan Bayross, BPB Publications, 2009.
2. BIG Java Cay Horstmann, Wiley Publication , 3rd Edition., 2009
3. Java 7 ,The Complete Reference, Herbert Schildt, 8th Edition, 2009.
4. The Complete Reference J2EE, TMH, Jim Keogh, 2002.
5. Java Server Pages, Hans Bergsten, Third Edition, O'Reilly Media December 2003.

Internet TechnologiesLab

Software Lab based on Internet Technologies

JAVA Script

1. Create a student registration form. Create functions to perform the following checks:
   a. Roll number is a 7-digit numeric value
   b. Name should be an alphabetical value (String)
   c. Non-empty fields like DOB
2. Implement a static password protection.
3. Write a java script
   a. To change the colour of text using SetTimeOut()
   b. To move an image across screen using SetInterval()

JAVA Programs

1. WAP to find the largest of n natural numbers.
2. WAP to find whether a given number is prime or not.

3. WAP to print the sum and product of digits of an Integer and reverse the Integer.
4. Write a program to create an array of 10 integers. Accept values from the user in that array. Input another number from the user and find out how many numbers are equal to the number passed, how many are greater and how many are less than the number passed.
5. Write java program for the following matrix operations:
   a. Addition of two matrices
   b. Summation of two matrices
   c. Transpose of a matrix
   Input the elements of matrices from user
6. Write a java program that computes the area of a circle, rectangle and a Cylinder using function overloading.

JDBC

1. Create a table 'Student' and 'Teacher' in 'College' database and insert two rows in this newly created table using JDBC API and do the following:
   a. Update an already created table 'Teacher' in 'College' database by updating a teacher's name, with "Dr." appended before the name, whose name is "Rita".
   b. Repeat the same thing for all the teachers using PreparedStatement.
   c. Delete the student with ID=3 from 'Student' database.
   d. Insert two students to the ResultSet returned by the query which selects all students with FirstName="Ayush". The database must also get updated along with ResultSet.
2. Create a procedure in MySQL to count the number of Rows in table 'Student'. Use Callable Statement to call this method from Java code.

JSP Practical list

1. Display the pattern:

1
1 2
1 2 3

Take 'n' in a textbox from user. Display this pattern using

• Scriptlets
• <c:forEach> loop

2. Make two files as follows:

a. main.html: shows 2 text boxes and 3 radio buttons with values "addition", "subtraction" and "multiplication"
b. operate.jsp: depending on what the user selects perform the corresponding function (Give two implementations: using request.getParameter() and using expression language)
3. Validate User input entered in a form. The input must include Name, DOB, Email ID, Lucky Number, Favorite food etc. (Refer Chapter 8)
4. Display Good Morning <uname>, Good Afternoon <uname> or Good Evening <uname> based on the current time of the day.
5. Create your custom library which contains two tags: <hello>, <choco>.
Usage of the tags:
• <hello name=”Ajay”>: Output should be Hello Ajay. It contains a mandatory attribute ‘name’ which can accept Dynamic value.
• <choco texture=”Chewy”>: Output should be FiveStar, BarOne.
<choco texture=”Crunchy”>: Output should be Munch. KitKat.
That means the mandatory attribute must accept a value, and based on the attributes value, it should give output. You must use a bean ChocoBean for this purpose.

SEMESTER VI

Course code: CMF25202

DSE6B: Elective:Computer Science - VI
Mobile Applications

Credits: Theory – 04, Practical – 01 **Theory: 60 Lectures**

Course Outcome:

After successful completion of the course, the student is able to

CO1. Deliberate the details of Concepts of Event Driven Programming

CO2. Learn in details with examples issues of Mobile applications

CO3. Specify the details of Mobile applications Development tools and Frameworks

CO4. Deliberate in details with examples common Mobile device UI's

CO5. Write down in depth Data persistence Remote data storage and communication

CO6. Learn in details with examples Code signing

Unit - 1 (15 Lectures)

Event Driven Programming: UI event loop, Threading for background tasks, Outlets / actions, delegation, notification, Model View Controller (MVC) design pattern.

Mobile application issues: limited resources (memory, display, network, file system), input / output (multi-touch and gestures), sensors (camera, compass, accelerometer, GPS)

Unit - 2 (15 Lectures)

Development tools: Apple iOStoolchain: Objective-C, Xcode IDE, Interface Builder, Device simulator.

Frameworks: Objective-C and Foundation Frameworks, Cocoa Touch, UIKit, Others: Core Graphics, Core Animation, Core Location and Maps, Basic Interaction.

Unit - 3 **(15 Lectures)**

Common UI's for mobile devices: Navigation Controllers, Tab Bars, Table Views, Modal views, UI Layout.

Data Persistence: Maintaining state between application invocations, File system, Property Lists, SQLite, Core Data.

Unit - 4 **(15 Lectures)**

Remote Data-Storage and Communication: "Back End" / server side of application, RESTful programming, HTTP get, post, put, delete, database design, server side JavaScript / JSON.

Code signing: security, Keychain, Developers and App Store License Agreement (6L)

Reference:

1. Rajiv Ramnath, Roger Crawfis, and Paolo Sivilotti, Android SDK 3 for Dummies, Wiley, 2011.
2. Valentino Lee, Heather Schneider, and Robbie Schell, Mobile Applications: Architecture, Design, and Development, Prentice Hall, 2004.
3. Brian Fling, Mobile Design and Development, O'Reilly Media, 2009. Maximiliano
4. Firtman, Programming the Mobile Web, O'Reilly Media, 2010.
5. Christian Crumlish and Erin Malone, Designing Social Interfaces, O'Reilly Media, 2009.
6. James E Smith, Ravi Nair, “Virtual Machines”, Morgan Kaufmann Publishers, 2006.

Mobile Applications Lab

Software Lab based on Mobile Applications:

1. Installing Android Environment
2. Create Hello World Application
3. Sample Application about Android Resources
4. Sample Application about Layouts

5. Sample Application about Intents
6. Sample Application I about user interfaces
7. Sample Application about Animations
8. Make a Project based on above labs
9. Sample Application about Android Data
10. Sample Application about SQLite I
11. Sample Application about SQLite II
12. Project Presentation

SEMESTER VI

Course code: CMF25402

DSE6C: Elective:Computer Science - VI
Cloud Computing

Credits: Theory – 04, Practical – 01 **Theory: 60 Lectures**

Course Outcome:

After successful completion of the course, the student is able to

CO1. Learn in depth Fundamentals of Cloud Computing

CO2. Understand the details of Cloud Services and File System

CO3. Learn in depth Concept of Collaborating with Cloud

CO4. Understand the details of Virtualization in cloud

CO5. Learn the classification and characteristics of Security challenges in Cloud Computing

CO6. Specify the classification and characteristics of Security challenges in Cloud Computing

CO7. Understand the details of Security challenges in Cloud Computing

CO8. Understand the Common standards of Cloud Computing

CO9. Deliberate in details with examples Various Application of Cloud Computing

Unit - 1 (15 Lectures)

Cloud Introduction: Cloud Computing Fundamentals: Cloud Computing definition, Types ofcloud, Cloud services: Benefits and challenges of cloud computing, Evolution of CloudComputing , usage scenarios and Applications , Business models around Cloud– Major Players in Cloud Computing - Issues in Cloud - Eucalyptus - Nimbus - Open Nebula, CloudSim.

Cloud Services And File System: Types of Cloud services: Software as a Service - Platform asa Service – Infrastructure as a Service - Database as a Service - Monitoring as a Service –Communication as services.

Unit - 2 **(15 Lectures)**

Service providers- Google App Engine, Amazon EC2, Microsoft Azure, Sales force.

Collaborating With Cloud: Collaborating on Calendars, Schedules and Task Management –Collaborating on Event Management, Contact Management, Project Management –Collaborating on Word Processing , Databases – Storing and Sharing Files- Collaborating viaWeb-Based Communication Tools – Evaluating Web Mail Services – Collaborating via SocialNetworks – Collaborating via Blogs and Wikis. 185 CS-Engg&Tech-SRM-2013

Unit - 3 **(15 Lectures)**

Virtualization For Cloud: Need for Virtualization – Pros and cons of Virtualization – Types of Virtualization – System Vm, Process VM, Virtual Machine monitor – Virtual machine properties - Interpretation and binary translation, HLL VM - Hypervisors – Xen, KVM , VMWare, Virtual Box, Hyper-V.

Unit - 4 **(15 Lectures)**

Security, Standards, And Applications: Security in Clouds: Cloud security challenges – Software as a Service Security, Common Standards: The Open Cloud Consortium – The Distributed management Task Force – Standardsfor application Developers – Standards for Messaging – Standards for Security, End user access to cloud computing, Mobile Internet devices and the cloud.

Reference:

1. Bloor R., Kanfman M., Halper F. Judith Hurwitz “Cloud Computing ” Wiley India Edition,2010
2. John Rittinghouse& James Ransome, “Cloud Computing Implementation Management and Strategy”, CRC Press, 2010
3. Antohy T Velte ,Cloud Computing : “A Practical Approach”, McGraw Hill,2009
4. Michael Miller, Cloud Computing: “Web-Based Applications That Change the Way You Work and Collaborate Online”, Que Publishing, August 2008.
5. James E Smith, Ravi Nair, “Virtual Machines”, Morgan Kaufmann Publishers, 2006.

Online Reading/Supporting Material

1. Haley Beard, "Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing", Applications and Data Centers in the Cloud with SLAs, Emereo Pty Limited, July 2008
2. webpages.iust.ac.ir/hsalimi/.../89.../Cloud%20Common%20standards.pptop ennebula.org,
3. www.cloudbus.org/cloudsim/, http://www.eucalyptus.com/
4. hadoop.apache.org
5. http://hadoop.apache.org/docs/stable/hdfs_design.html
6. http://static.googleusercontent.com/external_content/untrusted_dlcp/ research.google.com/en//archive/mapreduce-osdi04.pdf

Cloud Computing Lab

Software Lab based on Cloud Computing:

1. Create virtual machines that access different programs on same platform.
2. Create virtual machines that access different programs on different platforms.
3. Exploring Google cloud for the following
    a) Storage
    b) Sharing of data
    c) Manage your calendar, to-do lists,
    d) A document editing tool
4. Exploring Open source cloud (Any two)

SEMESTER VI

Course code: CMF38002

SEC4A: Elective:Computer Science - VII
Android Programming

Credits: Theory – 01, Practical – 01 **Theory: 15 Lectures**

Course Outcome:

After successful completion of the course, the student is able to

CO1. Learn the details of Overview of Android

CO2. Understand in details with examples Concepts of OOP's Using JAVA

CO3. Learn in depth Development Tools

CO4. Understand in depth User Interface Architecture

CO5. Learn the details of User Interface Design

CO6. Understand in depth SQLite Database Connectivity

Unit - 1 (15 Lectures)

Introduction: History of Android, Introduction to Android Operating Systems, Android Development Tools, Android Architecture.

Overview of object oriented programming using Java: OOPs Concepts: Inheritance, Polymorphism, Interfaces, Abstract class, Threads, Overloading and Overriding, Java Virtual Machine.

Development Tools: Installing and using Eclipse with ADT plug-in, Installing Virtual machine for Android sandwich/Jelly bean (Emulator), configuring the installed tools, creating a android project – Hello Word, run on emulator, Deploy it on USB-connected Android device.

User Interface Architecture: Application context, intents, Activity life cycle, multiple screen sizes.

User Interface Design: Form widgets, Text Fields, Layouts, Button control, toggle buttons, Spinners (Combo boxes), Images, Menu, and Dialog.

Database: Understanding of SQLite database, connecting with the database.

Reference:

1. Android application development for java programmers. By James C. Sheusi. Publisher: Cengage Learning, 2013.

ONLINE READING / SUPPORTING MATERIAL:

1. http://www.developer.android.com
2. http://developer.android.com/about/versions/index.html
3. http://developer.android.com/training/basics/firstapp/index.html
4. http://docs.oracle.com/javase/tutorial/index.htm (Available in the form of free downloadable ebooks also).
5. http://developer.android.com/guide/components/activities.html
6. http://developer.android.com/guide/components/fundamentals.html
7. http://developer.android.com/guide/components/intents-filters.html.
8. http://developer.android.com/training/multiscreen/screensizes.html
9. http://developer.android.com/guide/topics/ui/controls.html
10. http://developer.android.com/guide/topics/ui/declaring-layout.html
11. http://developer.android.com/training/basics/data-storage/databases.html

Android Programming Lab

Software Lab Based on Android Programming:

1. Create “Hello World” application. That will display “Hello World” in the middle of the screen in the emulator. Also display “Hello World” in the middle of the screen in the Android Phone.
2. Create an application with login module. (Check username and password).
3. Create spinner with strings taken from resource folder (res >> value folder) and on changing the spinner value, Image will change.
4. Create a menu with 5 options and and selected option should appear in text box.
5. Create a list of all courses in your college and on selecting a particular course teacher-in-charge of that course should appear at the bottom of the screen.
6. Create an application with three option buttons, on selecting a button colour of the screen will change.
7. Create and Login application as above. On successful login, pop up the message.
8. Create an application to Create, Insert, update, Delete and retrieve operation on the database.

SEMESTER VI

Course code: CMF38202

SEC4B: Elective:Computer Science - VII
PHP Programming

Credits: Theory – 01, Practical – 01 **Theory: 15 Lectures**

Course Outcome:

After successful completion of the course, the student is able to

CO1. Learn in depth Elements of PHP

CO2. Learn in depth Interaction Methods Between HTML and PHP

CO3. Understand in depth PHP function

CO4. Understand in depth String Manipulation

CO5. Learn the characteristics of Regular Expression

CO6. Learn the details of Developing PHP Web Application

Unit - 1 (15 Lectures)

Introduction to PHP: PHP introduction, inventions and versions, important tools and software requirements (like Web Server, Database, Editors etc.), PHP with other technologies, scope of PHP, Basic Syntax, PHP variables and constants, Types of data in PHP , Expressions, scopes of a variable (local, global),, PHP Operators : Arithmetic, Assignment, Relational , Logical operators, Bitwise , ternary and MOD operator.

PHP operator Precedence and associativity

Handling HTML form with PHP: Capturing Form Data, GET and POST form methodsDealing with multi value fields, Redirecting a form after submission, PHP conditional events and Loops: PHP IF Else conditional statements (Nested IF and Else)Switch case, while ,For and Do While Loop, Goto , Break ,Continue and exit

PHP Functions: Function, Need of Function , declaration and calling of a function, PHP Function with arguments, Default Arguments in Function, Function argument with call by value, call by reference, Scope of Function Global and Local

String Manipulation and Regular Expression: Creating and accessing String , Searching & Replacing String, Formatting, joining and splitting String , String Related Library functions, Use and advantage of regular expression over inbuilt function, Use of preg_match(), preg_replace(), preg_split()

functions in regular expression Array: Anatomy of an Array ,Creating index based and Associative array ,Accessing array, Looping with Index based array, with associative array using each() and foreach(),Some useful Library function

Reference:

1. Rajiv Ramnath, Roger Crawfis, and Paolo Sivilotti, Android SDK 3 for Dummies, Wiley, 2011.
2. Valentino Lee, Heather Schneider, and Robbie Schell, Mobile Applications: Architecture, Design, and Development, Prentice Hall, 2004.
3. Brian Fling, Mobile Design and Development, O'Reilly Media, 2009. Maximiliano
4. Firtman, Programming the Mobile Web, O'Reilly Media, 2010.
5. Christian Crumlish and Erin Malone, Designing Social Interfaces, O'Reilly Media, 2009.

PHP Programming Lab

Software Lab Based on PHP:

1. Create a PHP page using functions for comparing three integers and print the largest number.
2. Write a function to calculate the factorial of a number (non-negative integer). The function accept the number as an argument.
3. WAP to check whether the given number is prime or not.
4. Create a PHP page which accepts string from user. After submission that page displays the reverse of provided string.
5. Write a PHP function that checks if a string is all lower case.
6. Write a PHP script that checks whether a passed string is palindrome or not? (A palindrome is word, phrase, or sequence that reads the same backward as forward, e.g., madam or nurses run)

7. WAP to sort an array.
8. Write a PHP script that removes the whitespaces from a string.

   Sample string : 'The quick " " brown fox'

   Expected Output :Thequick""brownfox
9. Write a PHP script that finds out the sum of first n odd numbers.
10. Create a login page having user name and password. On clicking submit, a welcome message should be displayed if the user is already registered (i.e.name is present in the database) otherwise error message should be displayed.
11. Write a PHP script that checks if a string contains another string.
12. Create a simple 'birthday countdown' script, the script will count the number of days between current day and birth day.
13. Create a script to construct the following pattern, using nested for loop.

    *

    * *

    * * *

    * * * *

    * * * * *
14. Write a simple PHP program to check that emails are valid.
15. WAP to print first n even numbers.
16. $color = array('white', 'green', 'red")

    Write a PHP script which will display the colors in the following way :

    Output :

    white, green, red,

    • green

    • red

    • white

17. Using switch case and dropdown list display a “Hello” message depending on the language selected in drop down list.

18. Write a PHP program to print Fibonacci series using recursion.

19. Write a PHP script to replace the first 'the' of the following string with 'That'.

    Sample : 'the quick brown fox jumps over the lazy dog.'

    Expected Result : That quick brown fox jumps over the lazy dog.

SEMESTER VI

Course code: CMF38402

SEC4C: Elective:Computer Science - VII
System Administration and Maintenance

Credits: Theory – 01, Practical – 01 **Theory: 15 Lectures**

Course Outcome:

After successful completion of the course, the student is able to

CO1. System Administration & Maintenance

CO2. Understand in details of Networking OS Environment

CO3. Deliberate in depth Basic LINUX Commands

CO4. Deliberate in details with examples Basic Windows Commands

CO5. Learn the details of Server Configuration and Maintenance

Unit - 1 **(15 Lectures)**

Part I - Linux/Unix: Basics of operating system, services,Installation and configuration, maintenance. What is linux/unix Operating systems?, Kernel, API, cli, gui,Difference between linux/unix and other operating systems, Features and Architecture, Linux features, advantages, disadvantages

Part II - Windows: Windows as operating system, history, versions. PC hardware, BIOS, Devices and drivers, Kernal Configuration and building, Application installation, configuration and maintenance, Server services and Client services, Difference between WindowsXP/windows7 and windows server 2003/2008.

Reference:

1. Evi Nemeth, Garth Snyder and others,Unix and Linux System Administration Handbook, 4th Ed,Pearson Education, 2016.
2. PDaniel J. Barrett, Linux Pocket Guide: Essential Commands, 3rd Edition,Shroff/O'Reilly; Second edition 4 June 2012
3. Woody Leonhard,Windows 7 All-in-One For Dummies,2009

System Administration and Maintenance Lab

Linux:

Linux Desktop tour.Configuring desktop environment and desktop settings.
Basic Commands :Terminal, shell,Cat, ls, cd, date, cal, man, echo, pwd, Mkdir, rm, rmdir Ps, kill
Package Installation
Synaptic package manager

Windows:

Creating users – Admin and regular.
Path of their personal files. Adding and changing passwords.
Difference between workgroup and domain.Concept of roles.
user profiles – creating and roaming Concept of Active Directory. Creating active directory in windows 2003/2008.
Process and Disk management
Windows Task manager. File systems – NTFS, FAT.
Services
Control Panel
C:/program Files, C:/system C:/windows
Add /remove new hardware (like printer), Add/remove new programmes.
Network Administration
Ipconfig,Ping, tracert, route, hostname, net, netstat, whoami
Set manual IP address, check connectivity – ipv4, ipv6
Administrator Tools
Control Panel -> Administrative Tools
Computer Management, Local security Policy, Performance Monitor, Task Scheduler, Antivirus and firewall.
Misc
Start->Accessories->System tools ->All options (Remote desktop, backup/restore etc.)
LAN – sharing printer, files and folder over the network.

Question Paper Pattern
Theory (4 Credits)

Time: 3 Hours Max. Marks: 70

Part – A

I. Answer any Eleven Question out of given Twelve Questions. 11 X 2 = 22

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
11.
12.

Note: Three Questions each from the Units 1, 2, 3, and 4

Part - B

II. Answer any Two SubQuestionsfrom each main Question.

13. A) **2 X 6 = 12**
B)
C)
14. A) **2 X 6 = 12**
B)
C)
15. A) **2 X 6 = 12**
B)
C)
16.A) **2 X 6 = 12**
B)
C)

Note: Each Main questions contains 3 sub questions carries 06 Marks (may have internal Split-ups) and from Units 1, 2, 3 and 4 respectively

Question Paper Pattern

Theory (1 Credit)

Time: 2 Hours Max. Marks: 50

Part – A

I. Answer all Questions. 05 X 02 = 10

1.
2.
3.
4.
5.

Part - B

II. Answer any Four Questions out of given Five Questions. 4 X 10 = 40

1.
2.
3.
4.
5.

Note: Each Main questions contains 3 sub questions carries 06 Marks (may have internal Split-ups) and from Units 1, 2, 3 and 4 respectively

Question Paper Pattern

Practical / Project (1 or 1.5 or 2 Credits)

Time: 3 Hours Max. Marks: 70

Practicals

1. Two Experiments/ Programs 20 Marks Each 2 x 20 = 40 Marks

a. Write-ups 10 Marks

b. Conducting & Results 10 Marks (Any One for 2 Hours of Practical's)

2. Viva – Voice 10 Marks

3. Record 10 Marks

Project

1. Project Presentation 15 Marks

2. Project Demo 20 Marks

3. Viva – Voice 10 Marks

4. Record 25 Marks

Question Paper Pattern

Practical (1 Credit)

Time: 2 Hours Max. Marks: 50

a. Experiment/ Programs 30 Marks Each 30 Marks

b. Conducting & Results 10 Marks

2. Viva – Voice 10 Marks

3. Record 10 Marks

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE
(AUTONOMOUS)
B.N. ROAD, MYSURU-570025

DEPARTMENT OF ECONOMICS

Revised Syllabus for Undergraduate (UG)
CBCS Scheme - 2017-18

Scheme of Study

Sem	Paper Code	Course	Teaching Hours / week	L T P	Credit	I.A Marks	Theory Exam	Total Marks
I	Core - 1 DLA21011	Principles of Micro Economics-I	5+1	5-1-0	6	30	70	100
II	Core - II DLB21011	Principles of Micro Economics-II	5+1	5-1-0	6	30	70	100
III	Core - III DLC21011	Principles of Macro Economics-I	5+1	5-1-0	6	30	70	100
IV	Core - IV DLD21011	Principles of Macro Economics-II	5+1	5-1-0	6	30	70	100
Discipline Specific Elective (DSE) – Any one								
V	DSE – 1A DLE21011	Economics of Development	5+1	5-1-0	6	30	70	100
V	DSE – 1B DLE21211	Money and Banking	5+1	5-1-0	6	30	70	100
V	DSE – 1C DLE21411	Environmental Economics	5+1	5-1-0	6	30	70	100
Skill Enhancement Course (SEC) -1								
V	SEC - 1 DLE21611	Financial Economics	4	3-1-0	4	30	70	100
Discipline Specific Elective (DSE) – Any one								
VI	DSE - 1A DLF21011	Indian Economy	5+1	5-1-0	6	30	70	100
VI	DSE - 1B DLF21211	Economic History of India-1857-1947	5+1	5-1-0	6	30	70	100
VI	DSE – 1C DLF21411	Public Finance	5+1	5-1-0	6	30	70	100
Skill Enhancement Course (SEC)-2								
VI	SEC – 2 DLF21811	Data Analysis	4	3-1-0	4	30	70	100

Generic Elective

Sem	Paper Code	Course	Teaching Hours / week	L T P	Credit	I.A Marks	Theory Exam	Total Marks	Remarks
V	GE-1 DLE21811	Indian Economy	**5+1**	**5-1-0**	**6**	**30**	**70**	**100**	**To benefit those students interested to study** *Indian Economy* **irrespective of his / her programme**
VI	GE-2 DLF21811	Indian Economy	**5+1**	**5-1-0**	**6**	**30**	**70**	**100**	

Scheme of Assessment

Year	SEM	COURSE CODE	TITLE OF THE PAPER	CONTINUOUS ASSESSMENT				MAX.MARKS			DURATION OF EXAM
				C1		C2		C3	TH	IA	TH
				TH	AS	TH	SE				
I	I	DLA21011	Principles of Micro Economics-I	10	5	10	5	70	70	30	3h
	II	DLB21011	Principles of Micro Economics-II	10	5	10	5	70	70	30	3h
II	III	DLC21011	Principles of Macro Economics-I	10	5	10	5	70	70	30	3h
	IV	DLD21011	Principles of Macro Economics-II	10	5	10	5	70	70	30	3h
III	V	DSE - 1A DLF21011	Economics of Development	10	5	10	5	70	70	30	3h
		DSE - 1B DLF21211	Money and Banking	10	5	10	5	70	70	30	3h
		DSE – 1C DLF21411	Environmental Economics	10	5	10	5	70	70	30	3h
		SEC – 1 DLE21611	Financial Economics	10	5	10	5	70	70	30	3h
		GE-1 DLE21811	Indian Economy	10	5	10	5	70	70	30	3h
	VI	DSE - 1A DLF21011	Indian Economy	10	5	10	5	70	70	30	3h
		DSE - 1B DLF21211	Economic History of India-1857-1947	10	5	10	5	70	70	30	3h
		DSE – 1C DLF21411	Public Finance	10	5	10	5	70	70	30	3h
		SEC – 1 DLF21611	Data Analysis	10	5	10	5	70	70	30	3h
		GE-1 DLF21811	Indian Economy	10	5	10	5	70	70	30	3h

Core and Discipline Specific Elective (DSE)

Semester I	Semester II
Core Economics I: Principles of Microeconomics-I	Core Economics II: Principles of Microeconomics-II
Semester III	Semester IV
Core Economics III: Principles of Macroeconomics-I	Core Economics IV: Principles of Macroeconomics-II
Semester V	Semester VI
Discipline Specific Elective I One of the following: i. DSE-1A : Economics of Development ii. DSE-1B : Money and Banking iii. DSE-1C :Environmental Economics	Discipline Specific Elective II One of the following: iv. DSE-1A: Indian Economy v. DSE -1B: Public Finance vi. DSE- 1C:Economic History of India 1857-1947
Skill Enhancement Course(SEC)1: Financial Economics	Skill Enhancement Course(SEC)2: Data Analysis

Generic Electives

Semester	Course Title	Remarks
V	GE-1 Indian Economy	**Benefits those students interested to study** *Indian Economy* **irrespective of his / her programme**
VI	GE-2 Indian Economy	

TEMPLATE

Sem	Core			DSE			SEC	
	No. of Courses	**Credits**	**Total Hours**	**No. of Courses**	**Credits**	**Total Hours**	**No. of Courses**	**Credits**
I	1	6	75+15	-	-	-	-	-
II	1	6	75+15	-	-	-	-	-
III	1	6	75+15	-	-	-	-	-
IV	1	6	75+15	-	-	-	-	-
V	-	-	-	1	6	75+15	1	4
VI	-	-	-	1	6	75+15	1	4

Programme Outcome

After completing the graduation in BA Economics, Geography the students are able to:

PO1. Explain, graph, and analyze key economics models

PO2. Understand current events and evaluate specific policy proposals

PO3. To address problem that do not have clear economic solutions

PO4. Develop critical and quantitative thinking skills

PO5. Communicate effectively in written, oral and graphical form about specific issues

PO6. Apply economic analysis to everyday problems in real world situations

PO7. Understand and appreciate relationship between man and Environment

PO8. Read, interpret, and generate maps and other geographic representations

PO9. To extract, analyze, and present information from a spatial perspective

PO10. Understand physical-geographic processes, global distribution of landforms and ecosystems

PO11.The role of physical environment on human population

PO12. Develop the ethical aptitudes and dispositions necessary to acquire and hold leadership positions in industry, government, and professional organizations

Programme Specific Outcomes

On Completion of BA Economics, Geography students will:

PSO1. Understand theoretical and practical aspects of Economics and Geography

PSO2. Evaluate Economic behaviour inconsonance with Geographical factors

PSO3. Suggest the policy makers about desirable changes to be made in Micro and Macro Economic issues based on geographical factors

PSO4. Gain ability to understand the economic problems in Geographical indicators

PSO5. Able to offer palatable solutions for economic and geographical challenges

PSO6. Attain Proficiency to analyze the economic decision of Government and non-Govt. entities that correlate with Geographical factors

PSO7. Gain requisite knowledge to evaluate land use pattern and demographical profile

PSO8. Apply GIS for understanding Market situation, Transport problem change in Weather Condition, Cropping Pattern, and Natural Calamities and so on

DLA21011

I – Semester

Economics I: Principles of Microeconomics-I

Course outcome

On completion of the Course, students will:

CO1. Understand in details with examples Concepts of Micro and Macro Economics.
CO2. Deliberate in depth Law of Demand.
CO3. Understand in depth laws of utility.
CO4. Learn in details with examples meaning and properties of indifference curve.
CO5. Deliberate in depth cost and revenue concepts.
CO6. Understand the details of meaning and types of markets.
CO7. Identify in details with examples perfect competitive market.
CO8. Specify the details of concepts of Marginal cost and Marginal revenue.

Course Description:

This course exposes the student to the basic principles and application of Microeconomic Theory.

I. Introduction: 12

Economics, Meaning, Scope and Need for the study. Concepts of Micro and Macro Economics-Scope-Importance and Limitations of Micro Economics. Scarcity and choice-opportunity cost-production possibility curve.

II. Demand and Supply: 24

a)Demand-Meaning, Law of Demand-Individual and Market Demand-Exceptions to Law of Demand-Determinants of Demand-Shifts of Demand versus movement along with a Demand Curve.

b)Elasticity-Price elasticity of Demand-Types of price Elasticity of Demand-Calculating elasticity-Determinants of price elasticity –Concepts of Income elasticity and Cross elasticity.

c)Supply-Meaning, Law of Supply- Determinants of Supply-equilibrium of Demand and Supply.

d)Application of Demand and Supply-Price rationing-Price Floors-Consumer surplus and Producer surplus.

III. Consumer Theory: 14

a) Marshalian Utility Theory – Concepts of Utility-Law of Diminishing Marginal Utility-Diamond Water Paradox-Law of Equi-Marginal Utility.

b) Indifference Curve Analysis-Meaning and properties of Indifference Curve. Budget

Constraint-Consumer Equilibrium-Price, Income and substitution Effects.

IV. Production Analysis: 15

a)Production-Meaning- Production Function-TP-AP-MP-Law of Variable Proportions-Economies and Diseconomies of Scale.

b) Cost and Revenue- Concepts of Cost-short run and Long run cost curves. Concepts of Revenue- short run and Long run revenue curves.

c) Equilibrium of firm-Marginal Cost and Marginal Revenue.

V. Market Structure and Perfect Competition: 10

a)Market –Meaning and classification.

b)Perfect Competition-Features-Price and output determination in short run and Long run under perfect Competition.

Reference:

Case, Karl E and Ray C. Fair- Principles of Economics, Pearson Education, Inc..8th edition, 2007.

Samuelson P.A-Economics(18th Edition, McGraw hill)

Mukarjee Sampath- Modern Economic Theory(New Age International)

H L Ahuja-Modern Economic Theory(S.Chand & Company)

Mithani. D.M -Modern Economic Analysis(Himalayan Publication publication)

McConnel Compbell & Stanley Brue-Micro Economics(16th Edition, McGraw hill)

Zen-Micro Economic Analysis(McGraw Hill)

KPM Sundaram and M.C.Vaish -Principles of Economics(Himalayan Publication publication)

S.Sankaran-Principles of Economics(Himalayan Publication publication)

M.L.Jhingan-Micro Economic Theory

DLB21011

II – Semester

Economics II: -Principles of Microeconomics-II

Course outcome

On completion of the Course, students will:

CO1. Learn in depth types of Imperfect Competition.
CO2. Deliberate the characteristics of Price Discrimination.
CO3. Identify the classification and characteristics of Kinked Demand Curve.
CO4. Identify in details with examples Merits and Public Goods.
CO5. Write down the classification and characteristics of General Equilibrium of Exchange and Production.
CO6. Understand in details with examples General Equilibrium of Exchange and Production.
CO7. Write down in details with examples Marginal Productivity Theory.

Course Description:

This is a sequel to Principles of Microeconomics-I that highlights market fluctuation.

I. Imperfect Competition and Monopoly: 15

Concept and Types of Imperfect Competition-Monopoly-Monopolistic-Oligopoly-Duopoly. Monopoly-meaning-Types and features of Monopoly-price and output determination in short run and Long run. Price Discrimination-Meaning-Types-Remedies for Monopoly.

II. Monopolistic and Oligopoly Competition: 16

a) Monopolistic competition- Meaning-Features-price and output determination in short run and Long run- Product Differentiation.
b) Oligopoly-Meaning-Features-Concepts of Kinked Demand Curve-Price Leadership and Cartels.

III. General Equilibrium and Externalities: 17

a) General Equilibrium of Exchange and Consumption-General Equilibrium of Exchange and Production.
b) Externalities-Meaning-Types-Marginal Cost Pricing-Public Goods-Merit Goods-Government Failure-Market Failure.

IV Income Distribution and Factor Pricing: 13

Inputs-Demand for inputs-Marginal Productive theory-Modern theory-Theory of Distribution and Distribution of Income.

V. International Trade: 14

a) Trade-Meaning-Internal and International Trade-Theories of International Trade-Absolute Advantage and Comparative Cost Advantage.
b) Free Trade and Protectionist Policy of Trade.
c) Concepts of Terms of Trade-Trade Barriers-Tariffs and Quotas.

Reference:

Case, Karl E and Ray C. Fair Principles of Economics, Pearson Education, Inc.8th edition, 2007.

Samuelson P.A-Economics(18th Edition McGraw hill)

Mukarjee Sampath- Modern Economic Theory(New Age International)

H L Ahuja-Modern Economic Theory(S. Chand & Company)

Mithani. D.M -Modern Economic Analysis(Himalayan publication)

McConnel Compbell & Stanley Brue-Micro Economics(16th Edition, McGraw hill)

K. K. Dwett -Modern Economic Theory(S.Chand & Company)

S.Sankaran-Principles of Economics(Himalayan publication)

M.L.Jhingan-Micro Economic Theory

M.L.Seth-Microeconomics(Lakshminarayan Agarwal)

G.Mankiw-Microeconomics(New Age International)

Mithani.D.M - International Economics(Himalaya Publishing House, Mumbai)

Jhingan.M.L - International Economics(Virnda Publication)

Sharma.A.K - International Economics(Anmol Publication)

DLC21011

III – Semester
Economics III - Principles of Macroeconomics-I

Course outcome

On completion of the Course, students will:

CO1. Identify in details with examples Key variables of Macro Economics.
CO2. Understand in details with examples Concepts of National Income.
CO3. Identify in depth Marginal Efficiency of Capital.
CO4. Specify the details of Concept of Multiplier.
CO5. Identify the characteristics of Keynesian Macro Economics.
CO6. Deliberate in depth Liquidity Theory of money.
CO7. Identify the characteristics of Demand for Money.
CO8. Identify in details with application, if applicable, Concepts of Micro and Macro Economics

Course Description:

This course introduces students to the basic concepts in Macroeconomics, definition, measurement and variables like GDP, consumption, savings, investment and Balance of Payments.

I. Introduction: 15

Macro Economics-Meaning-Definition-Scope-Importance and Limitation.

Key Variables of Macro Economics-Income-Output-Expenditure. Concepts of Stock and Flow. Equilibrium-General and partial Equilibrium.

II. National Income Accounting: 16

a) National Income- Definition- Concepts of National Income-GNP-NNP-GDP-NDP-Per-capita Income-Disposable Income-NI at Factor Cost-NI at Market Cost-nominal and Real Income. Green GDP
b) Measurement of National Income: Methods of measuring National Income-Importance-Difficulties.

III. Determination of Income and Employment: 17

Keynesian Macro-Economics: Concept of Effective Demand-Consumption Function-APC and MPC-APS and MPS.

Investment Function-Induced Investment and Autonomous Investment-Rate of interest and MEC(Marginal Efficiency of Capital)

Determination of Equilibrium-ASF and ADF –Concept of Multiplier.

IV. Macro Economic Policies of the Government: 13

Monetary Policy-Meaning-Objectives and Instruments-Quantitative and Qualitative methods.

Fiscal Policy- Meaning-Objectives and Instruments-Tax and expenditure.

V. Money In a Modern Economy: 14

Money –Meaning-Definition and Functions-Importance-Demand for Money and Supply for Money. Quantitative Theory Money [Fisher's Equation] and Liquidity Theory of Money.

Reference:

Case, Karl E and Ray C Fair, Principles of Economics, Pearson Education, Inc.8th edition, 2007.

