MASTER OF SOCIAL WORK

MSW

SYLLABUS

CREDIT BASED, CHOICE BASED CONTINUOUS ASSESSMENT PATTERNED EDUCATION SYSTEM

(Regulations, Scheme of Examination and Course Content)

To be effective from the Academic Year 2022-23

DEPARTMENT OF STUDIES IN SOCIAL WORK
JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE, OOTY ROAD, MYSORE

JSS College of Arts, Commerce and Science

(Autonomous)

Ooty Road, Mysore

Master of Social Work Programme

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 HC-1	Social Work - History and Ideologies	2:1:0	3
2.	SWA HC-2	Work with Individuals and Families	2:1:0	3
3.	SWA HC-3	Work with Groups	2:1:0	3
4.	SWA HC-4	Work with Communities	2:1:0	3
5.	SWA HC-5	Human Growth and Development	2:1:0	3
6.	SWA HC-6	Social Work Practicum – I	0:1:2	3
		Total		**18**

II Semester

Sl. No.	Course Code	Course Title	L:T:P	Credits
1.	SWB HC-7	Management of Developmental and Welfare Services	2:1:0	3
2.	SWB HC-8	Social Work Research and Statistics	2:1:0	3
3.	SWB HC-9	Social Work Practicum – II (Social Work Camp and Summer Placement)	0:0:3	3
4.	SWB HC-10	Social Work Practicum - III	0:1:2	3
5.	SWB SC-1	Communication and Counselling / Gandhian Approach to Welfare and Development	3:1:0	4
6.	SWB SC-2	Personal and Professional Growth/ Population and Environment	2:1:0	3
			Total	**19**

III Semester

Sl. No.	Course Code	Course Title	L:T:P	Credits
1.	SWC HC-11	Human Resource Management	2:1:0	3
2.	SWC HC-12	Social Work Practicum – IV	0:1:2	3
3.	SWC SC-3	Social Work with Tribal and Rural communities/Organizational Behavior and Organizational Development	2:1:0	3
4.	SWC SC-4	Preventive and Social Medicine and Medical Social Work /Rehabilitation and After Care Services	2:1:0	3
5.	SWC SC-5	Social Policy, Planning and Development/ Legal System in India	2:1:0	3
6.	SWC OE	Gerentological Social Work / Social Work Practice with Children	4:0:0	4
			Total	**19**

IV Semester

Sl. No.	Course Code	Course Title	L:T:P	Credits
1	SWD HC-13	Employee Relations and Legislation	2:1:0	3
2	SWD HC-14	Mental Health and Psychiatric Social Work	2:1:0	3
3	SWD HC-15	Major Project	0:2:4	6
4	SWD HC-16	Social Work Practicum – V	0:1:2	3
5	SWD HC-17	Social Work Practicum – VI (Block Placement)	0:0:2	2
6	SWD SC-6	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.

Objectives of the Course (Master of Social Work):

1. To provide education and training in social work to those desirous of making a career in social work practice.
2. To provide opportunities through intensive field practicum to work with variety of people in their development and provide service to those who are in need of it.
3. To provide inter-disciplinary collaboration for better understanding of human problems, services and issues related to human development.
4. To link theory with practice in every sphere of human service.
5. To develop requisite knowledge, skills and values in working with people.
6. To promote among learners a sense of responsibility and commitment to work with different sections of people and especially of the vulnerable sections of the society
7. To promote opportunities and to create awareness for personal growth
8. To acquire knowledge and skills in undertaking practice-based research and to administer human service organizations

Name of the Course:

The course shall be called ' **Master of Social Work' (MSW)**.

Duration of the Course:

The Course 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 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 type 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.

PATTERN OF QUESTION PAPER

Pattern 3

(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 2 marks. This part covers all units of the syllabus.

PART – B

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 –C

There is a single question such as case study (may contain sub questions) covering entire syllabus carrying 15 marks. No choice.

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

SOCIAL WORK PRACTICUM

The practicum with different learning opportunities is designed to provide scope to develop and enhance professional practice skills. Learning is aided through observation, analysis of social realities and experience of participation in designing and providing social work intervention.

The tasks are organized to help the learner acquire beginning skills, practice those already acquired, and master them from simple to complex. The learner is gradually encouraged to become an independent worker during the course of study.

Objectives

The objectives are met by providing a variety of experiences to learners to:

1.   i.   Develop the ability to observe and analyze social realities. Understand the
    ii.   characteristics of social systems and their dynamics. Appreciate society's
    iii.   response to people's needs, problems and social issues.
    iv.   Develop critical understanding of the application of legislation, legal process, and social policy.

2.   i.   Develop the ability to examine the process of programme management and participate in the effort at various levels.
    ii.   Develop the ability to recognize the need for newer programs, initiate and Participate in them.
    iii.   Use Human Rights tools, understanding of gender justice, and need for equity in all intervention.
    iv.   Develop an understanding of organizational structure, resource management, and day-to-day administration for human service programmes - developmental and welfare programmes
    v.   Develop the capacity to integrate knowledge and practice-theory by participating in intervention.

3.   i.   Clarify and imbibe values which sustain positive attitude and professional ethics.
    ii.   Develop the capacity for self-direction, growth and change through self awareness.

4.   i.   Enhance writing skills to document practice appropriately. Recordings to be viewed as an expression of interest, motivation and involvement in practice and as evidence of enrichment in the process of professional growth.

To meet these outcomes, several opportunities with specific objectives are designed. The different sets of opportunities with details of content and related tasks are listed separately.

Paper code: NSW -1

Paper 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.

OBJECTIVES

a. Understand the concepts to examine social phenomenon. b. Develop skills to analyse Indian society and change.
c. Understand change and conflict.
d. Understand the system for economic order.
e. Develop skills for social analysis.
f. 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.

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University of Mumbai.

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Marriage and Family in India, London: Oxford University Press.

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Human Society, New York.

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Journals/ Magazines

Sociological Bulletin (Journal of the Indian Sociological Society).

Contribution to Indian Sociology.

Social Change, Issues and Perspectives (Journal of the Council for Social Development).

Economic and Political Weekly, EPW Research Foundations, Mumbai.

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
Paper code: SWAHC- 1
Paper 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.

OBJECTIVES

    a. Understand the history of evolution of social work profession, both in India and the West.
    b. Develop insights into the origin and development of ideologies, approaches to social change.
    c. Understand rationale, goals, ideals and ethics for social change.
    d. Understand the perceptions of people and social problems, the status of benefactors and their motives.
    e. Develop skills to understand contemporary reality in its historical context.
    f. Understand self as a part of own environment and explore own assumptions, ideals, values to develop sensitivity to marginalization of vulnerable groups.

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.

REFERENCES

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   Costin Lela B.; Atherton,   to Social Work and Social Welfare,
   Charles R. and Contributors   New York, McGraw-Hill Book Company.
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Journals/ Magazines
Economic and Political Weekly, The Indian Journal of Social Work, Lokayan Bulletin and Vikalp.

Odd semester
Paper code: SWAHC- 2
Paper Title: WORK WITH INDIVIDUALS AND FAMILIES

INTRODUCTION

This course aims to develop simple to complex skills of working with individuals and families in various situations like crisis, preventive, facilitative and developmental.

OBJECTIVES

a. Understand casework as a method of social work, and appreciate its place in social work practice.
b. Understand the values and principles of working with individuals and families.
c. Develop the ability to critically analyse problems of individuals and families and factors affecting them.
d. Enhance understanding of the basic concepts, tools and techniques in working with individuals and families, in problem-solving and in developmental work.
e. Develop appropriate skills and attitudes to work with individuals and families.

Course Content

UNIT I
Social case work: 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.

REFERENCES

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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. '

20. Timms, N. 1964   Social Case Work: Principles and Practice, London: Routledge and Kegan Paul.

Odd semester
Paper code: SWAHC -3
Paper 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.

OBJECTIVES

a. Develop awareness about the specific characteristics of Group Work and its contributions as a method of social work intervention,
b. Gain knowledge about group formation and the use of a variety of group approaches.
c. Develop understanding of concepts, dynamics and small group theory in relation to all types of groups, e.g. family, staff, committee, long-term client groups.
d. Identify the various situations and settings where the method could be used in the context of social realities of the country.

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.

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Odd semester
Paper code:SWAHC-4
Paper 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.

OBJECTIVES

a. Understand the critical elements of community organisation practice.
b. Enhance critical understanding of the models and strategies for community organisation practice.
c. Make the micro-macro connections between the range of complex issues in practice.
d. Develop attitudes conducive to participatory activities for civil society.

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.

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Development and Change, Hague Blackwell Publisher.

Paper code: SWAHC-5
Paper 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.

OBJECTIVES

   a. Develop an overall understanding of the principles of growth; their relevance and application to behaviour at various phases in the life span.
   b. Understand the twin roles of individual's heritage and environmental influences in growth and development.
   c. Understand interactional nature of growth and behaviour at various stages in the life span: infancy, childhood, adolescence, youth, adulthood and old age, and impact of cultural aspects.
   d. Develop sensitivity towards needs, developmental tasks and health status along with need for developmental programmes for the same.
   e. Apply the information of growth, development and health in social work practice in general and individuals, groups and communities in particular.

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.

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Odd semester
Code: SWAHC-6
 Title: SOCIAL WORK PRACTICUM - I

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.

Code: SWBHC -7
Paper 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.

OBJECTIVES

a. Understand the overall environment and its impact on the nature, structure and development of organizations in corporate, public and voluntary sectors in the context of social work profession.
b. Understand policies and procedures involved in establishing and maintaining human service organizations.
c. Acquire skills to network and participate in the management of resources - human, material and environmental.
d. Develop skills to participate in management of programmes, as a part of the inter-disciplinary team and initiate as well as develop new programmes.
e. Develop ability to analyse the practices applied in specific settings.

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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Paper Code: SWBHC-8
Paper 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.

OBJECTIVES

a. Develop an understanding of scientific approach to human inquiry in comparison to the native or common sense approach in various aspects, and its process.
b. Understand major research strategies, meaning, scope and importance of social work research.
c. Develop an ability to see the linkages between practice, research, theory and their role in enriching one another.
d. Develop ability to conceptualize, formulate and conduct simple research projects/exercises (This would include a broad range of basic research skills such as conceptualization of a research strategy and problem; writing a research proposal; developing tools for col1ecting data; use of sampling, strategies; data collection, processing, presentation, analysis and interpretation; and writing research report etc).
e. Make informed assessment and judicious use of research studies and findings.
f. Develop skills for use of library and documentation services for research.

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.

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Code : SWBHC-9
Title: SOCIAL WORK PRACTICUM - II:

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: SWBHC -10
Title : SOCIAL WORK PRACTICUM - III

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
Paper Code: SWBSC-1
 Paper title: COMMUNICATION AND COUNSELING

INTRODUCTION

This paper relates the relevance of components of communication and counseling in social work practice.

OBJECTIVES

a. Understand the meaning and importance of communication in day-to-day life.
b. Focus on interpersonal communication of interviewing and allied aspects.
c. Develop holistic understanding of counseling as a tool for help.
 d. Acquire knowledge of various approaches: their theoretical under-pinnings for goals, values, processes and techniques,
e. Develop skills of application to real life situations.

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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Becoming Naturally Therapeutic: A Return to the
True Essence of Helping, New York, Bantam
Books.