Sikdar, Shoumyen, Principles of Macroeconomics, 2nd edition, Oxford University Press, India

Samuelson P.A-Economics(18th Edition, McGraw hill)

Mukarjee Sampath- Modern Economic Theory(New Age International)

H L. Ahuja-Modern Economic Theory(S. Chand & Company)

Mithani. D.M -Modern Economic Analysis(Himalayan Publication)

McConnel Compbell & Stanley Brue-Micro Economics(16th Edition, McGraw hill)

K. K. Dwett-Modern Economic Theory(S. Chand & Company)

S. Sankaran-Principles of Economics(Himalayan Publication)

M. L. Jhingan-Macro Economic Theory

M. L. Seth-Macroeconomics(Lakshminarayan Agarwal)

G. Mankiw-Macroeconomics(New Age International)

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IV – Semester
Economics IV: -Principles of Macroeconomics-II

Course outcome

On completion of the Course, students will:

CO1. Specify in details with examples IS-LM Analysis.
CO2. Learn in depth Supply side Economics.
CO3. Identify the details of Rational Expectation.
CO4. Identify in details with examples Concept if Inflation.
CO5. Learn the classification and characteristics of Balance of Trade.
CO6. Specify the classification and characteristics of Disequilibrium in Balance of Payment.
CO7. Understand the details of Devaluation and its Effects.
CO8. Identify the classification and characteristics of Exchange rate.

Course Description:

This is a sequel to Principles of Macroeconomics that analyses various theories of determination of National Income in detail. It also introduces students to concept of Inflation, its relationship with unemployment and some basic concepts in an open economy.

I. IS-LM Analysis: 17

Goods Market and Money and their Equilibrium-Derivation of IS curve-shift in the IS curve. Money Market Equilibrium-LM curve- shift in the LM curve. Intersection of IS-LM curve-Simultaneous Equilibrium of Goods and Money Market-Critique of IS-LM Model.

II. Modern Macro Economics: 18

a) Supply Side Economics-Basic propositions of supply side Economics-Taxation-Labour supply-Incentives to save and investment –The Tax wedge-Tax Revenue and Laffer's curve.
b) Rational Expectations Analysis-Introduction to New Keynesian Theory-ASF and ADF. The New Classical Rational Expectations-Model –Policy implication[Lucas Model]

III Inflation and Unemployment: 13

Concept of Inflation-Meaning-Definitions-Types-Determinants-Causes-Effects-Relationship between Inflation and Unemployment-Philip's Curve.

IV. Balance of Payments: 15

Balance of Payment-Balance of Trade and Balance of Payments-Composition of BOP-Current Account-Capital account-Official Holdings etc.

Disequilibrium in BOP- Types-Causes-measures to Correct Disequilibrium in Balance of

Payments.

V. Foreign Exchange Rate: 12

Exchange Rate-Meaning and Types-Flexible-Fixed-Managed. Determination of Exchange Rate-Devaluation and its Effects.

Reference:

Case, Karl E and Ray C. Fair, Principles of Economics, Pearson Education, Inc..8th edition, 2007.

Sikdar, Shoumyen, Principles of Macroeconomics,2nd edition, Oxford University Press, India.

Samuelson P.A-Economics(18th Edition, McGraw hill)

Mukarjee Sampath- Modern Economic Theory(New Age International)

H L. Ahuja-Modern Economic Theory(S. Chand & Company)

Mithani. D. M -Modern Economic Analysis(Himalayan Publication)

Mc Connel Compbell & Stanley Brue-Micro Economics(16th Edition, McGraw hill)

K. K. Dwett-Modern Economic Theory(S. Chand & Company)

S. Sankaran-Principles of Economics(Himalayan Publication)

M. L. Jhingan -Macro Economic Theory

M. L. Seth-Macroeconomics(Lakshminarayan Agarwal)

G. Mankiw-Macroeconomics((New Age International)

DLE21011

V Semester
Discipline Specific Elective (DSE)-1A:
Economics of Development

Course outcome

On completion of the Course, students will:

CO1. Learn in depth Understand the concept of Economic development and factors affect Development.
CO2. Deliberate in details with examples Differentiate Economic development and growth.
CO3. Identify the characteristics of Demographic Trends.
CO4. Specify in depth Harrod -Domar Growth Model.
CO5. Understand the classification and characteristics of Endogenous Growth theory.
CO6. Identify the details of Poverty Eradication Measures.
CO7. Deliberate in depth Amartya Sen and Bhagavathi Debate.

Course Description:

This course reviews major trends in aggregate economic indicators of economic development, factors in economic development and theories of economic development and growth

I Economic Development: 18

Economic Development –Meaning-definition-Economic Growth and Development-Factors affecting Development-Indicators of Economic Development-[National Income, Per capita Income, Basic needs approach- PQLI-HDI-GEM-MDPI(Multi Dimensional Poverty Index)Happiness Index]

II Factors in Economic Development: 12

Capital Formation, Human Capital-Physical Capital-Technology- Demographic Trends-Institutional factors.

III. General Theories of Economic Growth 15

Adamsmith, Karl Marx and Schumpeter's Theories of Economic Development. Harrod-Domor Growth Model.

IV. Partial Theories of Economic Growth and Development: 12

Arthur Lewis- Labour Surplus Model. Big push Theory-Theories of Dualistic Development-Endogenous Growth Theory.

V. Economic Growth and Distributive Justice: 18

Economic Growth and Social Justice: Poverty- Meaning, Types, Measures and Causes. Poverty Eradication Measures-Unemployment- Meaning, Types, Measures And Causes.

Measures to reduce Unemployment. Occupational Structure in the Organized and Unorganized Sector (with reference to India) Amartya Sen- Bhagavathi Debate.

Reference:

Michael P Todaro and Stephen Smith. Economic Development, Pearson, 11th edition (2011).

Uma Kapila, Indian Economy since Independence, Academic Foundation, 19th edition (2009).

United Nations Development Programme, Human Development Report 2010.palgrave Macmillan (2010).

Government of India, Economic Survey (latest).

Government of India, Five Year Plan (latest).

Government of India. Finance Commission Report (latest).

Dutt Ruddar & Sundaram .K. P. M -Indian Economy

Misra S. K & V. K. Puri-Indian Economy(Himalaya Publishing House)

Agarwal A. N -Indian Economy(Vishwa Publications)

P. K. Dhar -Indian Economy(New Age International)

DLE21211

V Semester

Discipline Specific Elective (DSE) 1B: Money and Banking

Course outcome

On completion of the Course, students will:

CO1. Understand the characteristics of Demand for Money.
CO2. Specify the classification and characteristics of Capital Market.
CO3. Deliberate the details of Theories of Interest.
CO4. Learn the classification and characteristics of Functions of Commercial bank.
CO5. Understand the characteristics of Indian Banking System.
CO6. Learn the characteristics of Evaluation and Functions of Central bank.
CO7. Deliberate the details of Monetary Policy.

Course Description:

This course exposes students to the theory and functioning of the monetary and financial sectors of the economy. It highlights the organization, structure and role of financial markets and institutions. It also discusses interest rates, monetary management and instruments of monetary control, financial and banking sector reforms and monetary system with special reference to India.

I. Money : 12

Concept, Functions and its Classification. Demand for Money and determinants. Supply of money and determinants. Theories of Value of Money.

II. Money Market and Capital Market: 15

Money Market-Meaning-Structure and Instruments-Characteristics of a Good Money Market.

Capital Market- Meaning-Structure and Instruments.

III. Interest Rates: 14

Rate of Interest-Meaning-Structure-Functions-short term and Long Term Interest. Theories of Interest rate Determination-Interest rate in India.

IV Commercial Bank: 16

a) Commercial Bank-Functions-Role-Balance Sheet..

b) Indian Banking System-Banking sector reforms, Changing role and structure.

V. Central Banking and Monetary Policy: 18

a) Central Bank-Evaluation and Functions of Central Bank.

b) RBI and its role in the Development of Banking System in India- RBI and Monetary Policy. Credit control Instruments.

Reference:

F. S. Mishkin and S. G. Eakins, Financial Markets and Institutions, Pearson Education,6th edition,2009

F. J. Fabozzi, F, Modigilani, F. J. Jones, M. G. Ferri, Foundations of Financial markets and Institutions, Pearson Education,3rd edition,2009

L. M. Bhole and J. Mahukud, Financial Institutions and Markets, Tata McGraw Hill,5th edition,2011

M. Y. Khan, Indian Financial System, Tata McGraw Hill, 7th edition, 2011.

Various latest issues of RBI Bulletins, Annual Reports, Reports on Currency and Finance and Reports of the Working Group, IMF Staff Papers.

L. V. Chandler-Money & Banking (S. Chand & Company)

D. M. Mithani- Money & Banking and Financial System(Himalaya Publishing house)

R. R. Paul-Monetary Economics(Kalyani Publishers)

B. Gupta-Monetary Economics(S. Chand & Company)

DLE21411

V Semester

Discipline Specific Elective (DSE)-1C: Environmental Economics

Course outcome

On completion of the Course, students will:

CO1. Deliberate in details with examples Pareto Optimality.
CO2. Understand the details of Market failure and Externalities.
CO3. Understand in details with examples Implementation of Environmental Policy
CO4. Identify in details with examples Economics of climate change
CO5. Specify the details of Cost- benefit analysis of Environmental policies.
CO6. Deliberate the characteristics of Sustainable Development.
CO7. Identify the details of Environmental Valuation Methods and Application.
CO8. Specify in depth Perspectives from Indian experience.

Course Description:

This course introduces students to concepts, methods and policy options in managing the environment using tools of economic analysis. Since several environmental problems are caused by economic activity, for instance, carbon emissions, over-harvesting of renewable resources and air and water pollution as a by- product of industrial activity. This course examines different approaches to adjusting behavior through economic institution such as markets and incentives.

I. Introduction: 16

Key environmental issues and problems, economic way of thinking about these problem, basic concepts from economics; Pareto optimality and market failure in the presence of externalities; property rights and other approaches.

II. The Design and Implementation of Environmental Policy: 18

Overview, Pigouvian taxes and effluent fees, tradable permits, implementation of environmental policies in India and international experience; trans-boundary environmental problems: economics of climate change.

III. Environmental Valuation Methods and Applications: 14

Valuation of non-market goods and services-theory and practice; measurement methods; cost-benefit analysis of environmental policies and regulations.

IV Sustainable Development: 12

Concepts: measurement; perspectives from Indian experience.

Reference:

Roger Perman, Yue Ma, Michael Common, David Maddison and James McGilvray, ”Natural Resource and Environmental Economics” Pearson Education/Addison.

Charles Kolstad,” Intermediate Environmental Economics” Oxford University press 2nd edition.2010.

Robert N. Stavins (ed.),"Economics of the Environment: Selected Readings", W. W. Norton 6th edition, 2012.

DLE21611

V Semester

Skill Enhancement Course (SEC)-1: Financial Economics

Course outcome

On completion of the Course, students will:

CO1. Learn in depth Basic theory of interest.
CO2. Learn in details with examples Investment decisions under uncertainty.
CO3. Deliberate the classification and characteristics of Portfolios of assets.
CO4. Understand the details of Capital Asset Pricing Model.

Course Description:

This course introduces students to the economics of finance, essential aspects of financial asset valuation. The students are introduced to numerical techniques in finance using spreadsheet programmes such as Microsoft Excel. The course will impart skills that will be useful in a variety of business settings including investment banks, asset management companies and in the field of financial and business journalism.

I Deterministic cash-flow streams : 22

Basic theory of Interest, Investment decisions under uncertainty: Pay back period Method, Net Present Value Method, Internal Rate of return Method, fixed Income securities: Bond, Prices and Yields, Interest rate sensitivity and duration the term structure of Interest rates, spot rates and forward rates.

II. Single-period random cash flows: 21

Random asset returns; portfolios of assets: portfolio mean and variance: feasible combinations of mean and variance: Portfolio analysis: the Markowitz model and Two fund theorems: risk-free assets and the one-fund theorem.

III. Capital Asset Pricing Model(CAPM): 17

The Capital Market: Capital Asset Pricing Model: Securities Market: use of the CAPM model in investment analysis and as a pricing formula.

Reference:

David G. Luenberger. Investment Science - Oxford University Press.USA.1997

Richard A. Brealey and Stewart C. Myers - Principles of Corporate Finance, McGraw-Hill, 7th Edition
Burton G. Malkiel. A Random Walk Down Wall Street, W. W. Norton & Company, 2003
Simon Benninga, Financial Modeling, MIT Press, USA, 1997
L. V. Chandler-Money & Banking (S. Chand & Company)
D. M. Mithani - Money & Banking and Financial System (Himalaya Publishing house)
R. R. Paul-Monetary Economics (kalyani Publishers

B. Gupta-Monetary Economics (S. Chand & Company)

DLF21011

VI Semester

Discipline Specific Elective (DSE)-1A : Indian Economy

Course outcome

On completion of the Course, students will:

CO1. Understand the characteristics of Indian Agricultural policies.
CO2. Identify the classification and characteristics of Regional variation.
CO3. Write down the classification and characteristics of New Industrial Policy.
CO4. Specify in depth Public and Private Sector.
CO5. Identify in depth Monetary Policy.
CO6. Understand in depth FDI and WTO.
CO7. Learn in details with examples Public Debt.
CO8. Identify the details of Effects of Parallel Economy.

Course Description:

This course examines sector-specific trends in key indicators and their implications in the post-Independence period.

I. Indian Agriculture: Policies and Performance **14**

Role of Agriculture in India-Agriculture development-Agriculture-Production and Productivity-Agriculture Credit-Agriculture Labour-Agriculture Pricing and Marketing-Land Reforms-Regional Variation.

II. Indian Industries: Policies and Performance **15**

Role of Industries-Problems of Large Scale and Small Scale Industries in India. Private Sector and Public Sector Industries-Disinvestment Policy. New Industrial Policy.

III. Development of Tertiary and Service Sector In India **16**

Role of commercial banks in Indian economy; Reserve Bank of India and Monetary policy; Reforms in the Banking sector(Narasimmam committee only)
Growth of Service Sector in India: Trends and Issues. Health and Education Policy.

IV. India's Foreign Trade: Trends and Policies **13**

Composition, directions, Trends in India's Foreign Trade. FDI and WTO. WTO and India's Foreign Trade. Balance of Trade, Balance of Payments. Trade Liberalization.

V. Indian Public Finance **17**

Revenue and expenditure of central and state governments; India's public debt; deficit financing; financial relations between central and state; parallel economy-meaning, causes, extent and consequences; measures to control it.

Reference:

UmaKapila Indian Economy Since Independence, Academic Foundation,19th edition(2009)

Government of India, Economic Survey (latest).

Government of India, Five Year Plan (latest).

Michael P Todaro and Stephen Smith. Economic Development, Pearson, 11th edition (2011).

Uma Kapila, Indian Economy since Independence, Academic Foundation, 19th edition (2009).

United Nations Development Programme, Human Development Report 2010.palgrave Macmillan (2010).

Government of India, Economic Survey (latest).

Government of India, Five Year Plan (latest).

Government of India. Finance Commission Report (latest).

Dutt Ruddar & Sundaram.K.P.M-Indian Economy

Misra S.K & V.K.Puri-Indian Economy(Himalaya Publishing House)

Agarwal A.N-Indain Economy(Wishva Publications)

P.K.Dhar-Indian Economy(New Age International)

DLF21211

VI Semester
Discipline Specific Elective (DSE)-1B:

Economic History of India 1857-1947

Course outcome

On completion of the Course, students will:

CO1. Learn in depth Indian Economy in the pre -British period.
CO2. Specify in depth Estimation of National Income in India.
CO3. Identify the characteristics of Agriculture markets and Institutions- credit.
CO4. Understand in details with examples Evaluation of Entrepreneurial and Industrial Structure.
CO5. Learn the details of Government and fiscal policy.

Course Description:

This course analyses key aspects of Indian economic development during second half of British rule and investigates the place of Indian economy in the wider colonial context. This course links directly to the course on India's development after independent in 1947.

I. Introduction: Colonial India: Background and Introduction **13**

Overview of colonial economy.

II. Macro Trends: **15**

National Income; population; occupational structure.

III. Agriculture: **17**

Agrarian structure and land relations; agricultural markets and institutions-credit.
Commerce and technology; trends in performance and productivity; famines.

IV. Railway and Industry: **16**

Railways; the de-industrialization debate; evolution of entrepreneurial and industrial structure; Nature of industrialization in the interwar period; constraints to industrial breakthrough; labor relations.

v. Economy and State in the Imperial Context: **14**

The imperial priorities and the Indian economy; drain of wealth; international trade,Capital, flows and the colonial economy- changes and continuities; government and fiscal policy.

Reference:

Lakshmi Subramaniam, History of India-1707-1857, Orient Blackswan (2010)
Tirthankar Roy, The Economic History of India 1857-1947,Oxford University (2011)

J.Krishmamurthy, Occupational Structure, The Cambridge
Irfan Habib, Indian Economy 1858-1914,(2006)

DLF21411

VI Semester
Discipline Specific Elective (DSE)-1C: Public Finance

Course outcome

On completion of the Course, students will:

CO1. Understand the classification and characteristics of Public Economics and Public Finance.
CO2. Understand in details with examples Test of maximum social Advantage.
CO3. Understand in depth Tax and non Tax Revenue.
CO4. Identify the characteristics of Central and State financial Relations.
CO5. Deliberate the classification and characteristics of Central and State financial Relations.

Course Description:

This course gives a non-technical overview of government finances with special reference to India. It will look into the efficiency and equity aspects of Taxation of the centre, states and the local governments and the issues of fiscal federalism and decentralization in India. The course will be useful for students aiming towards careers in the government sector, policy analysis, business and journalism.

I Introduction : 13

Meaning, Nature and Scope of Public Finance, differences between Public Economics and Public Finance.

II Principles of Public Economics: 15

Principles of maximum social advantage, Principle of allocation of resources; Test of maximum social advantage; Pareto's welfare Theory; Social welfare functions of modern governments; Distinction between private and public goods; Market imperfection; Externalities.

III Public Revenue, Expenditure and Debt: 17

a) Public Revenue-Tax and Non-Tax Revenue-Cannon of Taxation.
b) Public Expenditure-Principles of Public Expenditure and Wagner's Law of Increasing state Activities.
c) Public Debt-Meaning-Causes-Burden and Redemption.

IV Issues In Indian Public Finance:

a) Working of monetary and fiscal policies **16**
b) Current Issues of Indian Tax System.
c) Central and State financial Relations.
d) State and Local Finance.

V Budget: 14

Classification of Budgets: Programme performance budget; Budgetary deficits-Revenue and fiscal deficits; Zero based budgeting; Fiscal policy-meaning and objectives.

Reference:

Musgrave, R. A. and P. B. Musgrave, Public Finance in Theory and Practice, Mc-Graw Hill, 1989

Mahesh Purohit," Value Added Tax: Experience of India and other Countries' Gayatri Publications, 2007

Kaushik Basu, and A. Maertens (ed).The Oxford Companion to Economics in India, Oxford University Press, 2007

M. M. Sury - Government Budgeting in India, Commonwealth publishers, 1990.

Shankar Acharya,' Thirty Years of tax reform' in India, Economic and Political Weekly, May 2005.

Report of the 13th Finance Commission - Government of India

Economic survey - Government of India (latest)

State Finances: A Study of Budgets, Reserve Bank of India (latest).

H. L. Bhatia-Public Finance (Sulthan Chand & Sons)

S. K. Singh-Public Finance in Theory & Practice (Himalayan Publications)

K. P. M. Sundaram & K. K. Andley -Public Finance (Sulthan Chand & Sons)

B. P. Tyagi- Public Economics (Himalayan Publications)

DLF21611

VI Semester
Skill Enhancement Course (SEC)-1: DATA ANALYSIS

Course outcome

On completion of the Course, students will:

CO1. Understand the classification and characteristics of Population Census versus Sample Survey.
CO2. Specify the details of Measures of Central Tendency
CO3. Understand in depth Karl Pearson Method
CO4. Learn in details with application, if applicable, Normal Distributions
CO5. Learn the details of Introduction to Probability theory

Course Description:

This course introduces the student to collection and presentation of data. Discusses how data can be summarized and analyzed for drawing statistical inferences. The students will be introduced to important data sources that are available and will also be trained in the use free statistical software to analyze data.

I.	Data: Meaning, Types, Importance of Data, Sources of Data. Population Census versus Sample Survey.	14
II.	Univariate frequency distributions. Measures of Central tendency: Mean, Median and Mode, Measures of Dispersion, Skeweness and kurtosis.	**15**
III.	Bivariate frequency distribution. Correlation, Karl Pearson Method-Spearman's Rank Correlation-Regression- Estimator.	**14**
IV.	Introduction to probability theory- Notions of random experiment ,sample space. Event, probability of an event. Conditional probability. Independence of events. Random variables and Probability distributions. Binomial and normal distributions.	**17**

Reference:

P. H. Karmel and M. Polasek (1978), Applied Statistics for Economics
M. R. Spiegel, Theory and Problems of probability And Statistics
Veerachamy –Quantitative methods for Economics-(New Age International)
Anderson, David R, Dennis, Sweeney & Thomas A Williams Statistics for Business & Economics (New Age International)
C. K. Renukarya – Mathematics and Statistics for Economics (Chethana Book house)
Suresh. B. H-Quantitative Techniques (Chethana Book house)

DLF21811/ DLE21811

GENERIC ELECTIVE PAPER FOR V&VI SEMESTER V-DLE21811(K G) & VI- DLF21811(H P)
INDIAN ECONOMY

Course outcome

On completion of the Course, students will:

CO1. Identify in details with examples Human Resource.
CO2. Learn the characteristics of Population policy.
CO3. Identify the details of Role of Agriculture.
CO4. Understand the details of Rural Development.
CO5. Understand in depth Disinvestment.
CO6. Deliberate the classification and characteristics of Foreign Trade.
CO7. Specify in details with application, if applicable, Public Revenue and Expenditure.
CO8. Specify the characteristics of Parallel Economy.

Module 1: Introduction
Features of Indian Economy; Concepts of National Income -GNP-NNP-GDP-NDP- Percapita Income-Disposable Income- Green GDP; Human Resource - Importance: Causes and Effects of Population Explosion and its measures: India's Population Policy and Development; Key indicators of Latest Census; Poverty: Definition, Extent and measurement of Poverty; Poverty and Inequality; Poverty Alleviation Schemes; Unemployment: Definition and Types: Employment Guarantee Schemes.

Module 2: Agriculture and Rural Development
Role of Agriculture; Cropping Pattern-Land Reforms-Green Revolution-Agriculture Production-Efficiency and Productivity- Food Security; Climate change & Agriculture; Sources of Agricultural Credit-Co-Operatives Banks, Regional Rural Banks, NABARD, Commercial Banks; Agricultural Marketing-Problems and remedies; Agriculture and WTO; Rural Development Programmes-Development of Economic and Social Infrastructure in rural India.

Module 3: Industrial Development
Role of Industries; Industrial Policy since 1991; $MSME_s$-Role and Problems; Large Scale Industries; Disinvestment in Public Sector undertakings; Industrial Sickness; SEZs; progress of Indian Industrial Sector in the context of Globalization and its impact on Indian economy. Role of Foreign Direct Investment and Multinational Companies.

Module 4: Development of Tertiary Sector
Reserve Bank of India and Monetary Policy; Role of Commercial Banks in Indian Economy; Reforms in the Banking Sector (Narasimmam Committee only): Foreign Trade- Trends, Composition, directions of Trade-India's Balance of Payments; Impact of WTO on India's foreign trade; New EXIM Policy. India's Foreign Exchange Reserves.

Module 5: Indian Public Finance

Budget-Meaning-Types; Revenue and Expenditure of Central and State Governments; Tax revenue of Government of India-Tax reforms. India's public Debt; Deficit Financing; Financial relations between Central and State; Role of Fiscal Policy: Parallel Economy-Meaning, Causes, Extent and Consequences; Measures to Control it.

Reference:

Dutt Ruddar & Sundaram K.P.M-Indian Economy(S. Chand & Co, New Delhi)
Kapila Uma, Indian Economy since Independence, Academic Foundations, New Delhi
Misra S.K & V.K Puri - Indian Economy (Himalaya Publishing House)
S. Sankaran - Indian Economy(Margham Publications)
Mohan Rakesh (Edition), Facts of the Indian Economy, OUP, New Delhi
Vaidyanathan A. India's Economic Reforms and Development, Oxford University Press New Delhi
Agarwal A.N- Indian Economy (Vishva Publications)
M.C.Vaish-Indian Economy (New Age International)
P. K. Dhar- Indian Economy (New Age International)
Economic Survey (Recent) – Govt. of India and Karnataka
Data Sources: Hand Book of statistics of Indian Economy
Census Report & NSSO Report

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE

(AUTONOMOUS)

B.N. ROAD, MYSORE-25

DEPARTMENT OF ECONOMICS

MODEL QUESTION PAPER

I, II, III, IV, V&VI Semester

(CBCS Scheme)

Time: 3 Hours **Max. Marks – 70**

PART-A

I. Answer the following questions. **5x2=10**

1)

a) ----------

b) ----------

c) ----------

d) ----------

e) ----------

PART-B

II. Answer any four of the following questions. **4x5=20**

2. ----------

3. ----------

4. ----------

5. ----------

6. ----------

7. ----------

PART-C

III. Answer any four of the following questions. **4x10=40**

8. ----------

9. ----------

10. ----------

11. ----------

12. ----------

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE

(Autonomous)

B N ROAD, MYSURU- 570 025

DEPARTMENT OF ELECTRONICS

Syllabus

CHOICE BASED CREDIT SYSTEM

For B.Sc programme

Physics, Mathematics, Electronics

2017-18

PROGRAMME CODE: BSc-04 (2017-18)

Semester	Course Code	Course Title	Course type	No. of credits			
				L	T	P	Total
I	CMA26004	Network Analysis And Analog Electronics	**Core**	04	-	02	06
II	CMB26004	Linear And Digital Integrated Circuits	**Core**	04	-	02	06
III	CMC26004	Communication Electronics	**Core**	04	-	02	06
IV	CMD26004	Microprocessor And Microcontroller	**Core**	04	-	02	06
Discipline Specific Elective papers (DSE 1): Choose any 1							
V	CME26004	Digital Signal Processing	DSE-1A	04	-	01	05
	CME26404	Electronic Instrumentation	DSE-1B	04	-	01	05
Discipline Specific Elective papers (DSE 2): Choose any 1							
VI	CMF26004	VERILOG & VHDL	DSE-1A	04	-	01	05
	CMF26204	Photonic Devices and Power Electronics	DSE-1B	04	-	01	05
Skill Enhancement Course (SEC) Choose any 1							
V	CME26204	Electrical Circuits And Network Skills	SEC-1A	2	-	-	2
	CME26604	Computer Networks	SEC-1B	2	-	-	2

Assessment Maximum marks – 100

Course type	C1		C2		C3 Exam Marks		Assigned Marks (Percentage)			Total
	Theory	Lab	Theory	Lab	Theory	Lab	Theory	Lab	IA	
DSC	**10**	**05**	**10**	**05**	**70**	**70**	**50**	**20**	**30**	**100**
DSE	**10**	**05**	**10**	**05**	**70**	**70**	**50**	**20**	**30**	**100**
SEC	**15**	**-**	**15**	**-**	**50**	**-**	**70**	**--**	**30**	**100**

SCHEME OF VALUATION FOR PRACTICAL EXAMINATION

- A candidate appearing for the first time should submit a duly signed and certified practical record
- Each candidate has to perform one experiment in the specified duration of three hours for ***FIFTY marks***
- Practical record has to be valued for ***TEN* marks** by examiners at the time of examination
- IA for ***TEN marks*** in practical is awarded by continuous assessment in the lab

I. ANALOG & DIGITAL EXPERIMENTS:

Sl no	Component	Marks
1	Write up of the experiment	15
2	Conducting experiment	30
3	Result	05
4	Viva-voce	10
5	Practical record	10
TOTAL		**70**

II. FOR PROGRAMMING EXPERIMENTS:

Sl no	Component	Marks
1	Program Writing	15
2	Entering /Coding	20
3	Execution	10
4	Result / Verification	05
5	Practical record	10
6	Viva	10
TOTAL		**70**

Programme Outcome

Bachelor of Science in Physics, Mathematics, Electronics

After completing the graduation in the Bachelor of Science the students are able to:

PO1: Demonstrate proficiency in Mathematics and the Mathematical concepts needed for a proper understanding of Physics.

PO2: Demonstrate the ability to justify and explain their thinking and/or approach.

PO3: Develop state-of-the-art laboratory and professional communication skills.

PO4: Apply the scientific method to design, execute, and analyze an experiment.

PO5: Explain scientific procedures and their experimental observations.

PO6. Understand the value of Mathematical proof.

PO7: Demonstrate proficiency in writing and understanding proofs.

PO8: Apply mathematical problems and solutions in aspects of science and technology.

PO9: Gain experience to investigate the real world problems.

PO10: Apply mathematical ideas and models to problems.

PO11: Apply appropriate troubleshooting techniques to electronic circuits / systems and perform test procedures.

PO12: Assist, Assemble, modify and test electronic circuits in accordance with job requirements.

PO13: Communicate effectively in technical and non-technical environments.

Programme Specific Outcome

Bachelor of Science in Physics, Mathematics, Electronics

After completing the graduation in the Bachelor of Science the students are able to:

PSO1: Find career opportunities.

PSO2: Develop competence to write competitive examinations.

PSO3: Develop proficiency in the analysis of complex physical problems.

PSO4: Use mathematical or other appropriate techniques to solve complex physical problems.

PSO5: Create a hypothesis and appreciate how it relates to broader theories.

PSO6: Demonstrate skills in the use of Computers for control, data acquisition, and data analysis in experimental investigations.

PSO7: Apply knowledge of Physics, Mathematics and Electronics fundamentals to the solve problems in Electronic circuits & communication systems.

PSO8: Apply appropriate troubleshooting techniques to Electronic circuits / systems and perform test procedures.

CMA26004

SEMESTER I

DSC1: NETWORK ANALYSIS AND ANALOG ELECTRONICS

Credits: Theory – 04, Practical – 02 Theory: 60 Lectures

COURSE OUTCOME:

After completion of the course the student is able to

CO1: Deliberate Network theorems with examples

CO2: Specify the classification and characteristics of semiconductor diodes and transistors

CO3: Deliberate in detail the application of semiconductor diodes and transistors

CO4: Understand the characteristics of FET & UJT.

Unit-1

Circuit Analysis:

Concept of Voltage and Current Sources. Kirchhoff's Current Law, Kirchhoff's Voltage Law. Mesh Analysis. Node Analysis. Star and Delta networks - Star-Delta and Delta – Star Conversions. Principal of Duality.

Network Theorems - Superposition Theorem. Thevenin's Theorem. Norton's Theorem. Reciprocity Theorem. Maximum Power Transfer Theorem (Statement and explanation only).

Two Port Networks: h, y and z parameters and their conversion. (15 Lectures)

Unit-2

Junction Diode and its applications:

PN junction diode (Ideal and practical) construction of diode, formation of depletion layer in diode, V-I characteristics. Static and dynamic resistance, dc load line analysis,Quiescent (Q) point.

Zener diode, Reverse saturation current, Zener and avalanche breakdown. Qualitative idea of Schottky diode.

Rectifiers- Half wave rectifier, Full wave rectifiers (center tapped and bridge) - circuit diagrams, working and waveforms, Expressions for ripple factor and efficiency.

Filter- Shunt capacitor filter, working.

Regulation- Line and load regulation, Zener diode as voltage regulator and explanation for load and line regulation. (15 Lectures)

Unit-3

Bipolar Junction Transistor:

Introduction to transistors- construction, types and operation of transistors, Characteristics of transistor in CE and CB configurations, Regions of operation (active, cut off and saturation), Current gains α and β. Relations between α and β. DC load line and Q point.

Transistor biasing:

Need for biasing, DC load line and Q point, Thermal runaway,

Stabilization - stability and stability factor, Expression for stability factor S. (only S_{Ico} derivation), Fixed Bias and Voltage Divider Bias.

Amplifiers:

Definition and classification of amplifiers, single stage CE amplifier- construction, working and frequency response

Transistor as a two port network, h-parameter equivalent circuit. Small signal analysis of single stage CE amplifier. Input and Output impedance, Current and Voltage gains.

Power amplifiers -Class A (Qualitative analysis), Class B (derivation for expression for efficiency) and class C Amplifiers (Qualitative analysis)

(15 Lectures)

Unit-4

Application of transistors:

Cascaded Amplifiers:

Two stage RC Coupled Amplifier and its Frequency Response.

Feedback in Amplifiers:

Concept of feedback, negative and positive feedback (expression for gain), advantages of negative feedback.

Sinusoidal Oscillators:

Barkhausen criterion for sustained oscillations. Phase shift and Colpitt's oscillator - derivation of expression for Frequency and Condition of oscillation.

Unipolar Devices:

JFET -Construction, working and I-V characteristics (output and transfer),expression for Pinch off voltage (no derivation).

UJT - Construction, working, equivalent circuit and I-V characteristics – UJT relaxation oscillator

(15 Lectures)

Reference Books:

• Electric Circuits, S. A. Nasar, Schaum's outline series, Tata McGraw Hill (2004).

• Electrical Circuits, M. Nahvi& J. Edminister, Schaum's Outline Series, Tata McGraw-Hill (2005).

• Electrical Circuits, K.A. Smith and R.E. Alley, 2014, Cambridge University Press.

• Network, Lines and Fields, J.D.Ryder, Prentice Hall of India.

• Electronic Devices and Circuits, David A. Bell, 5th Edition 2015, Oxford University Press.

• Electronic Circuits: Discrete and Integrated, D.L. Schilling and C. Belove, Tata McGraw Hill.
• Electrical Circuit Analysis, Mahadevan and Chitra, PHI Learning.
• Microelectronic circuits, A.S. Sedra, K.C. Smith, A.N. Chandorkar, 2014, 6th Edn., Oxford University Press.
• J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill (2001).
• J. J. Cathey, 2000 Solved Problems in Electronics, Schaum's outline Series, Tata McGraw Hill (1991).

NETWORK ANALYSIS AND ANALOG ELECTRONICS LAB

1. To familiarize with basic electronic components (R, C, L, diodes, transistors), digital Multimeter, Function Generator and Oscilloscope.
2. Measurement of Amplitude, Frequency & Phase difference using Oscilloscope.
3. Verification of Thevenin's theorem and (b) Norton's theorem.
4. Verification of (a) Superposition Theorem and (b) Reciprocity Theorem
5. Verification of the Maximum Power Transfer Theorem.
6. Study of the I-V Characteristics of (a) p-n junction Diode and (b) Zener diode.
7. Study of (a) Half wave rectifier and (b) Full wave rectifier (FWR) with C filter and without filter
8. Zener diode as voltage regulator (at the output of Full Wave Rectifier)
9. Study of the I-V Characteristics of UJT
10. UJT relaxation oscillator.
11. Study of the output and transfer I-V characteristics of common source JFET.
12. Study of Fixed Bias and Voltage divider bias configuration for CE transistor.
13. Study of Single Stage CE amplifier.
14. Study of the RC Phase Shift Oscillator.
15. Study the Colpitt`s oscillator.

(Note: Minimum of Eight experiments to be conducted)

CMB26004

SEMESTER II

DSC 2A: LINEAR AND DIGITAL INTEGRATED CIRCUITS

Credits: Theory – 04, Practical – 02 Theory: 60 Lectures

COURSE OUTCOME:

After completion of the course the student is able to

CO1: Understand the characteristics and applications of operational amplifiers

CO2: Design different signal conditioning circuits like filters, A/D and D/A converters

CO3: Understand the fundamentals of converting from one number system to another

CO4: Interpret logic functions, combinational and sequential digital circuits

Unit-1

Operational Amplifiers (Black box approach):
Differential amplifier, Block diagram of Op-amp, Characteristics of an Ideal and Practical Operational Amplifier (IC 741), Open and closed loop configurations, Frequency Response. CMRR. Slew Rate.

Applications of Op-Amps:
Inverting and non-inverting amplifiers and concept of Virtual Ground, (1) Summing, averaging and Scaling amplifiers (2) Difference Amplifier (3) Differentiator (4) Integrator (5) Active low pass and high pass Butterworth filter (1st order only).

(15 Lectures)

Unit-2

Applications of Op-amp contd. &Timer (IC 555):
Wein bridge oscillator, Comparator and Zero-crossing detector
Introduction, 555 Timer - block diagram, 555 as a monostable multivibrator. 555 as an astable multivibrator

D-A and A-D Conversion:
D – A conversion- 4 bit binary weighted and R-2R D-A converters, circuit and working. Accuracy and Resolution.
A-D conversion -characteristics, successive approximation ADC. (Mention of relevant ICs for all). (15 Lectures)

Unit-3

Number System and Codes:

Decimal, Binary, Octal and Hexadecimal number systems –conversion from one system to another. Representation of signed and unsigned binary numbers, Binary arithmetic- addition, Subtraction by 1's and 2's complement method, multiplication& division. Hexadecimal arithmetic – addition and subtraction. BCD code.

Logic Gates and Boolean algebra:

Discussion and Truth Tables of OR, AND, NOT, NOR, NAND, XOR, XNOR Gates. NAND & NOR as universal gates. Basic postulates of Boolean algebra. Principle of duality. De Morgan's theorems. Simplification of Boolean expressions. Boolean expression for logic circuits and vice versa.