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Corporate Communications - The Age of Image,
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Paper code: SWBSC -1
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.

OBJECTIVES

a. Develop an understanding of Gandhi's concept of society and his approach to
social transformation.
b. 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.
c. 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

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Even semester
Paper Code: SWSC-2
Paper 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.

OBJECTIVES

a. Understand self as a being, as one in the process of becoming and experience self-awareness.
b. Examine own values and attitudes and explore choices made to express self in own environment.
c. Develop positive life skills and practice self-help methods for integration and for stress reduction.
d. Understand and uphold professional values and 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.

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Paper code: SWBSC-2
Paper 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.

OBJECTIVES:

a. Understand characteristics, determinants of population growth.
b. Examine population policy, plan and initiatives.
c. Understand inter-relatedness of human life, living organisms and environment.
d. Examine utilization and management of resources.
e. Develop skills to participate in activities related to the two areas.

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.

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Odd Semester
Paper code: SWCHC-11
Paper 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.

OBJECTIVES

a. Develop managerial skills in different functional areas of management with practical focus on HRM.
b. Develop the competence to evolve the problem-solving approaches by applying conceptual and behavioural skills.
c. Develop interpersonal skills/ competence and leadership qualities to work in a group with team building approach.
d. Develop sound theoretical base in various concepts and theories to enable the student to develop a broad perspective of the management field.
e. Distinguish the strategic approach to Human Resources from the traditional functional approach.
f. Understand the relationship of HR strategy with overall corporate strategy.

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: SWCHC-12
Title: SOCIAL WORK PRACTICUM - IV

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

Odd semester
Paper code : SWCSC-3
Paper 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.

OBJECTIVES

a. Develop an understanding of tribal and rural communities.
b. Understand the characteristics and problems of tribal and rural communities.
c. Acquire knowledge about the contribution of Governmental and Non-governmental Organisations to tribal and rural development.
d. Develop an understanding of the functions of Panchayath Raj Institutions with particular reference to Karnataka.
e. 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:**

1. Barnabas, A. P. 1987	Rural Community Development in India, In Encyclopedia of Social Work in India, Vol. II, New Delhi: Ministry of Welfare, Government of India,
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Paper code SWCSC-3

Paper 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.

OBJECTIVES:

a. To impart knowledge about individual, group and organizational dynamics and their consequences,
b. To make clear the concepts and approaches that help in developing models or systems that support human ingenuity.
c. To acquaint the students with the knowledge of theories and practices that govern human behavior at work,
d. To help the learner understand the value and worth of human resources in an organization.
e. To enable the students to become aware of their communication skills and sensitize them to their potential to become successful managers.
f. To gain self-confidence and healthy self-respect while retaining respect for other's rights.
g. To understand the application of Transactional Analysis in several areas of employee management.

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.

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Odd semester
Paper code: SWCSC-4
Paper 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.

OBJECTIVES

a. Understand the concept and dimensions of health.
b. Understand the issues related to the prevention, clinical features and treatment of major communicable and non-communicable diseases.
c. Trace the historical development of medical social work in India and abroad.
d. Understand the nature of medical social work services.
e. Understand the tenets of National Health Policy of India and modernization of community based health care services. .
f. Understand the health care services at different levels.

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.

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Paper code: SWCSC-4
Paper 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.

OBJECTIVES:

a. To understand the concept of handicap, rehabilitation and the scope for practice.
b. To identify the specific client categories requiring the rehabilitation services, problem specificity and rehabilitation service interventions.
c. To acquaint oneself with different rehabilitation settings, different therapeutic approaches to rehabilitation process.
d. To 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.

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Paper code: SWCSC-5
Paper 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.

OBJECTIVES

   a. Gain knowledge of policy analysis and the policy formulation process.
   b. Acquire skills in critical analysis of social policies and development plans.
   c. Develop an understanding of social policy in the perspective of national goals as stated in the Constitution, particularly with reference to Fundamental Rights and the Directive Principles of State Policy.
   d. Critically understand the concept, content and process of social development.
   e. Develop the capacity to identify linkages among social needs, problems, development issues and policies.
   f. Locate strategies and skills necessary for social development and reinforce
       values of social justice, gender justice and equality.

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.

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Recommended Journals / Periodicals

Alternatives; Development and Change; Economic and Political Weekly.

Paper code : SWCSC-5
Paper 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.

OBJECTIVES

a. Acquire information on the legal rights of people.
b. Develop an understanding of the legal system and get acquainted with the
   process of the legal system with emphasis on functioning in India.
c. Understand the role of the police, prosecution, judiciary and correction. d. Gain insight into the problems faced by the people belonging to different
   strata of society, in interacting with this system.
e. Develop an understanding of the processes and problems of public interest
   litigation and legal aid to marginalized.

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.

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Open Elective
Paper Code: SWOE
Paper 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.

OBJECTIVES:
   a. To get an overview of the perspectives on aging and scope for practice.
   b. To understand the various challenges related to aging, healthy aging and problems of the elderly in difficult situations.
   c. To identify agencies working with elderly, the different care settings and issues in working with elderly in different settings. To gain an insight into process of working with elderly.
   d. To train the learners in applying specific social work intervention measures in working with senior citizens, care givers and to have an understanding of
   e. 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

REFERENCES

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 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 SWOE
Paper Title: SOCIAL WORK PRACTICE WITH CHILDREN

INTRODUCTION

Children are the future of human society. Profession of social work has to work with children in difficult circumstances while rendering services in varied settings. There is a need for social workers specially trained in working with the children and adolescents. Such trained social workers can render valuable services to children in need of professional help.

The current paper focuses on children as a special group for focused social work intervention through facilitating acquisition of knowledge about children from different perspectives, types of settings where the children can be helped and application of social work methods to render social work intervention to children.

OBJECTIVES

a. To understand children facing difficult circumstances and the impact of difficult circumstances on children's development.
 b. To gain an overview of agencies where children form the major client group, and appropriate evaluation of children's problems.
c. To impart to the trainee, specific social work intervention methods in dealing with children as a client group; to understand the Rights of children in the legal, national and international context.

Course Content

UNIT I

Human reproductive system - beginning of life till beginning of adulthood. Understanding the children and adolescents from different perspectives - developmental, demographic, economic, psychological, sociological, environmental, familial, educational dimensions of child development. Issues in adolescence - self image, peer group, career choice, sexuality, education, vocation and other issues Healthy child development, importance of supportive environment in upbringing of the children.

UNIT II

Children in difficult circumstances - developmental delay, physical and intellectual handicaps; chronic illnesses, nutritional deficiencies, accidents, poverty, child labour,

abandoned and orphaned children, adoption issues, children in institutions, psychological problems in children, self harm and suicides in children, addiction related problems in children, children brought up by single parent due to death, divorce and other related issues, problems in formal schooling, children living in difficult situations - children in streets, slums, war zones, migration, children in conflict with law, truancy, drug abuse, running away from homes, neglected children, child abuse, child trafficking, child marriage and any other. Special focus on adolescent issues as applicable.

UNIT III

Children in difficulties – Helping agencies, Settings and issues - paediatric hospitals, nursing homes, child care centres, child guidance clinics, residential care services for children - residential schools, orphanages, homes for children in conflict with law, agencies dealing with differently abled children, any other.
Assessment, intervention, follow up and evaluation of children and adolescents facing difficulties.

UNIT IV

Social Work Intervention Programmes - Case work, group work, community organisation methods in helping children, school mental health programmes, home visits, school visits, life skills training, family life education for adolescents, creative use of play therapy, art, dance, drama and other mediums for helping children, child

help lines, child care centres, adoption services, special rehabilitation services for rescued children and any other.

Legislations pertaining to children, legal protection, International, National and non-governmental organisations working with children, Rights of the children.

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6. Hurlock, Elizabeth. 1996   Personality Development. New Delhi, Tata McGraw Hill Publications.

7. Kantha Amod and Varma, R.M, 1993   Neglected Child – Changing Perspective, New Delhi, Prayas Juvenile Aid Centre,.

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9. NIPCCD.1992.   National Evaluation of Integrated Child Development Services, New Delhi.

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14. Venkatesan. S. 2004	Children with Developmental Disabilities, New Delhi, Sage Publications,.

Even semester (IV Semester)

Paper code SWDHC-13
Paper 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.

OBJECTIVES

a. Develop the skills of interpersonal relationship as per organisational requirement.
b. Understand the trends and dynamics between the partners in the organisation.
c. Enhance the knowledge on organisational performance, role and responsibility.
 d. Develop the knowledge on various statutory / legal aspects influencing the
   organizations.
e. To stimulate thinking on rationale behind the Laws and their enforcement.

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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Paper code: SWDHC-14
Paper 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.

OBJECTIVES

a. Understand the concepts 'mental health' and 'mental illness'.
b. Understand the signs and symptoms, etiology, diagnosis and treatment of
   mental health problems.
c. Understand different services for the care of mentally ill.
d. Understand historical background of psychiatric social work in India and
   abroad.Understand the nature of psychiatric social work services and relevance of team work.
e. Understand the nature of collaboration with voluntary organisations for the
   welfare of mentally ill.
f. Identify the issues related to psychiatric social work department in hospitals
   and community mental health settings.

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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Illinois: University of Chicago Press.

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26. National Mental Health Programme for India

Code SWDHC -15
Title: **MAJOR PROJECT**

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.

Evaluation of the Project will be done along with the viva-voce examination by the viva-voce committee constituted for the assessment of social work practicum.

Even semester
Code: **SW DHC-6**
Title : **SOCIAL WORK PRACTICUM - V**

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: **SWDHC-17**
Title: **SOCIAL WORK PRACTICUM – VI**: (BLOCK PLACEMENT)

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.

Paper code: SWDSC-6
Paper 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.

OBJECTIVES

a. To develop multi facets of the personality and to build self confidence.
b. To develop a spirit of continuous learning and innovation.
c. To strengthen the competency base of individuals, teams and organization and also femilar with the organizational culture.
d. Understand and further the organization culture.
e. To appreciate the importance of bottom-line focus to the Human Resource
   function and trend toward HR Accountability.
f. To understand the various approaches to and techniques of measuring HR issues.
g. To create awareness of different types of information systems in an organization so as to enable the use of computer resources efficiently, for effective decision- making.

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.

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2. Business Today   Managing People: The Business Today, ExperientialGuide to Managing Workforce 2000, January 7-21, 1996.

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Development, New Delhi: Oxford and IBH Publishing Co. Pvt. Ltd

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Code: SWDSC-6
Title: CASE STUDIES

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.

Evaluation of the case study 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.

Credit Matrix, Course of Study and Scheme of Examination
for M.Sc. Degree Programme in Biochemistry

(With effect from 2021-22)

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	08	08	04	–	**20**
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	SC	**Choose any ONE from the following** (i) Chemical Principles and Biochemical Reactions (ii) Plant Biochemistry (iii) Microbial Biochemistry	3:1:0	4
		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	SC	**Choose any ONE from the following** (i) Human Physiology and Nutrition (ii) Research Methodology and Biostatistics (iii) Clinical Research Methods and Industrial Biochemistry	3:1:0	4
		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	SC	**Choose any ONE from the following** (i) Genomics, Proteomics and Bioinformatics (ii) Biotechnology and Research Methodology (iii) Pharmaceutical Biochemistry	4:0:0	4
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 <u>CREDITS</u> to be earned for <u>M.Sc. BIOCHEMISTRY</u>		76

* Grade Point will be calculated with respect to the allotted credits

HC	Hard Core Course
SC	Soft Core 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	IA C1*	IA C2*	Exam C3	Total
				Max. Marks			
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	4	15	15	70	100
BCA230	SC	Enzymology	3	15	15	70	100
BCA250	SC	**Choose any ONE from the following** (i) Chemical Principles and Biochemical Reactions (ii) Plant Biochemistry (iii) Microbial Biochemistry	3	15	15	70	100
						Semester Total Marks	**500**

Course Code	Course Type	Course Title	Exam Hrs	IA C1*	IA C2*	Exam C3	Total
				Max. Marks			
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	4	15	15	70	100
BCB250	SC	Immunology and Microbiology	3	15	15	70	100
BCB260	SC	**Choose any ONE from the following** (i) Human Physiology and Nutrition (ii) Research Methodology and Biostatistics (iii) Clinical Research Methods and Industrial Biochemistry	3	15	15	70	100
						Semester Total Marks	**500**

Course Code	Course Type	Course Title	Exam Hrs	IA C1*	IA C2*	Exam C3	Total
				Max. Marks			
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	4	15	15	70	100
BCC220	SC	**Choose any ONE from the following** (i) Genomics, Proteomics and Bioinformatics (ii) Biotechnology and Research Methodology (iii) Pharmaceutical Biochemistry	3	15	15	70	100
BCC630	OE	Nutrition and Health	3	15	15	70	100
					Semester Total Marks		**500**

Course Code	Course Type	Course Title	Exam Hrs	IA C1*	IA C2*	Exam C3	Total
				Max. Marks			
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 (if MCQs are used as assessment pattern, then there will be 30 MCQs carrying one mark each conducted through LMS of one hour duration and in both the cases the scored marks is reduced to 10 marks and 5 marks for continuous assessment is added, making a total of 15 marks each for C1 and C2.

- 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	<u>Cell fractionation techniques</u>: 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 <u>vs.</u> Partition chromatography. Paper, TLC, Ion exchange, Reverse phase, Gel filtration, Affinity, HPLC, and Gas chromatographic techniques.	
2.1.2	Beer-Lamberts Law, Its verifications and Deviations, Concept of Absorptions, Transmission, Scattering, Phosphorescence, Fluorescence, Luminescence, Diffraction Spectra.	14
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.	
3.1.2	Other electrophoretic methods–Isoelectric focusing, 2–dimensional gel electrophoresis, Capillary electrophoresis and PFGE.	12
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.	
	4.1.2	Analysis of subcellular fractions, marker enzymes and determination of relative molecular mass–Svedberg's constant, sedimentation velocity and sedimentation equilibrium.	**14**
	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	
3.1.2	Biosynthesis and degradation of heme	**08**
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.	
4.1.2	Supercoiling of DNA – negative and positive, linking number	
4.1.3	Structure of RNA, tRNA, rRNA, siRNA / miRNA Denaturation and renaturation, T_m (factors affecting T_m) and Cot curves, Isolation and purification of nucleic acids from biological sources.	**16**
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:		
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.	**16**
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:		
2.1	**Enzyme Catalyzed Reactions**	
2.1.1	Bisubstrate enzyme catalysed reactions–Cleland's notation with examples for ordered, ping pong, and random.	**08**
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	<u>Nature of enzyme catalysis</u>: 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	<u>Oligomeric proteins and Cooperativity</u>: 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	<u>Mechanisms of action of specific enzyme:</u> 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	<u>Multienzyme complexes</u>: 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:		
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.	**16**
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 Mg^{2+} in chlorophyll. Chelates and complexes.	

		No. of Lectures
Unit II:		
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	**08**
2.1.3	Electrodes: Hydrogen electrode, oxygen electrode, oxidation and reduction reactions, redox potential.	

		No. of Lectures
Unit III:		
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 chirality, relation between chirality and optical activity, representation of chiral structures by Fischer.	
3.1.2		**12**
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	Mechanism of Organic Reactions: Classification of organic reactions. Reaction intermediates, reaction energetics, rate, order and molecularity of reactions.		
4.1.2	Mechanisms and stereochemistry of substitution, addition, and elimination. Rearrangements reactions. Mechanisms of ester hydrolysis. Aromaticity and resonance structure. Hydrogenation- homogenous and heterogenous hydrogenation	**12**	
4.1.3	Secondary metabolites: Phytochemicals, terpenes, polyphenols, procyanidins, flavonoids, xanthones, alkaloids and pigments.		

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**		
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.	**08**	
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:		
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,	**10**
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:		
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,	**14**
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:			
	1.1	**Flow Cytometry and Model Systems**	
	1.1.1	Flow Cytometry: Principle and design of flow cytometer, cell sorting.	08
	1.1.2	Animal models: Choice of animals, types of studies, mutant organisms, cultured cells, plant as models and tissue culture models.	

Unit II:			
	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.	16
	2.1.4	Principle and Applications of Autoradiography	

Unit III:			
	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.	10
	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.	**14**
	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.	
	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:		
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	**10**
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:		
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.	**14**
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:		
3.1	**Chemistry of Lipids**	
3.1.1	Classification & biological significance of lipids, fatty acids and Steroids	**12**
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:		
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	12
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),

[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.

[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:		
1.1	**Antigens and Antibodies**	
1.1.1	<u>Introduction</u>: 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.	**12**
1.1.2	<u>Antigens and Antibodies</u>: 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:		
2.1	**Complement and Cellular Basis of Immunity**	
2.1.1	<u>Complement</u>: Structure, components, properties and functions of complement pathways, biological consequences of complement activation.	**12**
2.1.2	Hyper sensitivity reactions (Type I, II, III and IV).	
2.1.3	<u>Cellular basis of immunity</u>: 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:		
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.	**12**
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:		
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	**12**
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:		
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.	**16**
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.	
4.1.2	Deficiency symptoms of B complex members and fat soluble vitamins, hypervitaminosis, vitamin like compounds.	**08**
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:			
	4.1	**Testing Methods**	**08**
	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
  [7] Basic Principle of Clinical Research and Methodology, Jaypee Brothers Medical Publishers (P) Ltd. 2009 ed.
  [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:			
	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.	**12**
	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:			
	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	**12**
	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	<u>Endocrine System</u>–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

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[2] The Cell: A Molecular Approach, Fourth Edition by Geoffrey M. Cooper and Robert E. Hausman.

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[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	<u>Hormonal disorders</u>: 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	<u>Biochemical aspects of hematology</u>: Total cell count, differential count, hematocrit.	
	4.1.2	Disorders of erythrocyte metabolism, hemoglobinopathies, thalassemias, thrombosis, porphyrias and anemias. Laboratory tests to measure coagulation and thrombolysis.	12
	4.1.3	Doping	
	4.1.4	<u>Detoxification in the body</u>: 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:		
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.	**12**
1.1.3	Microbes, plants and animals, Accessing and retrieving genome project information from web, Comparative genomics, ESTs and SNPs.	

Unit II:		
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,	**12**
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:		
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	**08**
3.1.2	Structural proteomics	
3.1.3	Metabolomics	

Unit IV:			
	4.1	**Biological Databases and Sequence Analysis**	
	4.1.1	<u>Introduction biological databases</u>: Types (relational & object–oriented). Primary, secondary & specialized databases.	
	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.	**16**
	4.1.4	<u>Basics of sequence analysis</u>: 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
[3]   Campbell AM & Heyer LJ, Discovering Genomics, Proteomics and Bioinformatics, 2nd Edition. Benjamin Cummings 2007
[4]   Primrose S & Twyman R, Principles of Gene Manipulation and Genomics, 7th Edition, Blackwell, 2006.
[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
	BIOTECHNOLOGY AND RESEARCH METHODOLOGY	**4**

COURSE OUTCOME(S):

Upon completion of the course, the student is able to

CO1	Understand the concepts of biotechnology
CO2	Provide examples of current applications of biotechnology
CO3	Explain the concept and application of enzyme technology
CO4	Explain the general principles of generating transgenic plants, animals and microbes
CO5	Understand the concepts of research methods, tools and ethics

			No. of Lectures
Unit I:			
	1.1	**Tissue culture and transgenesis**	
	1.1.1	Techniques of tissue culture–culturing explants and haploids, protoplasts fusion and embryoids.	**12**
	1.1.2	Methods of gene transfer to plants, animals and bacteria-Ca transfection, electroporation, shotgun and others.	
	1.1.3	Transgenic plants, gene knockouts and transgenic animals.	

			No. of Lectures
Unit II:			
	2.1	**Industrial Biotechnology**	
	2.1.1	Fermentors: principle, types product recovery and purification of ethanol, citric acid, vitamin B12, streptomycin.	**16**
	2.1.2	Enzyme biotechnology–production and uses of industrially important enzymes such as protease, immobilization of enzymes and their applications	
	2.1.3	Waste treatment, bioenergy, biogas production, biopesticides and bioleaching.	

Unit III:			
	3.1	**Biosafety and Bioethics**	
	3.1.1	Biotechnology–potential hazards, biological weapons, biosafety of GM foods and GMOs–substantial equivalence and safety testing.	**08**
	3.1.2	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.	
	3.1.3	IPR, its concepts and conditions–patenting of genes, cells and life forms, evaluation of life patenting.	

Unit IV:			
	4.1	**Research Methodology**	
	4.1.1	Types of Research: Academic, Industrial, Clinical, Basic and Applied research. Research objectives, review of literature and hypothesis formulation.	
	4.1.2	Information, types and sources. PubMed as a resource. Research Design: Types of studies-cohort, double blind, placebo and cross-over.	**12**
	4.1.3	Statistical Methods: Error and significance, sample size and data collection, presentation of data, parametric and non-parametric tests	
	4.1.4	Ethical issues: ICMR guidelines of ethical issues, IPR and Plagiarism	

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.
  [4] A Textbook on Biotechnology H.D. Kumar 2nd edition East West Press 1998.
  [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.
  [12] Handbook of Research Methodology: A compendium for scholars and researchers, Dr. Shanti Bhushan Mishra Dr. Shashi Alok, EDUCREATION PUBLISHING, 2019
  [13] Research Methodology: A step-by-step Guide for Beginners, 3rd Edition, Ranjit Kumar, SAGE Publications, 2011

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:		
1.1	**Drugs**	
1.1.1	Drugs: History of Drugs Classification of drugs, routes of drug administration, absorption and distribution of drugs.	**10**
1.1.2	Factors influencing drug absorption and elimination of drugs. ☐	

Unit II:		
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.	**14**
2.1.2	Drug metabolism: Mechanism of phase I and II enzyme reactions, biochemical importance of xenobiotic metabolism. ☐	

Unit III:		
3.1	**Anticancer Drugs**	
3.1.1	Cancer: Cancer and principles of cancer chemotherapy, mode of action of anti cancer drugs.	**12**
3.1.2	Antimetabolites, antibiotics, alkylating agents and other agents, ☐	

Unit IV:		
4.1	**Adverse Drug Reactions**	
4.1.1	Adverse drug reactions and drug induced side effects.	**12**
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:		
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.	**10**
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:		
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	**14**
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 <u>Undernutrition:</u> Protein energy malnutrition, nutritional anemia's, vitamin A deficiency and iodine deficiency disorders <u>Overnutrition:</u> Obesity, Coronary Heart Disease and Diabetes	14	
3.1.2	<u>National Nutrition Policy and Programmes:</u> 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	10	
4.1.2	<u>Nutrition for special conditions:</u> 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		

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:			
	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.	**14**
	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.	**12**	
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.		