Combinational Logic Analysis and Design:

Standard representation of logic functions (SOP and POS), Minimization Techniques - (Karnaugh map minimization up to 4 variables for SOP).

(15 Lectures)

Unit-4

Combinational and sequential circuits:

Arithmetic Circuits:

Binary Addition and subtraction - Half and Full Adder. Half and Full Subtractor, 4-bit binary Adder/Subtractor.

Data processing circuits:

Multiplexers(4 X 1) , De-multiplexers (1 X 4) ,
Decoders- 2 to 4 lines, 3 to 8 lines, BCD to decimal
Encoders - 8 to 3 line, Decimal to BCD encoders

Sequential Circuits:

RS flip flop; clocked RS and D flip flops. JK flip flop. (Level and edge triggered)Race around condition. Preset and Clear operations. Master-slave JK Flip-Flop.

Shift registers:

Study of Serial-in-Serial-out, Serial-in-Parallel-out, Parallel-in-Serial-out and Parallel-in-Parallel-out Shift Registers (only up to 4 bits).

Counters (4 bits):

Asynchronous counters- Ripple counter, Decade Counter, Ring Counter. Synchronous Counter.

(15Lectures)

Reference Books:

- OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edition, 2000, Prentice Hall.
- Operational Amplifiers and Linear ICs, David A. Bell, 3rd Edition, 2011, Oxford.
- University Press.
- Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed., 2011, Tata McGraw.
- Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt. Ltd.
- Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
- Digital Systems: Principles & Applications, R.J.Tocci, N.S.Widmer, 2001, PHI Learning.
- Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia (1994).
- R. L. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGraw- Hill (1994).

LINEAR AND DIGITAL INTEGRATED CIRCUITS LAB

Section – A: Op-Amp. Circuits (Hardware)

1. To design an inverting amplifier using Op-amp (741)& to study its frequency response
2. To design non-inverting amplifier using Op-amp (741) & to study frequency response.
3. To add two dc voltages using Op-amp in inverting mode.
4. To study the zero-crossing detector and comparator.
5. To investigate the use of an op-amp as an Integrator.
6. To investigate the use of an op-amp as a Differentiator.
7. To study a Wien bridge oscillator using an op-amp.
8. To design a circuit to simulate the solution of simultaneous equation and 1^{st} / 2^{nd} order differential equation.
9. Design a Butterworth Low Pass active Filter (1st order) & to study Frequency Response.
10. Design a Butterworth High Pass active Filter (1st order) & to study Frequency Response.
11. R – 2R digital to analog converter (DAC).

Section-B: Digital circuits (Hardware)

1. To design a combinational logic system for a specified Truth Table.
2. To convert Boolean expression into logic circuit & design it using logic gate ICs.
3. To minimize a given logic circuit.
4. Half Adder and Full Adder.
5. Half Subtractor and Full Subtractor.

6. 4 bit binary adder and adder-subtractor using Full adder IC.
7. Seven segment decoder.
8. To design an AstableMultivibrator of given specification using IC 555 Timer.
9. To design a MonostableMultivibrator of given specification using IC 555 Timer.
10. To build Flip-Flop (RS, Clocked RS, D-type and JK) circuits using NAND gates.
11. To build JK Master-slave flip-flop using Flip-Flop ICs.
12. To build a Counter using D-type/JK Flip-Flop ICs and study timing diagram.
13. To make a Shift Register (serial-in and serial-out) using D-type/JK Flip-Flop ICs.

Section-C: SPICE/MULTISIM simulations for electronic circuits and devices

1. To verify the Thevenin's and Norton Theorems.
2. Design and analyze the series and parallel LCR circuits
3. Design the inverting and non-inverting amplifier using an Op-Amp of given gain
4. Design and Verification of op-amp as integrator and differentiator
5. Design the 1st order active low pass and high pass filters of given cut-off frequency
6. Design a Wein Bridge oscillator of given frequency.
7. Design clocked SR and JK Flip-Flop`s using NAND Gates
8. Design 4-bit asynchronous counter using Flip-Flop ICs
9. Design the CE amplifier of a given gain and its frequency response.

(At least 04 experiments each from section A, B and C to be done)

CMC26004

SEMESTER III

DSC 3: COMMUNICATION ELECTRONICS

Credits: Theory – 04, Practical – 02 Theory: 60 Lectures

COURSE OUTCOME:

After completion of the course the student is able to

CO1: Understand the classification and characteristics of analog communication systems

CO2: Identify the classification and characteristics of pulse modulation systems

CO3: Specify the classification and characteristics of digital communication systems

CO4: Specify the classification and characteristics of satellite communication systems

CO5: Identify the classification and characteristics of mobile communication systems

Unit-1

Electronic communication:

Introduction to communication – means and modes. Need for modulation. Block diagram of an electronic communication system. Brief idea of frequency allocation for radio communication system in India (TRAI). Electromagnetic communication spectrum, band designations and usage. Channels and base-band signals. Concept of Noise, signal-to-noise (S/N) ratio.

Analog Modulation – Amplitude modulation:

Amplitude Modulation, modulation index – expression for modulation index, Analysis of AM wave, Power Relation, Current Calculation, Modulation by several sine waves.Frequency spectrum of AM wave, Generation of AM (Emitter Modulation),

Single side band generation- Balanced modulator and suppression of sidebands using filter method.

Amplitude Demodulation (diode detector), (15 Lectures)

Unit-2

Analog Modulation contd:

Frequency Modulation (FM) and Phase Modulation (PM), modulation index and frequency spectrum, equivalence between FM and PM, Generation of FM using VCO, FM detector (slope detector),

Block diagram of AM & FM super heterodyne receiver

Analog Pulse Modulation:

Channel capacity, sampling theorem, Basic Principles-PAM, PWM, PPM, modulation and detection technique for PAM only, Multiplexing. (15 Lectures)

Unit-3

Digital Pulse Modulation:
Need for digital transmission, Pulse Code Modulation, Digital Carrier Modulation Techniques, Sampling, Quantization and Encoding. Concept of Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK), and Binary Phase Shift Keying (BPSK).

Introduction to Communication systems: Satellite Communication–
Introduction, need, Geosynchronous satellite orbits, geostationary satellite, advantages of geostationary satellites. Satellite visibility, transponders (C - Band), path loss, ground station, simplified block diagram of earth station (15 Lectures)

Unit-4

Communication systems: Mobile Telephony system –
Mobile Telephony System – Basic concept of mobile communication, frequency bands used in mobile communication, Frequency reuse, Interference, Cell splitting, Sectoring, Segmentation and Dualization, Cellular Telephone Topology, Roaming and Handoffs, SIM number, IMEI number, need for data encryption, architecture (block diagram) of mobile communication network, idea of GSM, CDMA, TDMA and FDMA technologies
GPS navigation system (qualitative idea only) (15 Lectures)

Reference Books:

• Electronic Communications, D. Roddy and J. Coolen, Pearson Education India.
• Advanced Electronics Communication Systems- Tomasi, 6th edition, Prentice Hall.
• Modern Digital and Analog Communication Systems, B.P. Lathi, 4th Edition, 2011, Oxford University Press.
• Electronic Communication systems, G. Kennedy, 3rd Edn., 1999, Tata McGraw Hill.
• Principles of Electronic communication systems – Frenzel, 3rd edition, McGraw Hill.
• Communication Systems, S. Haykin, 2006, Wiley India.
• Electronic Communication system, Blake, Cengage, 5th edition.
• Wireless communications, Andrea Goldsmith, 2015, Cambridge University Press.

COMMUNICATION ELECTRONICS LAB

1. To study an Amplitude Modulator using Transistor.
2. To study envelope detector for demodulation of AM signal.
3. To study FM – Generator.
4. To study AM Transmitter and Receiver
5. To study FM Transmitter and Receiver
6. To study Time Division Multiplexing (TDM)
7. To study Pulse Amplitude Modulation (PAM).
8. To study Pulse Width Modulation (PWM).
9. To study Pulse Position Modulation (PPM).
10. To study ASK, PSK and FSK modulators.
11. IF amplifier.
12. RF amplifier.

(Minimum of eight is to be conducted)

CMD26004

SEMESTER IV

DSC 4: MICROPROCESSOR AND MICROCONTROLLER LAB

Credits: Theory – 04, Practical – 02 **Theory: 60 Lectures**

COURSE OUTCOME:

After completion of the course the student is able to

CO1: Understand the architecture of 8085 microprocessors

CO2: Write down the instruction set and simple programs of 8085 microprocessors.

CO3: Understand the architecture and instruction set of 8051microcontrollers

CO4: Specify the characteristics of embedded system

.**Unit-1**

Microcomputer Organization:

Input/output Devices. Data storage (idea of RAM and ROM). Computer memory. Memory organization & addressing. Memory Interfacing. Memory Map.

8085 Microprocessor Architecture:

Main features of 8085. Block diagram. Pin-out diagram of 8085. Data and address buses. Registers. ALU. Stack memory. Program counter.

8085 Programming:

Instruction classification, Instructions set - Data transfer, Arithmetic, logical and branch instructions (15 Lectures)

Unit-2

8051 microcontroller:

Introduction and block diagram of 8051 microcontroller, overview of 8051 family, architecture of 8051,

8051 assembly language programming - Inside the 8051, structure of assembly language, Program counter and ROM memory map, data types and directives, 8051 flag bits and the PSW register

8051 I/O port

Introduction of I/O port programming, pin out diagram of8051 microcontroller, I/O port pins description & their functions, (15 Lectures)

Unit-3

8051 Programming:
8051 addressing modes - Immediate and register addressing modes and accessing memory locations using various addressing modes, Bit addresses for I/O and RAM, assembly language instructions using each addressing mode

Arithmetic and logic instructions -Arithmetic instructions, logic and compare instructions, rotate instruction and serializing data, swap instructions

JUMP, LOOP & CALL instructions - Loop and jump instructions, call instructions

(15 Lectures)

Unit-4

8051 programming in C: Data types and time delay in 8051 C, I/O programming in 8051 C, logic operations and manipulation in 8051 C, data conversion programs in 8051 C - for ASCII and BCD conversions.

Introduction to embedded system:
Embedded systems and general purpose computer systems. Architecture of embedded system. Classifications, applications and purpose of embedded systems.

(15 Lectures)

Reference Books:

- Microprocessor Architecture Programming & applications with 8085, 2002, R.S.Goankar, Prentice Hall.
- Embedded Systems: Architecture, Programming & Design, Raj Kamal, 2008, Tata McGraw Hill.
- The 8051 Microcontroller and Embedded Systems Using Assembly and C, M.A.Mazidi, J.G. Mazidi, and R.D. McKinlay, 2nd Ed., 2007, Pearson Education India.
- Microprocessor and Microcontrollers, N. Senthil Kumar, 2010, Oxford University Press.
- 8051 microcontrollers, Satish Shah, 2010, Oxford University Press.
- Embedded Systems: Design & applications, S.F. Barrett, 2008, Pearson Education India.
- Introduction to embedded system, K.V. Shibu, 1st edition, 2009, McGraw Hill.
- Embedded Microcomputer systems: Real time interfacing, J.W. Valvano 2011,Cengage Learning

MICROPROCESSOR AND MICROCONTROLLER LAB

Section-A: Programs using 8085 Microprocessor

1. Addition and subtraction of numbers using direct addressing mode.
2. Addition and subtraction of numbers using indirect addressing mode.
3. Multiplication by repeated addition.
4. Division by repeated subtraction.
5. Handling of 16-bit Numbers.
6. Block data handling.
7. Other programs (e.g. Parity Check, etc.).

Section-B: Experiments using 8051 microcontroller:

1. Binary addition , subtraction , multiplication and division
2. 8 bits multiplication and division.
3. Fibonacci series.
4. Average of a number.
5. Square and Square root of a number.
6. Palindrome.
7. BCD to Binary conversion.
8. Finding the smallest and largest numbers from the given N binary numbers.
9. To find that the given numbers is prime or not.
10. To find the factorial of a number.
11. Write a program to make the two numbers equal by increasing the smallest number and decreasing the largest number.
12. Use one of the four ports of 8051 for O/P interfaced to eight LED's. Simulate binary counter (8 bit) on LED's. 5. Program to glow the first four LEDs then next four using TIMER application.
13. Program to rotate the contents of the accumulator first right and then left.
14. Program to run a countdown from 9-0 in the seven segment LED display.
15. To interface seven segment LED display with 8051 microcontroller and display 'HELP' in the seven segment LED display.
16. To toggle '1234' as '1324' in the seven segment LED display.
17. Interface stepper motor with 8051 and write a program to move the motor through a given angle in clock wise or counter clockwise direction.
18. Application of embedded systems: Temperature measurement & display on LCD

Note: At least 04 experiments each from section A and B to be done.

SEMESTER V

DSE1A: DIGITAL SIGNAL PROCESSING

Credits: Theory – 04, Practical – 02 Theory: 60 Lectures

COURSE OUTCOME:

After completion of the course the student is able to

CO1: Identify the details of discrete/digital signals and systems

CO2: Understand the classification and characteristics of frequency domain analysis of discrete time signals.

CO3: Specify with examples DSP filters

Unit-1

Discrete-Time Signals and Systems:
Classification of Signals, Transformations of the Independent Variable, Periodic and Aperiodic Signals, Energy and Power Signals, Even and Odd Signals, Discrete-Time Systems, System Properties. Impulse Response, Convolution Sum; Graphical Method; Analytical Method, Properties of Convolution; Commutative; Associative; Distributive; Shift; Sum Property System Response to Periodic Inputs, Relationship Between LTI System Properties and the Impulse Response; Causality; Stability; Invertibility, Unit Step Response.

(15 Lectures)

Unit-2

Discrete-Time Fourier Transform:
Fourier Transform Representation of Aperiodic Discrete-Time Signals, Periodicity of DTFT, Properties; Linearity; Time Shifting;Frequency Shifting; Convolution Property.
The *z*-Transform: Bilateral (Two-Sided) *z*-Transform,Inverse*z*-Transform, Relationship Between *z*-Transform and Discrete-Time FourierTransform, *z*-plane, Region-of-Convergence; Properties of ROC, Properties.
Filter Concepts: Phase Delay and Group delay, Zero-Phase Filter, Linear-Phase Filter,Simple FIR Digital Filters, Simple IIR Digital Filters, All pass Filters, Averaging Filters, Notch Filters

(15 Lectures)

Unit-3

Discrete Fourier Transform: Frequency Domain Sampling (Sampling of DTFT), The Discrete Fourier Transform (DFT) and its Inverse, DFT as a Linear transformation, Properties; Periodicity; Linearity; Circular Time Shifting; Circular Frequency Shifting; Circular Time

Reversal; Linear Convolution Using the DFT (Linear Convolution Using Circular Convolution), Circular Convolution as Linear Convolution with aliasing.

Fast Fourier Transform: Direct Computation of the DFT, Symmetry and Periodicity Properties of the Twiddle factor (*WN*), Radix-2 FFT Algorithms; Decimation-In-Time (DIT) FFT Algorithm; Decimation-In-Frequency (DIF) FFT Algorithm, Inverse DFT Using FFT Algorithms. (15 Lectures)

Unit-4

Realization of Digital Filters: Non Recursive and Recursive Structures, Canonic and Non Canonic Structures, Equivalent Structures (Transposed Structure), FIR Filterstructures; Direct-Form; Cascade-Form; Basic structures for IIR systems; Direct-Form I.

Infinite Impulse Response Digital Filter: Design of IIR Filters from Analog Filters, IIR Filter Design by Approximation of Derivatives, Backward Difference Algorithm, Impulse Invariance Method. (15 Lectures)

Reference Books:

- Digital Signal Processing, Tarun Kumar Rawat, 2015, Oxford University Press, India.
- Digital Signal Processing, S. K. Mitra, McGraw Hill, India.
- Principles of Signal Processing and Linear Systems, B.P. Lathi, 2009, 1st Edn. Oxford University Press.
- Fundamentals of Digital Signal processing using MATLAB, R.J. Schilling and S.L.Harris, 2005, Cengage Learning.
- Fundamentals of signals and systems, P.D. Cha and J.I. Molinder, 2007, Cambridge University Press.
- Digital Signal Processing Principles Algorithm & Applications, J.G. Proakis and D.G. Manolakis, 2007, 4th Edn., Prentice Hall.

DIGITAL SIGNAL PROCESSING LAB

1. Verification of properties of a system : linear and convolution
2. Finding DFT of a given sequence
3. Linear and circular convolution using DFT
4. Solution of simple difference equations
5. Verification of sampling theorem
6. Determination of impulse response of a given system
7. Determination of response of system to any arbitrary input
8. Design of simple IIR filters – Butterworth

9. Finding DFT using FFT. 1. Write a program to generate and plot the following sequences:

(a) Unit sample sequence $\delta(n)$,
(b) Unit step sequence u(n),
(c) Ramp sequence r(n) ,
(d) Real valued exponential sequence

$$x(n) = (0.8)^{n} u(n) \text{ for } 0 \leq n \leq 50.$$

10. Write a program to compute the convolution sum of a rectangle signal (or gate function) with

itself for N = 5

$$(n) = \left(\frac{n}{2N}\right) = \Pi\left(\frac{n}{2N}\right) = \begin{cases} 1 & -N \leq n \leq N \\ 0 & otherwise \end{cases}$$

(Note: Minimum of 08 experiments to be done).

CME26404

SEMESTER V

DSE1B: ELECTRONIC INSTRUMENTATION

Credits: Theory – 04, Practical – 02 Theory: 60 Lectures

COURSE OUTCOME:

After completion of the course a student is able to

CO1: Specify in detail, basic electronic measurement instruments.

CO2: Write down the classification and working of impedance measuring instruments.

CO3: Specify the details of power supply.

CO4: Understand the working and applications of transducers

Unit 1:

Measurements: Accuracy and precision. Significant figures. Error and uncertainty analysis. Shielding and grounding. Electromagnetic Interference.

Basic Measurement Instruments: DC measurement-ammeter, voltmeter, ohm meter, AC measurement, Digital voltmeter systems (integrating and non-integrating). Digital Multimeter; Block diagram principle of measurement of I, V, C. Accuracy and resolution of measurement.

Measurement of Impedance- A.C. bridges, Measurement of Self Inductance (Anderson's bridge), Measurement of Capacitance (De Sauty's bridge), Measurement of frequency (Wien's bridge).

(15 Lectures)

Unit 2:

Power supply: Block Diagram of a Power Supply, Qualitative idea of C and L Filters. IC Regulators (78XX and 79XX), Line and load regulation, Short circuit protection. Idea of switched mode power supply (SMPS) and uninterrupted power supply (UPS).

Oscilloscope: Block Diagram, CRT, Vertical Deflection, Horizontal Deflection. Screens for CRT, Oscilloscope probes, measurement of voltage, frequency and phase by Oscilloscope. Digital Storage Oscilloscopes. LCD display for instruments.

(15 Lectures)

Unit 3:

Lock-in-amplifier: Basic Principles of phase locked loop (PLL), Phase detector (XOR & edge triggered), Voltage Controlled Oscillator (Basics, varactor), lock and capture. Basic idea of PLL IC (565 or 4046). Lock-in-amplifier, Idea of techniques for sum and averaging of signals.

Signal Generators: Function generator, Pulse Generator, (Qualitative only).

Virtual Instrumentation: Introduction, Interfacing techniques (RS 232, GPIB, USB), Idea about Audrino microcontroller and interfacing software like lab View).

(15 Lectures)

Unit 4:

Transducers:

Classification of transducers, Basic requirement/characteristics of transducers, Active and Passive transducers, Resistive (Potentiometer- Theory, temperature compensation & applications), Capacitive (variable air gap type), Inductive (LVDT) & piezoelectric transducers. Measurement of temperature (RTD, semiconductor IC sensors), Light transducers (photo resistors & photovoltaic cells). (15 Lectures)

Reference Books:

• W.D. Cooper and A. D. Helfrick, Electronic Instrumentation and Measurement Techniques, Prentice Hall (2005).

• E.O. Doebelin, Measurement Systems: Application and Design, McGraw Hill Book - fifth Edition (2003).

• David A. Bell, Electronic Devices and Circuits, Oxford University Press (2015).

• Alan S. Morris, "Measurement and Instrumentation Principles", Elsevier (Butterworth Heinmann-2008).

• S. Rangan, G. R. Sarma and V. S. Mani, Instrumentation Devices and Systems, Tata Mcgraw Hill (1998).

• Introduction to measurements and instrumentation, 4th Edn., Ghosh, PHI Learning.

ELECTRONIC INSTRUMENTATION LAB

1. Measurement of resistance by Wheatstone bridge and measurement of bridge sensitivity.
2. Measurement of Capacitance by De Sauty's bridge.
3. To determine the Characteristics of resistance transducer - Strain Gauge (Measurement of Strain using half and full bridge).
4. To determine the Characteristics of LVDT.
5. To determine the Characteristics of Thermistors and RTD.
6. Measurement of temperature by Thermocouples.
7. Design a regulated power supply of given rating (5 V or 9V).
8. To design and study the Sample and Hold Circuit.
9. To plot the frequency response of a microphone.

(Note: Minimum of 08 experiments to be done).

CMF26004

SEMESTER VI

DSE1A: VERILOG & VHDL

Credits: Theory – 04, Practical – 02 Theory: 60 Lectures

COURSE OUTCOME:

After completion of the course the student is able to

CO1: Identify the details of Digital logic design flow.

CO2: Learn the characteristics and model the digital circuits using VHDL behavioural modelling

CO3: Deliberate in detail the dataflow and structural modelling in VHDL

CO4: Describe digital circuits utilizing various constructs of Verilog

Unit-1

Digital logic design flow

Review of combinational circuits. Combinational building blocks: multiplexers, demultiplexer, decoders, encoders and adder circuits. Review of sequential circuit elements: flip-flop, latch and register. Finite state machines: Mealy and Moore. Other sequential circuits: shift registers and counter (15 lectures)

Unit-2

VHDL: Basic Language elements

Identifiers, Data Objects, Data types, Operators

Behavioral Modelling

Entity Declaration, Architecture Body, Process statement, Variable assignment statement, Signal Assignment, Wait statement, If statement, Case statement, Null statement, Loop statement, Exit statement, Next statement, Assertion statement, Report statement, More on Signal Assignment statement, other sequential statements. (15 Lectures)

Unit-3

Dataflow Modelling

Concurrent Signal Assignment, Concurrent versus Sequential Signal Assignment, Delta Delay Revisited, Multiple Drivers, Conditional Signal Assignment Statement, Selected Signal Assignment Statement, The UNAFFECTED value, Block Statement, Concurrent Assertion Statement, Value of signal.

Structural Modeling

An example, Component Declaration, Component Instantiation, Other examples Resolving Signal Values (15 lectures)

Unit-4

Verilog HDL:

Introduction to HDL. Verilog primitive operators and structural Verilog Behavioral Verilog. Design verification. Modeling of combinational and sequential circuits (including FSM and FSMD) with Verilog Design examples in Verilog. (15 lectures)

Reference Books:

1. LizyKurien and Charles Roth. *Principles of Digital Systems Design and VHDL.*Cengage Publishing. ISBN-13: 978-8131505748.
2. Palnitkar, Samir, *Verilog HDL.* Pearson Education; Second edition (2003).
3. Ming-Bo Lin. *Digital System Designs and Practices: Using Verilog HDL andFPGAs.* Wiley India Pvt Ltd. ISBN-13: 978-8126536948.
4. ZainalabedinNavabi. *Verilog Digital System Design.* TMH; 2ndedition. ISBN-13:978-0070252219.
5. Wayne Wolf. *FPGA Based System Design.* Pearson Education.S. K. Mitra, Digital Signal processing, McGraw Hill, 1998.
6. VLSI design, Debaprasad Das, 2nd Edition, 2015, Oxford University Press.
7. D.J. Laja and S. Sapatnekar, Designing Digital Computer Systems wit.

VERILOG AND VHDL LAB
Experiments using Verilog

1. Write code to realize basic and derived logic gates.
2. Half adder, Full Adder using basic and derived gates.
3. Half subtractor and Full Subtractor using basic and derived gates.
4. Design and simulation of a 4 bit Adder.
5. Multiplexer (4x1) and Demultiplexer using logic gates.
6. Decoder and Encoder using logic gates.
7. Clocked D, JK and T Flip flops (with Reset inputs).
8. 3-bit Ripple counter

Experiments using VHDL

1. Behavioral modeling and simulation of basic gates
2. Structural modeling and simulation of simple Boolean expression
3. Modeling and simulation of adders and subtractors
4. Modeling and simulation of magnitude comparators
5. Modeling and simulation of Flip-flops
6. Modeling and simulation of Shift registers
7. Modeling and simulation of Counters
8. Modeling and simulation of encoders and decoders
9. Modeling and simulation of multiplexers

Note: At least 04 experiments - each from section A and B to be done.

CMF26204

SEMESTER VI

DSE1B: PHOTONIC DEVICES AND POWER ELECTRONICS

Credits: Theory – 04, Practical – 02 Theory: 60 Lectures

COURSE OUTCOME:

After completion of the course the student is able to

CO1: Deliberate the Principles and operations of Photonic devices.

CO2: Deliberate the Principle of operation and characteristics of optical fibers

CO3: Understand the mode of signal prorogation in optical fibres

CO4: Deliberate the characteristics and application of power devices

UNIT 1:

Photonic Devices

Classification of photonic devices. Interaction of radiation and matter, Radiative transition and optical absorption. Light Emitting Diodes- Construction, materials and operation. Semiconductor Laser- Condition for amplification, laser cavity, heterostructureand quantum well devices. Charge carrier and photon confinement, line shape function. Threshold current. Laser diode. Photodetectors: Photoconductor. Photodiodes (p-i-n, avalanche) and Photo transistors,quantum efficiency and responsivity. Photomultiplier tube.

(15 Lectures)

UNIT 2:

Solar Cell

Construction, working and characteristics LCD Displays: Types of liquid crystals, Principle of Liquid Crystal Displays,applications, advantages over LED displays.

Introduction to Fiber Optics:

Evolution of fiber optic system- Element of an Optical Fiber Transmission link- Ray Optics- Optical Fiber Modes and Configurations –Mode theory of Circular Wave guides- Overview of Modes-Key Modal concepts- Linearly Polarized Modes -Single Mode Fibers-Graded Index fiber structure. (15 Lectures)

UNIT 3:

POWER ELECTRONICS

Power Devices: Need for semiconductor power devices, Power MOSFET (Qualitative).Introduction to family of thyristors. Silicon Controlled Rectifier (SCR)- structure, I-Vcharacteristics, Turn-On and Turn-Off characteristics, ratings, Gate-triggering circuits.Diac and Triac- Basic structure, working and V-I characteristics. Application of Diacasa triggering device for Triac. (15 Lectures)

UNIT 4:

Insulated Gate Bipolar Transistors (IGBT): Basic structure, I-V Characteristics,switching characteristics, device limitations and safe operating area (SOA).

Applications of SCR: Phase controlled rectification, AC voltage control using SCR and Triac as a switch. Power Invertors- Need for commutating circuits and their varioustypes, dc link invertors, Parallel capacitor commutated invertors, Series Invertor,limitations and its improved versions, bridge invertors.

(15 Lectures)

Reference Books:

1. J. Wilson & J.F.B. Hawkes, Optoelectronics: An Introduction, Prentice Hall India (1996).
2. S.O. Kasap, Optoelectronics & Photonics, Pearson Education (2009).
3. AK Ghatak& K Thyagarajan, Introduction to fiber optics, Cambridge Univ. Press (1998).
4. Power Electronics, P.C. Sen, Tata McGraw Hill.
5. Power Electronics, M.D. Singh & K.B. Khanchandani, Tata McGraw Hill.
6. Power Electronics Circuits, Devices & Applications, 3rd Edn., M.H. Rashid,Pearson Education.
7. Optoelectronic Devices and Systems, Gupta, 2nd edn., PHI learning.
8. Electronic Devices and Circuits, David A. Bell, 2015, Oxford University Press.

PHOTONIC DEVICES AND POWER ELECTRONICS LAB

1. To determine wavelength of sodium light using Michelson's Interferometer.
2. Diffraction experiments using a laser.
3. Study of Electro-optic Effect.
4. To determine characteristics of (a) LEDs, (b) Photo voltaic cell and (c) Photo diode.
5. To study the Characteristics of LDR and Photodiode with (i) Variable Illumination intensity, and (ii) Linear Displacement of source.
6. To measure the numerical aperture of an optical fiber.
7. Output and transfer characteristics of a power MOSFET.
8. Study of I-V characteristics of SCR.
9. SCR as a half wave and full wave rectifiers with R and RL loads.
10. AC voltage controller using TRIAC with UJT triggering.
11. Study of I-V characteristics of DIAC
12. Study of I-V characteristics of TRIAC.

CME26204

Skill Enhancement Course (SEC)

SEC1A: ELECTRICAL CIRCUITS AND NETWORK SKILLS

(Credits: 02) Theory: 30 Lectures

Course Outcome:

After completion of the course the student acquires skill to

CO1: Design and trouble shoot the electrical circuits and networks

CO2: Carry-out simple domestic wiring.

UNIT 1:

Basic Electricity Principles:

Voltage, Current, Resistance, and Power. Ohm's law. Series, parallel, and series-parallel combinations. AC and DC Electricity. Familiarization with multimeter, voltmeter and ammeter.

Electrical Circuits:

Basic electric circuit elements and their combination. Rules to analyze DC sourced electrical circuits. Current and voltage drop across the DC circuit elements. Single-phase and three-phase alternating current sources. Rules to analyze AC sourced electrical circuits. Real, imaginary and complex power components of AC source. Power factor. Saving energy and money.

Electrical Drawing and Symbols:

Drawing symbols. Blueprints. Reading Schematics. Ladder diagrams. Electrical Schematics. Power circuits. Control circuits. Reading of circuit schematics. Tracking the connections of elements and identify current flow and voltage drop. (15 Lectures)

UNIT 2:

Generators and Transformers:

DC Power sources. AC/DC generators. Inductance, capacitance, and impedance. Operation of transformers.

Electric Motors:

Single-phase, three-phase & DC motors. Basic design. Interfacing DC or AC sources to control heaters & motors. Speed & power of ac motor

Solid-State Devices:

Resistors, inductors and capacitors. Diode and rectifiers. Components in Series or in shunt. Response of inductors and capacitors with DC or AC sources

Electrical Protection:

Relays. Fuses and disconnect switches. Circuit breakers. Overload devices. Ground-fault protection. Grounding and isolating. Phase reversal. Surge protection. Relay protection device.

Electrical Wiring:

Different types of conductors and cables. Basics of wiring-Star and delta connection. Voltage drop and losses across cables and conductors. Instruments to measure current, voltage, power in DC and AC circuits. Insulation. Solid and stranded cable. Conduit. Cable trays. Splices: wirenuts, crimps, terminal blocks, and solder. Preparation of extension board. (15 Lectures)

Reference Books:

1. Electrical Circuits, K.A. Smith and R.E. Alley, 2014, Cambridge University Press.
2. A text book in Electrical Technology - B L Theraja - S Chand & Co.
3. A text book of Electrical Technology - A K Theraja.
4. Performance and design of AC machines - M G Say ELBS Edn.

CME26604

Skill Enhancement Course (SEC)

SEC1B: COMPUTER NETWORK

Credits: 02 Theory: 30 Lectures

COURSE OUTCOME:

After completion of the course the student acquires skill to

CO1: Understand the concepts of network devices

CO2: Understand the terminology and concepts of the OSI model

Unit 1:

Data communication, Components & Basic Concepts

Line configuration- point-to-point, multipoint, Topology – Mesh, Star, Tree, Bus, Ring, and Hybrid Topologies Transmission modes – Simplex, Half Duplex, Full Duplex. Categories of networks – LAN, MAN, WAN, Internet

Transmission Media

Guided media – Twisted pair cable, Co-axial cable, Optical fiber

Multiplexing:

Many to one/one to many, types of multiplexing, Frequency division multiplexing, time division multiplexing, multiplexing applications

Error detection

Types of error, multiple bit error, Burst error,Detection – redundancy, Checksu Error correction – Single bit error correction, Hamming code (15 Lectures)

Unit 2

The OSI Model

Model – layered Architecture, Functions of layers- physical layer, Data link layer, Network layer, Transport layer, Session layer, Presentation Layer, Application layer

Networking and internetworking devices

Repeaters, Bridges- types of Bridges, Routers- Routing concepts, Gate ways

World Wide Web:

Uniform Resource Locator (URL), Browser Architect (15 Lectures)

Text Book:

Introduction to Data Communications & Networking by- BEHROUZ FOROUZAN

Reference Book:

Computer Networks by – ANDREW S TANENBAUM

Pattern of theory Question Paper for DSC/DSE

From the academic year 2017-2018 onwards

Time: 3 hours **Max. Marks: 70**

Credits: 4

Part –A

I. Answer all questions. **1 x 10 = 10**

- Ten questions to be set from the four units of the syllabus.
- Minimum of two questions to be set from each unit.
- The question can be simple problems also.

Part - B

II. Answer any Four questions. **4 x 5 = 20**

- **Six** questions to be set from four units of the syllabus.
- Minimum of one question to be set from each unit,
- This section can have questions **or** problems.

Part - C

III. Answer all the questions **4 x 10 = 40**

- Total of four questions to be set.
- One question to be set from each unit for TEN marks with internal choice.
- The questions can have subdivisions.

Pattern of theory Question Paper for SEC

From the academic year 2017-2018 onwards

Time: 2 hours **Max. Marks: 50**

Credits: 2

Part –A

I. Answer any TEN questions **2 x 10 = 20m**

- Total of TWELVE questions to be set.
- SIX questions to be set from each unit.

Part –B

II. Answer any THREE questions selecting at least one question from each unit
3 x 10 = 30m

- FIVE questions to be set.
- Minimum of two questions to be set from each unit.
- Questions can have subdivisions.

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE

(Autonomous)

B N ROAD, MYSURU- 570 025

DEPARTMENT OF ENGLISH

Syllabus

CHOICE BASED CREDIT SYSTEM

ENGLISH (LANGUAGE)

2017-18

Course Structure

BA/BCom

Semester	Course code	Course Title	Course Type	No. of Credits			
				L	T	P	Total
I	DLA02011/12/13/14/15	Poetry, Prose & Grammar	Core	2	1	-	03
II	DLB02011/12/13/14/15	Poetry, One Act Plays & Grammar	Core	3	-	-	03
III	DLC02011/12/13/14/15	Novel & Language Component	Core	2	1	-	03
IV	DLD02011/12/13/14/15	Drama & Language component	Core	3	-	-	03
IV	DLD24011/12/13/14/15 DND24001	Communicative skills	AECC	2	-	-	02
IV	DLD25011/12/13/14/15 BA	Communicative skills	SEC	2	-	-	02

BSc/BCA/BBA

Semester	Course Code	Course Title	Course Type	No. of Credits			
				L	T	P	Total
I	CMA02001/02/03/04/05/06/07/08	Poetry, Prose & Grammar	AECC	3	-	-	03

	DCA02001 **BDA02001**						
II	**CMB02001/02/03/04/05/06/07/08** **DCB02001** **BDB02001**	**Poetry, One Act Plays & Grammar**	**AECC**	**3**	**-**	**-**	**03**
III	**CMC02001/02/03/04/05/06/07/08** **DCC02001** **BDC02001**	**Novel & Language Component**	**AECC**	**3**	**-**	**-**	**03**
IV	**CMD02001/02/03/04/05/06/07/08** **DCD02001** **BDD02001**	**Drama & Language component**	**AECC**	**3**	**-**	**-**	**03**

Assessment

Max.Marks-100

Course type	**C1**		**C2**		**C3**		**Total**
	Marks	**Duration(Hr)**	**Marks**	**Duration(Hr)**	**Marks**	**Duration(Hr)**	
Language	**15**	**1**	**15**	**1**	**70**	**3**	**100**

Communication	**15**	**1**	**15**	**1**	**70**	**3**	**100**

Scheme of assessment for English (Language) under CBCS scheme - 2017-18

Year	Sem	Course Code	TITLE OF THE PAPER	PERCENTAGE				
				C1	C2	C3		
				Theory	Theory	Theory	IA	Duration
I	I	DLA02011/12/13/14/15	**Poetry, Prose & Grammar**	**15**	**15**	**70**	**30**	**3h**
	II	DLB02011/12/13/14/15	**Poetry, One Act Plays & Grammar**	**15**	**15**	**70**	**70**	**3h**
II	III	DLC02011/12/13/14/15	**Novel& Language Component**	**15**	**15**	**70**	**70**	**3h**
	IV	DLD02011/12/13/14/15	**Drama & Language component**	**15**	**15**	**70**	**70**	**3h**
	IV	DLD24011/12/13/14/15 DND24001	**AECC**	**15**	**15**	**50**	**50**	**2h**
	IV	DLD25011/12/13/14/15 DND25001	**SEC**	**15**	**15**	**50**	**50**	**2h**

Programme Outcome & Programme Specific Outcome

Programme: Bachelor of Arts (BA)
History and Political Science
Kannada and Geography
Economics and Geography
History and English
Journalism and English

Programme Outcome:
After completing the graduation the students are able to:
PO1: Understand and analyze the Socio-cultural aspects of society.
PO2: Take up higher studies followed by Research.
PO3: Learn the Origin and Etymology of different places.
PO4: Analyze political aspects related to various periods.
PO5: Learn historical aspects and multi culture of the world at large.
PO6: Assist media, publicity and reports of prominent events.