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):

Upon completion of the course, the student is able to

CO1	Understand the importance of plasmids and viruses to genetic engineering.
CO2	Understand the principle of Mendelism and gene development
CO3	Describe how mutations occur and scope of population genetics
CO4	Explain the principle of genetic engineering
CO5	Understand the value of and the processes involved in the amplification of DNA

		No. of Lectures
Unit I:		
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,	**12**
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:			
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	16	
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	**Tools of Genetic Engineering**		
3.1.1	Basic principles–mechanism of natural gene transfer by Agrobacterium, generation of foreign DNA molecules.		
3.1.2	Restriction enzymes, their types and target sites, cutting and joining DNA molecules, linkers, adapters, homopolymers, enzymes used in genetic engineering.		
3.1.3	Cloning vehicles and their properties, natural plasmids, in vitro vectors, cosmids and T-DNA based hybrid vectors.	12	
3.1.4	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.		
3.1.5	DNA sequencing strategies–Sanger's and Maxam–Gilbert's methods and NGS.		

Unit IV:			
4.1	**Amplification & Applications of Genetic Engineering**		
4.1.1	Amplification of DNA by PCR technique and applications.		
4.1.2	*Insitu* hybridization, analysis of DNA, RNA and protein by blotting techniques.		
4.1.3	Marker and Reporter genes.	8	
4.1.4	Applications of genetic engineering: Transgenic plants and animals, DNA vaccines and Gene therapy		

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.

[3] Daubenmier, R.F. (1970). Plants and Environment: A text book of Plant Autoecology, Wiley Eastern Private Limited

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[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 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   **1X4=04**
1.
2.

C) Answer any ONE of the following   **1X8=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	**5X2=10**

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

Part – B	**4X6=24**

8.
9.
10.
11.
12.
13.

Part – C	**3X12=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	SC	3:1:0	4
2. Microbiology 3. Cancer Biology 4. Cell Biology	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	SC	3:1:0	4
2. Metabolomics 3. Food and Environmental Biotechnology 4. Pharmaceutical Biotechnology	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 - Preparation 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.

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.

<div align="center">**CANCER BIOLOGY (SOFT CORE) – 48 Hrs**</div>

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

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.

<div align="center">**NON CREDIT COURSE**</div>

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. Immunoprecipation 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 comprehensive 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 artificial 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

Choice - Based Credit System (CBCS)

BOTANY

2018-19 ONWARDS
(MODIFIED ON 2022)

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.			

No.	Course/Paper Code	Title of the Course /Paper	Hrs/Wk L:T:P	Credits
FOURTH SEMESTER 16				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.

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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…………………………………………..

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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

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<u>SCHEME OF PRACTICAL EXAMINATION/ASSESSMENT</u>
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…………………………………………..

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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

Sl. No.		
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.

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.

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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:

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2. Simpson, M.G. 2006. Plant Systematics. Elsevier, Amsterdam.

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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.

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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.

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2) Chapman and Chapman, V.J. 1973. The Algae. Macmillan Co., New York.

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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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4) Sally E. Smith and David J. Read (2008). Mycorrhizal Symbiosis. 3rd edn. Academic Press, New York.
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 combinationsof 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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4) Eames, 1961. Morphology of Angiosperms. McGraw Hill book Co., Inc., New York.
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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.

References:

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2) 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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5) Brooker. R.J. 1999. Genetics –analysis and principles. Addison Wesley Longman Inc.California.
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14) Buchanan, B.B. W.Gruissem and Jones, R.L. (2000). Biochemistry and Molecular Biology of Plants. ed. ASPP Press.USA.

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.

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1) Atherly, A.G. Girton, J.R. Donald, J.R. 1999. The Science of Genetics. Saunders College
2) Publishers. Fortworth.
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.
2) Cariquist, S. 1967. Comparative Plant Anatomy- Holt Reinert and Winston, New York.
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7) James, D. Mauseth, 1998. Plant anatomy The Benzamin/ Cummins Publishing Co.Inc.
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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:

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2) Jain, S.K. 1981. Glimpses of Indian. Ethno-botany, Oxford and I B H, New Delhi
3) S.K. Jain 1989. Methods and approaches in ethno-botany. (ed.) Society of ethno botanists, Lucknow, India.
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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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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.
3) Agrobios, India.
4) Yoganarasimhan, S.N. Medicinal Plants of India- Vol 1- Karnataka, Interline Publishing Pvt. Ltd.

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.
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photooxidation. Nature 384: 557- 560.

5) Taiz, L., and Zeiger, E. 1998. Plant Physiology. Sinaur Associates Inc. Publishers, Sunderland Massachusetts.

6) Mukherji, S., and GHosh, A.K. 1996. Plant Physiology. New Central Book Agency Pvt. Ltd. Kolkatta, India.

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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:
1) Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Rafi, Keith Roberts, and Peter

Walter. 2008. Molecular biology of the cell, 5th edn., Garland science, Taylor & Francis Group, LLC, 270 Madison Avenue, NewYork ,USA.

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8)   F.M. Ausubel, R.Brent, R.E. Kingston, D.D. Moore, J.G. Seidman, J.A. Smith, K. Struhl, (Current Edition) (2005). Current Protocols in Molecular Biology.

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11)   James D. Watson, Tania,. A. Baker, Stephen, P. Bell, Alexander ,Gannm, Michael Levine.2004. Molecular Biology of the gene. 5th Edition, Pearson Education.Philip M Gilmartin and Chris.

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.
8) Bhojwani, S.S. and Razdan, M.K. 2004. Plant Tissue Culture: Theory and practice. Elsevier Science Publishers, New York, USA.
9) PUROHIT S. D., 2012. Introduction To Plant Cell Tissue And Organ Culture PHI Learning Pvt. Ltd., New Delhi
10) Roberta, H. Smith, 2012. Plant Tissue Culture: Techniques and Experiments 3 edition. Academic Press; US.

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.
7) Karchar, S.J. 1995. Molecular Biology- A Project Approach, Academic Press, New York.
8) Sambrock, J., Fritch, E.F., and Maniatis, T. 1989. Molecular cloning- a laboratory manual.
9) Slater, A., Scott, N., and Flower, M. 2000. Plant Biotechnology- the Genetic Manipulation of Plants, Oxford University Press, Oxford.

10) Lea, P.J., and Leegood, R.C. 1999. Plant Biochemistry and Molecular Biology. John Willey and Sons Press, New York.

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.
5) Rangaswamy G and Mahadevan A 2002. Diseases of crop plants in India, Prentice
Hall of India Pvt. Ltd. New Delhi.
6) Mehrotra, R. S.1983-Plant Pathology Tata Mc. Graw Hill Pub. Co. Ltd., New Delhi.
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.

7) Razdan, M.K. 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: 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.
3) Hartmann and Kester, 1983. Plant propagation
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) L.M. Pierik 1987. In vitro culture of Higher plants Murtinus Nijhoff pub. Dordrecht.
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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

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.

6) Copeland, L.A. 1995. Principles of Seed Science and Technology- Kluwer Academic Publishers, The Netherlands.

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.
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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

Co. Pvt. Ltd. New Delhi.   edn. Oxford and IBH Publishing

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, NewDelhi.

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.

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.

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: S**ecretion, 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.
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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
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      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
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   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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3. Clarke, G.L. 1963. Elements of Ecology, . Wiley Eastern Limited. New Delhi.
4. Emmel, T.C. 1976. Population Biology, Harper and Row publishers, N.Y.
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7. Odum, E.P. 1983. Basic Ecology, Holt Saunders, Japan.
8. Sharma, P.D. 1996: Ecology and Environment Rastogi, Publications, Meerut.
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10. Negi,S.S and Bahuguna, V.K. 1983. An Introduction to wildlife management. Bishen Singh Mahendra Pal Singh. Dehara Dun, India.
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.
11. Clark, W. E 1963. History of the Primates IV Edn., Univ. of Chicago Press, Chicago.
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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.
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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
<u>Softcore - Model question paper</u>

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)

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]**
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   9.
  10.
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  14.
  15.
  16.

Q3. Answer the following: **[2×12=24]**

   17.   **(i)**
       Or
       (ii)

   18.   **(i)**
       Or
       (ii)

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 control pathological spoilages and insect infestation	4
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	3

		pure culture; Bacteriology of air & water; Anti-microbial agents – physical & chemical – mechanism & action	
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 waste, Hazardous waste .Quality and Safety of Frozen Foods: Fruits, Vegetable	3
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	14

	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.	
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 sanitizers	8
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	6

		methods, sanitizing & disinfestation, pest control in food processing; storage and service areas	
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: <mark>FRUIT & VEGETABLE</mark>, 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

TABLE OF CONTENTS

Plant Manager

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 <u>3</u> out of <u>3</u> National Occupational Standards (NOS) of "<u>Plant Manager</u>" Qualification Pack issued by "<u>Food Industry Capacity and Skill Initiative</u>".

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.

		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

Plant Manager

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**)*

Plant Manager

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

Plant Manager

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)	Out Of	Marks Allocation	
				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

Plant Manager

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)	Out Of	Marks Allocation	
				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

Plant Manager

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

Plant Manager

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

Plant Manager

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	Skills Practical
				Theory	
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 and 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)	Out Of	Marks Allocation	
				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%**	

Plant Manager

Choice Based Credit System & Continuous Assessment Grading Pattern

SYLLABUS FOR

MASTER OF ARTS IN ENGLISH

Programme Code: ENG

2021-24

JSS COLLEGE OF ARTS, COMMERCE & SCIENCE

(An Autonomous College of University of Mysore; Re-Accredited by NAAC with 'A' Grade)

POSTGRADUATE DEPARTMENT OF STUDIES & RESEARCH IN ENGLISH

OOTY ROAD, MYSURU-570 025, KARNATAKA

POSTGRADUATE DEPARTMENT OF STUDIES & RESEARCH IN ENGLISH

COURSES OFFERED

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)   Realism and Fiction   **ENA 250**

       *(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) Dalit Literature   **ENB 230**

       *(Soft Core-II) English Essayists   **ENB 220**

Note: * Soft Core Elective Courses

JSS College of Arts, Commerce and Science, PG Dept. of Studies in English, Ooty Road, Mysuru 25

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) Indian Diaspora Fiction   **END 240**

          *(Soft Core II) African Fiction   **END 220**

Note: * Soft Core Elective Courses

JSS College of Arts, Commerce and Science, PG Dept. of Studies in English, Ooty Road, Mysuru 25

POSTGRADUATE DEPARTMENT OF STUDIES & RESEARCH IN ENGLISH

Choice Based Credit System & Continuous Assessment Grading Pattern Syllabus

MA PROGRAMME IN ENGLISH

2021-24

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.	Realism and 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.	Dalit Literature	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.	Indian Diaspora Fiction	3	1	0	4	4
		2.	African Fiction	3	1	0	4	
							Total Credits	**16**
						Total Credits at the end of the Course		**76**

Programme Outcomes

On graduating from this programme student is able to

PO1: Learn to write logically relating the real-life scenario with the issues depicted in literary texts.

PO2: Demonstrate critical reading, writing, and thinking skills in writing analytical essays.

PO3: Recognise and understand figurative language in literary works of various literatures.

PO4: Equips the students to understand theoretical developments in literary studies.

PO5: Acquire skills of criticism in reading literary works of different periods of various genres.

PO6: Write focused, organised, well-developed text-based essays.

Programme Specific Outcomes

On completion, the graduate of this programme is able to

PSO1: Acquire the competence to work as English Language teacher at Primary, Secondary, Higher secondary and Pre-University level.

PSO2: Gain basic knowledge needed to enroll for M Phil or PhD programmes.

PSO3: Demonstrate good communication skills.

PSO4: Draft literary essays demonstrating the skills of critical thinking and creative writing.

PSO5: Participate in discussions and debates demonstrating good communication skills.

PSO6: Learn the skills to work as English language trainer.

Course I – (HC-I) ENGLISH LITERATURE FROM CHAUCER TO MILTON

Course Code: ENA 010   **Credits: 4**
Teaching Hours: 60 (4 Hours/Week)

Course Outcomes

At the end of the Course, student able to

CO1: Recognize and understand figurative language, such as allegory and metaphor, and literary techniques, such as irony, rhyme, and allusion.
CO2: Identify the unique qualities of the authors studied, and compare and contrast them.
CO3: Develop a well-written argument about one or more literary texts or authors, and accurately cite literary and other sources.
CO4: Develop ability to read, summarize and critically analyse poems and sonnets of various themes.

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.

Books for Reference and Further 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: Norton, 2006.

5. Al Poplaski: *English Literature in Context.*

Course II – (HARD CORE-II) ELIZABETHAN AGE

Course Code: ENA-020   **Credits: 4**
Teaching Hours: 60 (4 Hours/Week)

Course Outcomes

At the end of the Course, student able to

CO1: Understand the origin and growth of English Theatres and Renaissance plays.
CO2: Demonstrate knowledge of Elizabethan culture, society and politics.
CO3: Analyse Shakespearean Tragedies and Comedies in terms of language, character and
       Themes.
CO4: Develop ability to read, summarize and critically analyse Shakespearean sonnets on
        various themes.

UNIT –I
Background – Elizabethan Age

Elizabethan theatre and audience Shakespeare- Tragedy and Comedy

UNIT – II
Marlowe: *Dr. Faustus*

Ben Jonson: *Volpone*

Thomas Nashe: *Dido: Queen of Carthage*

UNIT – III
William Shakespeare: 1) *King Lear*
                     2) *Julius Caesar*
                     3) *As you Like It*
                     4) *Tempest*

UNIT – IV
Shakespeare's Sonnets: **18, 19, 29, 30, 33, 55, 60, 71, 73, 114, 116, 130, 131, 133**

Books for Reference and Further 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**
Teaching Hours: 60 (4 Hours/Week)

Course Outcomes

At the end of the Course, student able to
CO1: Apply knowledge of the historical and cultural contexts of the literature of this period
       to comprehend the works of major authors.
CO2: Recognize and understand figurative language, such as allegory and metaphor, and
        literary techniques - irony, rhyme, and allusion.
CO3: Reflect and write analytically about the literary texts and their contexts.
CO4: Develop skills of literary critical analysis reading the prescribed plays, novels and
        essays.

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- *Oroonoko (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

Books for Reference and Further 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**
Teaching Hours: 60 (4 Hours/Week)

Course Outcomes
At the end of the Course, student able to
CO1: Understand the impact of French Revolution on Romantic and Victorian age.
CO2: Learn the issues related to Woman's Question during the period and contributions of
      Mary Wollstonecraft and J S Mill to this movement.
CO3: Recognize and understand the use of allegory, metaphor, irony, rhyme, rhythm, allusion
      in Romantic and Victorian poetry
CO4: Reflect analytical skill of understanding literary essays of Victorian philosophers.   .
CO5: Develop ability to read, summarize and critically analyse the novels of Jane Austen, Emily
      Bronte, Charles Dickens and Thomas Hardy.

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 the Last* (Chs.1 and 2)
2. J.S. Mill: "On Liberty"
3. Mathew Arnold: Culture and Anarchy
   (Ch 1: Sweetness & Light , Ch 2: Hellenism & Hebraism)

Books for Reference and Further 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

PAPER- V – (SOFT CORE-I)   **REALISM AND FICTION**

Course Code: ENA-250   **Credits: 4**
Teaching Hours: 60 (4 Hours/Week)

Course Outcomes:
At the end of the Course, student able to
CO1: Understand Realism as a literary movement and types of Realism.
CO2: Learn the narrative techniques employed by the realistic novelists.
CO3: Critically analyse the use of symbolisms in the prescribed novels.
CO4: Understand and analyse the realistic novels of British, American, and Indian writers.
CO5: Read, summarize and critically analyse the novels of Charlotte Bronte, George Eliot, William Makepeace, Hawthorne, Henry James, Steinbeck, Premchand, Tagore and Kamal Markandaya.

Unit I:

Realism as a literary movement, Types: Social Realism, Regionalism, Kitchen Sink Realism, Naturalism and Realism, Narrative techniques, Realistic novelists

Unit II:

Charlotte Bronte: *Jane Eyre*
George Eliot: *Mill on the Floss*
William Makepeace Thackeray: *Vanity Fair*

Unit III:

Nathaniel Hawthorne: *The Scarlet Letter*
Henry James: *The Portrait of a Lady*
John Steinbeck: *The Grapes of Wrath*

Unit IV:

Premchand: *Nirmala*, translated into English by Alok Rai
Tagore: *The Home and the World*
Kamala Markandaya: *Nectar in a Sieve*

Books/Texts for Reference and Further Reading:
1. Henry James, *The Art of the Novel*, ed. R P Blackmore, 1934.
2. Percy Lubbock, *The Craft of Fiction*, 1921.
3. E M Forster, *Aspects of the Novel*, 1927.
4. Wayne C. Booth, *The Rhetoric of Fiction*, 1961.
5. Sandra Gilbert and Susan Gubar, *The Madwoman in the Attic: the Woman Writer and the Nineteenth-Century Literary Imagination*, 1979.

SOFT CORE II: Contemporary Indian Novels in English

Course Code: ENA-240   **Credits: 4**
Teaching Hours: 60 (4 Hours/Week)

Course Outcomes

At the end of the Course, student able to

CO1. Learn to explore the thematic paradigm shift in the contemporary Indian writings.
CO2. Appreciate the postmodern literary devices employed by the writers.
CO3. Read and critically analyse the Indian novels published in 2000 and after.
CO4. Develop ability to read, summarize and critically analyse various themes in the works of
Anurag Mathur, Anita Desai, Vikram Seth, Shashi Deshpande, Amit Chaudhuri, Anita
Nair, Upamanyu Chatterjee and Manju Kapur.

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

Books for Reference and Further 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- I

Course Code: ENB 040   **Credits: 4**

Teaching Hours: 60 (4 Hours/Week)

Course Outcomes

At the end of the Course, student able to

CO1: Understand the social, political and cultural milieu of the age.

CO2: Learn the impact of World War I and II on 20th Century poetry.

CO3: Identify and analyse literary elements like rhyme, rhythm, tone, style, imagery and, symbols, etc.

CO4: Reflect the analytical skills of understanding war poetry.

UNIT – I

World Wars – I & II, Imagism, Surrealism, Symbolism, Free Verse, Existentialism, and

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

Books for Reference and Further Reading:

1. F. R. Leavis. *New Bearings in English Poetry*
2. Faber Book of Modern Verse
3. Norton Anthology of English Literature

Course II (Hard Core-II) - LITERARY CRITICISM-I

Course Code: ENB 020   **Credits: 4**

Course Outcomes

At the end of the Course, student able to

CO1: Learn the meaning, elements and characteristics of classical literary criticism.

CO2: Understand the basics of literary/ critical theories.

CO3: Learn the technique of early literary criticism.

CO4: Acquire the skills to interpret literary works using literary theories.

Unit I:
Origin, growth, and development of Literary Criticism, Various Posits and Literary Contexts

Principles of Literary and Practical Criticism

Unit II:
1. Longinus: *On the Sublime*

2. Plato on Mimesis in *A Short History of English Literary Criticism* by Wimsatt& Brooks

3. Aristotle: *Poetics*

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**
Teaching Hours: 60 (4 Hours/Week)

Course Outcomes

At the end of the Course, student able to

CO1: Understand the Origin and Growth of Indian English Writing.
CO2: Study different phases of Indian writing and understand their features.
CO3: Understand the social, political and cultural milieu of Pre-independent India explored
    in literary works.
CO4: Explore different issues in Indian Writing in English depicted in poetry, plays, novels,
    and essays.

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

4. Aurobindo: *Savitri* Canto-I

Unit III: Drama
1. Girish Karnad: *Hayavadana*

2. Vijay Tendulkar: *Silence! The Court is in Session*

3. Mahesh Dattani: *The Final Solution*

Unit IV: Fiction
1. Mulk Raj Anand: *Untouchable*

2. Raja Rao: *Kanthapura*

3. R.K. Narayan: *A Tiger for Malgudi*

Unit IV: Criticism

1. Hiriyanna: *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**

Teaching Hours: 60 (4 Hours/Week)

Course Outcomes

At the end of the Course, student able to

CO1: Learn history and growth of feminism as a movement, and the waves of feminism.
CO2: Understand the phrases such as Sex and Gender, women's rights.
CO3: Explore feminist issues in the novels of Buchi Emecheta, Margaret Atwood and Mahasweta Devi.
CO4: Read and understand the feminist ideas in the works of Simone de Beauvoir, Virginia Woolf and Showalter.
CO5: Appreciate and analyse the poems of Kamala Das and Maya Angelou.

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: *The 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, The Old Playhouse, 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

Course IV – (SOFT CORE-II) DALIT LITERATURE

Course Code: ENB-230   **Credits: 4**
Teaching Hours: 60 (4 Hours/Week)
Course Outcomes
At the end of the Course, student able to
CO1: Understand the origin and growth of Dalit literature in India.
CO2: Understand the sufferings of marginalised in Dalit writings.
CO3: Compare and analyse the life of oppressed in the works various languages translated
        into English like Kannada, Gujarathi, Punjabi, Tamil and Telugu.
CO4: Compare and analyse the different forms of Dalit Literature based on different
        experiences.

UNIT I: Introduction to Dalit Literature
Essays:
1. Movements of Dalit identity- K C Das
2. Indian Dalits (Introduction- Sharankumar Limbale. (Dalit Literature and Aesthetics)
3. Dalit Literature- B Krishnappa (The Exercise of Freedom)
4. We Too Are Human-B R Ambedkar (The Exercise of Freedom)

Unit II: Poetry
1. H Govindaiah.   "In The Soil of Tears" and "A Letter to Father
                                          Searching For Me"
2. Challapalli Swaroopa Rani: "Water" and "Forbidden Theory"
3. Sukirtharani: "Paraia God" and "Untitled Poem"
4. Jyoti Lanjewar: "Cave" and "Mother"
5. Gurudas Alam: "For Freedom" and "Treatment of Untouchables" (From The
                                          Core Of Untouchable's)
6. Bipin Gohel: "To The Fading Man I Sing" and "To A Poet At Mushaira"

Unit III: Short Stories
        1. Devanoora Mahadeva: "Odallala"
        2. Pathik Parmar :   "Naked Feet"
        3. M.M. Vinodini: "The Parable of Lost Daughter –Luke15"

Unit IV: Autobiographies
        1. Dr. Siddalingaiah – "Ooru Keri-I"
        2. Urmila Pawar – "The Weave of My Life: A Dalit Woman's
           Memoirs"
        3. Bama Faustina- "Karukku"
Books for Reference and Further Reading:
        D.R. Nagaraj *The Flaming Feet*
        Eleanor Zelliot *From Untouchable To Dalit*
        Mulk Raj Anand *Apology For Heroism*
        Arjun Dangle *Poisoned Bread*
        Encyclopedia of Dalits in India: Literature
        Sathyanarayana: The Exercise of Freedom
        K. Singh: Dalitism and Feminism: Locating Woman in Dalit Literature

(SOFT CORE-II)   ENGLISH ESSAYISTS

Course Code: ENB-220   **Credits: 4**

Teaching Hours: 60 (4 Hours/Week)

Course Outcomes

At the end of the Course, student able to

CO1: Understand the genre of prose essays and appreciate the essayist's artistic statements.