Programme Specific Outcome:
After completing the graduation the students are able to:
PSO1: Build competence to face competitive examination
PSO2: Draft letters and reports
PSO3: Improve communication skills and prepare personal profile

Programme: Bachelor of Science (Physical science) (BSc)
Physics, Chemistry and Mathematics
Physics, Mathematics and Electronics
Physics, Mathematics and Computer Science

After completing the graduation students are able to:
PO1: Take up research activities.
PO2: Pursue computer generated programmes related to their subject of study
PO3: Further scientific studies towards career building and job opportunities
PO4: Imbibe and impart scientific invention

Programme Specific Outcome:
After completing the graduation the students are able to:
PSO1: Improve language proficiency in computer application

PSO2: Build competence to face competitive examination
PSO3: Improve communication skills and prepare personal profile

Programme: Bachelor of Science (Natural science) (BSc)
Chemistry, Botany and Zoology
Chemistry, Zoology and Bio Technology
Botany, Bio Chemistry and Micro Biology
Botany, Micro Biology and Bio Technology

After completing the graduation students are able to:
PO1: Take up research activities
PO2: Learn medical transcription
PO3: Further specific studies towards career building and job opportunities
PO4: Improve communication skills and prepare personal profile
PO5: Imbibe and impart scientific discoveries

Program Specific Outcome:
After completing the graduation the students are able to:
PSO1: Build competence to face competitive examination
PSO2: Improve communication skills and prepare personal profile
PSO3: Enhance ability in preparing dissertation

Programme: Bachelor of Commerce and Administration (BCom & BBA)
After completing the graduation the students are able to:
PO1: Improve Communication and Skill enhanced activities
PO2: Face interviews and create PPTs and reports.

Program Specific Outcome:
After completing the graduation the students are able to:
PSO1: Build competence to face competitive examination
PSO2: Improve communication skills and prepare personal profile
PSO3: Draft letters and reports

Syllabus – CBCS

DLA02011/12/13/14/152017-18

BA/BSc/BCom/BBA/BCA

I Semester

Language English

Poetry, Prose & Language Component

Max. Marks-70 **3 Credits/Week**

Course Outcome:

After completion of the course a student is able to

CO1. Identify the qualities of mercy as said by Shakespeare
CO2. Understand all are equal before Death
CO3. Understand the conflict between beauty and duty
CO4. Understand abundance of God's creations
CO5. Identify Honesty and friendship
CO6. Understand diplomacy in politics
CO7. Understand the Technique of Prose writing
CO8. Understand in detail with examples the basic concept of English Grammar

Poetry:

1. An Attribute of God - William Shakespeare
2. Death, The Leveller- James Shirley
3. Stopping by Woods On A Snowy Evening - Robert Frost
4. God's Grandeur - G M Hopkins
5. A Poison Tree - William Blake
6. Ajamil and the Tigers - Arun Kolatkar

Prose:

1. All About a Dog - A G Gardiner
2. The Man in Asbestos - Stephen Leacock
3. A Day's Wait - Ernest Hemmingway
4. The Parrot's Training - Rabindranath Tagore
5. The Eyes are not here - Ruskin Bond

LanguageComponent:

1. Parts of Speech
2. Punctuation

3. Letter Writing – Letter of Application/ grievance letter/ Personal letter
4. Comprehension

DLB02011/12/13/14/15 BA/BSc/BCom/BBA/BCA

II Semester

Language English

Poetry, One Act Plays & Language Component

Max. Marks-70 **3 Credits/Week**

Course Outcome:

After completion of the course a student is able to

CO1. Learn the details of THE SUNNE RISING BY JOHN DONNE
CO2. Understand the concept of ON SHAKESPEARE BY JOHN MILTON
CO3. Deliberate the details of THE SECOND COMING BY W B YEATS
CO4. Identify in depth the Characters of a happy life by Sir Henry Wotton
CO5. Understand in details the quality of FIDELITY BY WILLIAM WORDSWORTH
CO6. Identify in details the needs of self-reliance in THE CRUTCHES BY BERTOLT BRECHT
CO7. Specify the importance of need for survival in The Pie and The Tart by Hugh Chesterman
CO8. Deliberate the belief in super natural existence in The Man Upstairs by Hugh Beresford
CO9. Deliberate the role of virtues and vices in the life of Everyman
CO10. Understand in details with examples the basic concept of English Grammar

Poetry:

1. The Sunne Rising - John Donne
2. On Shakespeare - John Milton
3. The Second Coming - W B Yeats
4. Characters of a Happy Life - Sir Henry Wotton
5. Fidelity - William Wordsworth
6. The Crutches - Bertolt Brecht

One Act Plays:

1. The Pie and the Tart - Hugh Chesterman
2. The Man Upstairs - Hugh Beresford
3. Everyman -Unknown

Language Component:

1. Subject & Verb Agreement
2. Active Voice & Passive Voice
3. Articles

4. Expansion of an Idea

DLC02011/12/13/14/15 BA/BSc/BCom/BBA/BCA

III Semester

Language English

Fiction & Language Component

Max. Marks-70 3 Credits/Week

Course Outcome:

After completion of the course a student is able to

CO1. Learn the characteristics of The Man-eater of Malgudi
CO2. Understand in depth The Man-eater of Malgudi
CO3. Identify the qualities of beast in Man
CO4. Understand in detail with examples the basic concept of English Grammar

Fiction

The Man-Eater of Malgudi - R K Narayan

Language Component

1. Question Tag
2. Framing of questions
3. One word substitutes
4. Words often confused

DLD02011/12/13/14/15 **BA/BSc/BCom/BBA/BCA**

IV Semester

Language English

Drama & Language Component

Max. Marks-70 **3 Credits/Week**

Course Outcome:

After completion of the course a student is able to

CO1. Learn the characteristics of Julius Caesar
CO2. Understand in depth Julius Caesar
CO3. Identify in details the relevance of Julius Caesar
CO4. Understand in detail with examples the basic concept of English Grammar

Drama

Julius Caesar William Shakespeare

Language Component

1. Direct& Indirect Speech
2. Degrees of comparison
3. Linkers
4. Essay Writing

DLD24011/12/13/14/15 **BA/BCom**

Ability Enhancement Compulsory Course (AECC)

Max. Marks-50 **2 Credits/Week**

Course Outcome:
After completion of the course a student is able to

CO1. Introduce themselves in a better way
CO2. Participate in Panel and Group discussion
CO3. Enhance communication skills
CO4. Develop presentation skills

I. **Speaking Skills –**Self Introduction
Group Discussion
Presentation Skills
Panel Discussion
Interview Skills (Mock Interview)

II. **Reading Skills --**Newspaper Reading
Intonations
Reading (Loud& Silent)
Conversation Skills (Banks, Hotels, etc.)

III. **Writing Skills —** Vocabulary building
Prefix & Suffix
Antonyms & Synonyms
Story Writing
Resume Writing
Dialogue Writing
Translation (Paragraph Translation)

DLD25011/12/13/14/15 **SEC-BA-IV SEM**

Skill Enhancement Course (SEC)

Max. Marks: 50 **2 Credits/weeks**

Course Outcome:

After completion of the course a student is able to

CO1.Develop reading and writing skills
CO2. Conceptualise and expand the given topic
CO3. Prepare effective sentence
CO4. Understand Basic English language

Topic	Marks
1. Essay Writing	10
2. Precise Writing	10
3. Passage Expansion	10
4. Sentence (Types)	10
5. Nouns and Pronouns	10

Pattern of Question Paper
BA/BSC/BCOM/BBA/BCA

Max. Hrs-3 **Max. Marks-100**

Section A
Poetry

I. Annotate Four of the following: 4x5=20

1.
2.
3.
4.
5.
6.

Section B
Poetry

II. Answer Two of the following: 2x8=16

1.
2.
3.
4.

Section C
Prose

III. Answer Two of the following: 2x7=14

1.
2.
3.
4.

Section D
Language Component

IV. 1. Parts of Speech 5
2. Punctuation 5
3. Letter Writing 5
4. Comprehension 5

V. Internal Assessment 30

DLD24011/12/13/14/15 SEC-BA&BCom-IV SEM

Ability Enhancement Compulsory Course (AECC)

Max. Marks: 50 2 Credits/weeks

Section A

Fiction

I. ANTONYMS & SYNONYMS – 10 MARKS
II. Story Writing – 10 marks
III. Resume writing- 10 marks
IV. Dialogue writing -10 marks
V. Translation/Precise writing- 10 marks

DLD25011/12/13/14/15 SEC-BA-IV SEM

Skill Enhancement Course (SEC)

Max. Marks: 50 2 Credits/weeks

Section A

Fiction

I. Answer FIVE of the following: 5x10=50

1.
2.
3.
4.
5.

ENVIRONMENTAL STUDIES SYLLABUS

(2017 to 2020)

Unit 1 : Multidisciplinary nature of environmental studies Definition, scope and importance Need for public awareness. (2 lectures)

Unit 2 : Natural Resources : Renewable and non-renewable resources :

Natural resources and associated problems. a) Forest resources : Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. b) Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d) Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. e) Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies. f) Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification. • Role of an individual in conservation of natural resources. • Equitable use of resoureces for sustainable lifestyles. (8 lectures)

Unit 3 : Ecosystems • Concept of an ecosystem.

• Structure and function of an ecosystem. • Producers, consumers and decomposers. • Energy flow in the ecosystem. • Ecological succession. • Food chains, food webs and ecological pyramids. • Introduction, types, characteristic features, structure and function of the following ecosystem :- a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) (6 lectures)

Unit 4 : Biodiversity and its conservation

• Introduction – Definition : genetic, species and ecosystem diversity. • Biogeographical classification of India • Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values • Biodiversity at global, National and local levels. • Inida as a mega-diversity nation V • Hot-sports of biodiversity. • Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts. • Endangered and endemic species of India • Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity. (8 lectures)

Unit 5 : Environmental Pollution

Definition • Cause, effects and control measures of :- a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution

g. Nuclear hazards • Solid waste Management : Causes, effects and control measures of urban and industrial wastes. • Role of an individual in prevention of pollution. • Pollution case studies. • Diaster management : floods, earthquake, cyclone and landslides. (8 lectures)

Unit 6 : Social Issues and the Environment

• From Unsustainable to Sustainable development • Urban problems related to energy • Water conservation, rain water harvesting, watershed management • Resettlement and rahabilitation of people; its problems and concerns. Case Studies • Environmental ethics : Issues and possible solutions. • Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies. • Wasteland reclamation. • Consumerism and waste products. • Environment Protection Act. • Air (Prevention and Control of Pollution) Act. • Water (Prevention and control of Pollution) Act • Wildlife Protection Act • Forest Conservation Act • Issues involved in enforcement of environmental legislation. • Public awareness. (7 lectures)

Unit 7 : Human Population and the Environment

• Population growth, variation among nations. • Population explosion – Family Welfare Programme. VII • Environment and human health. • Human Rights. • Value Education. • HIV/AIDS. • Women and Child Welfare. • Role of Information Technology in Environment and human health. • Case Studies. (6 lectures)

Unit 8 : Field work

• Visit to a local area to document environmental assetsriver/forest/grassland/hill/mountain

• Visit to a local polluted site-Urban/Rural/Industrial/Agricultural • Study of common plants, insects, birds.

• Study of simple ecosystems-pond, river, hill slopes, etc

. (Field work Equal to 5 lecture hours)

NEP SYLLABUS B.A/B.Sc Semester 1

Title of the Course: Principles of Geomorphology

Code: GEOGDSC T1.1

Number of Theory Credits	Number of lecture hours/ semester	Number of practical Credits	Number of practical hours/ semesters
4	52 or 56	2	52 or 56

Course Outcomes:

1. After the completion of this course, students should be able to:
2. Define the field of Geomorphology and to explain the essential principles of it.
3. To outline the mechanism of dynamic nature of the Earth's surface and interior of the Earth.
4. To illustrate and explain the forces affecting the crust of the earth and its effect on it.
5. To understand the conceptual and dynamic aspects of landform development

Course Objectives:

This course aims to:

1. To define the concepts in Geomorphology and Physical Geography
2. To introduce various concept to understand cycles of the solid Earth surface
3. To understand the dynamic nature of the Earth's surface, various processes, and landforms.
4. To study the impact human on geomorphic system.

Content of Theory Course 1	52/56Hrs
Unit – 1 Geomorphology	13/14
Introduction to geography: physical and human geography Introduction to Geomorphology: meaning, nature, development, and scopePrinciples of Geomorphology Geological Time Scale Distribution of continents and oceans	
Unit – 2 Systems and Cycles of the Solid Earth	13/14
Internal structure of the earth Alfred Wegener's continental drift Theory of Isostacy: Views of Pratt and Airy Convectional current theory and concept of sea floor spreading Theory of Plate Tectonics: plate boundaries, subduction, Case Studies: Volcano, Earthquake: reporting of latest incidents Case Studies: Volcano, Earthquake: reporting of latest incidents	
Unit – 3 The Dynamics of Earth	13/14
Earth's Movements: Endogenetic and Exogenetic forces, Sudden and Diastrophic movements- Epeirogenetic and Orogenetic Movements-Process of folding and faulting Vulcanicity and earthquake Rocks: Characteristics, types, importance, and rock cycle Weathering: meaning, types and controlling factors Mass Movement: meaning, controlling factors, types-landslides, rock-falls	

Unit – 4 Evolution of Landforms	13/14
Evolution of Landforms Landforms: meaning, types and factors controlling landforms developmentSlope development: concept and types Concept of Cycle of Erosion–W.M. Davis and W. Penck Agents of Denudation: river; drainage patterns, groundwater, Sea waves, Windand Glaciers and resultant landforms. Application of geomorphology: in India and Karnataka (Regional planning, Urban planning and transportation, Mining, Hazard management, Agriculture and Environmental management).	

References

1. Ahmed E. (1985) Geomorphology, Kalyani Publishers, New Delhi.
2. Bloom A.L. (1978) Geomorphology: A Systematic Analysis of Late CenozoicLandforms Prentice – Hall of India, New Delhi.
3. Brunsden D. (1985) Geomorphology in the Service of Man: The Future ofGeography, Methnen, U.K.
4. Chorley, R.J., Schumm, S. A. and Sugden, D.E. 1984: Geomorphology, Methuen,London
5. Cooke, R.U. and Warren, 1973: Geomorphology in Deserts, Batsford, London
6. Dayal, P. 1996: Textbook of Geomorphology, Shukla Book Depot, Patna.
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9. Homes A. (1965) Principles of Physical Geology, 3rd Edition, ELBSS Edn.
10. Hugar M R Physical Geography part 1(Kannada Version)
11. Kolhapure and S S Nanjan, Physical Geography (Kannada Version)
12. Nanjannavar S S: Physical Geography (Kannada Version)
13. P Mallappa, Physical Geography (Kannada Version)
14. Ranganath Principles of Physical Geography (Kannada Version)
15. Strahler A.N. (1968) The Earth Sciences, Harper & Row Intl. Edn, New York
16. Thornberry W.D. (1969) Principles of Geomorphology 2nd Edition, Wiley Intl. Edn. &Wiley, 1984.
17. Verstappen H. (1983) Applied Geomorphology, Geomorphological Surveys forEnvironmental Develop- ment, Elsevier, Amsterdam

Reference Websites

1. http://www.solarviews.com/eng/earth.htm
2. http://www.moorlandschool.co.uk/earth/tectonic.htm
3. https://www.usgs.gov/
4. https://www.ksndmc.org/

Pedagogy

Formative Assessment	
Assessment Occasion/type	**Weightage in Marks**
Case Studies	30%
Assignment	20%
CIA	50%
Total	100%

GEOGDSC P1.1 **Geomorphology Practical**

CREDIT:02

Content of Practical Course 1: List of Experiments to be conducted

Exercise-1: Identification of Rocks and Minerals. Mineral samples: Iron ore, Bauxite ore and Manganese. Rock Samples: Granite, Basalt, Lime Stones, Sandstone, quartzite, and marble.

Exercise-2: Extraction and interpretation of Geomorphic information from Topographicalmaps

Exercise-3: Preparation of contour map from toposheet, Construction of Relief Profiles-serial, Super imposed, Projected & Composite.

Exercise-4: Slope Analysis - Slope Maps (Wentworth method) Slope calculation and conversion (isotan and isosin) and aspect maps & Hypsometric curve and integral

Exercise-5: Drainage Morphometry: delineation of watershed, stream ordering and Morphometric analysis: mean stream length, drainage density and drainage frequency. **Field Work**: Measurement of channel cross-sections in the field, Geomorphic map of channel bed, Study of erosional and depositional features in the field.

Case Study: students must be taken to observe local land formation and degradation and write areport on their effectiveness.

B.A. / BSc Semester 1

Title of the Course: GEOGOE T1.1 - 1. Introduction to Physical Geography

Number of Theory Credits	Number of lecture hours/ semester
3	42 - 45

Course Outcomes:

1. Students will be able to understand the fundamental concepts in Earth Sciences
2. Understands basic terminology used to describe physical processes and landscapeforms.
3. Describe elements of the atmosphere and the oceans

Course Objectives:

This course aims to

1. Study basic principles of the Earth Sciences
2. Understand the landforms, atmospheric elements and structure and basics ofoceanography

Content of Theory Course 1	42/45Hrs
Unit – 1	11
Origin, Shape and Size of the Earth, Movement of the Earth- Rotation and Revolution, Effects of the movement of Earth,Coordinates -Latitude, Longitude and Time. Structure of the Earth,	
Unit – 2	11
Rocks - types,significance, Weathering – types. Agents of Denudation - River, Glacier, Wind and Under Ground water. Volcanicity, Earthquakes and Tsunamis	
Unit – 3	11
Structure and Composition of Atmosphere,Weather and Climate. Atmospheric Temperature, Heat Budget of the atmosphere Atmospheric Pressure, Winds and Precipitation	
Unit – 4	12
Distribution of Land and Sea, Submarine Relief of the Ocean, Temperature and Salinity of Sea Water. Ocean Tides, Waves and Deposits, Ocean currents - Atlantic, Pacific and IndianOceans. Marine Resources: Biotic, mineral and energy resources	

References

1. B.S. Negi (1993) Physical Geography. S.J. Publication, Meerut
2. D.S. Lal (1998) Climatology. Chaitnya publishing house, Allahabad
3. K. Siddhartha (2001) Atmosphere, Weather and Climate. Kisalaya publication, NewDelhi
4. R.N. Tikka (2002) Physical Geography. Kedarnath Ramnath & co, Meerut.
5. Willian D. Thornbury (1997) Principle of Geomorphology. New Age International (PvtLtd.) New Delhi.

Pedagogy

Formative Assessment	
Assessment Occasion/type	**Weightage in Marks**
Quiz	30%
Assignment	20%
CIA	50%
Total	100%

B.A. / BSc Semester 1

Title of the Course: OE 1.1.2 Fundamentals of Remote Sensing

Code: GEOGOE T1.1.2

Number of Theory Credits	**Number of lecture hours/ semester**
3	**42 - 45**

Course Outcomes:

1. This course is to make understand the basic concepts of Remote Sensing and toimpart necessary skills of remote sensing analysis, and image interpretation to thestudents. So that, students acquire employable skills in remote sensing.
2. Students will learn how to handle and process the satellite images for understandingof biophysical phenomena of the earth system.

Course Objectives:

1. To congregate the basic concepts and fundamentals of physical principles of remotesensing
2. To create a firm basis for successful integration of remote sensing in any field ofapplication.
3. To study basics of digital image processing and image interpretation techniques.
4. To study the applications of the remote sensing to solve the real-world problems.

Content of Theory Course 1	**52/56Hrs**
Unit – 1 Introduction	11
Definition of Remote Sensing, developmental stages, Laws of Physics, electromagnetic waves, spectrum, regions, wavelength, frequencies, and applications. Types-Satellites, Sensors, Payloads, Orbits, telemetry of satellites.	
Process and types of Remote Sensing	11
Process of remote sensing, interaction of radiation with atmosphere and targets, atmospheric noises, attenuation in radiance, resolutions of remote sensing, optical remote sensing, visible region of the spectrum, thermal remote sensing, microwaveremote sensing, Hyperspectral remote sensing, LiDAR, and other remote sensing Platforms.	

Unit – 3 Image Classification and Interpretation	11
Satellite products and its spectral characteristics, composite images, band ratios; Land use land cover classification schemes-Anderson and NRSC; Visual image interpretation, elements, stages of interpretation and interpretation keys. Image classification- supervised, unsupervised, and principal component analysis (PCA) and accuracy assessment.	
Unit – 4 Applications of Remote Sensing	12
Disaster Management, Meteorological Studies, Agricultural and Irrigation Studies, Forestry Studies, Hydrological Studies, Natural Resource, Oceanic and Coastal mapping, Soil resource mapping, Urban and Rural Mapping and Management.	

References

1. Image processing and GIS for remote sensing: techniques and applications; Second Edition (2016) - Liu, Jian-Guo, Mason, Philippa J
2. Introduction to Remote Sensing and Image Interpretation (2003); Lillesand T.M.
3. Introduction to Remote Sensing, Fifth Edition (2011); James B. Campbell, Randolph H.Wynne
4. Introductory Digital Image Processing: A Remote Sensing Perspective, Fourth Edition(2015) - John R. Jensen
5. Practical handbook of remote sensing, First Edition (2016) - Lavender, Andrew, Lavender, Samantha
6. Remote Sensing and GIS, Second Edition (2011), Bhatta, B.
7. Remote sensing and image interpretation (2015); Chipman, Jonathan W., Kiefer, Ralph W., Lillesand
8. Remote Sensing of the Environment: An Earth Resource Perspective (Prentice HallSeries in Geographic Information Science) - Second Edition (2006), John Jensen

1. https://onlinecourses.nptel.ac.in/noc19_ce41/preview

Pedagogy

Formative Assessment	
Assessment Occasion/type	**Weightage in Marks**
Quiz	30%
Assignment	20%
CIA	50%
Total	100%

B.A. / BSc Semester 2

Title of the Course: Introduction to

Climatology CODE: GEOGDSC T2.1

Number of Theory Credits	Number of lecture hours/ semester	Number of practical Credits	Number of practical hours/ semesters
4	52 or 56	2	52 or 56

Course Outcomes:

After the completion of this course, students should be able to

1. define the field of climatology and to understand the atmospheric composition and structure.
2. to outline the mechanism and process of solar radiation transfer to earth surface and toex- plain the temperature distribution and variation according to time and space.
3. to illustrate and explain the air pressure system, wind regulating forces and the formationof the Atmospheric Disturbance.
4. to understand and compute the air humidity as well as to explain the process of Condensation and formation of precipitation and its types.

Course Objectives:

This course aims to:

1. to define the field of climatology and components of the climate system
2. to introduce various dimensions of climatology like structure and composition.
3. to understand the global atmospheric pressure, temperature, and wind system.
4. to study the concept of atmospheric moisture and its types

Content of Theory Course 1	52/56Hrs
Unit – 1 Composition and Structure of the Atmosphere	14
Nature and Scope of Climatology, Atmospheric Sciences; Climatology and Meteorology Origin and structure of the Atmosphere: Troposphere, Stratosphere, Mesosphere, Ionosphere, Exosphere and their characteristics. Composition of the atmosphere Weather and Climate	
Unit – 2 Atmospheric Temperature	14
Insolation: Definition, Mechanism, Solar Constant. Factors affecting the Insolation: Angle of incidence, length of the day, Sunspots,Distance between the earth and the sun, effect of the atmosphere. Heating and cooling process of the atmosphere-Radiation, Conduction,convection, and advection. Temperature: meaning and Influencing Factors on the Distribution ofTemperature Distribution of the temperature: Vertical, Horizontal, and Inversion of temperature. Global Energy Budget: Incoming shortwave solar radiation, Outgoing Longwave Terrestrial radiation, Albedo. Net Radiation and Latitudinal Heat Balances.	
Unit – 3 Atmospheric Pressure and Winds	14

Atmospheric Pressure: Influencing factors on atmospheric pressure.Vertical and Horizontal Distribution of the atmospheric pressure and Pressure Belts, Pressure Gradient. Tri-cellular-Hadley, Ferrel's and Polar Cells. Winds: influencing factors, Types - planetary, seasonal, local wind Variable winds-Cyclones and anti-cyclones. Air-Masses and Fronts: Definition, Nature, Source Regions, Classification.	
Unit – 4 Atmospheric Moisture	14
Humidity: Sources, influencing factors and types-Absolute, Relative and Specific. Hydrological cycle: process of evaporation, condensation. Clouds and its types Precipitation and its forms. Climate Change: Causes and consequences, recent issues-floods, drought,	

References

1. Lal, D. S. (1998). Climatology. Allahabad: Chaitanya Publishing House.
2. P Mallappa, Physical Geography (Kannada Version)
3. Ranganath Principles of Physical Geography (Kannada Version)
4. Nanjannavar S S: Physical Geography (Kannada Version)
5. Hugar M R Physical Geography part 1(Kannada Version)
6. Goudar M B, Physical Geography (Kannada Version)
7. Kolhapure and S S Nanjan, Physical Geography (Kannada Version)
8. Lutgens, Frederic K. & Tarbuck, Edward J. (2010). The Atmosphere: An Introductionto Meteorology. New Jersey: Pearson Prentice Hall.
9. Oliver, John E. & Hidore, John J. (2003). Climatology: An Atmospheric Science.Delhi: Pearson Education.
10. Singh, S. (2005). Climatology. Allahabad: Prayag Pustak Bhawan.
11. Barry, R.G. and Chorley, R.J. (2003): Atmosphere, Weather and Climate; Psychology Press, Hove; East Sussex.
12. Critchfield, H.J., (1975): general Climatology, Prentice Hall, New Jersey.
13. Mather,J.R.(1974): Climatology: Fundamentals and Applications; Mc Craw Hill BookCo., U.S.A.
14. Rumney, G.R. (1968): Climatology and the World Climates, Macmillan, London.
15. Trewartha, G.T. (1980): An Introduction to Climate; McGraw Hill, New York, 5thedition, (International Student Edition)

Reference Websites

1. https://earthobservatory.nasa.gov/
2. https://mausam.imd.gov.in/
3. https://www.weatheronline.in/
4. https://earthexplorer.usgs.gov/
5. https://www.nhc.noaa.gov/satellite.php

Pedagogy

Formative Assessment	
Assessment Occasion/type	**Weightage in Marks**
Quiz	30%
Assignment	20%
CIA	50%
Total	100%

GEOGDSC P2.1- **Climatology Practical CREDITS: 2**

Content of Practical Course 1: List of Experiments to be conducted

Conduct all exercises with Goal, Procedure, devices, and findings.

Exercise 1: Understanding Structure and functions of the Indian Meteorological Department (IMD).

Exercise 2: Collection of climatic data from IMD website.

https://mausam.imd.gov.in/bengaluru/

Exercise 3: Plotting of downloaded climatic data using graphical methods-

Elementary Instrumental Observation:

Exercise 4: Centigrade and Fahrenheit thermometer for measuring temperature.

Exercise 5: Mercurial Barometer and Aneroid Barometer for measuring atmosphericpressure

Exercise 6: Wind Vane and cup-anemometer.

Exercise 7: Wet and Dry bulb thermometer for measuring humidity

Exercise 8: Rainguage- Dial type for measuring rainfall Exercise 3: Rainfall Trend Analysis.

Exercise 9: Interpretation of Indian Daily Weather charts.

Exercise 10: Deriving water balance chart, Actual and potential evapotranspiration

Note: Students are expected to download weather charts of the four seasons.

B.A. / BSc Semester 2

Title of the Course: 1 Introduction to Human Geography CODE: GEOGOE T2.1.1

Number of Theory Credits	Number of lecture hours/ semester
3	42 - 45

Course Outcomes:

1. Students will learn how human, physical, and environmental components of theworld interact.
2. Students will be familiarized with economic processes such as globalization, tradeand their impacts on economic, cultural and social activities.
3. The student will describe what geography and human geography are.
4. Understand population dynamics and migration.

Course Objectives:

This course aims to

1. Understand the basics concepts of human geography
2. Study population attributes and dynamic nature of it
3. Introduce economic, cultural, and trade activities and their impact on thedevelopment of the region

Content of Theory Course 1	45Hrs
Unit – 1 Introduction to Human Geography	11
Nature and scope, Development Environmental Determinism and Possiblism, Neo determinism (stop and godeterminism) Approaches to human geography: Exploration and Descriptive approach, regionalanalysis Approach, Areal Differentiation Approach, Spatial organization Approach.Modern approaches: Welfare or Humanistic Approach, Radical Approach, Behavioral Approach, Post Modernism in geography Fields and sub fields in Human geography	
Unit – 2 Geographical Analysis of Population	11
Distribution and Growth of Population Density of population: meaning and Types: Arithmetic Density and PhysiologicalDensity. Regional distribution of Density of Population. Population Movement: Migration, Raventein's Law of Migration, Factors of population Migration, Economic Push and Pull factors, Cultural Push and Pull Factors, Environmental Push and Pull Factors. Migration Types: Immigration and Emigration, Internal and International Migration	
Unit – 3 Cultural Patterns and Processes	11
Concept of Culture, Material and Non material culture Cultural Regions, cultural Traits and Complexes, cultural Hearths, cultural Diffusion. Languages of the World: Types, Classification and Distribution. Religions: Types and Classification. Distribution. Universalizing Religions: Christianity, Islam, Buddhism. Ethnic Religions: Hinduism, the Chinese religion, Shintoism, Judaism. The Major tribal population of the world.	

Unit – 4 Human Economic Activities, Development and Settlements	12
Primary Economic Activities – Agriculture, Types: Primitive Subsistence, Intensive subsistence, Plantation Agriculture, Extensive Commercial grain cultivation, MixedFarming, Dairy Farming Secondary Activities: Manufacturing, classification – based on size – Small Scale and Large scale. Based on Raw material – Argo-based, Mineral based,Chemical Based and Forest based. Industrial Regions of the world. Tertiary Activities: Types: Trade and commerce, Retail Trading services, Wholesaletrading. Transport and communications: Factors, communication services – Telecommunication. Services: Informal and Non formal sector. Information technology and service. Human Settlements: Factors, Classification, Types and Patterns: Rural, Urban. Compact or Nucleated and Dispersed settlements. Rural settlement Patterns: linear,rectangular, circular, star shaped, T shaped.	

References

1. Hartshorne, T. A., & Alexander, J. W. (2010). Economic Geography. New Delhi: PHI Learning.
2. Knox, P., Agnew, J., & McCarthy, L. (2008). The Geography of the World Economy. London: Hodder Arnold.
3. Lloyd, P., & Dicken, B. (1972). Location in Space: A Theoretical Approach to Economic Geography. New York: Harper and Row.
4. Siddhartha, K. (2000). Economic Geography: Theories, Process and Patterns, NewDelhi: Kisalaya Publications.
5. Smith, D. M. (1971). Industrial Location: An Economic Geographical Analysis, NewYork: John Wiley and Sons.

Pedagogy

Formative Assessment	
Assessment Occasion/type	**Weightage in Marks**
Quiz	30%
Assignment	20%
CIA	50%
Total	100%

B.A. / BSc Semester 2

Title of the Course: 2. Basics of Geographic Information Systems (GIS)
CODE: GEOGOE T2.1.2

Number of Theory Credits	Number of lecture hours/ semester
3	39 or 42

Course Outcomes:

1. Students are trained to adapt the theoretical concepts in a practical way through the mathematical models of geography.
2. Students will have the hands-on training on various modes of spatial and non-spatialdata collection, data storage, data analytics, data interpretation and data display through the thematic maps.
3. Students are exposed on spatial thinking to solve the geographical problems withrange of proven mathematical and statistical models.
4. Students can employ in various corporate and government organisation where theydeal to solve geographical problems.

Course Objectives:

This course aims to:

1. Understand the concept and techniques of the Geographic Information Systems.
2. Define the GIS data types and structures.
3. Study geo processing and visualization concepts and techniques in GIS.

Content of Theory Course 1	52/56Hrs
Unit – 1 Introduction	10
Emergence of GI Science, Milestone and Developmental stages in GIS, Definition, scope, role of GIS in digital world; Components, functionalities, merits and demerits, global market, interdisciplinary domains, and its integration with GIS.	
Unit – 2 Geodesy and Spatial Mathematics	10
Cartesian coordinates, latitude, longitudes, formats of angular units, geographical coordinates, Datum: WGS84, vs NAD32. UTM, Aerial Distance measurement using Geographic and projected coordinates, Area, Perimeter, length by coordinates andvarious international measures.	
Unit – 3 GIS Data and Scale	10
Spatial Data and its structures; sources and types of data collection; data errors, topology of data and relationship. Large Scale vs Small Scale, generalization; precision and accuracy of data-logical consistency and non-spatial data integration	
Unit – 4 Geoprocessing and Visualization	12
Spatial and Non-Spatial Queries, proximity analysis, Preparation of Terrain andSurface models. Hotspot and density mapping. Types of maps, thematic maps and Its types, relief maps, flow maps and cartograms. Tabulations: Graphs and Pivottables	

References

1. An Introduction to Geographical Information Systems - Ian Heywood (2011)
2. Geographic Information Systems and Cartographic Modelling - Tomlin, C.D. (1990)
3. Geographic Information Systems and Environmental Modelling - Clarke, C., K. (2002)
4. Geographic Information Systems and Science - Paul A. Longley, et. al. (2015)
5. Geographic Information Systems: A Management Perspective - Aronoff, S. (1989)
6. GIS - Fundamentals, Applications, and Implementations - Elangovan, K. (2006)
7. Introduction to Geographical Information Systems - Chang, Kang-Tsung (2015)
8. Mathematical Modeling in Geographical Information System, Global PositioningSystem and Digital Cartography - Sharma, H.S. (2006)
9. Remote Sensing and GIS - Bhatta, B. (2011)
10. Spatial analysis and Location-Allocation Models - Ghosh, A. and G. Rushton (1987)

Reference Websites

1. IIRS MOOC programme: https://isat.iirs.gov.in/mooc.php
2. ITC Netherlands, Principles of GIS https://webapps.itc.utwente.nl/librarywww/papers_2009/general/principlesgis.pdf
3. Geographical Information Systems: Principles, Techniques, Management and Applications https://www.geos.ed.ac.uk/~gisteac/gis_book_abridged/

Pedagogy

Formative Assessment	
Assessment Occasion/type	**Weightage in Marks**
Quiz	30%
Assignment	20%
CIA	50%
Total	100%

CBCS SCEME

B.A III Semester Core Course (Paper – III)

(For Students admitted in 2017-18 and onwards)

Teaching hours: 8hrs (theory 4hrs + Practical 4hrs)

Credit 4:0:2 Total 6 credits

60 Hrs lectures

3. General Cartography

1. Evolution of cartography – Traditional and Digital 06
3. Maps – Types, Elements and Uses 09
4. Map Scale – Types and Application, Reading Distances on a Map. 10
5. Map projection- Meaning, Types, Importance and uses 15
6. Representation of Data – Symbols, Dots, Choropleth, Isopleth and Flow Diagrams, Interpretation of Thematic Maps. 20

Note: This paper is not a practical paper, and the objective is to give basic information about various tools and techniques used in making maps. Students will not be involved in any laboratory work or hands on exercises, though a few demonstrations in the laboratories by teachers are recommended.

Reading List

1. Dent B. D., 1999: *Cartography: Thematic Map Design*, (Vol. 1), McGraw Hill.
2. Gupta K. K and Tyagi V. C., 1992: *Working with Maps*, Survey of India, DST, New Delhi.
3. Mishra R. P. and Ramesh A., 1989: *Fundamentals of Cartography*, Concept Publishing.
4. Robinson A., 1953: *Elements of Cartography*, John Wiley.
5. Sharma J. P., 2010: *Prayogic Bhugol*, Rastogi Publishers.
6. Singh R. L. and Singh R. P. B., 1999: *Elements of Practical Geography*, Kalyani Publishers
7. Singh R. L., 1998: *Prayogic Bhoogol Rooprekha*, Kalyani Publications.
8. Steers J. A., 1965: *An Introduction to the Study of Map Projections*, University of London.

III SEMESTER
Practical Paper – III
MAP PROJECTION

Unit	Topic	Total teaching hours: 60
Unit I	**Cylindrical Map Projections:** 1. Simple cylindrical projection 2. Cylindrical Equal- area projection 3. Mercator's projection	**25**
Unit II	**Conical Map projections** 1. Simple Conical projection 2. Bonne's projection 3. Polyconic projection	**10**
Unit III	**Zenithal map projections (Polar Case)** 1. Zenithal Equal -distant. 2. Zenithal Equal – area 3. Zenithal Gnomonic 4. Zenithal Stereographic	**25**

Note: The above map projections should be constructed with exercises, properties and uses.