CO2: Learn to appreciate the literary devices employed by the essayists.

CO3: Understand the importance of essays as a genre to bring social change based on close
      reading of the essayist's observations on society.

CO4: Appreciate and analyse the views in Bacon, Hazlitt, Charles Lamb, Bertrand Russell,
      Mathew Arnold and Orwell's essays.

Unit I
General Introduction to Essay as a genre of literary art, Notable Essayists of British Literature

Unit II
1. Francis Bacon: a) Of Studies
                       b) Of Ambition

2. Hazlitt: a) On Going a Journey
                       b) On the Ignorance of the Learned

Unit III
3. Charles Lamb: a) Poor Relations
                       b) Chimney Sweepers

4. Bertrand Russell: a) Behaviorism and Values
                       b) Freedom versus Authority in Education

Unit IV
5. Mathew Arnold: a) Wordsworth
                       b) John Keats

6. George Orwell: a) Charles Dickens
                       b) Politics and English Language

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**
Teaching Hours: 60 (4 Hours/Week)

Course Outcomes

At the end of the Course, student able to

CO1: Understand the social, political and cultural milieu of the age.
CO2: Learn and analyse the impact of World War I and II on 20th Century fiction.
CO3: Appreciate the use of various literary devices and postmodern techniques such as
       Stream of Consciousness, Dark Humour in modern writings.
CO4: Understand and write about the new theatres evolved in modern age.

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*

Course II – (HARD CORE-II) INDIAN WRITING IN ENGLISH - II

Course Code: ENC 020   **Credits: 4**
Teaching Hours: 60 (4 Hours/Week)

Course Outcomes

At the end of the Course, student able to

CO1: Understand characteristic features of post-independent Indian Writing in English.
CO2: Read, compare and critically analyse essays of Indian critics.
CO3: Describe the Indianness in Indian Writing in English.
CO4: Write about the use of various literary devices by Indian writers, such as Arundati Roy,
Amitav Ghosh, Shanta Gokhale and RK Narayan.

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*

3. Jahnavi Barua: *Next Door*

UNIT – III
1. M. K. Gandhi: *My Experiments with Truth*

2. Shanta Gokhale: *One Foot on the Ground*

3. R K Narayan: *My Days*

UNIT – IV
1. Gayathri Spivak: "Can the Subaltern Speak?"

2. Meenakshi Mukherjee: "The Anxiety of Indianness"

3. Aijaz Ahamed: *In Theory (Chapter 8* on Indian Literature)

Books for Reference and Further 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**
Teaching Hours: 60 (4 Hours/Week)

Course Outcomes
At the end of the Course, student able to
CO1: Learn the emergence of New Literatures from Commonwealth literature.
CO2: Learn the thematic concerns in New Literatures.
CO3 Read and analyse the cultural conflict in New literatures such as African, Australian, Canadian and Caribbean and the impact of colonisation on native cultures.
CO4: Write focused analytical essays on the novels of Chinua Achebe, Wole Soyinka, Alice Munro, Patrick White, and V S Naipaul.
CO5: Appreciate the use of various literary devices in the poetry of Dennis Brutus, David Diop, AJM Smith, Judith Wright, Derek Walcott, and Braithwaite.
CO6: Learn and write critical analysis on the essays of Ngugi, Northrop Frye and Wilson Harris.

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: *Voss*
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: *Guerrillas*
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*

JSS College of Arts, Commerce and Science, PG Dept. of Studies in English, Ooty Road, Mysuru 25

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**
Teaching Hours: 60 (4 Hours/Week)

Course Outcomes
At the end of the Course, student able to
CO1: Learn and appreciate the use of Indianness in the modern Indian poetry.
CO2: Analyse the themes, imagery, symbolism in the poems of Ezekiel, Ramanujan, Daruwalla, de Souza, Mahapatra, Parthasarathy, Anita Nair and Vikram Seth.
CO3: Understand and appreciate the human values and human predicament in modern Indian poetry.
CO4: Analyse the trend setting themes explored in contemporary Indian poetry.

Unit-I
    1. Nissim Ezekiel: Night of the Scorpion; Enterprise
                                Urban; Poet, Lover, Birdwatcher
    2. A K Ramanujan: Obituary, A River
                                  Love Poem for a Wife II, Small Reflections on a Great House
Unit II
    3. Keki N Daruwalla: Death of a Bird, The Mistress, The Ghaghra in Spate
    4. Eunice de Souza: Bequest, Advice to Women, Women in Dutch Paintings,
                                  Feeding the Poor on Christmas
Unit III
    5. Jayanta Mahapatra: Hunger, Freedom, Grandfather, Dhauli

    6. R Parthasarathy: Rough Passage: a. Exile b. Trial c. Homecoming

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*

<div align="center">

Course V – (SOFT CORE-II)   FEMINISM

</div>

Course Code: ENC 220   **Credits: 4**
Teaching Hours: 60 (4 Hours/Week)

Course Outcomes

At the end of the Course, student able to

CO1: Analyse the texts critically and write the main ideas given in the prescribed texts.
CO2: Write logically the feelings expressed by the feminists.
CO3: Learn to appreciate the literary theories employed by the feminists to bring gender justice
      in the society and in literary representation.
CO4: Analyse the critical ideas expressed by Shoshona Felman, Elaine Showalter, Toril Moi
      and Susie Tharu in their prescribed essays or prose works.

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

Books for Reference and Further Reading:

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

<div align="center">**OPEN ELECTIVES COURSE**

A COURSE ON WRITTEN AND SPOKEN ENGLISH</div>

Dept. code 570   **Credits: 4**

Teaching Hours: 60 (4 Hours/Week)
Course Outcomes

At the end of the Course, student able to

CO1: Learn the correct use of parts of speech and English grammar.
CO2: Understand grammar rules and apply them in conversation and communication.
CO3: Write effectively describing impressions, feelings and experiences.
CO4: Talk about familiar topics and give explanations and reasons for opinions, past
        actions and future plans.
CO5: Understand comprehension passages and answer the implied questions rightly.

UNIT I

Basic Grammar
Definition of Parts of Speech and correct usage
   1. Noun   2. Pronoun   3. Adjectives: Degrees of comparison and correct usage.
   4. Verb, Tenses: Present, Past and Future and their correct usage.
   5. Adverb: Kinds of Adverbs and their correct usage
   6. Conjunction   7. Preposition
   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 **Reading skills** to be taught.

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.
Reading Skills with a focus on Idioms, Phrases, Antonyms, Homophones, Homonyms and Figures of Speech

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. Letter Writing:
             Personal letters
             Leave note
             Application for a job
             Letter to the editor

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Letters of complaints
Placing orders
2. Precise Writing
3. Short Essay writing

Unit - IV
Writing skills to be taught through:

A. Guided Composition
B. Expansion of an Idea/ Proverb
C. Comprehension
Comprehension of Poetry/ Prose/ Short Story/ Essay of selected texts

Comprehension of Poetry: **1.** Robert Frost: **Stopping by Woods on a Snowy Evening**
2. Wole Soyinka: **Telephone Conversation**

Comprehension of Prose: Radhakrishnan: **Humanities V/S Science**

Comprehension of Short Story: Maxim Gorky: **One Autumn Night**

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**

Teaching Hours: 60 (4 Hours/Week)

Course Outcomes

At the end of the Course, student able to

CO1: Learn the meaning, elements and characteristics of contemporary literary criticism.

CO2: Writes the essays using the skills of literary critical analysis.

CO3: Learn to write analytical essays on the literary texts of the prescribed critics.

CO4: Articulate and discuss the latest developments in the specific field of practice of literary

theories.

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**
Teaching Hours: 60 (4 Hours/Week)

Course Outcomes

At the end of the Course, student able to

CO1: Understand the significance of Renaissance, Transcendentalism and journey metaphor in American literature.
CO2: Appreciate and analyse the poems of Emily Dickinson, Wallace Stevens, Walt Whitman and Robert Frost.
CO3: Understand and write critically about the themes, narrative techniques, character analysis in the novels of Mark Twain, Douglas, Toni Morisson and Ray Bradbury.
CO4: Acquire the ability to understand and explore the human condition in the plays of Arthur Miller, Eugene O'Neill and Edward Albee.

UNIT –I
American Renaissance, Journey as Metaphor, Westward Movement, Transcendentalism

UNIT – II
Emerson: American Scholar
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
                 I Heard a Fly Buzz
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, Birches

UNIT III
Mark Twain: Huckleberry Finn
Fredrick Douglas: Narrative of the Life of an American Slave
Toni Morrison: The Bluest Eye
Ray Bradbury: Fahrenheit 451

UNIT – IV
Arthur Miller: Death of a Salesman
Eugene O'Neill: The Hairy Ape
Edward Albee: The Zoo Story

Books for Reference and Further 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 - III: SOFTCORE Elective I: INDIAN DIASPORA FICTION
Course Code: END 240   **Credits: 4**

Course Outcomes:
At the end of the Course, student able to
Course Outcomes

CO1: Learn the background of Diaspora Literature & major themes of Diaspora Literature

CO2: Compare and Contrast authors' treatment of themes, characters, subject matter etc.

CO3: Identify and analyse literary elements like plot, setting, tone, point of view, style, image, symbols, etc.

CO4: Trace the role of partition, corruption, fantasy, migration, etc. and psychological aspects behind human behaviour in the novels prescribed.

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

Books for Reference and Further Reading:

1. Avtar Brah. *Cartographies of Diaspora: Contesting Identities*. London: Routledge, 1996.

2. Homi K. Bhabha. *The Location of Culture*, 1994.

3. Edward W. Said. *Orientalism*. New Delhi: Penguin, 2001.

Course Code: END-230   **Credits: 4**
Teaching Hours: 60 (4 Hours/Week)

Course Outcomes

At the end of the Course, student able to

CO1: Learn the social, political and cultural milieu of the African society represented in fiction.

CO2: Understand and write critical essays on contemporary African novels such as Anthills of the Savannah, Purple Hibiscus, The Bride Price and Changes: A Love Story.

CO3: Articulate and discuss the latest developments in the specific fields of postcolonial African writings to bring gender justice in the society.

CO4: Write critically on the role of the characters in the novels of Achebe, Adichie. Emecheta and Aidoo.