References:

1. Salar Massod. M. : Map Projections, Roa and Raghavam Co., Mysore.
2. Ranganath & Mallappa : Map Projections (kan version), Chetana Book House, Mysore.
3. Erwin Raisz : General Cartography; Mc Graw- Hill book company Inc.
4. Singh R L : Elements of Practical Geography, Student's Friends, Allahbad.
5. George P Kellaway : Methuen & Co. , Ltd., London.
6. Gopal Singh : Mapwork & Practical Geography, Surjeet Book Depot, New Dehli.

B.A IV Semester Core Course(Paper – IV)
(For Students admitted in 2017-18 and onwards)

Teaching hours : 8hrs (theory 4hrs + Practical 4hrs)
Credit 4:0:2 Total 6 credits

Environmental Geography

60 Hrs lectures

1. Meaning and importance of Environmental Geography, Concepts and Approaches; Ecosystem – Structure, Functions. 15
2. Human-Environment Relationship in Equatorial, Desert, Mountain and Coastal Regions. 15
3. Environmental Problems and Management: Air Pollution; Biodiversity Loss; Solid and Liquid Waste. 16
4. Environmental Programmes and Policies: Developed Countries; Developing Countries, with special reference to India. 14

Reading List

1. Casper J.K. (2010) Changing Ecosystems: Effects of Global Warming. Infobase Pub. New York.
2. Hudson, T. (2011) Living with Earth: An Introduction to Environmental Geology, PHI Learning Private Limited, New Delhi.
3. Miller, G.T. (2007) Living in the Environment: Principles, Connections, and Solutions, Brooks/ Cole Cengage Learning, Belmont.
4. Singh, R.B. (1993) Environmental Geography, Heritage Publishers, New Delhi.
5. UNEP (2007) Global Environment Outlook: GEO4: Environment For Development, United Nations Environment Programme. University Press, Cambridge.
6. Wright R. T. and Boorse, D. F. (2010) Toward a Sustainable Future, PHI Learning Pvt Ltd, New Delhi.
7. Singh, R.B. and Hietala, R. (Eds.) (2014) Livelihood security in Northwestern Himalaya: Case studies from changing socio-economic environments in Himachal Pradesh, India. Advances in Geographical and Environmental Studies, Springer
8. Singh, Savindra 2001. *Paryavaran Bhugol,* Prayag Pustak Bhawan, Allahabad. (in Hindi)
9. L.T Nayak – Environmental Geography(in Kannada)
10. Dr.Ranganath - Environmental Studies(in Kannada)

IV SEMESTER
Practical Paper – IV

APPLICATIONS OF STATISTICAL METHODS IN GEOGRAPHY

Unit	Topic	Total teaching hours: 60
1.	a). Methods of data collection – Primary and secondary sources, census and sampling methods. b) . Measures of Central Tendency: Direct and shortcut Methods- a)Arithmetic mean b) Median c) Mode (Grouping and formula)	35
2.	a). Measures of dispersion – Mean and standard deviations b). Measures of association correlation c). Time series analysis	25

References:

1. Singh R. L. : Elements of Practical Geography
2. Gopal Singh : Map Work and Practical Geography
3. Misra R. P. : Fundamentals of Cartography
4. Zamir Alvi : Statistical Geography, Methods and Applications.
5. Aslam Mahmood : Statistical Methods in Geography.
6. Ashis Sarkar : Practical Geography, Orient Longman, Kolkata.
7. Dr. C K Renukarya : Basic statistics (Kan & Eng Version)

Discipline Specific Elective Papers (2 Compulsory Papers)

B.A V Semester DSE-I (Paper – V)

(For Students admitted in 2017-18 and onwards)

Teaching hours theory 4hrs Practical 4hrs

Credit 4:0:2 Total 6 credits

1. Geography of India

1. Physical Setting – Location, Structure and Relief, Drainage, Climate. 14
2. Population – Size and Growth since 1901, Population Density and Distribution, Literacy, Sex Ratio. 10
3. Settlement System – Types – Rural and urban, Patterns of Settlements 10
4. Resource Base –Livestock (cattle & fisheries),Power (Coal,& hydroelectricity) Minerals (iron ore and bauxite). 10
5. Economy – Agriculture (Rice, Wheat, Sugarcane, Groundnut, Cotton); Industries (Cotton Textile, Iron-Steel, Automobile), Transportation Modes (Road and Rail). 16

Reading List

1. Hussain M., 1992: G*eography of India*, Tata McGraw Hill Education.
2. Mamoria C. B., 1980: *Economic and Commercial* G*eography of India*, Shiva Lal Agarwala.
3. Miller F. P., Vandome A. F. and McBrewster J., 2009: *Geography of India: Indo- Gangetic Plain, Thar Desert, Major Rivers of India, Climate of India, Geology of India*, Alphascript Publishing.
2. Nag P. and Sengupta S., 1992: G*eography of India*, Concept Publishing.
3. Pichamuthu C. S., 1967: *Physical Geography of India*, National Book Trust.
4. Sharma T. C. and Coutinho O., 1997: *Economic and Commercial* G*eography of India*, Vikas Publishing.
7. Singh Gopal, 1976: *A* G*eography of India*, Atma Ram.
8. Spate O. H. K. and Learmonth A. T. A., 1967: *India and Pakistan: A General and Regional Geography*, Methuen.
9. Rana, Tejbir Singh, 2015, Diversity of India , R.K. Books, Delhi.

V SEMESTER
Practical Paper – V
FUNDAMENTALS OF G.I.S

Unit Topic Total teaching hours: 60

Unit 1 a) Meaning, definitions, components and importance of GIS 20
b) Spatial entities – Point, line and polygon
Sources of spatial data- Census, Topographical Maps, Aerial Photographs and Satellite Imageries

Unit 2 a) Spatial Data Structure 20
- Raster and vector data Structures
Linking spatial and non spatial data
b) Introduction to MapInfo software

Unit 3 20
a) Geo – referencing , Choice of map projection
b) Digitization
c) Attaching attribute data (Creating data base)
d) Editing
e) Map layout
f) Thematic map

References:

1. Burrough P.A. : Geographical Information Systems for Land Resources
2. Maguire D. J. : Computers in Geography
3. Star J. C and J.E. : Geographic Information Systems
4. Internet : GIS. Development
5. Heywood : Introduction to GIS, 2002.
6. Mahesh : Introduction to GSI Shivalingappa Chandrashekar

Discipline Specific Elective Papers (2 Compulsory Papers)

B.A VI Semester DSE-II (Paper – VII)

(For Students admitted in 2017-18 and onwards)

Teaching hours theory 4hrs Practical 4hrs

Credit 4:0:2 Total 6 credits

4. Geography of Tourism

1. Concepts, Nature and Scope; Inter-Relationships of Tourism, Recreation and Leisure; Geographical Parameters of Tourism by Robinson. 12

2. Type of Tourism: Nature Tourism, Cultural Tourism, Medical Tourism, Pilgrimage 14

3. Recent Trends of Tourism: International and Regional; Domestic (India); Eco- Tourism, Sustainable Tourism, Meetings, Incentives, Conventions and Exhibitions (MICE), Carrying capacity of Tourism 14

4. Impact of Tourism: Economy; Environment; Society 10

5. Tourism in India: Tourism Infrastructure; Case Studies of Himalaya, Desert and Coastal and Heritage; National Tourism Policy 10

Reading List

1. Dhar, P.N. (2006) International Tourism: Emerging Challenges and Future Prospects. Kanishka, New Delhi.
2. Hall, M. and Stephen, P. (2006) Geography of Tourism and Recreation – Environment, Place and Space, Routledge, London.
3. Kamra, K. K. and Chand, M. (2007) Basics of Tourism: Theory, Operation and Practise, Kanishka Publishers, Pune.
4. Page, S. J. (2011) Tourism Management: An Introduction, Butterworth- Heinemann- USA. Chapter 2.
5. Raj, R. and Nigel, D. (2007) Morpeth Religious Tourism and Pilgrimage Festivals Management: An International perspective by, CABI, Cambridge, USA, www.cabi.org.
6. Tourism Recreation and Research Journal, Center for Tourism Research and Development, Lucknow
5. Singh Jagbir (2014) "Eco-Tourism" Published by - I.K. International Pvt. Ltd. S-25, Green Park Extension, Uphaar Cinema Market, New Delhi, India(www.ikbooks.com).

VI SEMESTER
Practical Paper – VI
COMPUTER MAPPING AND GPS SURVEYING

Unit	Topic	Total teaching hours: 60
1.	Introduction to Computer : Generation of Computers, Hardware and Software Components	20
2.	Computer graphics : Creating Data base in computer, creation of Line, Bar and Pie diagrams. Thematic Maps - Choro chromatic and schematic Maps	20
3.	GPS Surveying: Concepts, Segments and applications, plotting way points by using map source software .	20
4.	Tour report / Factory visit	

References:

1. Singh L.R. : Fundamentals of Practical Geography, Sharadha Pustaka Bhavan, Alahabad, 2006
2. Dr. M.A. Siddaqui : Introduction to Geographical Information System, Sharadha Pustaka Bhavan, Alahabad, 2006
3. Chang : Introduction to GIS, Tata McGraw Hill W, New Delhi.

Skill Enhancement Course (2 Compulsory Papers)

B.A V Semester SEC –I (Paper – VI)

(For Students admitted in 2017-18 and onwards)

Teaching hours theory 4hrs

Credit 4:0:0 Total 4 credits

1. Regional Planning and Development

1. Concept, Need and Types of Regional Planning. 8
2. Characteristics and Delineation of Planning Region. 10
3. Regionalization of India for Planning (Agro Ecological Zones). 12
4. Models for Regional Planning: Growth Pole Theory; Core Periphery Model and Growth Foci Concept in Indian Context. 15
5. Backward Regions and Regional Plans- Special Area Development Plans in India; DVC-The Success Story and the Failures; NITI Aayog. 15

Reading List

1. Blij H. J. De, 1971: *Geography: Regions and Concepts*, John Wiley and Sons.
2. Claval P.l, 1998: *An Introduction to Regional Geography*, Blackwell Publishers, Oxford and Massachusetts.
3. Friedmann J. and Alonso W. (1975): *Regional Policy - Readings in Theory and Applications*, MIT Press, Massachusetts.
4. Gore C. G., 1984: *Regions in Question: Space, Development Theory and Regional Policy*, Methuen, London.
5. Gore C. G., Köhler G., Reich U-P. and Ziesemer T., 1996: *Questioning Development; Essays on the Theory, Policies and Practice of Development Intervention*, Metropolis- Verlag, Marburg.
6. Haynes J., 2008: *Development Studies*, Polity Short Introduction Series.
7. Johnson E. A. J., 1970: *The Organization of Space in Developing Countries*, MIT Press, Massachusetts.
8. Peet R., 1999: *Theories of Development*, The Guilford Press, New York.
9. UNDP 2001-04: *Human Development Report,* Oxford University Press.
10. World Bank 2001-05: *World Development Report,* Oxford University Press, New

Skill Enhancement Course (2 Compulsory Papers)

B.A VI Semester SEC- II (Paper – VIII)

(For Students admitted in 2017-18 and onwards)

Teaching hours theory 4hrs

Credit 4:0:0 Total 4 credits

4. Field Techniques and Survey based Project Report

1. Field Work in Geographical Studies – Role, Value and Ethics of Field-Work. 10
2. Defining the Field and Identifying the Case Study – Rural /Urban /Physical /Human /Environmental. 10
3. Field Techniques – Merits, Demerits and Selection of the Appropriate Technique; Observation (Participant / Non Participant). 12
4. Questionnaires (Open/ Closed / Structured / Non-Structured); Interview with Special Focus on Focused Group Discussions; Space Survey (Transects and Quadrants, Constructing a Sketch). 16
5. Designing the Field Report – Aims and Objectives, Methodology, Analysis, Interpretation and Writing the Report. 12

Practical Record

1. Each student will prepare an individual report based on primary and secondary data collected during field work.
2. The duration of the field work should not exceed 10 days.
3. The word count of the report should be about **8000 to 12,000** excluding figures, tables, photographs, maps, references and appendices.
4. One copy of the report on A 4 size paper should be submitted in soft binding.

Reading List

1. Creswell J., 1994: *Research Design: Qualitative and Quantitative Approaches* Sage Publications.
2. Dikshit, R. D. 2003. The Art and Science of Geography: Integrated Readings. Prentice-Hall of India, New Delhi.
3. Evans M., 1988: "Participant Observation: The Researcher as Research Tool" in *Qualitative Methods in Human Geography*, eds. J. Eyles and D. Smith, Polity.
4. Mukherjee, Neela 1993. Participatory Rural Appraisal: Methodology and Application. Concept Publs. Co., New Delhi.
5. Mukherjee, Neela 2002. Participatory Learning and Action: with 100 Field Methods. Concept Publs. Co., New Delhi
6. Robinson A., 1998: "*Thinking Straight and Writing That Way*", in *Writing Empirical Research Reports: A Basic Guide for Students of the Social and Behavioural Sciences*, eds. by F. Pryczak and R. Bruce Pryczak, Publishing: Los Angeles.
7. Special Issue on "Doing Fieldwork" *The Geographical Review* 91:1-2 (2001).
8. Stoddard R. H., 1982: *Field Techniques and Research Methods in Geography*, Kendall/Hunt.
9. Wolcott, H. 1995. The Art of Fieldwork. Alta Mira Press, Walnut Creek, CA.

DEPARTMENT OF GEOGRAPHY

MODEL QUESTION PAPER FOR CBCS SCHEME

B.A GEOGRAPHY

(For I,II,III,IV,V AND VI semesters)

Time : 3 Hours **Max. Marks : 70**

Part-A

I. Answer any five of the following questions. **5x2=10**

1)……
2)……
3)……
4)……
5)……
6)……
7)……

Part-B

II. Answer any Six of the following questions. **6x5=30**

8)……
9)……
10)……
11)……
12)……
13)……
14)……
15)……

Part –C

III. Answer any Three of the following questions. **3x10=30**

16)……
17)……
18)……
19)……
20)……

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE, OOTY ROAD, MYSURU-25

(AUTONOMOUS)

DEPARTMENT OF HINDI

LANGUAGE - HINDI

SYLLABUS

CBCS

2017-2020

SCHEME OF STUDY & ASSESSMENT

B-COM/BBA/BCA
CBCS

Programme: Bachelor of Commerce
Programme: Bachelor of Business Administration
Programme: Bachelor of Computer Application

Semester	Course Title	Course code	No of credits L: T: P:	Assessment				Duration of Exam
				C1	C 2	C3	TO	
I	Hindi Kahani aur Vyakarna	DNA 05001 BDA 05001 DCA 05001	2 : 1 : 0	15	15	70	100	03
II	Hindi Gadya aur Vyakarna	DNB 05001 BDB 05001 DCB 05001	2 : 1 : 0	15	15	70	100	03
III	Hindi Kavya aur Anuvada Paribhashik Shabdavali	DNC 05001 BDC05001 DCC 050001	2 : 1 : 0	15	15	70	100	03
IV	Hindi Upanyas Tatha Vanijya Hindi	DND 05001 BDD05001 DCD 05001	2 : 1 : 0	15	15	70	100	03

B-COM
CBCS AE

Semester	Course Title	Course code	No of credits L: T: P	Assessment				Duration of Exam
				C1	C 2	C3	TO	
III	**Communicative Hindi**	DNC 30001	2 : 0 : 0	15	15	50	80	02

Programme Outcome for Bachelor of Commerce, Bachelor of Business Administration, Bachelor of Computer Applications

After the completion of the graduation students are:

PO1: Motivated for higher education.

PO2: Able to write resume, application and business letters

PO3: Able to write and communicate effectively.

Programme Specific Outcome for Bachelor of Commerce, Bachelor of Business Administration, Bachelor of Computer Applications

After the completion of the graduation students are:

PSO1: Able to write and communicate effectively.

PSO2: Able to avail job opportunity in translation.

DNA 05001 /BDA 05001 /DCA 05001

I Semester
Language Hindi
Kahani aur Vyakarna

60hrs (4hrs/week) 3 Credits

Course out come

After successful completion of this course students are able to
CO1.Deliberate in detail, short stores of 20th century
CO2. Deliberate in detail, Bade bhahe Sahab by Premchand
CO3. Understand the classification and characteristics of Akasha deep by Jayashankar Prasada
CO4. Understand with application, details of Hindi vyakaran

UNIT A & B Saat Shrest Kahaniyan

1. Bade bhai Saheb
2. Aakasha Beep
3. Chif ke Davath
4. Sabachar ka Thavej
5. Jalathe Huha Daine
6 .Fas ke edar udar
7. Jahar

UNIT C Hindi Vyakaran

Portions Prescribed:

1) Vyakaran ka samanya parichay
2) Varnamala : Swaron ka vargeekaran, vyanjanon ka vargeekaran
3) Shabdabhed; a) Vyuthpatthi ki dristi se
   b) Uthpatthi ki drishti se
   c) Roopantar ki drishti se
4) Sandhi : Paribhasha aur bhed
5) Sangya : Paribhasha aur bhed
6) Sangya ke roopantar:
   a) Ling - Paribhasha aur bhed – Ling Nirnay ke niyam
      Ling parivarthan ke niyam
   b) Vachan – Paribhasha aur bhed – Vachan parivarthan ke niyam
   c) Karak – Paribhasha aur bhed
7) Sarvanaam : Paribhasha aur bhed
8) Visheshan – Paribhasha aur bhed

Reference

1) Saral Hindi Vyakaran –Pb. Prabhath Prakashan, # 4/19, Asaf Ali road,New Delhi-02
2) Parishkrith Hindi Vyakaran - Badarinath Kapur
3) Abhinav Hindi Vyakaran - Prof. N.Nagappa, Pb. Rajpal &sons, New Delhi
4) Shikshaarthi Hindi Vyakaran - Prof. N.Nagappa, Pb. Rajpal &sons, New Delhi
5) Sankshipta Hindi Vyakaran - Kamatha prasad Guru, Nagari Pracharini Sabha, kaashi.
6) Vyavaharik Hindi Vyakaran Tatha Rachana –Dr. Hardev Bahari, Lokabharathi prakashan, Allahabad -1

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DNB 05001 /BDB050 01/DCB05001

II Semester
Language Hindi
Hindi Gadya aur Vyakarna

60hrs (4hrs/week) 3 Credits

Course out come

After successful completion of this course students are able to

CO1. Understand with application, details of Hindi vyakaran

CO2. Understand the details of Prose of 20th cenyury

CO3. Identify the classification and characteristics of Hindi vyakaran

UNIT A&B Sahitya sapthak (prescribed Lessons – 1,2,4,,7,8,11,13)

Judge ka peissla
Vapasi
Irsha tu na gayi meri man se
Mai Narak se Bol Raha hoon
Adyaksha Mahodaya
Girimitiyonke Desh Mei
Jab maa Ro Padi

UNIT C Hindi Vyakaran :

1) Kriya-Paribhasha aur bhed ,'NE–NiyaZm Kriya ke roopantar-Kaal, Vachya, Prayog , Arth
2) Kriya Visheshan - Paribhasha aur bhed
3) Sambandha boodhak avyay – Paribhasha aur bhed
4) Samucchaya boodhak avyay -- Paribhasha aur bhed
5) Vismayadi boodhak avyay --Paribhasha aur bhed
6) Upasarg aur Pratyay --Paribhasha aur bhed
7) Samas --Paribhasha aur bhed
8) Pad-parichay

Reference

1) Saral Hindi Vyakaran –Pb. Prabhath Prakashan, # 4/19, Asaf Ali road,New Delhi-02
2) Parishkrith Hindi Vyakaran - Badarinath Kapur
3) Abhinav Hindi Vyakaran - Prof. N.Nagappa, Pb. Rajpal &sons, New Delhi
4) Shikshaarthi Hindi Vyakaran - Prof. N.Nagappa, Pb. Rajpal &sons, New Delhi
5) Sankshipta Hindi Vyakaran - Kamatha prasad Guru, Nagari Pracharini Sabha, kaashi.
6) Vyavaharik Hindi Vyakaran Tatha Rachana –Dr. Hardev Bahari, Lokabharathi prakashan, Allahabad -1

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DNC05001 /BDC05001 /DCC05001

III Semester
Language Hindi
Hindi Kavya aur Anuvada Paribhashik Shabdavali

60hrs (4hrs/week) 3 Credits

Course out come

After successful completion of this course students are able to

CO1. Deliberate the classification and characteristics of medieval and modern hindi kavya
CO2:. Understand the details of Kaber by saakhe
CO3: Identify the characteristics of Hemala by ramadhare simha dinakar
CO4: Learn in depth preyatham by suryakanta threepati nirala
CO5: Understand the characteristics of Hindi Anuvada

UNIT A&B- KAVYAGANGA (Prescribed Lessons 1,2,5,8,11,12,13,14,16,19)

Kaber
Thulse Das
Bhihare Lal
Maithilisharan Gupta
Surya Kanth Tripathi Nirala
sumitranandan pant
Subhadra Kumari Chauhan
Ramkumar Verma
Ramdhari Simha Dinkar
Kuvempu

UNIT C -Anuvad tatha Paribhashik Shabdavali

Portions Prescribed :

1) Anuvad ki Paribhashayen , Adhunik jagat mein Anuvad ka mahatva Anuvadak kee Yogyathayen , Anuvad kala hai yaa vignan ?
2) Anuvad ke prakar:
3) Shabdanuvad
4) Bhavanuvad
5) Kavyanuvad
6) Saranuvad
7) Angreji / Kannad se Hindi me Anuvad – vice versa (passages)
8) Paribhashik Shabdavali

Reference

1) Anuvad Vignan – Bholanath Thiwari Pb. Shabdaker, Delhi -110092
2) Anuvad Kala Kuch Vichar –Anuvad Prakash Khemani , S.Chand & co. Delhi.

3) Anuvad Siddhant aur Samasyayen- R.N. Srivastava and K.K.Goswami
4) Alok Prakashan , Delhi Anuvad Patrika Ank, Pb. Anuvad Sahitya Parishad , New Delhi

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DND05001 /BDD05001 /DCD05001

IV Semester
Language Hindi

Hindi Upanyas Tatha Vanijya Hindi

60hrs (4hrs/wee 3 Credits

Course out come

After successful completion of this course students are able to

CO1:. Learn in details Novel-Gaban by Premchand
CO2:. Learn the classification and characteristics of Vanijya Hindi
CO3:. Learn the application of Vanijya Hindi

UNIT A&B - Gaban(sankshith)

UNIT C - Vanijya Hindi

Portions Prescribed :

1) a. Patra Vyavahar ka Samanya Parichay tatha Mahatva
   b. Patron ke prakar
2) Vyavasaik patra Vyavahar :
   a. Bank Sambandhi Patra
   b. Beema Sambandhi Patra
   c. Pooch-Taach Sambandhi Patra
   d. Shikayati Sambandhi Patra
   e. Naukari Sambandhi Patra
   f. Pari patra
   g. Agency Sambandhi Patra
3) Alekhan - Uttam Alekhan ke gun
4) Sampreshan - uske Prakar
5) Sankshiptikaran - Sankshipt Lekhan ke Pradhan gun aur udaaharan

Reference

1) Vyavasaik Sampreshan –Dr. Anup Chandra Bhayani Pb. Rajpal &sons, New Delhi-6
2) Karyalay Alekhan aur Tippan – Karnatak Mahila Hindi Seva Samithi, Chamarajpet,Bangalore.
3) Prashasanik Hindi – Ed. Ramdarash Mishra and amswaroop Shastry
4) Vanijya Patra Vyavahar,Anuvad,Nibandh tatha Sankshiptikaran – A V Narti, Gnanoday Prakashan , Dharwad.

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DNC 30001

II B-COM
III Semester
Language Hindi

Communicative Hindi

30hrs (2hrs/week) 2 Credits

Course out come

After successful completion of this course students are able to

CO1. Learn the details of Communicative Hindi

CO2. Identify in depth Communicative Hindi

CO3. Deliberate in depth Communicative Hindi

UNIT I : HINDI GRAMMAR

1) Parts of speech – A general outlook
2) Gender - a) Ling pehchanne ke niyam
   b) Ling parivarthan ke niyam
3) Synonymns and Antonymns
   a)Definition
   b)Difference

UNIT II : GENERAL COMMUNICATION AND PRACTICE

1) Conversation - in market, hotel , journey etc.
2) Conversation on health , education etc.
3) Practice.

Reference

1. Saral Hindi Vyakaran –Pb. Prabhath Prakashan, # 4/19, Asaf Ali road,New Delhi-02
2. Parishkrith Hindi Vyakaran - Badarinath Kapur
3. Abhinav Hindi Vyakaran - Prof. N.Nagappa, Pb. Rajpal &sons, New Delhi
4. Shikshaarthi Hindi Vyakaran - Prof. N.Nagappa, Pb. Rajpal &sons, New Delhi
5. Sankshipta Hindi Vyakaran - Kamatha prasad Guru, Nagari Pracharini Sabha, kaashi.
6. Anuvad Vignan - Bholanath Thiwari , Shabdakar , Delhi -92
7. Anuvad Kala – Kuch Vichar - Anandprakash Khemani , S.Chand & Co., Delhi
   Anuvad siddhant aur Samasyayen

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Model Question Paper

Language HINDI I ,II , & III SEMESTERS of B.COM / BBA / BCA

Time : 3 Hrs Max. Marks : 70

I) Total Main questions with internal choice on the prescribed text book 10 marks each 10 x 2 = 20

II) One Annotation question – three out of five on the prescribed text book 05 marks each 05 x 3 = 15

III) Two short answer questions with internal choice on Vyakaran /prayojan moolak Hindi / Anuvad as the case may be, 10 marks each 10 x 2 = 20

IV) 15 objective type questions on Vyakaran /prayojan moolak Hindi / Anuvad as the case may be, 01 mark each 01 x 15 = 15

MODEL QUESTION PAPER

Qn.1. ..... OR ..... 01 x 10 = 10

Qn.2. .....OR ..... 01 x 10 = 10

Qn. 3. Annotate three out of six 05 x03 =15

Qn.4. .....OR..... 01 x 10 = 10

Qn.5. .....OR..... 01 x 10 = 10

Qn.6. Objective type questions 01 x 15 =15

INTERNAL ASSESSMENT - 30 MARKS

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III SEMESTER - PAPER III

Communicative Hindi

MODEL QUESTION PAPER

TIME : 2HOURS **MAX. MARKS : 50**

Instructions: All sections are compulsory

UNIT-I: Hindi Grammar

I. . Answer The Following Questions in a sentence or a ward. 1 X 10 = 10

1).....2)..... 3).....4).....5).....

6).....7).....……8)…….9)……10)……..

II . Answer The Following Questions (Any four) 4 X 5 = 20

1).....2).....

3).....4).....

5)……6)……..

UNIT II : GENERAL COMMUNICATION AND PRACTICE 2 X 10 = 20

I . Answer The Following Questions (any two)

1..... 2.....

3..... 4.....

INTERNAL ASSESSMENT - 30 MARKS ,F-1 -15,F-2-15

SCHEME OF STUDY & ASSESSMENT
INSTRUCTION

BA CBCS

BAEG11/HP12/KG13/HE14/JE15

Semester	Course Title	Course code	No of credits L: T: P:	Assessment				Duration of Exam
				C1	C2	C 3	TO	
I	Hindi Gadya aur Vyakarna	DLA 05011 DLA 05012 DLA 05013 DLA 05014 DLA 05015	2 : 1 : 0:	15	15	70	100	03
II	Hindi Kahani aur Vyakarna	DLB 05011 DLB 05012 DLB 05013 DLB 05014 DLB 05015	2 : 1 : 0:	15	15	70	100	03
III	Hindi Nataka aur Vanjya Hindi	DLC 05011 DLC 05012 DLC 05013 DLC 05014 DLC 05015	2 : 1 : 0:	15	15	70	100	03
IV	Hindi Kavya aur Anuvada Paribhashik Shabdavali	DLD 05011 DLD 05012 DLD 05013 DLD 05014 DLD 05015	2 : 1 : 0:	15	15	70	100	03

BA
CBCS AECC

Semester	Course Title	Course code	No of credits L: T: P:	Assessment				Duration of Exam
				C1	C 2	C3	TO	
III	Communicative Hindi	DLC 30001	2 : 0 : 0:	15	15	50	80	02

SCHEME OF STUDY & ASSESSMENT
BA/BSc

Programme: BA-HE/HP/EG/KG/JE

Programme: BSc-PCM / PMCS / PMCm / PME /CZBT/BMBt /BBM / CBZ

Semester	Course Title	Course code	No of credits L: T: P	Assessment				Duration of Exam
				C1	C2	C 3	TO	
I	Hindi Gadya aur Vyakarna	CMA 05001	2 : 1 : 0	15	15	70	100	03
		CMA 05002						
		CMA 05003						
		CMA 05004						
		CMA 05005						
		CMA 05006						
		CMA 05007						
		CMA 05008						
II	Hindi Kahani aur Vyakarna	CMB 05001	2 : 1 : 0	15	15	70	100	03
		CMB 05002						
		CMB 05003						
		CMB 05004						
		CMB 05005						
		CMB 05006						
		CMB 05007						
		CMB 05008						
III	Hindi Nataka aur Vanjya Hindi	CMC 05001	2 : 1 : 0	15	15	70	100	03
		CMC 05002						
		CMC 05003						
		CMC 05004						
		CMC 05005						
		CMC 05006						
		CMC 05007						
		CMC 05008						
IV	Hindi Kavya aur Anuvada Paribhashik Shabdavali	CMD 05001	2 : 1 : 0	15	15	70	100	03
		CMD 05002						
		CMD 05003						
		CMD 05004						
		CMD 05005						
		CMD 05006						
		CMD 05007						
		CMD 05008						

Programme Outcome for Bachelor of Arts

After the completion of the graduation student are able to:

PO1: Understand culture and heritage

PO2: Manage business affairs

PO3: Create interest in literature

PO4: Report and edit public events effectively

PO5: Develop reading, writing, communication and reasoning skills

Programme Specific Outcome for Bachelor of Arts

After the completion of the Graduation Student are able to:

PSO1: Understand basic knowledge of Hindi grammar

PSO2: Understand the History of short stories and their relevance to society at large

PSO3: Avail job opportunity in translation

Programme Outcome for Bachelor of Science–PCM, PMCs, PMCm, PME, CZBt, BMBt, BBM, CBZ

Programme Outcome for Bachelor of Science

After the completion of the graduation student are able to:

PO1: Inculcate human values

PO2: Avail job opportunities in translation

PO3: Create interest in literature

Programme Specific Outcome for Bachelor of Science

After the completion of the graduation student are able to:

PSO1: Get information about the History ancient medieval and modern Hindi literature

PSO2: Develop research aptitude

DLA 05011 /12/13/14/15
CMA 05001/2/3/4/5/6/7/8

I Semester

Hindi Gadya aur Vyakarna

60hrs (4hrs/week**)** 3 Credits

Course out come

After successful completion of this course students are able to

CO1: Identify in details with examples prose of 20th century
CO2: Write down in depth prose of 20th century
CO3: Deliberate in depth prose of 20th century
CO4: Specify the classification and characteristics of Hindi vykaran
CO5: Identify the characteristics of Hindi vykaran

UNIT-A & B: Sahitya sapthak (prescribed Lessons – 1,2,4,,7,8,11,13)

Judge ka peissla
Vapasi
Irsha tu na gayi meri man se
Mai Narak se Bol Raha hoon
Adyaksha Mahodaya
Girimitiyonke Desh Mei
Jab maa Ro Padi

UNIT C Hindi Vyakaran :<u>Portions Prescribed :</u>

1) Vyakaran ka samanya parichay
2) Varnamala : Swaron ka vargeekaran, vyanjanon ka vargeekaran
3) Shabdabhed; a) Vyuthpatthi ki dristi se
   b) Uthpatthi ki drishti se
   c) Roopantar ki drishti se
4) Sandhi : Paribhasha aur bhed
5) Sangya : Paribhasha aur bhed
6) Sangya ke roopantar:
   a) Ling - Paribhasha aur bhed – Ling Nirnay ke niyam
      Ling parivarthan ke niyam

b) Vachan – Paribhasha aur bhed – Vachan parivarthan ke niyam
c) Karak – Paribhasha aur bhed
7) Sarvanaam : Paribhasha aur bhed
8) Visheshan – Paribhasha aur bhed

<u>Reference</u>

1. Saral Hindi Vyakaran –Pb. Prabhath Prakashan, # 4/19, Asaf Ali road,New Delhi-02

2. Parishkrith Hindi Vyakaran - Badarinath Kapur
3. Abhinav Hindi Vyakaran - Prof. N.Nagappa, Pb. Rajpal &sons, New Delhi
4. Shikshaarthi Hindi Vyakaran - Prof. N.Nagappa, Pb. Rajpal &sons, New Delhi
5. Sankshipta Hindi Vyakaran - Kamatha prasad Guru, Nagari Pracharini Sabha, kaashi.
6. Vyavaharik Hindi Vyakaran Tatha Rachana –Dr. Hardev Bahari, Lokabharathi prakashan,
   Allahabad -1

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DLB 05011 /12/13/14/15

CMB 05001/2/3/4/5/6/7/8

II Semester
Hindi Kahani aur Vyakarna

60hrs (4hrs/week) 3 Credits

Course out comes

After successful completion of this course students are able to

CO1:. Write down the details of short stories of 20th century

CO2: Identify in depth short stores of 20th century

CO3: Identify in details with application, if applicable, short stores of 20th century

CO4: Identify the classification and characteristics of Hindi vyakaran

CO5: Write down the characteristics of Hindi vyakaran

UNIT A & B Hindi ke Prathinidi Kahaneeya (Prescribed Lessons 1,2,3,7 ,9 10,12)

Usane kaha thank .
Puraskar
Pus ke Rath
Chif ke saath1.Jaj ka peissla
Dopahar ka Bhojan
Akeli
Prayaschita

UNIT C Hindi Vyakaran
Portions prescribed:

1) Kriya - Paribhasha aur bhed , 'NE' -Niyam
   Kriya ke roopantar - Kaal, Vachya, Prayog , Arth
2) Kriya Visheshan - Paribhasha aur bhed
3) Sambandha boodhak avyay – Paribhasha aur bhed
4) Samucchaya boodhak avyay -- Paribhasha aur bhed
5) Vismayadi boodhak avyay --Paribhasha aur bhed
6) Upasarg aur Pratyay --Paribhasha aur bhed
7) Samas --Paribhasha aur bhed
8) Pad-parichay

Reference

1. Saral Hindi Vyakaran –Pb. Prabhath Prakashan, # 4/19, Asaf Ali road,New Delhi-02
2 .Parishkrith Hindi Vyakaran - Badarinath Kapur
3. Abhinav Hindi Vyakaran - Prof. N.Nagappa, Pb. Rajpal &sons, New Delhi
4. Shikshaarthi Hindi Vyakaran - Prof. N.Nagappa, Pb. Rajpal &sons, New Delhi
5. Sankshipta Hindi Vyakaran - Kamatha prasad Guru, Nagari Pracharini Sabha, kaashi.

6 .Vyavaharik Hindi Vyakaran Tatha Rachana –Dr. Hardev Bahari, Lokabharathi prakashan, Allaha

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DLC 050 11/12/13/14/15

CMC 05001/2/3/4/5/6/7/8

III Semester

Hindi Nataka aur Vanjya Hindi

60hrs (4hrs/week) 3 Credits

Course outcome

After successful completion of this course students are able to

CO1. Understand the characteristics of Hindi Natak
CO2. Deliberate in details with application, if applicable, Hindi Natak -deep daan by Ramkumar varma
CO3. Deliberate the characteristics of Hindi Natak -Red ke haddi by Jagadeshachandra mathur
CO4. Understand the details of Hindi Natak -sukhe dale by Upendranath ashka
CO5. Write down in details with examples Hindi Natak -mai bee manav hu by Vishnu prabakar
CO6. Identify the details of Hindi Vanijya Hindi
CO7. Specify in depth Vanijya Hindi

UNIT A &B -EKanki Sapthak (1 to 6)

Deep daan
Reed ke hadde
Sukhi daal
mai bhe Manav hu
Ande ke chillke
Bahu ke Bida

UNIT C Vanijya Hindi

Portions Prescribed :

1) a. Patra Vyavahar ka Samanya Parichay tatha Mahatva
   b. Patron ke prakar
2) Vyavasaik patra Vyavahar :
   a. Bank Sambandhi Patra
   b. Beema Sambandhi Patra
   c. Pooch-Taach Sambandhi Patra
   d. Shikayati Sambandhi Patra
   e. Naukari Sambandhi Patra
   f. Pari patra
   g. Agency Sambandhi Patra
3) Alekhan - Uttam Alekhan ke gun

4) Sampreshan - uske Prakar
5) Sankshiptikaran - Sankshipt Lekhan ke Pradhan gun aur udaaharan

Reference Books

1) Vyavasaik Sampreshan –Dr. Anup Chandra Bhayani Pb. Rajpal &sons, New Delhi-6
2) Karyalay Alekhan aur Tippan – Karnatak Mahila Hindi Seva Samithi, Chamarajpet,Bangalore.
3) Prashasanik Hindi – Ed. Ramdarash Mishra and amswaroop Shastry
4) Vanijya Patra Vyavahar,Anuvad,Nibandh tatha Sankshiptikaran – A V Narti, Gnanoday Prakashan , Dharwad.