Unit I: Chinua Achebe: *Anthills of the Savannah*

Unit II: Chimamanda Adichie Ngozi: *Purple Hibiscus*

Unit III: Buchi Emecheta: *The Bride Price*

Unit IV: Ama Ata Aidoo: *Changes: A Love Story*

Suggested Reading:

1. Butler, Judith. *Gender Trouble*: *Feminism and the Subversion of Identity*. New York: Routledge, 1990.

2. Ogundipe-Leslie, Omolara. *Re-Creating Ourselves African Women and Critical Transformations*. Trenton, NJ: Africa World P, 1994.

3. Palmer, Eustace (ed.). An Introduction to the African Novel. A Critical Study of Twelve Books. London: Heinemann, 1979.

4. Ashcroft, Bill. *Post-Colonial Transformation*. London and New York: Routledge, 2001.

5. Ashcroft, Bill, Gareth Griffiths, and Helen Tiffin. Eds. *The Post-Colonial Studies Reader*. London and New York: Routledge, 2002.

Course – IV – (HARDCORE - III)   Major Project Work Leading to a Dissertation

Course Code: END 030   **Credits: 4**
Teaching Hours: 60 (4 Hours/Week)

Course Outcomes

At the end of the Course, student able to

CO1: Learn to investigate the area of topic chosen for project work in detail.
CO2: Learn research skills and demonstrate scholarly expertise in exploring the subject to prepare the
        dissertation for the project work.
CO3: Learn the skills of research analysis in writing thesis.
CO4: Able to think logically and relate the issues and findings to real life scenario.

Students will be encouraged to undertake a major project work in disciplines related to literature of contemporary interest.

Suggested Areas:

> Folklore
> Performing Arts
> Popular Culture
> Gender and Sexuality
> Dalit and Subaltern Discourses
> Media Studies
> World Literatures in English
> General Survey of Poetic Works of Classical Writers
> General Survey of Poetic Works of Modern Writers

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.

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ಜೆಎಸ್ಎಸ್ ಮಹಾವಿದ್ಯಾಪೀಠ

ಜೆಎಸ್ಎಸ್ ಕಲಾ, ವಾಣಿಜ್ಯ ಮತ್ತು ವಿಜ್ಞಾನ ಕಾಲೇಜು

(ಸ್ವಾಯತ್ತ)

ಬಿ.ಎನ್. ರಸ್ತೆ, ಮೈಸೂರು – ೫೭೦ ೦೧೫

ಕನ್ನಡ ಸ್ನಾತಕೋತ್ತರ ವಿಭಾಗ

ಪಠ್ಯ – ಪಾಠಕ್ರಮ – ಪರೀಕ್ಷಾ ಯೋಜನೆ

ಚಾತುರ್ಮಾಸ ಯೋಜನೆ (ಸಿಬಿಸಿಎಸ್-ಸಿಎಜಿಪಿ)

೨೦೧೭-೧೮

ಮೊದಲನೆಯ ವರ್ಷ ಎಂ.ಎ. ಕನ್ನಡ

೨೦೧೧ -೨೦೧೨ ರಿಂದ ಆರಂಭವಾಗುವ ಶೈಕ್ಷಣಿಕ ವರ್ಷಕ್ಕೆ

<u>ಮೊದಲನೆಯ ಚತುರ್ಮಾಸ (ಆಗಸ್ಟ್ – ಡಿಸೆಂಬರ್ ೨೦೧೧)</u>

ಪಠ್ಯ–ಪಾಠಕ್ರಮ ಮತ್ತು ಪರೀಕ್ಷಾ ಯೋಜನೆ

ಪತ್ರಿಕೆ ಸಂಖ್ಯೆ	ಪತ್ರಿಕೆಗಳ ಶೀರ್ಷಿಕೆ	ಕ್ರೆಡಿಟ್‌ಗಳ ಸಂಖ್ಯೆ	ಕ್ರೆಡಿಟ್‌ಗಳ ಸಂಖ್ಯೆ	ಬೋಧನಾ ಗಂಟೆಗಳು (ವಾರಕ್ಕೆ) ಕ್ಲಾಸು	ಟ್ಯುಟೋರಿಯಲ್	ಪರೀಕ್ಷಾ ಅವಧಿ (ಗಂಟೆಗಳು)	ಪರೀಕ್ಷಾ ಅಂಕಗಳು	ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನ ಅಂಕಗಳು	ಒಟ್ಟು ಅಂಕಗಳು
	ಪ್ರಧಾನ ವಿಷಯಗಳು (Hard Core)								
೧	ಪ್ರಾಚೀನ ಕನ್ನಡ ಸಾಹಿತ್ಯ : ಪದ್ಯ – ಪಂಪರಾಮಾಯಣ ಸಂಗ್ರಹ	೫:೦	೪	೨	೧	೨	೮೦	೨೦	೧೦೦
೨	ಪ್ರಾಚೀನ ಮತ್ತು ಮಧ್ಯಕಾಲೀನ ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಹಿನ್ನೆಲೆ	೭:೦	೨	೧	೧	೨	೮೦	೨೦	೧೦೦
೩	ಕನ್ನಡ ಛಂದಸ್ಸಿನ ಅಧ್ಯಯನ : ಪದ್ಯ	೫:೦	೪	೨	೧	೨	೮೦	೨೦	೧೦೦
೪	ವಿಮರ್ಶೆಯ ಅಧ್ಯಯನ	೭:೦	೨	೧	೧	೨	೮೦	೨೦	೧೦೦
೫	**ಉಪ ಪ್ರಧಾನ ವಿಷಯಗಳು (Soft Core)** ವಿದ್ಯಾರ್ಥಿ ಈ ಕೆಳಗಿನ ಯಾವುದಾದರೂ ಒಂದು ವಿಷಯವನ್ನು ಆಯ್ಕೆ ಮಾಡಿಕೊಂಡು ಮುಂದಿನ ಮೂರು ಚತುರ್ಮಾಸಗಳಲ್ಲಿಯೂ ಅದೇ ವಿಷಯವನ್ನು ಮುಂದುವರಿಸತಕ್ಕದ್ದು								
೫.೦	ಭಾಷಾವಿಜ್ಞಾನ ಅಧ್ಯಯನ : ಭಾಷಾ ವಿಜ್ಞಾನದ ಮೂಲತತ್ತ್ವಗಳು	೫:೦	೪	೨	೧	೨	೮೦	೨೦	೧೦೦
೫.೧	ಜಾನಪದ ಅಧ್ಯಯನ : ಜಾನಪದ ಸಾಹಿತ್ಯದ ತಾತ್ತ್ವಿಕ ಅಧ್ಯಯನ	೫:೦	೪	೨	೧	೨	೮೦	೨೦	೧೦೦
೫.೨	ಚಾರಿತ್ರಿಕ ಅಧ್ಯಯನ : ಕರ್ನಾಟಕ ಸಾಂಸ್ಕೃತಿಕ ಚರಿತ್ರೆ	೫:೦	೪	೨	೧	೨	೮೦	೨೦	೧೦೦

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ಮೊದಲನೆಯ ವರ್ಷ ಎಂ.ಎ. ಕನ್ನಡ

<u>ಎರಡನೆಯ ಚತುರ್ಮಾಸ</u> (ಜನವರಿ – ಮೇ ೧೦೧೨)

ಪಠ್ಯ–ಪಾಠಕ್ರಮ ಮತ್ತು ಪರೀಕ್ಷಾ ಯೋಜನೆ

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ಪತ್ರಿಕೆ ಸಂಖ್ಯೆ	ಪತ್ರಿಕೆಗಳ ಶೀರ್ಷಿಕೆ	ಕ್ರೆಡಿಟ್ಗಳ ಸಂಖ್ಯೆ	ಕ್ರೆಡಿಟ್‌ಗಳ ಸಂಖ್ಯೆ	ಬೋಧನಾ ಗಂಟೆಗಳು (ವಾರಕ್ಕೆ)		ಪರೀಕ್ಷಾ ಅವಧಿ (ಗಂಟೆಗಳಲ್ಲಿ)	ಪರೀಕ್ಷಾ ಅಂಕಗಳು	ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನ ಅಂಕಗಳು	ಒಟ್ಟು ಅಂಕಗಳು
				ಉಪನ್ಯಾಸ	ಟ್ಯುಟೋರಿಯಲ್				
	ಪ್ರಧಾನ ವಿಷಯಗಳು (Hard Core)								
೧	ಮಧ್ಯಕಾಲೀನ ಕನ್ನಡ ಸಾಹಿತ್ಯ : ಪದ್ಯ : ವಚನ ಸಾಹಿತ್ಯ	೫:೦	೪	೩	೨	೩	೮೦	೨೦	೧೦೦
೨	ಮಧ್ಯಕಾಲೀನ ಕನ್ನಡ ಸಾಹಿತ್ಯ: ಕಾವ್ಯ : ಹರಿಶ್ಚಂದ್ರ ಕಾವ್ಯ	೨:೦	೩	೨	೨	೩	೮೦	೨೦	೧೦೦
೩	ದ್ರಾವಿಡ ಭಾಷಾವಿಜ್ಞಾನ	೨:೦	೩	೨	೨	೩	೮೦	೨೦	೧೦೦
೪	ಕನ್ನಡ ವಿಮರ್ಶೆ : ಆಯ್ದ ಲೇಖನಗಳು	೫:೦	೪	೩	೨	೩	೮೦	೨೦	೧೦೦
೫	**ಉಪ ಪ್ರಧಾನ ವಿಷಯಗಳು (Soft core)**								
	ಕೆಳಗಿನ ಪತ್ರಿಕೆಗಳಲ್ಲಿ ವಿದ್ಯಾರ್ಥಿಯು ಹಿಂದೆ ಆಯ್ಕೆ ಮಾಡಿಕೊಂಡ ಪತ್ರಿಕೆಯನ್ನೇ ಈ ಚತುರ್ಮಾಸದಲ್ಲಿಯೂ ಅಧ್ಯಯನ ಮಾಡಬೇಕು.								
೫.೦	ಭಾಷಾವಿಜ್ಞಾನ ಅಧ್ಯಯನ : ಕನ್ನಡ ವ್ಯಾಕರಣಗಳ ತೌಲನಿಕ ಸಮೀಕ್ಷೆ	೫:೦	೪	೩	೨	೩	೮೦	೨೦	೧೦೦
೫.೧	ಜಾನಪದ ಅಧ್ಯಯನ : ಜನಪದ ಸಂಸ್ಕೃತಿಯ ತಾತ್ತ್ವಿಕ ಅಧ್ಯಯನ	೫:೦	೪	೩	೨	೩	೮೦	೨೦	೧೦೦
೫.೨	ಚಾರಿತ್ರಿಕ ಅಧ್ಯಯನ : ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ (೧೨ನೆಯ ಶತಮಾನ)	೫:೦	೪	೩	೨	೩	೮೦	೨೦	೧೦೦
೯	**<u>ವಿಶೇಷ ಉಪ ಪ್ರಧಾನ ವಿಷಯಗಳು</u> (Special Soft Core)**								
	ವಿದ್ಯಾರ್ಥಿಗಳು ಈ ಚತುರ್ಮಾಸದಲ್ಲಿ ಯಾವುದಾದರೂ ಒಂದು ವಿಶೇಷ ಉಪ ಪ್ರಧಾನ ವಿಷಯವನ್ನು ಆಯ್ಕೆ ಮಾಡಿ ಅಧ್ಯಯನ ಮಾಡಬೇಕು								
೯.೦	ಕನ್ನಡ ಸಂಸ್ಕೃತಿ ಚಿಂತನೆ (ಆಯ್ದ ಲೇಖನಗಳು)	೫:೦	೪	೩	೨	೩	೮೦	೨೦	೧೦೦
೯.೧	ಮಹಿಳೆ : ಸಮಾಜ-ಸಾಹಿತ್ಯ (ಆಯ್ದ ಲೇಖನಗಳು)	೫:೦	೪	೩	೨	೩	೮೦	೨೦	೧೦೦