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DLD 05011 /12/13/14/15
CMD 05001/2/3/4/5/6/7/8

IV Semester

Hindi Kavya aur Anuvada Paribhashik Shabdavali

60hrs (4hrs/week) 3 Credits

Course out comes

After successful completion of this course students are able to

CO 1. Write down the classification and characteristics of medieval and madran Hindi Kavya
CO2. Deliberate in details with application, if applicable, medieval - saakhi by Kaber
CO3. Specify in details with examples Hemala by Ramadhare Simha Dinakar
CO4. Specify in details with application, if applicable, Gurukul by Ramkumar Varma
CO5. Specify the characteristics of Hindi Anuvada Paribhasik Shabdavali
CO6. Learn in details with examples Hindi Anuvada Paribhasik Shabdavali

UNIT A & B KAVYAGANGA (Prescribed Lessons-1, 2,5, 8, 11, 12, 13, 14, 16,19)

Kaber
Thulse Das
Bhihare Lal
Maithilisharan Gupta
Surya Kanth Tripathi Nirala
sumitranandan pant
Subhadra Kumari Chauhan
Ramkumar Verma
Ramdhari Simha Dinkar
Kuvempu

UNIT C Anuvad tatha Paribhashik Shabdavali

Portions Prescribed :

1) Anuvad ki Paribhashayen , Adhunik jagat mein Anuvad ka mahatva Anuvadak kee Yogyathayen , Anuvad kala hai yaa vignan ?
2) Anuvad ke prakar:
   a) Shabdanuvad
   b) Bhavanuvad
   c) Kavyanuvad

d) Saranuvad

3) Angreji / Kannad se Hindi me Anuvad – vice versa (passages)
4) Paribhashik Shabdavali

Reference Books:

1) Anuvad Vignan – Bholanath Thiwari Pb. Shabdaker, Delhi -110092
2) Anuvad Kala Kuch Vichar –Anuvad Prakash Khemani , S.Chand & co. Delhi.
3) Anuvad Siddhant aur Samasyayen- R.N. Srivastava and K.K.Goswami
4) Alok Prakashan , Delhi Anuvad Patrika Ank, Pb. Anuvad Sahitya Parishad , New Delhi

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III Semester
Communicative Hindi

30hrs (2hrs/week) 2 Credits

Course out comes

After successful completion of this course students are able to

CO1. Learn the details of Communicative Hindi

CO2. Identify in depth Communicative Hindi

CO3. Deliberate in depth Communicative Hindi

UNIT I : HINDI GRAMMAR

1) Parts of speech – A general outlook
2) Gender - a) Ling pehchanne ke niyam
   c) Ling parivarthan ke niyam
3) Synonymns and Antonymns
   a) Definition
   b) Difference

UNIT II : GENERAL COMMUNICATION AND PRACTICE

4) Conversation - in market, hotel , journey etc.
5) Conversation on health , education etc.
6) Practice.

Reference

8. Saral Hindi Vyakaran –Pb. Prabhath Prakashan, # 4/19, Asaf Ali road,New Delhi-02
9. Parishkrith Hindi Vyakaran - Badarinath Kapur
10. Abhinav Hindi Vyakaran - Prof. N.Nagappa, Pb. Rajpal &sons, New Delhi
11. Shikshaarthi Hindi Vyakaran - Prof. N.Nagappa, Pb. Rajpal &sons, New Delhi
12. Sankshipta Hindi Vyakaran - Kamatha prasad Guru, Nagari Pracharini Sabha, kaashi.
13. Anuvad Vignan - Bholanath Thiwari , Shabdakar , Delhi -92
14. Anuvad Kala – Kuch Vichar - Anandprakash Khemani , S.Chand & Co., Delhi
    Anuvad siddhant aur Samasyayen

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Model Question Paper

Language HINDI I ,II , & III SEMESTERS of BA / BSC

Time : 3 Hrs Max. Marks : 70

II) Total Main questions with internal choice on the prescribed text book 10 marks each 10 x 2 = 20

II) One Annotation question – three out of five on the prescribed text book 05 marks each 05 x 3 = 15

III) Two short answer questions with internal choice on Vyakaran /prayojan moolak Hindi / Anuvad as the case may be, 10 marks each 10 x 2 = 20

IV) 15 objective type questions on Vyakaran /prayojan moolak Hindi / Anuvad as the case may be, 01 mark each 01 x 15 = 15

MODEL QUESTION PAPER

Qn.1. ..... OR ..... 01 x 10 = 10

Qn.2. .....OR ..... 01 x 10 = 10

Qn. 3. Annotate three out of six 05 x03 =15

Qn.4. .....OR..... 01 x 10 = 10

Qn.5. .....OR..... 01 x 10 = 10

Qn.6. Objective type questions 01 x 15 =15

INTERNAL ASSESSMENT - 30 MARKS

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BA CBCS AECC

III SEMESTER -PAPER III
Communicative Hindi

MODEL QUESTION PAPER

TIME : 2 HOURS MAX. MARKS : 50

Instructions: All sections are compulsory

UNIT-I:Hindi Grammar

I. . Answer The Following Questions in a sentence or a ward.

1).....2)..... 3).....4).....5).....

6).....7).....……8)…….9)……10)……..
1 X 10 = 10

II . Answer The Following Questions (Any four)
4 X 5 = 20

1).....2).....

3).....4).....

5)……6)……..

UNIT II : GENERAL COMMUNICATION AND PRACTICE
2 X 10 = 20

I . Answer The Following Questions (any two)

1..... 2.....

3..... 4.....

INTERNAL ASSESSMENT - 30 MARKS ,F-1 -15,F-2-15

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JSS COLLEGE OF ARTS, COMMERCE & SCIENCE

(AUTONOMOUS)

B.N. ROAD, MYSURU

DEPARTMENT OF HISTORY
UG CBCS SYLLABUS
(Revised)

(2018-19 Scheme)

TEMPLATE SYLLABUS IN HISTORY

Programme : BA

Subject : History

Sem	Core			DSE			GE		
	No. of Courses	Credits	Total Hours	No. of Courses	Credits	Total Hours	No. of Courses	Credits	Total Hours
I	1	6	75+15	-	-	-	-	-	90
II	1	6	75+15	-	-	-	-	-	90
III	1	6	75+15	-	-	-	-	-	90
IV	1	6	75+15	-	-	-	-	-	90
V	-	-	-	2	6	75+15	1	2	15
VI	-	-	-	2	6	75+15	1	2	15

Sem	Paper code	Paper	Teaching Hours Per week	L T P	Credit	Theory Exam	I.A. Marks	Total Marks
I	Core-1 DSC	History of Ancient India (upto 1100 AD)	5+1	5-1-0	6	70	30	100
II	Core-2 DSC	History of Medieval India (upto 1700)	5+1	5-1-0	6	70	30	100
III	Core -3 DSC	History of Karnataka (540-1565)	5+1	5-1-0	6	70	30	100
IV	Core – 4 DSC	History of Modern Karnataka (1700-1956)	5+1	5-1-0	6	70	30	100
V	DSE –1A	History of Modern India (1757-1947)OR History of Modern Europe(1789-1945)	5+1	5-1-0	6	70	30	100
	GE-1	History of Modern India (1498-1858)	2	2-0-0	2	35	15	50
VI	DSE – 2	History of Modern Asia(1900-1995)OR India and the Contemporary World91947-2000)	5+1	5-1-0	6	35	15	100
	GE -2	History of Modern India (1858-1947)	2	2-0-0	2	40	10	50

pattern of Question Paper

1. Internal Assessment
   Each paper will have an internal assessment component for 30 marks out of the maximum 100 Marks
2. **Theory Examination** **Max Marks 70**
   Theory question paper pattern
   Theory question paper for I – IV semester will have Four Parts

PART – A

This part consists of **Two** questions of 15 marks each and the student will have to answer **One** question **15 x 1 = 15**

PART – B

Part – B consists of Five questions of **Ten** marks each and the students will have to answer **Three** questions **10 x 3 = 30**

PART – C

This part will have **Five** questions of Five marks and the students will have to answer **Three** questions **5 x 3 = 15**

PART – D

Map question will have **Ten** marks out of which Five marks will be awarded to locating Five places. **Five** marks for writing explanatory note on the places **5 + 5 = 10**

The V & VI semester will have **Three parts Part – A** consists **01** question for **15** Marks. **Part – B** consists of **04** questions for **40 Marks** and **Part – C** consists of **15 Marks** for **03 questions**.

GENERIC ELECTIVES

Pattern of Question Paper

1. Internal Assessment
   Internal assessment component for 15 marks out of the maximum 50 Marks for G1&G2
2. **Theory Examination** **Max Marks 50**
   Theory question paper pattern
   Theory question paper for all the V – VI semester will have 3 Parts

PART – A

This part consists of **Five compulsory** questions of 2 marks each and the student will have to answer **One** question **5 x 2 = 10**

PART – B

Part – B consists of two questions of **Ten** marks each and the students will have to answer **one** question **10 x 1 = 10**

PART – C

This part will have **Five** questions of Five marks and the students will have to answer **Three** questions **5 x 3 = 15**

Programme Specific Out Comes for Bachelor of Arts

After completing the graduation in the Bachelor of Arts the students are able to:

PO1. Critically recognize the social, political, economic and cultural aspects of History.

PO2. Demonstrate thinking skills by analysing, synthesizing, and evaluating historical information from multiple sources.

PO3. Correctly extract evidence from primary sources by analysing and evaluating them in relation to their cultural and historical context.

PO4. Develop an informed familiarity with multiple cultures.

PO5. Emerge as a multifaceted personality who is self-dependent.

PO6. Spread the messages of equality, nationality, social harmony and other human values.

PO7. Comprehend the basic structures and processes of government systems and/or theoretical underpinnings.

PO8. Analyse political problems, arguments, information, and/or theories.

P09.Apply methods appropriate for accumulating and interpreting data applicable to the Discipline of political science.

PO10. Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes

Programme Specific Outcomes of History& Political Science

After completing the graduation in the Bachelor of Arts the students are able to:

PSO1 This Programme exerts it's Influence on life and destiny of Human beings.

PSO2 It is a stepping stone for one's success in competitive examinations.

PSO3 Understand the background of our religion, customs, institutions and so on.

PSO4Understand the present Social, political, religious and economic conditions of the people.

PSO5 Analyze the relationship between the past and the present, is lively presented in the History

PSO6 The study of History helps to import moral education and the feeling of patriotism in the hearts of the pupils

Programme Outcomes for Bachelor of Arts in History and English:

After completing the graduation in the Bachelor of Arts the students are able to:

PO1. Critically recognize the social, political, economic and cultural aspects of History.

PO2. Demonstrate thinking skills by analyzing, synthesizing, and evaluating historical information from multiple sources.

PO3. Correctly extract evidence from primary sources by analyzing and evaluating them in relation to their cultural and historical context.

PO4. Develop an informed familiarity with multiple cultures.

PO5. Demonstrate critical reading, writing, and thinking skills.

PO6. Write focused, organized, well-developed, and text-based essays using effective paragraphs.
PO7. Support a clear thesis statement, and demonstrate competence in Standard English Language and usage.
PO8. Develop and carry out research projects, and locate, evaluate, organize, and incorporate information effectively.
PO9. Write articles, novels, stories to spread the messages of equality, nationality, social harmony and other human values.
PO10. Acquire the ability to engage in independent and life-long learning in a broader context about socio-technological and demographic changes.

Programme Specific Outcomes of History& English

PSO1 .Identify cultural and literary synthesis

PSO2 .Critically recognize the social, political, economic and cultural aspects of History.

PSO3.Support a clear thesis statement, and demonstrate competence in Standard English Language and usage.

PSO4 .Write articles, novels, stories to spread the messages of equality, nationality, social harmony and other human values.

PSO5.Correctly extract evidence from primary sources by analyzing and evaluating them in relation to their cultural and historical context.

PSO6 .Develop an informed familiarity with multiple cultures.

Code-DLA24012

I – SEMESTER

PAPER- I HISTORY OF Ancient INDIA (upto -1206)

Course Outcomes

Programme Name; BA

Programme Code; HP12; HE14

CO1.Familiarise the students of early civilizations. The birth of new religions. Jainism and Budhism and the teachings of Mahaveera and Buddha

CO2. Discuss ancient republics, establishment of great Empires political land military adventures of out great rulers

CO3.Gain knowledge of Economic, Social and religious conditions and education system of ancient period.

CO4. Inspire the students through the great literary books and contributions to the growth of Art & Architectures

CO5. Understanding the administration of our great kingdoms and foreign trade And commercial activities are of great values in the development of the state.

Unit – I

Sources – Harappan culture – Vedic civilization - Rise of new Religions – Jainism; Life and Teachings of Mahaveera – Buddism – Life and Teachings of Buddha, Ancient Indian Republics

Unit – II

Historical background the Mauryans – Chandragupta Maurya and Ashoka – Administration – Art and Architecture – The Shathavahanas – Cultural Contribustions - The Kushanas – Kanishka – achievements – contribution to culture

Unit – III

The Guptas – Samudragupta and Chadragupta II – Golden Age Contributions, Vardhanas – Harshavardhana – Achievements – Nalanda University

Unit-IV

The Chalukyas - Pulikeshi II - Contributions to culture-The Rastrakutas-AmoghaVarsha Nrupatunga I-Contributions to culture-The Hoysalas-Vishnuvardhana-Art and Architecture

Unit – V

The Pallavas of Kanchi ; Mahendravarma I & Narasimha Varman I, Growth of Art and architecture – The Cholas – Rajaraja Chola I and Rajendra Chola I – Administration with reference to local – self government Art & Architecture

MAP

Places of Historical Importance:

1. Paithan
2. Lothal
3. Pataliputra
4. Badami
5. Thanjur
6. Malkhed
7. Nalanda
8. Maski
9. Dwarasamudra
10. Kanchi

Books for Study and Reference:

1) Romila Thapar – Recent perspective of India History – Oxford University Press Delhi – 1988
2) Romila Thapar – From Lineage to State – Oxford University Press – 2000
3) Romila Thaper – Ashoka and the decline of the Maurayas – Oxford University Press, Delhi – 1999
4) D. Kosambi – The Culture and Civilization of Ancient India – An historical outline – Vikas publications, New Delhi – 1997
5) A.L. Basham – The wonder that was India Vol – 1, Rupa & Co.,
6) R.S. Sharma – Indian Feudalism, Macmillan Publications, Madras – 1998
7) R.S. Sharma – Material Culture and Social Formation in Ancient India
8) R.S. Sharma – Aspects of political ideas and institutions in ancient India Motilal Banarasidas publication, New Delhi – 1999
9) B.N. Luniya – Evolution of Indian culture – Laxmi Narayan Agarwal, Agra – 1997

10) R.C. Manumdar – Ancient India – Motilal Banarsidas publications, New Delhi – 1982
11) A.S. Altekar – State & Government in Ancient India (Third Edition)
12) Vijaya Kumar – Urbanization in Ancient India (Thakur Abhinava Publication, New Delhi – 1981)
13) Irfan Habib and Vijaya Kumar Thakur – The Vedic Aryans
14) Burton Stein-Peasant and society in Medieval South India, Oxford, Delhi 1999
15) T.V.Mahalingam:South Indian politics
16) Dr. N. Chinnaswamy (Ed), Badami Chalukyas, Kannada Uni. Hampi

II – SEMESTER
PAPER- II
HISTORY OF MEDIEVAL INDIA
Upto 1700

Unit-I

The Rajputs-Origin-Early Turkish invasions-Mahammed of Ghor-Battles of Tarain-Rajput Architecture

Unit – II

Delhi Sultanate – Early Turkish Rule; The Slave Dynasty – The Khalijis : Alauddin Khaji, expansion of the Delhi Sultanate and Administrative reforms – The Tughluqs : Muhammad – bin – Tughluq – Administrative Experiments – Tughluq

Unit – III

The Great Mughals – Babur – foundation of the Mughal empire – Revival of Afghan rule – Shershah and his administration – Akbar – expansion of the empire, administrative reforms – religious policy – Aurangzeb – religious policy and Deccan policy-Contribution to Culture

Unit – IV

Rise of the Marathas – Shivaji – Military achievements – administration – Rise of peshwas – Balaji Vishwanath, Bajirao 1 and expansion of the Maratha power and Balaji Bajirao – The third battle of Panipat – 1761 causes of results

Unit – V

Society and Economy – Bhakti Movement – features – Kabir and Guru Nanak – Sufi Movement – features – Muinuddin Chisti and Nizamuddin Aulia – Economy : Growth of new towns and cities, trade and commerce

MAP

Places of Historical Importance:

1. Tarain
2. Delhi
3. Panipat
4. Devagiri
6. Kabul
7. Golkonda
8. Fathepur Sikri
9. Agra

5. Poona 10. Ahmadnagar

Books for Study and Reference:

1) Irfan Habib – Medieval India (1200 – 1750) Oxford University 1997
2) Sathish Chandra – Medieval India from Sultante to Mughals (Har Anand Publication – New Delhi – 1998)
3) Irfan Habib – Akbar & His India. Oxford Press – New Delhi – 1998
4) Muzafar Alam & Sanjay Subramanya – The Mughal State 1526-1750 (Oxford University – 1998)
5) Tarachand – Influences of Islam on Indian Culture (The Indian Press Publication Ltd, Allahabad)
6) L.P. Sharma – Sultanate of Delhi (Konark publication, New Delhi – 1998)
7) Moreland W H – From Akbar to Arurangazeb
8) Tapan Roy Choudhari & Irfan Habib – The CAMBRIDGE Economic History of India (2 Vol) orient and Logman in association with vambridge uni press)
9) L.P. Sharma History of Medival India – (1000-1707) Konark publications – New Delhi)
10) R.C. Majumdar – Ancient India
11) R.C. Majumdar and others – Advanced History of India, Macmillan India Ltd., Delhi 2000
12) SAA Razvi – Wonder that was India II
13) A C Banerjee – Medieval India
14) M Habibi and KA Nizami – A Comprehensive History of India – vol – Delhi Sultanate

III – SEMESTER
PAPER- III
HISTORY OF KARNATAKA
(540-1565)

Unit – I

Sources: Literary sources and Archeological sources

Unit – II

Socio-Religious movement-Shankaracharya-Ramanujacharya-Madhvacharya and Basaveshwara

Unit – III

Vijayanagar Empire – Origin,Sangam Dynasty: Deveraya II – Krishnadevaraya – Battle of Talikote

Unit – IV

Administration Cultural Contributions during Vijayanagar, Vijayanagara as seen by Foreign Travelers

Unit – V

The Bahamani Kingdom – Mohammad Gawan – Bahamani and Adilshahi's Art and Architecture Wodeyars of Mysore, Early Wodeyars – Raja Wodeyar -Chikkadevaraja Wodeyar – Administration and literature

MAP

Places of Historical Importance:

1. Udupi
2. Srirangam
3. Kudala Sangama
4. Gulbarga
5. Hampi
6. Srirangapattana
7. Talikote
8. Mysore
9. Raichur
10. Bidar

Books for Reference:

1. Burton Stein – Peasant State and Society in Medieval South India, Oxford, Delhi 1999
2. A.R. Kulkarni : Medieval Deccan History, Popular Pub House, Bombay 1996
3. K.A. Neelakanta Sastri : A History of South India, Oxford University Press, Madras
4. Heras : South India under Vijayanagar Empire (2 Vol)
5. Robert Sewl : A Forgotton Empire – Asian Educational Services, New Delhi
6. S. Rajashekara : Karnataka Architecture, Sujatha Pub 1985
7. T.V. Mahalingum : South Indian Polity
8. B.A. Salatore : Social Political Life in Vijayanagar Empire (II Vol)
9. Gordon Johnson : Architecture and Art of Southern India, Cambridge University Press 1998
10. Appadorai A : Economic Condition in South India, 1000-1500 AD (2 Vols) Madras University, Madras, 1936
11. K.R. Basavaraja : History and Culture of Karnataka, Chalukya Pub. Dharwad, 1984
12. G.S. Dixit – Krishnadevaraya – Life and Achievements, Pub. Directorate of Archaeology and Museums, Mysore
13. Shamarao : History of Mysore
14. Burton Stein : Vijayanagar, Cambridge Uni. Press
15. Dr. N. Chinnaswamy – (Ed) Badami Chalukyaru, Kannada Uni. Hampi

IV – SEMESTER
PAPER- IV
HISTORY OF MODERN KARNATAKA
(1700-1956)

Unit – I

Mysore Between 1704 – 1750 Dalavoys – rise of Hyder Ali – Relations with the British and the Marathas – Tippu Sultan – His relations with the British

Unit – II

Restoration of Mysore – Krishnaraja Wodeyar III – Dewan Purnaiah – Direct Rule of Krishnarja Wodeyar – Nagar insurrection – Cultural achievements of Krishnaraja Wodeyar III

Unit – III

Commissioners Rule – Mark Cubbon – administration – LB Bowring – Administration

Unit – IV

Rendition of Mysore – Dewan Rangacharlu – Sheshadri Ayer – Vishweshwaraiah – Sir Mirza Ismail

Unit – V

Backward class movement in Mysore – Freedom Movement in Karnataka – Belgum Congress Session – Unification Movement – Birth of United Karnataka in 1956

MAP

Places of Historical Importance:

1. Ankola
2. Mysore
3. Vidhuraswatha
4. Easuru
5. Kittur
6. Bangalore
7. Belagum
8. Mangalore
9. Bidanoor
10. Shivapura

Books for Reference:

1. Mohibul Hassan – History of Tippu Sultan the World Press Pvt. Ltd., 1971
2. P.B. Desai – History of Karnataka
3. K.R. Basavaraj – History and Culture of Karnataka, Chalukya Pub, Dharwad
4. Sheik Ali – Tippu Sultan – Geetha Book House, Mysore – 1982
5. James Manor – Political Change in an Indian State (Mysore 1831 – 1920) Rawal Pub. Jaipur 1996
6. Veerathappa K – Readings in Modern History of Mysore S Chand & Co. Delhi 1985
7. I.M. Muthanna – History of Modern Karnataka – Sterling Pub Delhi 1986
8. Naidu B.M – Intellectual History of Colonical India (Mysore 1831 – 1920) Rawal Pub. Jaipur 1996
9. Chandrashekar S – Dimenstions of Socio Political Change in Mysore 1918 – 1940 Delhi 1965
10. K.G. Made Gowda – Modern Mysore State, (A Study of Elite Polity and Society) Mysore Uni. Pub. 1997
11. Hayavadana Rao – Mysore Gazetteers Vol. 1 to 5, Bangalore 1929
12. R. Ramakrishna – Press and Politics in Modern Mysore 1997
13. G.S. Halappa – History of Freedom Movement in Karnataka
14. Shastri K.N.V. - Administration of Mysore under Mark Cubbon – London 1932
15. Mark Wiks – History of Mysore (3 Vol)
16. R.R. Diwakar – Karnataka through the Ages
17. Dr. R. Gopal and Dr. Narendra Prasad – Mummadi Krishnaraja Wodeyar Pub, Directorate of Archeology and Museums, Mysore
18. Dr. B.V. Sudhamani – Dalavoy Nanjaraja
19. Dr. K.S. Shivanna – Karnataka Charitre, Vol 3, Kannada University Hampi

V SEMESTER
PAPER V
DSE – 1 : HISTORY OF MODERN INDIA (1500 – 1947)

Unit 1

Advent of Europens –Portuguese-English-French-Anglo-French Rivalry- Conquest of Bengal by the British –Battles of Plassey and Buxar –Robert Clive –Dual Government in Bengal –Anglo – Maratha Wars Rise of Sikhs – Ranjit Singh –Anglo Sikh Wars

Unit-II

Consolidation of the British rule- The regulating Act-1773 Pitts's India Act –lord Welesly – Subsidiary Alliance _features and significance –doctrine of Lapse-Land Revenue Policies – Zamindari System –Roytwari System –its features

Unit III

Rebellion of 1857 –cause and consequences –Queen's proclamation act of 1858 – socio and Religious movements –Causes of the Indian Renaissance – the Brahma Samaj, Arya samaj, Ramakrishna Mission – The Aligarh Movement

Unit –IV

Rise and Growth of Nationalism – Foundation of Indian National Congress Moderates and their Achievements – Rise of Extrimism – Growth of Revolutionaries Nationalism till 1930 Gadar Movement, Chandrasjekar,Azad,Bhagat Sign

Unit –V

Gandhi Era – Round Table Conference – Government India Act of 1935 – Quit India Movement – Partition and Independence and Dr. B. R Ambedkar

Books For Reference:

1. Percival Spear: Oxford History of Modern India (1740-1975(new Delhi
2. Arthar D .Innes: History of British in India, Lal Pub. New Delhi 1999
3. Ranjit Guha :subaltern studies(10 Vols)
4. A.R Desai Social Background to Indian Nationalism
5. Tharachand History of Freedom Movement

V SEMESTER
MODERN EUROPE (1789 – 1945)(Elective paper)

Unit I-Revolutionary Phase

1) The French Revolution : Causes and Results
2) Napoleon Bonaparte – military achievements – administrative reforms – Continental system

Unit II – Reactionary Phase

1) The Vienna Congress and its work
2) Age of Metternich (1815 – 1848)
3) Napoleon III – Internal and External Policy

Unit III – Unification Movements

1) Italian Unification – Role of Mazzini, Count Cavour and Garibaldi
2) German Unification – Bismarck and his wars of unification

Unit IV – 20th Century Europe

1) The First World War – Causes and Consequences
2) The Bolshevik Revolution of 1917 – Causes – Role of Lenin
3) Rise of Fascism in Italy – Benito Mussolini
4) Rise of Nazism in Germany – Adolph Hitler

Unit V – Europe during the II World War

1) Second World War – Causes and Consequences – Genesis of Cold War
2) The UNO – Aims and Objectives – Structure; Organs and their functions

Books for Reference:

1) Kettelby, C.D.M : A short History Mod Europe Oxford Uni Press. Calcutta 2000
2) Gokhale B.K : Modern Europe 1848 – 1960, Himalayan Pub. House Bombay 1987
3) Sir Marriott J.A.R : A History of Europe 1815 to 1939. Surjeeth Pub Delhi 1986
4) H.A.L Fisher : A History of Europe (2 Vol) Surjeeth Pub. Delhi
5) C.D. Hazen : Europe since 1815
6) David Thomson : Europe since Napoleon
7) Edward Macnall Burns: Western Civilization, History and Culture, WW. Norton and Company inc, New York, 1963
8) TCW Blanning – The culture of Power and the The Power of Culture – Oxford Uni. Press – 2003

V SEMESTER

GE – 1 :HISTORY OF MODERN INDIA (1498 – 1858)

Unit 1

Advent of Europens –Portuguese-English-French-Anglo-French Rivalry- Conquest of Bengal by the British –Battles of Plassey and Buxar –Robert Clive –Dual Goverment in Bengal – Anglo – Maratha Wars Rise of Sikhs – Ranjit Singh –Anglo Sikh Wars

Unit-II

Consolidation of the British rule- The regulating Act-1773 Pitts's India Act –lord Wellesly –Subsidiary Alliance _features and significance –doctrine of Lapse-Land Revenue Policies

Unit III

Rebellion of 1857 –causes and consequences –Queen's proclamation act of 1858

Books For Reference:

1. Percival Spear: Oxford History of Modern India (1740-1975(new Delhi
2. Arthar D .Innes: History of British in India, Lal Pub. New Delhi 1999
3. Ranjit Guha :subaltern studies(10 Vols)
4. A.R Desai Social Background to Indian Nationalism
5. Tharachand History of Freedom Movement

VI SEMESTER
DSE – 2 : HISTORY OF MODERN ASIA (1900 – 1995)

Unit I – China: Historical background – Opium Wars

1) The Boxer Rebellion : Causes and results – Boxer Protocol
2) Revolution of 1911 – Causes and Consequences – Role of Dr Sun Yat – Sen
3) Conflicts between the Kuomintang Nationalists and the Communists

Unit II – Japan

1) Historical background with reference to Meiji Restoration
2) The Anglo – Japanese Alliance – 1902 – Its significance
3) Japan's relations with China between 1914 to 1939

Unit III – Turkey

1) Disintegration of Ottoman Empire
2) The Young Turk Movement – achievements of the Young Turk government
3) Mustafa Kemal Pasha – Modernization of Turkey

Unit IV – Iran

1) Historical background
2) Pahlavi Regime – Reza Shah Pahlavi
3) Mossadeq – The Oil Crisis

Unit V – Arabs and Jews

1) Rise and Growth of Arab Nationalism
2) Zionist Movement: Genesis and growth – Balfour Declaration, Birth of Israel

Books for Reference:

1) H.M. Vinacke: A History of the far East in Modern time
2) W. David M.D. Rise and Growth of Modern China. Himalayan Pub. Bombay 1987
3) D.G.E. Hall History of South East Asia
4) S.L. Roy : History of Far East and South East Asia (2 Vol)
5) K.M. Panikar : Asia and Western Dominance
6) Luke: Modern Turkey
7) Karan Armstrong : A History of Jerusalem
8) Immannel C.Y. HSU : The rise of Modern China, N.Y. 1995
9) George Ienczowsky : Middle East in the World Afairs
10) J.C. Michael – The Shaping of Arabs Clyde and Beers: The Far East
11) Shaik Ali thers : A short History of Modern Asia (1900 – 19600) Chandramouli Prakashana – 1987
12) B.K. Gokhale – History of Modern World, Himalaya Pub. House, New Delhi

VI SEMESTER

INDIA AND THE CONTEMPORARY WORLD (1947 – 2000)(Elective paper)

Unit I – Emergence of New India

1) Birth of Indian Republic – Adoption of Republican Constitution – its main features
2) India under Nehru – Economic Development during First Three five Years Plans
3) Formation of Linguistic States
4) National Policy of Education (NPE)

Unit II – Major Crisis

1) Kashmir Crisis

2) Khalistan Movement

Unit III – Foreign Policy

1) Features of Foreign Policy
2) India's Relations with Pakistan and China
3) India and U.S.A
4) India and U.S.S.R

Unit IV – Cold War (1950 – 1990)

1) Genesis, Truman and Marshall Plans, Berlin blockade, formation of Military Alliances, Cuba Missile Crisis, Re-unification of Germany, Dissolution of USSR and end of Cold War

Unit V – Developments in China, Africa and West Asia Since 1950

1) China under Mao and after – Internal Developments
2) Struggle against apartheid in South Africa – Nelson Mandela
3) Post Second World War Arab – Israel Relations

Books for Study and Reference:

1) DGE, Halls: History of south East Asia, Macmillan Pub Ltd. Hampshire 1995
2) Arjun Dev: Contemporary World
3) Shapire J.S : The World in Crisis
4) Petter Heehs. Modern India and the world. Oxford University Delhi 1991
5) V.K.R.V Rao: Nehru Legacy
6) Bipin Chandra: Communalism in modern India New Delhi 1979
7) B.R. Nanda (ed) : India's Foreign Policy
8) William Yale: The Near East
9) V.P. Menon : Transfer of Power
10) Bisweswara Prasad : Contemporary Africa, Asia Pub House, Bombay 1960
11) Colin Legum (ed) : Africa : A Handboo to continent
12) John Edwin Fogg : Latin America. Macmillan. London 1969
13) Brunn, Geoffrey: The World in the 20th Century N.Y.
14) Saghata Bose, Ayesha Jalal : Modern South Asia Oxford Uni. Press New Delhi 1999
15) William R Keyler : The Twentieth Century World
16) Daniel R Brower – The World Since 1945 – A Brief History, Pearson Prentice Hall, Delhi – 2005
17) Mohammad Anwar – ul Haque – Contemporary World History – NCERT Delhi

IV SEMESTER

GE-2 : HISTORY OF MODERN INDIA (1828-1947)

Socio and Religious movements –Causes of the Indian Renaissance – the Brahma Samaj, Arya Samaj, Ramakrishna Mission – The Aligarh Movement

Unit –IV

Rise and Growth of Nationalism – Foundation of Indian National Congress Moderates and their Achievements – Rise of Extremists

Unit –V

Gandhi Era – Round Table Conference – Government India Act of 1935 – Quit India Movement – Partition and Independence

Books For Reference:

1. Percival Spear: Oxford History of Modern India (1740-1975(new Delhi
2. Arthar D .Innes: History of British in India, Lal Pub. New Delhi 1999
3. Ranjit Guha :subaltern studies(10 Vols)
4. A.R Desai Social Background to Indian Nationalism
5. Tharachand History of Freedom Movement

JSS COLLEGE OF ARTS, COMMERCE & SCIENCE

(AUTONOMOUS)

B.N. ROAD, MYSURU-570025

DEPARTMENT OF JOURNALISM

SYLLABUS

Revised Syllabus for Undergraduate Journalism with CBCS scheme effective from 2017-18

Scheme of study for BA Journalism, English under CBCS

Paper No	Sem	Paper Code	Course	Teaching Hours Per week	L: T :P	Credit	I.A Marks	Theory Exam	Total Marks
1	I	DLA27015	Introduction to Journalism	5	5:1:0	6	30	70	100
2	II	DLB27015	Reporting and Editing for Print	5	5:1:0	6	30	70	100
3	III	DLC27015	Advertising and Public Relations	5	5:1:0	6	30	70	100
4	IV	DLD27015	Media Ethics and the Law	5	5:1:0	6	30	70	100
5	V	DLF27215	Development Journalism	5	5:1:0	6	30	70	100
6	V	DLE27415	Photo Journalism	5	5:1:0	6	30	70	100
7	VI	DLF27415	Film Appreciation	5	5:1:0	6	30	70	100
8	VI	DLE27815	Dissertation	5	5:1:0	6	30	70	100
9	VI	DLE27215	Introduction to new Media	5	5:1:0	6	30	70	100
11	V	DLE27615	Media Gender and Human Rights	4	3-1-0	4	30	70	100
12	VI	DLE27015	Introduction to TV and Radio	4	3-1-0	4	30	70	100

Generic Electives

For students opting Economics as Generic Elective, the students shall Choose Generic Elective from other Departments

Semester	Course Code	Course Title	Remarks
V	SEC - 1 DLE27615	Media Gender and Human Rights	Other students will elect the Journalism paper as their general Elective paper

Scheme of Assessment for BA Journalism, English under CBCS

Year	Sem	Course Code	Title of the Paper	Continuous Assessment			Max. Marks			Duration of Exam
				C1		C2	C3	TH	IA	TH
				TH		TH				
I	I	DLA27015	Introduction to Journalism	15		15	70	70	30	3h
	II	DLB27015	Reporting and Editing for Print	15		15	70	70	30	3h
II	III	DLC27015	Advertising and Public Relations	15		15	70	70	30	3h
	IV	DLD27015	Media Ethics and the Law	15		15	70	70	30	3h
III	V	DLE27015	Introduction to TV and Radio	15		15	70	70	30	3h
		DLE27415	Photo Journalism	15		15	70	70	30	
	VI	DLF27415	Film Appreciation	15		15	70	70	30	3h
		DLE27215	Introduction to new Media	15		15	70	70	30	

Core and Discipline Specific Elective (DSE)

Semester	Course Code	Course Title
Semester I	DLA27015 :	Introduction to Journalism
Semester II	DLB27015	Reporting and Editing for Print
Semester III	DLC27015	Advertising and Public Relations
Semester IV	DLD27015	Media Ethics and the Law
Semester V	DLE27015	Introduction to TV and Radio
Semester V	DLE27415	Photo Journalism
Semester VI	DLF27415	Film Appreciation
Semester VI	DLE27215	Introduction to new Media
Semester V	DLE27615	OE: Media Gender and Human Rights
Semester VI	DLF27215	OE: Development Journalism

TEMPLATE SYLLABUS IN JOURNALISM

Sem	Core			DSE			SEC	
	No. of Courses	Credits	Total Hours	No. of Courses	Credits	Total Hours	No. of Courses	Credits
I	1	6	75+15	-	-	-	-	-
II	1	6	75+15	-	-	-	-	-
III	1	6	75+15	-	-	-	-	-
IV	1	6	75+15	-	-	-	-	-
V	-	-	-	1	6	75+15	1	4
VI	-	-	-	1	6	75+15	1	4

Programme Outcomes for Bachelor of Arts in Journalism, English

After completing the graduation the students are able to:

PO1. Acquire a functional knowledge of the underlying principles and recent emerging trends of the media industry.

PO2. Create and design emerging audio media products

PO3. Conceptualize, create, design, and strategies high-quality media content for various digital platforms .

PO4. Appreciate and demonstrate the ability to produce reliable outcome.

PO5. Demonstrate critical reading, writing, and thinking skills.

PO6. Locate, evaluate, organize and incorporate information effectively

PO7. Develop and carry out research projects

PO8. Demonstrate competence in Standard English Language and usage in documentation

Programme Specific Outcomes for Bachelor of Arts in Journalism, English

On completion of this programme students are able to

PSO1: Gather, analyze and create journalism on contemporary issues for print, broadcast and other digital media.

PSO2: Produce work incorporating diverse groups and perspectives on local, national and international issues.

PSO3: Demonstrate an awareness of journalism as an ethical practice

PSO4: Write and edit clear, graceful, grammatically correct prose

PSO5: Analyze numerical data and utilize databases for multi-layered storytelling

PSO6: Demonstrate preparation for an entry-level position in the profession through a portfolio exhibiting their work.

PSO7: Report day to day activities effectively in written and oral pattern

PSO8: Draft reports and other written matter effectively

Semester: 1

Code: DLA27015

Introduction to Journalism

On completion of the course, students are able to:

CO1	Specify the characteristics of Different forms of journalism
CO2	Specify the details of language of news
CO3	Learn the classification and characteristics of print-electronic-online-citizen journalism
CO4	Understand the details of Ethics of Journalism
CO5	Deliberate the details of Role of Media in Democracy
CO6	Learn in depth uses of archives and internet.

Unit: 1 - Different forms of journalism-Yellow press, penny press, language of news, principles of clear writing
Unit: 2- Basic differences between the print-electronic-online-citizen journalism
Unit: 3- Role of Media in Democracy-Ethics of Journalism
Unit: 4- news, meaning, definition, nature and process of news. Types of news- Hard and soft news, components of news- skills of news writing.
Unit: 5- Structure of news-5ws and 1H, inverted pyramid, news worthiness, sources of news, values of news, uses of archives and internet.

Contemporary debates and issues to media

References:

1. Bruce D and Douglas Anderson- News writing and reporting for today's media
2. L. Stein, Susan Paterno and R Christopher Burnet- News writer's Handbook: An Introduction to Journalism.
3. George Rodman- Mass Media in a Changing World.
4. Carole Fleming and Emma Hemingway- An Introduction to Journalism
5. Richard Keeble- The news paper's Hand book.

Semester: 2

Code: DLB27015
Reporting and Editing for Print

On completion of the course, students are able to:

CO1	Deliberate the details of Role of Reporter, functions and qualities of reporter.
CO2	Learn in details with examples News agencies
CO3	Specify in depth types of reporting
CO4	Identify the details of press conferences
CO5	Write down the details of Types of leads,
CO6	Write down the characteristics of interviews, article writing, types of features
CO7	Learn in details with examples set up of a news room,
CO8	Identify the classification and characteristics of Trends in sectional news-supplements-columns and columnists
CO9	Identify in depth Paid news-agenda setting-gate keepers-pressures in news room

Unit: 1- Role of Reporter, functions and qualities of reporter. News agencies- types of reporting- press conferences

Unit: 2- Types of leads, interviews, article writing, types of features

Unit:3-Organisational pattern of a news paper-set up of a news room, editorial department, editing-principles of editing, style sheet, jargons, importance of picture, selection of picture, headlines-functions and types o headlines. Design of editorial page, letters to the editors, contents of editorial page.

Unit: 4- Trends in sectional news-supplements-columns and columnists

Unit: 5- Paid news-agenda setting-gate keepers-pressures in news room.

Practical:

1. Internal Assessment
2. Exercise of Record books
3. Discussions on contemporary issues.

References:

1. Baskette and Scissors- The Art of Editing
2. S.N. Chaturvedi- Dynamics of Journalism an Art of Editing
3. Bruce Itule and Dougals Andrson- News Writing and Reporting for Today's Media
4. F.W. Hodson- Modern News paper Practices
5. Fedler Fred- Reporting for Print Media

Semester: 3

Code: DLC27015

Practices of Advertising and Public Relations

On completion of the course, students are able to:

CO1	Learn the details of Introduction to Advertising
CO2	Write down the details of functions of Advertising
CO3	Identify the details of Theories of Advertising
CO4	Deliberate in details with examples models of Advertising
CO5	Understand the details of Apex bodies Like-AAAI and ASCI
CO6	Identify in depth Types of Advertising
CO7	Learn in depth ethics and tools for advertising
CO8	Understand in details with examples types of media for advertising
CO9	Identify in depth functions, principles of PR
CO10	Write down the details of tools of PR

Unit: 1- Introduction to Advertising, meaning, history and functions of Advertising-Theories, models-Apex bodies Like-AAAI and ASCI

Unit: 2- Types of Advertising and new trends, ethics and tools for advertising, types of media for advertising, Advertising department and Ad agency structure.

Unit: 3- Introduction to PR, Definition, growth of PR, functions, principles and tools of PR, structure of PR department

Unit: 4- Types of PR, corporate communication, apex bodies like-IPRA, PRSI, PSPF and their codes.

References:

1. Advertising made simple- Frank Jefkins
2. Advertising Theory and Practices- Chunawalla
3. Public Relations Techniques- Jefkins Frank Butterworth
4. Hand book of Public Relations- Heath Robert
5. Effective Public Relations- Cutlip S.M. and Center A.H.
6. Public Relations in India- Kaul J.M. and Noya Prakash

Semester: 4
Code: DLD27015
Media Ethics and the Law

CO1	Understand the details of Press commissions
CO2	Learn in depth Press Council of India
CO3	Deliberate the characteristics of Freedom of expression-Article 19(1)A
CO4	Write down in depth Case study of Romesh Thaper
CO5	Identify the details of Ethics for live telecasting
CO6	Deliberate the classification and characteristics of Media violence and laws
CO7	Understand in details with application, if applicable, Broadcasting Bill
CO8	Understand in depth Broadcasting Bill
CO9	Understand the characteristics of Copy right act
CO10	Understand in details with examples Cyber laws

Unit:1-Press commissions- PCI- media ethics- Freedom of expression-Article 19(1)A and 19(1)2, Case study of Romesh Thaper

Unit: 2- Ethics for live telecasting and sting operations-ethical issues in social media-media violence and laws

Unit: 3-Broadcasting Bill-NBA guidelines-Media and culture-pornography and women prohibition act-1986

Unit:4- Official Secrecy act-law of defamation-copy right act-RTI-2005, IT act, Intellectual property rights-cyber laws-contempt of court

References:

1. Mass Media laws and regulations- Venkat Iyer
2. Freedom of the Press- M.K. Joseph
3. Law of Press in India-D.D.Basu
4. Press and the law-A.W.Grover
5. Legal limits to journalism-A.G.Noorani

Semester:5
Code: DLE27015

Paper:1 Introduction to TV and Radio

CO1	Identify in depth Origin and growth of radio
CO2	Understand the details of Characteristics of Radio and structure of AIR
CO3	Deliberate the characteristics of FM and Community stations
CO4	Learn the classification and characteristics of TV-studio set up
CO5	Specify in details with examples Types of camera
CO6	Understand in depth uses of archives and internet.

Unit: 1- Origin and growth of radio-characteristics of radio, structure of AIR, FM and community stations-broadcast format-stages of radio productions

Unit: 2- Writing for radio-broadcast formats-use of voice-sound effects-PCR-studio-recording and mixing-sound editing

Unit: 3- Origin and growth of TV-characteristics of tv media, types of tv programmes-scripts for TV-studio set up

Unit: 4- Types of camera-uses of different lenses-uses of archives-editing skills-mixing and dubbing

References:

1. Mass Communication-Keval J. Kumar
2. Radio and TV journalism- K.M.Srivastava
3. Broadcast journalism-itas basic principles-S.C. Bhatt

4. Audio-Visual journalism-B.N.Ahuja
5. TV media and Radio Voice-Dr.Nagendra

Semester: 5
Code: DLE27415
Pape: 2 Photo Journalism

CO1	Understand the details of birth of camera
CO2	Identify in details with examples modernisation of Photography
CO3	Understand the details of digital photography
CO4	Understand in depth Equipments of photography camera
CO5	Learn in depth types of lighting
CO6	Specify in details with examples Types of photography
CO7	Understand in depth basics of photojournalism
CO8	Learn in depth Editing photo

Unit:1-History,and definition of Photojournalism.-birth of camera, modernization of Photography, uses in media, digital photography.

Unit:2- Equipments of photography camera- lenses- tripods- monopods- camera bags- digital storage.

Unit:3- Lighting-types of lighting-Recommended equipments for outdoor –introduction to indoor lighting and photographying

Unit:4- Types of photography- news photography- sports photography- the basics of photojournalism- importance of context in photo journalism-

Unit:1- Editing photo- editing softwares-correcting imperfect images-

References:

1. The photography Book by Editors of Phaidon press.
2. All about photography by Ashok Dilwali
3. Practical Photography by O.P. Sharma
4. The photographers Guide to Light by Freeman John Collins and Brown
5. Lonely Planet's Best Ever Photography Tips by Richard I' Anson

Semester: 6
Code: DLF27415
Paper: 1 Film Appreciation

CO1	Learn in depth Introduction to Cinema Language
CO2	Identify the details of nature of scenes
CO3	Understand the details of types of shots
CO4	Identify the characteristics of montage language
CO5	Specify the characteristics of types of sounds
CO6	Understand the details of use of colors
CO7	Specify in depth development of classical Hollywood cinema
CO8	Learn the details of cinema and the nation
CO9	Deliberate the details of globalization and Indian cinema

Unit:1- Cinema Language-visual language-types of shots- nature of scene-continuity editing- montage language- types of sounds- use of colors- stylistic elements- differences between story-plot-screen play

Unit:2- Film form- style of German expression- Film Noir- Italian Neo realism-French new wave genre- the development of classical Hollywood cinema

Unit:3- Visions of 3rd cinema-nonfiction cinema- feminist cinema theory- auteur-film authorship-a special focus on ray/Kurusawa

Unit:4- Hindi cinema1950- cinema and the nation-the Indian new wave-globalization and Indian cinema- the multiplex Era-film culture

References:

1. Andre Bazin-The Ontology of the Photographic Image

2. Sergei Eisenstein- A Dialectic Approach to Film Form
3. Tom Gunning- Non Continuity, Continuity,Dis Continuity: A theory of Genre in early Films.
4. David Bordwell- Classical Hollywood Cinema: Narrational Principles and Procedure
5. Paul Schraeder- Notes on Film Noir
6. Robert Stam- The cult of the Auteur
7. Richard Dyer- Heavens Bodies: Film Stars and Society.
8. Mahadev Prasad- Idealogy of Hindi Film

Semester:6
Code: DLE27215
Paper: 2 Introduction to new Media

CO1	Identify the details of Definition of new media
CO2	Understand in details with examples information society and new media
CO3	Write down in details with examples digital journalism-online communities
CO4	Deliberate the details of cyber security and privacy
CO5	Learn the classification and characteristics of website planning and visual design
CO6	Understand the characteristics of Original and growth of blogging
CO7	Specify in details with examples digital art scripting and screening

Unit: 1- Definition of new media, Basics- information society and new media-virtual culture and digital journalism-online communities

Unit:2- cyber security-privacy, new media ethics- web writing-linear and non-writing- visual and content design-website planning and visual design

Unit:3- Original and growth of blogging, creating a blog, video blog, photo blog, and micro blog, video, podcast

Unit:4- User general content and web 2.0-digital art scripting and screening-cyber security

References:

1. Understanding digital culture- Vincent Miller

2. What is new media?-Lev Manovich
3. Understanding new media- Siapera Eugenia
4. Who Controls the Internet- Goldsmith Jack and Tim Wu
5. New media and new technologies- Lister Dovey and Griddings Grant

Generic Elective Paper

Code: DLE27615
Paper: 1- Media Gender and Human Rights

CO1	Learn the classification and characteristics of Media and the Social world
CO2	Deliberate in depth - media impact on society
CO3	Understand the classification and characteristics of democratic policy and mass media
CO4	Identify the characteristics of media and cultural change
CO5	Learn in details with examples grass roots media
CO6	Understand the characteristics of media and gender
CO7	Specify the classification and characteristics of media and social differences
CO8	Deliberate the details of Media and Human Rights

Unit:1- Media and the Social world- media impact on society- democratic policy and mass media- media and cultural change- grass roots media

Unit:2- Gender conceptual framework- feminist theory- media and gender- media and masculinity-media power- media and social differences- genres- romances-television-soap opera- sports

Unit:3- Media and Human Rights- Theoretical perspectives- universal declaration of human rights-case studies.

References:

1. Street John- Mass media, politics and democracy
2. Balnaves Mark, StephanieDonald and Bria Shoe Smith- Media Theories and Approaches: A global Perspective
3. The media Reader: Continuity, and transformation
4. Mc Quill Denis- Mass Communication theory
5. Berger Arthur Asia- Media and Society: A critical Perspective
6. Nicholas Joe and Price John- Advanced Studies in Media
7. Rajagopal Arvind- The Indian Public Sphere: Readings in Media History
8. Bannerjee Menon and Priyameds- Human Rights Gender and Environmner

Open Elective Paper

Code: DLF27215:
Paper: 2- Development Journalism

CO1	Identify in depth Concept, meaning of development
CO2	Write down the details of models of development
CO3	Deliberate in depth evolution of development journalism
CO4	Specify the classification and characteristics of Communication for social change
CO5	Identify the characteristics of Development news and features
CO6	Learn in depth community radio for development
CO7	Understand in depth Development communication agencies and web sites
CO8	Understand in details with examples Mass media as a tool for development

Unit:1- Concept, meaning of development, models of development, evolution of development journalism-communication for social change

Unit:2- Development news and features, writing headline and captions, innovative leads, research and planning- print and broad cast development journalism

Unit:3- Visual and documentation-folk media, community radio for development, niche newspapers and magazines, Development communication agencies and web sites

Unit:4- Mass media as a tool for development, role of development agencies, and NGO, using new media technologies for development-devcom.-SITE, Krishi Darshan, KHeda, cyber media and e-governance

References:

1. Manual of Development Journalism- Alan Chalkley
2. Development Communication and media Debate- Mridala Menon
3. Television and Social change in rural India-Kirk Johnson
4. Everybody loves a good drought- P. Sainath

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE
(AUTONOMOUS)
B.N. ROAD, MYSORE-25

DEPARTMENT OF JOURNALISM

MODEL QUESTION PAPER
B.A.JOURNALISM
I, II, III, IV, V&VI Semester
(CBCS Scheme)

Time: 3 Hours **Max. Marks – 70**

Q: I- Write any five questions. Each question carries two marks. 2X5=10
1.....
2.....
3.....
4.....
5.....
6.....
7.....
Q: II - Write any four questions. Each question carries five marks. 5X4=20
1.....
2.....
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4.....
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Q: III - Write any four questions. Each question carries ten marks. 10X4=40

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2017 - 18 jAzÀ 2018-19

2017 – 18 - IVth Sem onword

2018 – 19 – IInd Sem onword

Choice based credit system (CBCS) Semester scheme (2017-18 to 2019-20)
14 weeks for teaching 2 weeks for test, Total 16 weeks

PROGRAMME BA-EG\HP\KG\HE\JE

Sem	papers	CURSE TITLE	COURSE CODE	Teach hours	Cred	L:T:P	EXAM	C1+C2	C3	Tot mrks
1st	1	SAHITHYA MATHU SAMSKRUTI GATAKA	DLA06001 DLA06002 DLA06003 DLA06004 DLA06005	3+1	3	3:1:0	3 hrs	15+15	70	100
2nd	2	SAHITHYA MATHU SAMSKRUTI GATAKA	DLB06001 DLB06002 DLB06003 DLB06004 DLB06005	3+1	3	3:1:0	3 hrs	15+15	70	100
3rd	3	SAHITHYA MATHU SAMSKRUTI GATAKA	DLC06001 DLC06002 DLC06003 DLC06004 DLC06005	3+1	3	3:1:0	3 hrs	15+15	70	100
4th	4	SAHITHYA MATHU SAMSKRUTI GATAKA	DLD06001 DLD06002 DLD06003 DLD06004 DLD06005	3+1	3	3:1:0	3 hrs	15+15	70	100
3rd		SAMARTHYA SAVARDHANE		2 hrs	3	3:1:0	2hrs	15+15	70	100

Choice based credit system (CBCS) Semester scheme (2017-18 to 2019-20)

14 weeks for teaching 2 weeks for test, Total 16 weeks

PROGRAMME B.SC-PCM/PMCs/PMCM/PME/CZBT/BMBT/BBM/CBZ

Sem	papers	CURSE TITLE	COURSE CODE	Teach hours	Cred	L:T:P	EXAM	C1+C2	C3	Tot mrks
1st	1	SAHITHYA MATHU SAMSKRUTI GATAKA	CMA06001 CMA 06002 CMA 06003 CMA 06004 CMA 06005 CMA 06006 CMA 06007 CMA 06008	3+1	3	3:1:0	3 hrs	15+15	70	100
2nd	2	SAHITHYA MATHU SAMSKRUTI GATAKA	CMB06001 CMB 06002 CMB 06003 CMB 06004 CMB 06005 CMB06006 CMB06007 CMB06008	3+1	3	3:1:0	3 hrs	15+15	70	100
3rd	3	SAHITHYA MATHU SAMSKRUTI GATAKA	CMC06001 CMC06002 CMC06003 CMC06004 CMC06005 CMC06006 CMC06007 CMC06008	3+1	3	3:1:0	3 hrs	15+15	70	100
4th		SAHITHYA MATHU SAMSKRUTI GATAKA	CMD06001 CMD 06002 CMD 06003 CMD 06004 CMD 06005 CMD06006 CMD06007 CMD06008	3+1	3	3:1:0	3 hrs	15+15	70	100

Choice based credit system (CBCS)Semester scheme (2017-18 to 2019-20)
14 weeks for teaching 2 weeks for test, Total 16 weeks

PROGRAMME -B.com

2 tests conducted each 15 marks 1hr for test it is compulsory

Sem	Papers	Course Title	COURSE CODE	Teaching hours	Credits	Examination	C1+C2	C3	Total marks
1st	1	SAHITHYA MATHU SAMSKRUTI GATAKA	DNA06001	3+1	3	3 hrs	15+15	70	100
2nd	2	SAHITHYA MATHU SAMSKRUTI GATAKA	DNB06001	3+1	3	3 hrs	15+15	70	100
3rd	3	SAHITHYA MATHU SAMSKRUTI GATAKA	DNC06001	3+1	3	3 hrs	15+15	70	100
4th	4	SAHITHYA MATHU SAMSKRUTI GATAKA	DND06001	3+1	3	3 hrs	15+15	70	100
3rd	3	SAMARTHYA SAVARDHANE	DNC31001	2 hrs	2	2hrs	15+15	70	100

2 tests conducted for 30 marks each 15 mark , 1 hour time(Internal assessment)

Choice based credit system (CBCS) Semester scheme (2017-18 to 2019-20)
PROGRAMME BA-EG\HP\KG\HE\JE

Sem	papers	COURSE TITLE	COURSE CODE
1st	1	SAHITHYA MATHU SAMSKRUTI GATAKA	DLA06001 DLA06002 DLA06003 DLA06004 DLA06005
2nd	2	SAHITHYA MATHU SAMSKRUTI GATAKA	DLB06001 DLB06002 DLB06003 DLB06004 DLB06005
3rd	3	SAHITHYA MATHU SAMSKRUTI GATAKA	DLC06001 DLC06002 DLC06003 DLC06004 DLC06005
4th	4	SAHITHYA MATHU SAMSKRUTI GATAKA	DLD06001 DLD06002 DLD06003 DLD06004 DLD06005
3rd		SAMARTHYA SAVARDHANE	DLC06011

Choice based credit system (CBCS) Semester scheme (2017-18 to 2019-20)

PROGRAMME B.SC-PCM/PMCs/PMCM/PME/CZBT/BMBT/BBM/CBZ

Sem	papers	CURSE TITLE	COURSE CODE
1st	1	SAHITHYA MATHU SAMSKRUTI GATAKA	CMA06001 CMA 06002 CMA 06003 CMA 06004 CMA 06005 CMA 06006 CMA 06007 CMA 06008
2nd	2	SAHITHYA MATHU SAMSKRUTI GATAKA	CMB06001 CMB 06002 CMB 06003 CMB 06004 CMB 06005 CMB06006 CMB06007 CMB06008
3rd	3	SAHITHYA MATHU SAMSKRUTI GATAKA	CMC06001 CMC06002 CMC06003 CMC06004 CMC06005 CMC06006 CMC06007 CMC06008
4th		SAHITHYA MATHU SAMSKRUTI GATAKA	CMD06001 CMD 06002 CMD 06003 CMD 06004 CMD 06005 CMD06006 CMD06007 CMD06008

Choice based credit system (CBCS)Semester scheme (2017-18 to 2019-20)

PROGRAMME -B.com

Sem	papers	Course Title	COURSE CODE
1st	1	SAHITHYA MATHU SAMSKRUTI GATAKA	DNA06001
2nd	2		DNB06001
3rd	3	SAHITHYA MATHU SAMSKRUTI GATAKA	DNC06001
4th	4	SAHITHYA MATHU SAMSKRUTI GATAKA	DND06001
3rd	3	SAMARTHYA SAVARDHANE	DNC31001

Choice based credit system (CBCS)Semester scheme (2017-18 to 2019-20)

PROGRAMME -BBA

Sem	papers	Course Title	COURSE CODE
1st	1	SAHITHYA MATHU SAMSKRUTI GATAKA	BDA06001
2nd	2	SAHITHYA MATHU SAMSKRUTI GATAKA	BDB06001
3rd	3	SAHITHYA MATHU SAMSKRUTI GATAKA	BDC06001
4th	4	SAHITHYA MATHU SAMSKRUTI GATAKA	BDD06001

Choice based credit system (CBCS)Semester scheme (2017-18 to 2019-20)

PROGRAMME - BCA

Sem	papers	Course Title	COURSE CODE
1st	1	SAHITHYA MATHU SAMSKRUTI GATAKA	DCA06001
2nd	2	SAHITHYA MATHU SAMSKRUTI GATAKA	DCB06001
3rd	3	SAHITHYA MATHU SAMSKRUTI GATAKA	DCC06001
4th	4	SAHITHYA MATHU SAMSKRUTI GATAKA	DCD06001

Programme Outcome for Programme BA

After completing the graduation students are able to

PO1-Understand Indian heritage & culture

PO2 -Manage business affairs.

PO3-Learn the origin & Etymology of the particular place

PO4-Understand socio- political concepts

PO5- Write report, editorials and letters.

PO6- Build confidence to face the competitive examination

Programme Specific Outcome for Programme BA

After completing the graduation students are able to

PSO1- Understand society, culture and human values

Programme Outcome for Programme BCom, BBA

After completing the graduation students are able to

PO1- Build confidence to face the competitive exams.

PO2- Learn the skill of letter writing ,drafting

PO3- Finds job opportunity.

Programme Specific Outcome for Programme BCom, BBA

After completing the graduation students are able to

PSO-1 Able to speak and write precisely

Programme Outcome for Programme BSc , BCA

After completing the graduation students are able to

PO1- Enhance the research ability.

PO2 – Build the carrier and job findings.

PO3- Apply of competitive knowledge to the related subjects

PO4- Understand the humanity and human life

PO5- Develop good relation with the society

PO6- Find the job opportunity

PO7- Build confidence to face the competitive examination

Programme Specific Outcome for Programme BSc , BCA

After completing the graduation students are able to

PSO-1 Communicate effectively technical and non technical things

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(2017-18 jAzÀ 2019-2020 ±ÉÊPÀëtÂPÀ ªÀµÀðPÉÌ)

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1	1 . C	¸Á»vÀå ªÀÄvÀÄÛ ¸ÀA¸ÀÌøw WÀlPÀ C. ºÉÆ¸ÀUÀ£ÀßqÀ PÁªÀå D. ¸ÀtÚPÀxÉUÀ¼ÀÄ	2 1	48	40 30	3	30	100
2	1 D	¸Á»vÀå ªÀÄvÀÄÛ ¸ÀA¸ÀÌøw WÀlPÀ C. £ÁlPÀ D.PÁzÀA§j	2 1	48	40 30	3	30	100
3	2.C	¸Á»vÀå ªÀÄvÀÄÛ ¸ÀA¸ÀÌøw WÀlPÀ C £ÀqÀÄUÀ£ÀßqÀ PÁªÀå ¸ÀªÀiPÁ°ÃªÀÄ C. «ZÁgÀ ¸Á»vÀå	2 1	48	40 30	3	30	100
4	2. D	¸Á»vÀå ªÀÄvÀÄÛ ¸ÀA¸ÀÌøw WÀlPÀ C. ºÀ¼ÀUÀ£ÀßqÀ PÁªÀå ¸ÀªÀiÁUÀªÀÄ C PÀ£ÁðlPÀ ªÀÄvÀÄÛ ¨sÁgÀwÃAiÀÄ ¸ÀA¸ÀÌøw aAvÀ£É/ ¥Àæ§AzsÀUÀ¼ÀÄ	2 1	48	40 30	3	30	100

DAvÀjPÀ ªÀiË®åªÀiÁ¥À£À: ¥ÀæwAiÉÆAzÀÄ ¥ÀwæPÉUÀÆ 15 UÀjµÁ×APÀUÀ¼À MAzÀÄ UÀAmÉ CªÀ¢üAiÀÄ JgÀqÀÄ QgÀÄ

¥ÀjÃPÉëAiÀÄ£ÀÄß £ÀqÉ¸À¯ÁUÀÄªÀÅzÀÄ. JgÀqÀÄ ¥ÀjÃPÉëUÀ¼ÀÄ PÀqÁØAiÀÄªÁVgÀÄvÀÛªÉ.

*«zÁåyðAiÀÄÄ UÀ½¹zÀ CAPÀ*UÀ¼À£ÀÄß DAvÀjPÀ ªÀiË®åªÀiÁ¥À£À CAPÀUÀ¼ÉAzÀÄ ¥ÀjUÀtÂ¸ÀvÀPÀÌzÀÄÝ.

ZÀvÀÄªÀiÁð¸À CªÀ¢ü : ¨ÉÆÃzsÀ£ÉUÁV 14 ªÁgÀUÀ¼ÀÄ ªÀÄvÀÄÛ ¥ÀjÃPÉëUÁV 2 ªÁgÀUÀ¼ÀÄ MlÄÖ 16 ªÁgÀUÀ¼ÀÄ.

BA.,B.Sc.

Semester – I

Title of the paper: Sahithya mathu Samskruti ghataka

Hosagannada kavya mathu Sanna kathegalu

Course code: DLA06001, DLA06002, DLA06003, DLA06004, DLA06005, CMA06001, CMA06002, CMA06003, CMA06004, CMA06005, CMA06006, CMA06007, CMA06008

Credits: 3 **Lecture hrs** : 4

Course outcome

CO1: Specify the details of modern poems of 20th century

CO2: Understand in depth thenkana galiaata-panje mangesh rai

CO3: Identify the details of nan puttnanji roopa-GPRajarathnam

CO4: Identify the details of anna yagna-dara bendre

CO5: Identify the details of yarigagi-videhi

CO6: Learn in details with examples nanna janagalu-siddalingaiah

CO7: Deliberate the classification and characteristics of short stories

CO8: Write down in depth gauthami helida kathe-masthi

CO9: Identify in details with examples thayi-UR Anantha moorthy

CO10: Specify the characteristics of munnadina-kodagina gowramma

©.J / ©.J¹ì.

ªÉÆzÀ®£ÉAiÀÄ ZÀvÀÄªÀiÁð¸À

¥ÀwæPÉ-1 : ¸Á»vÀå ªÀÄvÀÄÛ ¸ÀA¸Àìøw WÀlPÀ

(ªÁgÀPÉÌ 3 UÀAmÉUÀ¼À ¥ÁoÀ, 3 UÀAmÉUÀ¼À ¥ÀjÃPÉë, ¥ÀjÃPÁë CAPÀUÀ¼ÀÄ 70,

DAvÀjPÀ ªÀiË®åªÀiÁ¥À£À CAPÀUÀ¼ÀÄ 30)

¥ÀoÀå- 1: : ºÉÆ¸ÀUÀ£ÀßqÀ PÁªÀå :

(ªÁgÀPÉÌ 2 UÀAmÉUÀ¼À ¥ÁoÀ - ZÀvÀÄªÀiÁð¸ÀPÉÌ 32 UÀAmÉUÀ¼ÀÄ)

¤UÀ¢vÀ 12 PÀªÀ£ÀUÀ¼ÀÄ

1. ºÀÄvÀÛj ºÁqÀÄ - ¥ÀAeÉ ªÀÄAUÉÃ±ÀgÁAiÀÄ

2. ¤ÃA ªÀÄºÀaÒ°à ¢IA - PÀÄªÉA¥ÀÄ

3. £À£ï ¥ÀÄlßAf gÀÆ¥À - f.¦.gÁdgÀvÀß

4 vÀÄwÛ£À aÃ® - zÀ. gÁ. ¨ÉÃAzÉæ

5. ¥ÀæxÀªÀÄ gÁd¤UÉ - PÉ J¸ï £ÀgÀ¹AºÀ ¸Áé«Ä

6. £À£Àß CªÀvÁgÀ - JA. UÉÆÃ¥Á®PÀÈµÀÚ CrUÀ

7. dqÉ - f.J¸ï.J¸ï.

8. ªÀiÁ¹Û - ¤¸Ágï CºÀªÀÄzï

9. ¸ÀªÀÄUÁgÀ ©üÃªÀÄªÀé - JZï J¸ï ²ª À¥ÀæPÁ±ï

10. CqÀÄUÉ ªÀÄ£ÉAiÀÄ ºÀÄqÀÄV - ªÉÊzÉÃ»

11. gÁtÂ w«ÄäAiÀÄ ¹AºÁ¸À£À - «dAiÀiÁzÀ¨Éâ

12.£À£Àß d£ÀUÀ¼ÀÄ - ¹zÀÞ°AUÀAiÀÄå

¥ÀoÀå : 2: D. ¸ÀtÚPÀxÉUÀ¼ÀÄ:

(ªÁgÀPÉÌ 1 UÀAmÉÀ ¥ÁoÀ - ZÀvÀÄªÀiÁð¸ÀPÉÌ 16 UÀAmÉUÀ¼ÀÄ)

¤UÀ¢vÀ 5 PÀxÉUÀ¼ÀÄ

1. DgÀÄPÁ¸ÀÄ ªÀÄÄÆgÁuÉ - PÀÄªÉA¥ÀÄ
2. ªÉÆ¸Àj£À ªÀÄÄAUÀªÀÄä - ªÀiÁ¹Û
3. ±ÁæzÀÞ - n f gÁWÀªÀ
4. CªÀiÁ¸À ªÀÄºÁzÉÃªÀ - zÉÃªÀ£ÀÆgÀÄ
5. MAzÀÄ ¥ÀÄlÖ avÀæ UËgÀªÀÄä - PÉÆqÀV£À

BA.,B.Sc.

Semester – II

Title of the paper: Sahithya mathu Samskruti ghataka

Naataka mathu Kaadambari

Course code: DLB06001, DLB06002, DLB06003, DLB06004, DLB06005, CMB06001, CMB06002, CMB06003, CMB06004, CMB06005, CMB06006, CMB06007, CMB06008

Credits: 3 **Lecture hrs** : 4

Course outcome

CO1: Identify in depth thugalak drama-Girish karnaad

CO2: Specify in details with examples speciality of thuglakk

CO3: Identify the characteristics of limitations of thuglak

CO4: Identify the classification and characteristics of maranadandane-novel by baragururamachandrappa

CO5: Write down in depth speciality nd limitations maranadandane

CO6: Learn the classification and characteristics of kathana kavanagalu

CO7: Identify in details with application, if applicable, kari sidda -kuvempu

CO8: Specify the classification and characteristics of katte mathu dharma-siddlingayya

©.J / ©.J¹ì.
JgÀqÀ£ÉAiÀÄ ZÀvÀÄªÀiÁð¸À

¥ÀwæPÉ-2 : ¸Á»vÀå ªÀÄvÀÄÛ ¸ÀA¸Àìøw WÀlPÀ

(ªÁgÀPÉÌ 3 UÀAmÉUÀ¼À ¥ÁoÀ, 3 UÀAmÉUÀ¼À ¥ÀjÃPÉë, ¥ÀjÃPÁë CAPÀUÀ¼ÀÄ 70, DAvÀjPÀ ªÀiË®åªÀiÁ¥À£À CAPÀUÀ¼ÀÄ 30)

¥ÀoÀå-1 : £ÁlPÀ : CAwUÉÆ£É ¯ÉÃ: ®APÉÃ±ï

(ªÁgÀPÉÌ 2 UÀAmÉUÀ¼À ¥ÁoÀ - ZÀvÀÄªÀiÁð¸ÀPÉÌ 32 UÀAmÉUÀ¼ÀÄ)

¥ÀoÀå - 2: PÁzÀA§j : vÀ§â° ¤Ã£ÁzÉ ªÀÄUÀ£É, ¯ÉÃ- J¸ï J¯ï ¨sÉÊgÀ¥Àà

(ªÁgÀPÉÌ 1 UÀAmÉ ¥ÁoÀ ZÀvÀÄªÀiÁð¸ÀPÉÌ 16 UÀAmÉUÀ¼ÀÄ)

BA.,B.Sc.

Semester – III

Title of the paper: Sahithya mathu Samskruti ghataka

Desi kavya samakshama mathu nadugannada kavya

Course code: DLC06001, DLC06002, DLC06003, DLC06004, DLC06005, CMC06001, CMC06002, CMC06003, CMC06004, CMC06005, CMC06006, CMC06007, CMC06008

Credits: 3

Course outcome **Lecture hrs**: 4

CO1: Deliberate the details of medival period poetry

CO2: Understand in details with application, if applicable, vachanagalu

CO3: Learn the characteristics of keerthanegalu

CO4: Learn in depth folk literature

CO5: Identify the classification and characteristics of poems of raghavanka/lakshmeesha/kumaravyasa

CO6: Understand the characteristics of ramadanya charithe-kanakadaasa

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ªÀÄÆgÀ£ÉAiÀÄ ZÀvÀÄªÀiÁð¸À

¥ÀwæPÉ-3 : ¸Á»vÀå ªÀÄvÀÄÛ ¸ÀA¸ÀÌøw WÀlPÀ

(ªÁgÀPÉÌ 3 UÀAmÉUÀ¼À ¥ÁoÀ, 3 UÀAmÉUÀ¼À ¥ÀjÃPÉë, ¥ÀjÃPÁë CAPÀUÀ¼ÀÄ 70,DAvÀjPÀ ªÀiË®åªÀiÁ¥À£À CAPÀUÀ¼ÀÄ 30)

¥ÀoÀå- 1: : £ÀqÀÄUÀ£ÀßqÀ PÁªÀå ¸ÀªÀÄPÀëªÀÄ

(ªÁgÀPÉÌ 2 UÀAmÉUÀ¼À ¥ÁoÀ : ZÀvÀÄªÀiÁð¸ÀPÉÌ 32 UÀAmÉUÀ¼ÀÄ)

¤UÀ¢vÀ 6 ¨sÁUÀUÀ¼ÀÄ

1. ªÀZÀ£ÀUÀ¼ÀÄ - eÉÃqÀgÀ zÁ¹ªÀÄAiÀÄå, §¸ÀªÀtÚ, CPÀÌªÀÄºÁzÉÃ«

2. ¥ÀÄµÀà gÀUÀ¼É - ºÀjºÀgÀ

3. UÁ£ÀgÁtÂAiÀÄgÀ ¥Àæ¸ÀAUÀ - gÁWÀªÁAPÀ

4. GvÀÛgÀ PÀÄªÀiÁgÀ£À ¥Àæ¸ÀAUÀ - PÀÄªÀiÁgÀªÁå¸À

5. ±ÀÄa«ÃgÀ - £ÀAdÄAqÀPÀ«

6. QÃvÀð£ÉUÀ¼ÀÄ - PÀ£ÀPÀzÁ¸À

¥ÀoÀå- 2 : £ÀqÀÄUÀ£ÀßqÀ PÁªÀå :PÀ£ÀPÀzÁ¸ÀgÀ gÁªÀÄzsÁ£Àå ZÀjvÉ ¸ÀA : zÉÃ dªÀgÉÃUËqÀ

(ªÁgÀPÉÌ 1 UÀAmÉUÀ¼À ¥ÁoÀ : ZÀvÀÄªÀiÁð¸ÀPÉÌ 16 UÀAmÉUÀ¼ÀÄ)

BA.,B.Sc.

Semester – IV

Title of the paper: Sahithya mathu Samskruti ghataka

Maarga kavya samagama mathu vicharasahithya

Course code: DLD06001, DLD06002, DLD06003, DLD06004, DLD06005, CMD06001, CMD06002, CMD06003, CMD06004, CMD06005, CMD06006, CMD06007, CMD06008

Credits: 3

Course outcome **Lecture hrs**: 4

CO1: Understand the characteristics of ramadanya charithe-kanakadaasa

CO2: Understand the classification and characteristics of poems by pampa/ranna/janna/shadakshari

CO3: Learn in details with examples vichara sahitya

CO4: Identify the classification and characteristics of pragathi mimamse-sriranga

CO5: Understand in details with application, if applicable, vignyana mathu samaja jeevana-G hanumantha rao

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£Á®Ì£ÉAiÀÄ ZÀvÀÄªÀiÁð¸À

¥ÀwæPÉ-2 : ¸Á»vÀå ªÀÄvÀÄÛ ¸ÀA¸ÀÌøw WÀlPÀ

(ªÁgÀPÉÌ 3 UÀAmÉUÀ¼À ¥ÁoÀ, 3 UÀAmÉUÀ¼À ¥ÀjÃPÉë, ¥ÀjÃPÁë CAPÀUÀ¼ÀÄ 70,DAvÀjPÀ ªÀiË®åªÀiÁ¥À£À CAPÀUÀ¼ÀÄ 30)

¥ÀoÀå- 1: : ºÀ¼ÀUÀ£ÀßqÀ PÁªÀå ¸ÀªÀiÁUÀªÀÄ

(ªÁgÀPÉÌ 2 UÀAmÉUÀ¼À ¥ÁoÀ - ZÀvÀÄªÀiÁð¸ÀPÉÌ 32 UÀAmÉUÀ¼ÀÄ)

¤UÀ¢vÀ 6 ¨sÁUÀUÀ¼ÀÄ

1. £É£ÉAiÀÄ¢gÀtÚ ¨sÁgÀvÀzÉÆ½A - ¥ÀA¥À

2. zÀÄgÉÆåÃzsÀ£À «¯Á¥À - gÀ£Àß

3. ªÀÄºÁ±ÉéÃvÉ ªÀÈvÁÛAvÀA - £ÁUÀªÀªÀÄð

4. £À¼ÀPÀÆ§gÀ£À ¥Àæ¸ÀAUÀ - £ÁUÀZÀAzÀæ

5. «¢ü«¼À¸À£ÀzÀ £ÉgÀA§qÉAiÉÄ PÉÆAzÀÄ PÀÆUÀzÉ £ÀgÀgÀA – d£Àß

6vÉÆÃ¥Éð£É£Àß ¸ÁºÀ¸À¢gÀªÀA - µÀqÀPÀëgÀzÉÃªÀ

¥ÀoÀå- 2: :«ZÁgÀ ¸Á»vÀå

(ªÁgÀPÉÌ 1 UÀAmÉUÀ¼À ¥ÁoÀ ZÀvÀÄªÀiÁð¸ÀPÉÌ 16 UÀAmÉUÀ¼ÀÄ)

¤UÀ¢vÀ 4 ¨sÁUÀUÀ¼ÀÄ

1. ¥ÀæUÀw «ÄÃªÀiÁ¸É – ²æÃgÀAUÀ

2. «eÁÕ£À ªÀÄvÀÄÛ ¸ÀªÀiÁd fÃªÀ£À - f. ºÀ£ÀÄªÀÄAvÀgÁªï

3. ¨sÁgÀwÃAiÀÄvÉ - AiÀÄÄ Dgï C£ÀAvÀªÀÄÆwð

4.ªÀåQÛ «²µÀÖªÁ¢ : «ªÁºÀ: ¥ÉæÃªÀÄ - PÉ.¦ ¥ÀÆtðZÀAzÀæ vÉÃd¹é

B.COM, BBA, BCA.

Semester – I

Title of the paper: Sahithya mathu Samskruti ghataka

Hosagannada kavya mathu sannakathegalu

Course code: DNA06001, BDA06001, DCA06001

Credits: 3

Course outcome **Lecture hrs**: 4

CO1: Understand in details with examples modern poems of 20th century

CO2: Understand the details of be century

CO3: Deliberate in depth short stories

CO4: Learn in details with application, if applicable, chilume-mogalli ganesh

CO5: Identify in details with application, if applicable, jogathi kallu-annanda kanda

CO6: Understand the classification and characteristics of prarthane-BM Sri

C07: Learn the characteristics of kannada padagol-GPRajarathnam

CO8: Write down in details with application, if applicable, kunthiya belagu-v

CO9: Specify the details of kunthiya belagu-vijayadabbe

CO10: Write down in details with examples chomana makkala hadu-siddalingaiah

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ªÉÆzÀ®£ÉAiÀÄ ZÀvÀÄªÀiÁð¸À

¥ÀwæPÉ-1 : ¸Á»vÀå ªÀÄvÀÄÛ ¸ÀA¸Àìøw WÀlPÀ

(ªÁgÀPÉÌ 3 UÀAmÉUÀ¼À ¥ÁoÀ, 3 UÀAmÉUÀ¼À ¥ÀjÃPÉë, ¥ÀjÃPÁë CAPÀUÀ¼ÀÄ 70,DAvÀjPÀ ªÀiË®åªÀiÁ¥À£À CAPÀUÀ¼ÀÄ 30)

¥ÀoÀå- 1: : ºÉÆ¸ÀUÀ£ÀßqÀ PÁªÀå

(ªÁgÀPÉÌ 2 UÀAmÉUÀ¼À ¥ÁoÀ - ZÀvÀÄªÀiÁð¸ÀPÉÌ 32 UÀAmÉUÀ¼ÀÄ)

¤UÀ¢vÀ 12 PÀªÀ£ÀUÀ¼ÀÄ

1. ¥ÁæxÀð£É - ©.JA.²æÃ

2. ¨É¼ÀUÀÄ - zÀ. gÁ. ¨ÉÃAzÉæ

3. ªÀÄAdtÚ ºÉÃ½zÀ ¸ÀÜ¼ÀUÀvÉ - PÀÄªÉA¥ÀÄ

4. ¸ÀÜ¼ÀUÀ¼À ºÉ¸ÀgÀÄ - ªÀiÁ¹Û

5. gÁAiÀÄgÀÄ §AzÀgÀÄ ªÀiÁªÀ£À ªÀÄ£ÉUÉ - PÉ.J¸ï.£À

6. ªÀÄÄA¨ÉÊ eÁvÀPÀ - f.J¸ï.²ªÀgÀÄzÀæ¥Àà

7. gÉÆnÖ ªÀÄvÀÄÛ PÉÆÃ« - ¸ÀÄ.gÀA.JPÀÄÌAr

8. ªÀÄgÉvÉÃ£ÉAzÀgÉ ªÀÄgÉAiÀÄ° ºÁåAUÁ – ZÀAzÀæ ±ÉÃRgÀ PÀA¨ÁgÀ

9. PÀÄAwAiÀÄ ¨É¼ÀUÀÄ - «dAiÀiÁzÀ¨Éâ

10. ²ªÀ£À «ÄÃ¸ÀÄªÀ ºÁqÀÄ - ªÉÊzÉÃ»

11. ZÉÆÃªÀÄ£À ªÀÄPÀÌ¼À ºÁqÀÄ - ¹zÀÞ°AUÀAiÀÄ

12. zÁA¥ÀvÀå - ¸À. GµÁ

¥ÀoÀå : 2: ¸ÀtÚPÀxÉUÀ¼ÀÄ

(ªÁgÀPÉÌ 1 UÀAmÉ ¥ÁoÀ ZÀvÀÄªÀiÁð¸ÀPÉÌ 16 UÀAmÉUÀ¼ÀÄ)

¤UÀ¢vÀ 5 PÀxÉUÀ¼ÀÄ

1. ªÉAPÀl±Á«ÄAiÀÄ ¥ÀætAiÀÄ ¥Àæ¸ÀAUÀ - ªÀiÁ¹Û
2. ¨ÉÃ£Áå - AiÀÄ±ÀªÀAvÀ avÁÛ®
3. gÀÄzÀæ¥Àà£À RqÀÎ - PÀÄA. «ÃgÀ¨sÀzÀæ¥Àà
4. dé®AvÀ – VÃvÁ £ÁUÀ¨sÀÆµÀt
5. PÀÄAqÀdÓ£À ¥À¸ÀðAUÀ - PÀÈµÀÚªÀÄÆwð ºÀ£ÀÆgÀÄ

B.COM, BBA, BCA.

Semester – II

Title of the paper: Sahithya mathu Samskruti ghataka

Naataka mathu kaadambari

Course code: DNB06001, BDB06001, DCB06001

Credits: 3

Course outcome **Lecture hrs**: 4

CO1: Drama Antigone translated by P Lankesh

CO2: Specialities and limitions of Antigone

CO3: Novel Karvalo by K P Poorna chandra tejasvi

CO4: Specialties of Kathanakavanagalu

CO5: Nagi by kuvempu, Samadhiya sathva by Masthi

C06: Specialties and limitations of the novel Karvalo

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JgÀqÀ£ÉAiÀÄ ZÀvÀÄªÀiÁð¸À

¥ÀwæPÉ-2 : ¸Á»vÀå ªÀÄvÀÄÛ ¸ÀA¸Àìøw WÀlPÀ

(ªÁgÀPÉÌ 3 UÀAmÉUÀ¼À ¥ÁoÀ, 3 UÀAmÉUÀ¼À ¥ÀjÃPÉë, ¥ÀjÃPÁë CAPÀUÀ¼ÀÄ 70,DAvÀjPÀ ªÀiË®åªÀiÁ¥À£À CAPÀUÀ¼ÀÄ 30)

¥ÀoÀå-1 : £ÁlPÀ : CAwUÉÆ£É, ¯ÉÃ: ¦. ®APÉÃ±ï

(ªÁgÀPÉÌ 2 UÀAmÉUÀ¼À ¥ÁoÀ : ZÀvÀÄªÀiÁð¸ÀPÉÌ 32 UÀAmÉUÀ¼ÀÄ)

¥ÀoÀå - 2: PÁzÀA§j ,PÀªÁð¯ÉÆ ¯ÉÃ- PÉ.¦. ¥ÀÆt ZÀAzÀæ vÉÃd¹é

(ªÁgÀPÉÌ 1 UÀAmÉ ¥ÁoÀ - ZÀvÀÄªÀiÁð¸ÀPÉÌ 16 UÀAmÉUÀ¼ÀÄ)

B.COM, BBA, BCA.

Semester – III

Title of the paper: Sahithya mathu Samskruti ghataka

Desi kavya samakshama

Course code: DNC06001, BDC06001, DCC06001

Credits: 3

Course outcome **Lecture hrs** : 4

CO1: Write down the characteristics of selected poems of medieval period

CO2: Understand in details with examples VACHANAS

CO3: Learn in details with examples SELECTED POEMS OF HARIHARA/KUMARAVYASA/SARVAGNA

CO4: Deliberate the classification and characteristics of FOLK LITERATURE

CO5: Write down in details with examples SELECTEDPOEMS OF KUMAR VYASA (VIRATA PARVA)

CO6: Identify in details with examples characteristics and specialty of VIRATA PARVA

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ªÀÄÆgÀ£ÉAiÀÄ ZÀvÀÄªÀiÁð¸À

¥ÀwæPÉ-3 : ¸Á»vÀå ªÀÄvÀÄÛ ¸ÀA¸ÀÌøw WÀlPÀ

(ªÁgÀPÉÌ 3 UÀAmÉUÀ¼À ¥ÁoÀ, 3 UÀAmÉUÀ¼À ¥ÀjÃPÉë, ¥ÀjÃPÁë CAPÀUÀ¼ÀÄ 70,DAvÀjPÀ ªÀiË®åªÀiÁ¥À£À CAPÀUÀ¼ÀÄ 30)

¥ÀoÀå- 1: : £ÀqÀÄUÀ£ÀßqÀ PÁªÀå ¸ÀªÀÄPÀëªÀÄ

(ªÁgÀPÉÌ 2 UÀAmÉUÀ¼À ¥ÁoÀ - ZÀvÀÄªÀiÁð¸ÀPÉÌ 32 UÀAmÉUÀ¼ÀÄ)

¤UÀ¢vÀ 6 ¨sÁUÀUÀ¼ÀÄ

1. ªÀZÀ£ÀUÀ¼ÀÄ - C®èªÀÄ¥Àæ¨sÀÄ,ZÉ£Àß§¸ÀªÀtÚ, DAiÀÄÝQÌ CPÀÌªÀÄä

2. ¸ÁªÀÄªÉÃ¢ gÀUÀ¼É - ºÀjºÀgÀ

3. ZÀAzÀæªÀÄwAiÀÄ ¥Àæ¯Á¥À - gÁWÀªÁAPÀ

4. gÀt¢üÃgÀ gÁªÀÄ£ÁxÀ - £ÀAdÄAqÀPÀ«

5. zsÀªÀÄðAiÀÄÄzÀÞ - gÀvÁßPÀgÀ ªÀtÂð

6. wæ¥À¢UÀ¼ÀÄ - ¸ÀªÀðdÐ

¥ÀoÀå- 2 : «gÁl ¥ÀªÀð ¸ÀA : vÀ. ¸ÀÄ . ±ÁªÀÄgÁAiÀÄ

(ªÁgÀPÉÌ 1 UÀAmÉUÀ¼À ¥ÁoÀ ZÀvÀÄªÀiÁð¸ÀPÉÌ 16 UÀAmÉUÀ¼ÀÄ)

B.COM, BBA, BCA.

Semester – IV

Title of the paper: Sahithya mathu Samskruti ghataka

Maarga kavya samagama mathu vichara sahithya

Course code: DND06001, BDD06001, DCD06001

Credits: 3

Course outcome **Lecture hrs**: 4

CO1: Learn the classification and characteristics of selected poems of OLD KANNADA

CO2: Understand in details with examples poems by PAMPA/RANNA/JANNA/SHADAKSHARI

CO3: Learn the details of importance f studying old epics

CO4: Learn in depth prose of 20th century

CO5: Identify the details of MANNINA VASNE by GOPALAKRISHNA ADIGA

CO6: Specify in details with application, if applicable, MANAVEEYATHE ANTHRLLA ADARA BAGGE BY DEVANUR MAHADEVA

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£Á®Ì£ÉAiÀÄ ZÀvÀÄªÀiÁð¸À

¥ÀwæPÉ-2 : ¸Á»vÀå ªÀÄvÀÄÛ ¸ÀA¸ÀÌøw WÀlPÀ

(ªÁgÀPÉÌ 3 UÀAmÉUÀ¼À ¥ÁoÀ, 3 UÀAmÉUÀ¼À ¥ÀjÃPÉë, ¥ÀjÃPÁë CAPÀUÀ¼ÀÄ 70, DAvÀjPÀ ªÀiË®åªÀiÁ¥À£À CAPÀUÀ¼ÀÄ 30)

¥ÀoÀå- 1: : ºÀ¼ÀUÀ£ÀßqÀ PÁªÀå ¸ÀªÀiÁUÀªÀÄ

(ªÁgÀPÉÌ 2 UÀAmÉUÀ¼À ¥ÁoÀ ZÀvÀÄªÀiÁð¸ÀPÉÌ 32 UÀAmÉUÀ¼ÀÄ)

¤UÀ¢vÀ 6 ¨sÁUÀUÀ¼ÀÄ

1. PÀÄjvÉÆÃzÀzÉAiÀÄÄA PÁªÀå ¥ÀæAiÉÆÃUÀ ¥ÀjtvÀ ªÀÄwUÀ¼ï - ²æÃ «dAiÀÄ

2. £ÉvÀÛªÀÄ£Ár ¨sÁ£ÀÄªÀÄw ¸ÉÆÃ¯ÉÆÛqÉ - ¥ÀA¥À

3. ¤ÃgÉÆ¼ÀVzÀÄðA ¨ÉªÀÄvÀð£ÀÄgÀUÀ¥ÀvÁPÀA - gÀ£Àß

4. C©ÞAiÀÄÄªÉÆªÉÄð PÁ®ªÀ±À¢A ªÀÄAiÀiÁðzÉAiÀÄA zÁAlzÉ - £ÁUÀZÀAzÀæ

5. ¤ªÀÄð® zsÀªÀÄð¢AzÉ ¥Á°¸ÀÄ zsÀgÉAiÀÄA - d£Àß

6. PÉÆ¯ÉÆéqÉ PÁªÀgÁgÉ®ªÉÇ – gÀÄzÀæ¨sÀlÖ

¥ÀoÀå- 2: :«ZÁgÀ ¸Á»vÀå

(ªÁgÀPÉÌ 1 UÀAmÉUÀ¼À ¥ÁoÀ ZÀvÀÄªÀiÁð¸ÀPÉÌ 16 UÀAmÉUÀ¼ÀÄ)

¤UÀ¢vÀ 4 ¨sÁUÀUÀ¼ÀÄ

1. £ÀªÀÄä ¸ÀA¸Àìøw ºÉªÉÄä ¸Á®zÉ - ²ªÀgÁªÀÄ PÁgÀAvÀ

2. ªÀÄtÂÚ£À ªÁ¸À£É - JA. UÉÆÃ¥Á® PÀÈµÀÚ CrUÀ

3.PÀ£ÁðlPÀ ¸ÀA¸Àìøw «±ÉèÃµÀuÉ - PÉ.¦ ¥ÀÆtðZÀAzÀæ vÉÃd¹é

4. ªÀiÁ£À«ÃAiÀÄvÉ CAvÁgÀ®è CzÀgÀ §UÉÎ – zÉÃªÀ£ÀÆgÀÄ ªÀÄºÁzÉÃªÀ

BA

Semester – III

Title of the paper: Saamarthya samvardhane

Samvahana kaushala

Course code: DLC06011

Credits: 2

Course outcome **Lecture hrs** : 2

CO1: Able to develop Language skill.

CO2: Communication skill

CO3: Writing, reading, conversing, spelling

CO4: Face the interview

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ªÀÄÆgÀ£ÉAiÀÄ ZÀvÀÄªÀiÁð¸À

¥ÀwæPÉ-1 : ¸ÀAªÀºÀ£À PË±À®

(ªÁgÀPÉÌ 2 UÀAmÉUÀ¼À ¥ÁoÀ, 3 UÀAmÉUÀ¼À ¥ÀjÃPÉë, ¥ÀjÃPÁë CAPÀUÀ¼ÀÄ 50,DAvÀjPÀ ªÀiË®åªÀiÁ¥À£À CAPÀUÀ¼ÀÄ 30, ZÀvÀÄªÀiÁð¸ÀPÉÌ 32 UÀAmÉUÀ¼À ¥ÁoÀ)

1. ªÀiÁw£À PË±À® : ¸ÀéUÀvÀ, ¤gÀÆ¥ÀuÉ, ¸ÀA¨sÁµÀuÉ, UÀÄA¥ÀÄ ZÀZÉð, ¸ÀAzÀ±Àð£À, ¨sÁµÀt

2. CxÀðUÀæ»PÉ : ªÀiÁvÀÄ ªÀÄvÀÄÛ §gÀºÀzÀ ªÀåvÁå¸À, D¥ÀÛ NzÀÄ, ¸ÁgÁA±À, vÁvÀàAiÀÄð, «±ÉèÃµÀuÉ ªÀÄvÀÄ ÛªÁåSÁå£À

3. §gÀªÀtÂUÉ : ªÁPÀå gÀZÀ£É, n¥ÀàtÂ §gÀºÀ, ªÀgÀ¢ gÀZÀ£É, ¯ÉÃR£À aºÉßUÀ¼ÀÄ, ¸ÀAPÉëÃ¥À §gÀºÀ

4. ¥ÀvÀæUÀ¼ÀÄ : C¢üPÀÈvÀ ¥ÀvÀæ, CgÉ C¢üPÀÈvÀ ¥ÀvÀæ, eÁÕ¥À£À ¥ÀvÀæ, ¸ÀÄvÉÆÛÃ¯É

5. CfðUÀ¼ÀÄ : gÀeÉ Cfð, ªÉÃvÀ£À Cfð, §rÛ Cfð

6. C£ÀÄªÁzÀ : EAVèµï ¤AzÀ PÀ£ÀßqÀPÉÌ C£ÀÄªÁzÀ

Reference

1. *Mathru bhashe kannada tathva mathu bhodana marga- Anusooya V Paragi*
2. *Kushala kannada – H.O. Krishnamurthy*
3. *Aadalita kannada – H.S.K*
4. *Kriyathmaka vyyakarana – DR. Vasantkumar*

BCom

Semester – III

Title of the paper: Saamarthya samvardhane

Bhasha samvahana

Course code: DNC31001

Credits: 2

Course outcome **Lecture hrs**: 2

CO1: Able to develop Language skill.

CO2: Communication skill

CO3: Writing, reading, conversing, spelling

CO4: Face the interview

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ªÀÄÆgÀ£ÉAiÀÄ ZÀvÀÄªÀiÁð¸À

¥ÀwæPÉ-1 : ¨sÁµÁ ¸ÀAªÀºÀ£À

(ªÁgÀPÉÌ 2 UÀAmÉUÀ¼À ¥ÁoÀ, 3 UÀAmÉUÀ¼À ¥ÀjÃPÉë, ¥ÀjÃPÁë CAPÀUÀ¼ÀÄ 50,DAvÀjPÀ ªÀiË®åªÀiÁ¥À£À CAPÀUÀ¼ÀÄ 30, ZÀvÀÄªÀiÁð¸ÀPÉÌ 32 UÀAmÉUÀ¼À ¥ÁoÀ)

1. §gÀºÀ PË±À® : §gÀºÀ J®ègÀÆ PÀ°AiÀÄ¨ÉÃPÀÄ, §gÀºÀ ªÀÄvÀÄÛ ¸ÀA¸Àløw, §gÀºÀzÀ°è ¸Àj vÀ¥ÀÄà

2, ¨sÁµÁ ¥ÀæAiÉÆÃUÀ : CPÀëgÀUÀ¼À°è£À C±ÀÄzÀÞvÉ, ¥ÀzÀUÀ¼À £ÀqÀÄ«£À ªÀåvÁå¸À, ºÉÆ¸À ¥ÀzÀUÀ¼À gÀZÀ£É, ¥ÀzÀ ¸ÀÈ¶ÖAiÀÄ°è£À

C±ÀÄzÀÞvÉ, ªÁPÀå C±ÀÄzÀÞvÉ,

3. CxÀðUÀæ»PÉ : ªÀiÁvÀÄ ªÀÄvÀÄÛ §gÀºÀzÀ ªÀåvÁå¸À, , «±ÉèÃµÀuÉ ªÀÄvÀÄ ÛªÁåSÁå£À, ¸ÀA¨sÁµÀuÉ

4. §gÀªÀtÂUÉ : ªÁPÀå gÀZÀ£É, n¥ÀàtÂ §gÀºÀ, ªÀgÀ¢ gÀZÀ£É, ¯ÉÃR£À aºÉßUÀ¼ÀÄ, ¸ÀAPÉëÃ¥À §gÀºÀ

5. CfðUÀ¼ÀÄ : gÀeÉ Cfð, ªÉÃvÀ£À Cfð, §rÛ Cfð

6. ¥ÀvÀæUÀ¼ÀÄ: GzÀj ¥ÀvÀæ, ¥ÀgÁªÀÄ±Àð£À ¥ÀvÀæ, ¥ÀjZÀAiÀÄ ¥ÀvÀæ,ªÀ¸ÀÆ° ¥ÀvÀæÉ

Reference

1. *Mathru bhashe kannada tathva mathu bhodana marga- Anusooya V Paragi*
2. *Kushala kannada – H.O. Krishnamurthy*
3. *Aadalita kannada – H.S.K*
4. *Kriyathmaka vyyakarana – DR. Vasantkumar*

PÀ£ÀßqÀ ¨sÁµÉ

¥Àæ±Éß ¥ÀwæPÉ gÀÆ¥ÀgÉÃµÉ

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ªÉÆzÀ®£ÉAiÀÄ ZÀvÀÄªÀiÁð¸À

¸ÀªÀÄAiÀÄ: 3 UÀAmÉUÀ¼ÀÄ

UÀjµÁ×APÀUÀ¼ÀÄ: 70

¸Á»vÀå ªÀÄvÀÄÛ ¸ÀA¸ÀÌøw WÀlPÀ

¥ÀoÀå -1 ºÉÆ¸ÀUÀ£ÀßqÀ PÁªÀå(40 CAPÀUÀ¼ÀÄ)

1. C)	**MAzÀÄ** ¨sÁUÀzÀ ¨sÁªÀªÀ£ÀÄß ¸ÀAzÀ¨sÀð ¸À»vÀ «ªÀj¹ JgÀqÀÄ ¨sÁUÀUÀ¼À£ÀÄß PÉÆqÀ¨ÉÃPÀÄ	4
D)	**DgÀÄ** ¥ÀzÀUÀ½UÉ CxÀð §gÉ¬Äj, ºÀvÀÄÛ ¥ÀzÀUÀ¼À£ÀÄß PÉÆqÀ¨ÉÃPÀÄ	3
E)	**JgÀqÀÄ** «µÀAiÀÄUÀ¼À£ÀÄß PÀÄjvÀÄ n¥ÀàtÂ §gÉ¬Äj ªÀÄÆgÀÄ «µÀAiÀÄUÀ¼À£ÀÄß PÉÆqÀ¨ÉÃPÀÄ	3
2.	**£Á®ÌgÀ** ¸ÀAzÀ¨sÀð ¸ÁégÀ¸Åå §gÉ¬Äj, DgÀÄ ªÁPÀåUÀ¼À£ÀÄß PÉÆqÀ¨ÉÃPÀÄ	10
3.	**MAzÀÄ** ¥Àæ±ÉßU É GvÀÛj¹, JgÀqÀÄ ¥Àæ±ÉßUÀ¼À£ÀÄß PÉÃ¼À¨ÉÃPÀÄ	10
4.	**JgÀqÀÄ** ¥Àæ±ÉßUÀ½UÉ ¸ÀAQë¥ÀÛªÁV GvÀÛj¹, £Á®Äì ¥Àæ±ÉßUÀ¼À£ÀÄß PÉÃ¼À¨ÉÃPÀÄ	10

¥ÀoÀå -2. ¸ÀtÚPÀxÉUÀ¼ÀÄ(30 CAPÀUÀ¼ÀÄ)

5.	**MAzÀÄ** ¥Àæ±ÉßUÉ GvÀÛj¹, JgÀqÀÄ ¥Àæ±ÉßUÀ¼À£ÀÄß PÉÃ¼À¨ÉÃPÀÄ	10

	MAzÀÄ ¥Àæ±ÉßUÉ GvÀÛj¹ JgÀqÀÄ	10
6.	¥Àæ±ÉßUÀ¼À£ÀÄß PÉÃ¼À¨ÉÃPÀÄ	10
7.	**JgÀqÀÄ** ¥Àæ±ÉßUÉ¸ÀAQë¥ÀÛªÁV GvÀÛj¹ £Á®ÄÌ ¥Àæ±ÉßUÀ¼À£ÀÄß PÉÃ¼À¨ÉÃPÀÄ	

PÀ£ÀßqÀ ¨sÁµÉ

¥Àæ±Éß ¥ÀwæPÉ gÀÆ¥ÀgÉÃµÉ

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JgÀqÀ£ÉAiÀÄ ZÀvÀÄªÀiÁð¸À

¸ÀªÀÄÄAiÀÄ: 3 UÀAmÉUÀ¼ÀÄ
UÀjµÁ×APÀUÀ¼ÀÄ: 70

¸Á»vÀå ªÀÄvÀÄÛ ¸ÀA¸ÀÌøw WÀlPÀ
¥ÀoÀå -1 £ÁlPÀå (**40 CAPÀUÀ¼ÀÄ)**

1. C)	**MAzÀÄ** ¨sÁUÀzÀ ¨sÁªÀªÀ£ÀÄß ¸ÀAzÀ¨sÀð ¸À»vÀ «ªÀj¹	4
	JgÀqÀÄ ¨sÁUÀUÀ¼À£ÀÄß PÉÆqÀ¨ÉÃPÀÄ	
D)	**DgÀÄ** ¥ÀzÀUÀ½UÉ CxÀð §gÉ¬Äj, ºÀvÀÄÛ ¥ÀzÀUÀ¼À£ÀÄß PÉÆqÀ¨ÉÃPÀÄ	3
E)	**JgÀqÀÄ** «µÀAiÀÄUÀ¼À£ÀÄß PÀÄjvÀÄ n¥ÀàtÂ §gÉ¬Äj	3
	ªÀÄÆgÀÄ «µÀAiÀÄUÀ¼À£ÀÄß PÉÆqÀ¨ÉÃPÀÄ	
2.	**£Á®ÌgÀ** ¸ÀAzÀ¨sÀð ¸ÁégÀ¸Àå §gÉ¬Äj, DgÀÄ ªÁPÀåUÀ¼À£ÀÄß PÉÆqÀ¨ÉÃPÀÄ	10
3.	**MAzÀÄ** ¥Àæ±ÉßU É GvÀÛj¹, JgÀqÀÄ ¥Àæ±ÉßUÀ¼À£ÀÄß PÉÃ¼À¨ÉÃPÀÄ	10
4.	**JgÀqÀÄ** ¥Àæ±ÉßUÀ½UÉ ¸ÀAQë¥ÀÛªÁV GvÀÛj¹,	10

£Á®ÄÌ ¥Àæ±ÉßUÀ¼À£ÀÄß PÉÃ¼À¨ÉÃPÀÄ

¥ÀoÀå -2 , PÁzÀA§j(30 CAPÀUÀ¼ÀÄ)

5.	**MAzÀÄ** ¥Àæ±ÉßUÉ GvÀÛj¹, JgÀqÀÄ ¥Àæ±ÉßUÀ¼À£ÀÄß PÉÃ¼À¨ÉÃPÀÄ	10
6.	**MAzÀ**Ä ¥Àæ±ÉßUÉ GvÀÛj¹ , JgÀqÀÄ ¥Àæ±ÉßUÀ¼À£ÀÄß PÉÃ¼À¨ÉÃPÀÄ	10 10
7.	**JgÀqÀÄ** ¥Àæ±ÉßUÀ½UÉ ¸ÀAQë¥ÀÛªÁV GvÀÛj¹, £Á®ÄÌ ¥Àæ±ÉßUÀ¼À£ÀÄß PÉÃ¼À¨ÉÃPÀÄ	

PÀ£ÀßqÀ ¨sÁµÉ

¥Àæ±Éß ¥ÀwæPÉ gÀÆ¥ÀgÉÃµÉ

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ªÀÄÆgÀ£ÉAiÀÄ ZÀvÀÄªÀiÁð¸À

¸ÀªÀÄÄAiÀÄ: 3 UÀAmÉUÀ¼ÀÄ
UÀjµÁ×APÀUÀ¼ÀÄ: 70

¸Á»vÀå ªÀÄvÀÄÛ ¸ÀA¸ÀÌøw WÀlPÀ
À
¥ÀoÀå -1 : £ÀqÀÄUÀ£ÀßqÀ ¸ÀªÀÄPÀëªÀÄå(**40 CAPÀUÀ¼ÀÄ)**

1. C)	**MAzÀÄ** ¨sÁUÀzÀ ¨sÁªÀªÀ£ÀÄß ¸ÀAzÀ¨sÀð ¸À»vÀ «ªÀj¹	4
	JgÀqÀÄ ¨sÁUÀUÀ¼À£ÀÄß PÉÆqÀ¨ÉÃPÀÄ	
D)	**DgÀÄ** ¥ÀzÀUÀ½UÉ CxÀð §gÉ¬Äj, ºÀvÀÄÛ ¥ÀzÀUÀ¼À£ÀÄß PÉÆqÀ¨ÉÃPÀÄ	3
E)	**JgÀqÀÄ** «µÀAiÀÄUÀ¼À£ÀÄß PÀÄjvÀÄ n¥ÀàtÂ §gÉ¬Äj	3
	ªÀÄÆgÀÄ «µÀAiÀÄUÀ¼À£ÀÄß PÉÆqÀ¨ÉÃPÀÄ	

2.	**£Á®ÌgÀ** ¸ÀAzÀ¨sÀð ¸ÁégÀ¸Àå §gÉ¬Äj, DgÀÄ ªÁPÀåUÀ¼À£ÀÄß PÉÆqÀ¨ÉÃPÀÄ	10
3.	**MAzÀÄ** ¥Àæ±ÉßU É GvÀÛj¹, JgÀqÀÄ ¥Àæ±ÉßUÀ¼À£ÀÄß PÉÃ¼À¨ÉÃPÀÄ	10
4.	**JgÀqÀÄ** ¥Àæ±ÉßUÀ½UÉ ¸ÀAQë¥ÀÛªÁV GvÀÛj¹, £Á®ÄÌ ¥Àæ±ÉßUÀ¼À£ÀÄß PÉÃ¼À¨ÉÃPÀÄ	10

¥ÀoÀå -2 , ¸ÀA¸ÀÌøw ¸Á»vÀå(30 CAPÀUÀ¼ÀÄ)

5.	**MAzÀÄ** ¥Àæ±ÉßUÉ GvÀÛj¹, JgÀqÀÄ ¥Àæ±ÉßUÀ¼À£ÀÄß PÉÃ¼À¨ÉÃPÀÄ	10

PÀ£ÀßqÀ ¨sÁµÉ

¥Àæ±Éß ¥ÀwæPÉ gÀÆ¥ÀgÉÃµÉ

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£Á®Ì£ÉAiÀÄ ZÀvÀÄªÀiÁð¸À

¸ÀªÀÄÄAiÀÄ: 3 UÀAmÉUÀ¼ÀÄ
UÀjµÁ×APÀUÀ¼ÀÄ: 70

¸Á»vÀå ªÀÄvÀÄÛ ¸ÀA¸ÀÌøw WÀlPÀ
À
¥ÀoÀå -1 ºÀ¼ÀUÀ£ÀßqÀ ¸ÀªÀiÁUÀªÀÄ (40 CAPÀUÀ¼ÀÄ)

1. C)	**MAzÀÄ** ¨sÁUÀzÀ ¨sÁªÀªÀ£ÀÄß ¸ÀAzÀ¨sÀð ¸À»vÀ «ªÀj¹	4
	JgÀqÀÄ ¨sÁUÀUÀ¼À£ÀÄß PÉÆqÀ¨ÉÃPÀÄ	
D)	**DgÀÄ** ¥ÀzÀUÀ½UÉ CxÀð §gÉ¬Äj, ºÀvÀÄÛ ¥ÀzÀUÀ¼À£ÀÄß PÉÆqÀ¨ÉÃPÀÄ	3

E)	**JgÀqÀÄ** «µÀAiÀÄUÀ¼À£ÀÄß PÀÄjvÀÄ n¥ÀàtÂ §gÉ¬Äj ªÀÄÆgÀÄ «µÀAiÀÄUÀ¼À£ÀÄß PÉÆqÀ¨ÉÃPÀÄ	3
2.	**£Á®ÌgÀ** ¸ÀAzÀ¨sÀð ¸ÁégÀ¸Àå §gÉ¬Äj, DgÀÄ ªÁPÀåUÀ¼À£ÀÄß PÉÆqÀ¨ÉÃPÀÄ	10
3.	**MAzÀÄ** ¥Àæ±ÉßU É GvÀÛj¹, JgÀqÀÄ ¥Àæ±ÉßUÀ¼À£ÀÄß PÉÃ¼À¨ÉÃPÀÄ	10
4.	**JgÀqÀÄ** ¥Àæ±ÉßUÀ½UÉ ¸ÀAQë¥ÀÛªÁV GvÀÛj¹, £Á®Äì ¥Àæ±ÉßUÀ¼À£ÀÄß PÉÃ¼À¨ÉÃPÀÄ	10

¥ÀoÀå -2 , ¸ÀA¸ÀÌøw ¸Á»vÀå(30 CAPÀUÀ¼ÀÄ)

5.	**MAzÀÄ** ¥Àæ±ÉßUÉ GvÀÛj¹, JgÀqÀÄ ¥Àæ±ÉßUÀ¼À£ÀÄß PÉÃ¼À¨ÉÃPÀÄ	10

PÀ£ÀßqÀ ¨sÁµÉ

¥Àæ±Éß ¥ÀwæPÉ gÀÆ¥ÀgÉÃµÉ

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ªÀÄÆgÀ£ÉAiÀÄ ZÀvÀÄªÀiÁð¸À

¸ÀªÀÄAiÀÄ: 3 UÀAmÉUÀ¼ÀÄ

UÀjµÁ×APÀUÀ¼ÀÄ: 50

¸ÁªÀÄxÀåð ¸ÀAªÀzsÀð£É

(50 CAPÀUÀ¼ÀÄ)

1.	MAzÀÄ ¥Àæ±ÉßUÉ GvÀÛj¹, JgÀqÀÄ ¥Àæ±ÉßUÀ¼À£ÀÄß PÉÃ¼À¨ÉÃPÀÄ	10
2.	JgÀqÀÄ ¥Àæ±ÉßUÉ GvÀÛj¹, £Á®ÄÌ ¥Àæ±ÉßUÀ¼À£ÀÄß PÉÃ¼À¨ÉÃPÀÄ	10
3.	JgÀqÀÄ «µÀAiÀÄUÀ¼À£ÀÄß PÀÄjvÀÄ n¥ÀàtÂ §gÉ¬Äj ªÀÄÆgÀÄ «µÀAiÀÄUÀ¼À£ÀÄß PÉÆqÀ¨ÉÃPÀÄ	10
4.	EAVèµï ¤AzÀ PÀ£ÀßqÀPÉÌ C£ÀÄªÁ¢¹	05
5.	¯ÉÃR£À ¸ÀAPÉëÃ¦¹ ²Ã¶ðPÉ ¤ÃqÀÄªÀÅzÀÄ	10
6.	ªÁPÀåzÀ°è£À vÀ¥ÀÄàUÀ¼À£ÀÄß ¸Àj¥Àr¹ , ºÀvÀÄÛ¸Á°£À MAzÀÄ ¥ÀAQÛAiÀÄ£ÀÄß ¤ÃqÀÄªÀÅzÀÄ	05