ಕನ್ನಡ ಎಂ.ಎ ಎರಡನೆಯ ವರ್ಷ

ಮೂರನೆಯ ಚತುರ್ಮಾಸ (ಆಗಸ್ಟ್ – ಡಿಸೆಂಬರ್ ೧೦೧೨)

ಪಠ್ಯ–ಪಾಠಕ್ರಮ ಮತ್ತು ಪರೀಕ್ಷಾ ಯೋಜನೆ

ಪತ್ರಿಕೆ ಸಂಖ್ಯೆ	ಪತ್ರಿಕೆಗಳ ಶೀರ್ಷಿಕೆ	ಕ್ರೆಡಿಟ್‌ಗಳ ಸಂಖ್ಯೆ	ಕ್ರೆಡಿಟ್‌ಗಳ ಸಂಖ್ಯೆ	ಬೋಧನಾ ಗಂಟೆಗಳು (ವಾರಕ್ಕೆ)		ಪರೀಕ್ಷಾ ಅವಧಿ (ಗಂಟೆಗಳಲ್ಲಿ)	ಪರೀಕ್ಷಾ ಅಂಕಗಳು	ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನ ಅಂಕಗಳು	ಒಟ್ಟು ಅಂಕಗಳು
				ಕ್ಲಾಸ್	ಟ್ಯುಟೋರಿಯಲ್				
	ಪ್ರಧಾನ ವಿಷಯಗಳು (Hard core)								
೧	ತೌಲನಿಕ ಸಾಹಿತ್ಯ : ಪದ್ಯ : ಮಹಾಕಾವ್ಯ ಮತ್ತು ನಾಟಕ	೪:೦	೪	೩	೧	೩	೮೦	೨೦	೧೦೦
೨	ಆಧುನಿಕ ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಹಿನ್ನೆಲೆ	೪:೦	೪	೩	೧	೩	೮೦	೨೦	೧೦೦
೩	ಭಾರತೀಯ ಕಾವ್ಯಮೀಮಾಂಸೆ	೪:೦	೪	೩	೧	೩	೮೦	೨೦	೧೦೦
೪	ಸಂಶೋಧನ ವಿಧಾನ	೪:೦	೪	೩	೧	೩	೮೦	೨೦	೧೦೦
೫	**ಉಪ ಪ್ರಧಾನ ವಿಷಯಗಳು (Soft core)** ಕೆಳಗಿನ ಪತ್ರಿಕೆಗಳಲ್ಲಿ ವಿದ್ಯಾರ್ಥಿಯು ಹಿಂದೆ ಆಯ್ಕೆ ಮಾಡಿಕೊಂಡ ಪತ್ರಿಕೆಯನ್ನೇ ಈ ಚತುರ್ಮಾಸದಲ್ಲಿಯೂ ಅಧ್ಯಯನ ಮಾಡಬೇಕು.								
೫.೦	ಭಾಷಾ ವಿಜ್ಞಾನ ಅಧ್ಯಯನ : ಉಪಭಾಷಾ ವಿಜ್ಞಾನ (ಕನ್ನಡ)	೩:೧	೪	೩	೧	೩	೮೦	೨೦	೧೦೦
೫.೧	ಜಾನಪದ ಅಧ್ಯಯನ : ಕರ್ನಾಟಕ ಜಾನಪದ ಕಲೆಗಳು	೩:೧	೪	೩	೧	೩	೮೦	೨೦	೧೦೦
೫.೨	ಚಾರಿತ್ರಿಕ ಅಧ್ಯಯನ : ಶಾಸನಶಾಸ್ತ್ರ ಆಯ್ದ ಪಠ್ಯಗಳೊಡನೆ	೩:೧	೪	೩	೧	೩	೮೦	೨೦	೧೦೦
೬	**ಮುಕ್ತ ಐಚ್ಛಿಕ (Open Elective)**								
೬.೦	ಕನ್ನಡ ಭಾಷೆ ಸಾಹಿತ್ಯ (ಪ್ರಾಚೀನ, ಮಧ್ಯಕಾಲೀನ, ಆಧುನಿಕ)	೩:೧	೪	೩	೧	೩	೮೦	೨೦	೧೦೦

ಕನ್ನಡ ಎಂ.ಎ ಎರಡನೆಯ ವರ್ಷ

ನಾಲ್ಕನೆಯ ಚತುರ್ಮಾಸ (ಜನವರಿ–ಮೇ ೧೦೧೪)

ಪಠ್ಯ–ಪಾಠಕ್ರಮ ಮತ್ತು ಪರೀಕ್ಷಾ ಯೋಜನೆ

ಪತ್ರಿಕೆ ಸಂಖ್ಯೆ	ಪತ್ರಿಕೆಗಳ ಶೀರ್ಷಿಕೆ	ಕ್ರೆಡಿಟ್ ಸ್ವರೂಪ	ಕ್ರೆಡಿಟ್‌ಗಳ ಸಂಖ್ಯೆ	ಬೋಧನಾ ಗಂಟೆಗಳು (ವಾರಕ್ಕೆ) ಕ್ಲಾಸ್	ಟ್ಯುಟೋರಿಯಲ್	ಪರೀಕ್ಷಾ ಅವಧಿ (ಗಂಟೆಗಳು)	ಪರೀಕ್ಷಾ ಅಂಕಗಳು	ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನ ಅಂಕಗಳು	ಒಟ್ಟು ಅಂಕಗಳು
	ಪ್ರಧಾನ ವಿಷಯಗಳು (Hard core)								
೧	ಆಧುನಿಕ ಕನ್ನಡ ಸಾಹಿತ್ಯ : ಪದ್ಯ : ಕಾವ್ಯ ಮತ್ತು ಕಾದಂಬರಿ	೩:೧	೩	೩	೧	೩	೮೦	೨೦	೧೦೦
೨	ಪಾಶ್ಚಾತ್ಯ ಕಾವ್ಯಮೀಮಾಂಸೆ	೩:೧	೩	೩	೧	೩	೮೦	೨೦	೧೦೦
೩	ಸಮೂಹ ಮಾಧ್ಯಮ	೩:೧	೩	೩	೧	೩	೮೦	೨೦	೧೦೦
೪	ಅವಧಿಕ ಕಾರ್ಯ	೧:೨	೩	೧	೪	೩	೮೦	೨೦	೧೦೦
೫	**ಉಪ ಪ್ರಧಾನ ವಿಷಯಗಳು (Soft core)** ಕೆಳಗಿನ ಪತ್ರಿಕೆಗಳಲ್ಲಿ ವಿದ್ಯಾರ್ಥಿಯು ಹಿಂದೆ ಆಯ್ಕೆ ಮಾಡಿಕೊಂಡ ಪತ್ರಿಕೆಯನ್ನೇ ಈ ಚತುರ್ಮಾಸದಲ್ಲಿಯೂ ಅಧ್ಯಯನ ಮಾಡಬೇಕು.								
೫.೧	ಭಾಷಾವಿಜ್ಞಾನ ಅಧ್ಯಯನ : ಕನ್ನಡ ಭಾಷಾಸ್ವರೂಪ : ಆಯ್ದ ಪಠ್ಯಗಳು	೩:೧	೪	೩	೧	೩	೮೦	೨೦	೧೦೦
೫.೨	ಜಾನಪದ ಅಧ್ಯಯನ : ಕನ್ನಡ ಜನಪದ ಸಾಹಿತ್ಯ (ಆಯ್ದ ಪಠ್ಯಗಳು)	೩:೧	೪	೩	೧	೩	೮೦	೨೦	೧೦೦
೫.೩	ಚಾರಿತ್ರಿಕ ಅಧ್ಯಯನ : ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ (ಆಯ್ದ ಪಠ್ಯಗಳು)	೩:೧	೪	೩	೧	೩	೮೦	೨೦	೧೦೦

ಪ್ರಧಾನ ವಿಷಯ	: ೩೨ ಕ್ರೆಡಿಟ್
ಉಪಪ್ರಧಾನ ವಿಷಯ	: ೧೨ ಕ್ರೆಡಿಟ್
ವಿಶೇಷ ಉಪಪ್ರಧಾನ ವಿಷಯ	: ೦೪ ಕ್ರೆಡಿಟ್
ಮುಕ್ತ ಐಚ್ಛಿಕ	: ೦೪ ಕ್ರೆಡಿಟ್
ಒಟ್ಟು ಟ್ಯುಟೋರಿಯಲ್ ಮತ್ತು ಪ್ರಾಯೋಗಿಕ ತರಗತಿಗಳು	: ೫೨ ಕ್ರೆಡಿಟ್

ಆಯಾ ಪತ್ರಿಕೆಗಳಿಗೆ ಅನುಸಾರವಾಗಿ ಈ ಕೆಳಗಿನ ಪ್ರಾಯೋಗಿಕ ಅಭ್ಯಾಸಗಳನ್ನು ಪತ್ರಿಕೆಗಳು ಒಳಗೊಂಡಿರುತ್ತವೆ.

೧. ಪದ್ಯ ಓದುವ ಕ್ರಮ, ಅರ್ಥೈಸುವ ಕ್ರಮ, ವಿಶ್ಲೇಷಣೆ ಮತ್ತು ವಿಮರ್ಶೆ,

೨. ಭಾವಸ್ವಾರಸ್ಯ, ಸಂಭಾಷಣಾ ಕೌಶಲ, ಸನ್ನಿವೇಶಗಳ ಪರಿಚಯ

೩. ವಸ್ತು, ಪಾತ್ರ, ಭಾಷೆ ಬಳಕೆ, ರಚನೆ, ತಂತ್ರಗಾರಿಕೆ

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ಮೊದಲನೆಯ ವರ್ಷ ಎಂ.ಎ ಕನ್ನಡ

ಮೊದಲನೆಯ ಚತುರ್ಮಾಸ (ಆಗಸ್ಟ್-ಡಿಸೆಂಬರ್ ೧೦೧೧)

ಪ್ರಧಾನ ವಿಷಯಗಳು **(Hard Core)**

KNA ____: ಪತ್ರಿಕೆ: ೧ ಪ್ರಾಚೀನ ಕನ್ನಡ ಸಾಹಿತ್ಯ : ಪದ್ಯ (೩:೧=೪ ಕ್ರೆಡಿಟ್)

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ನಾಗಚಂದ್ರ : ಹಿನ್ನೆಲೆ, ಇತಿವೃತ್ತ, ಕೃತಿಗಳು

ಪದ್ಯ: ಪಂಪರಾಮಾಯಣ ಸಂಗ್ರಹ – ತಿರುವಳ್ಳೂರ್ ಶ್ರೀನಿವಾಸರಾಘವಾಚಾರ್, ಡಿ.ಎಲ್. ನರಸಿಂಹಚಾರ್, ಪ್ರಸಾರಾಂಗ, ಮೈಸೂರು ವಿ.ವಿ., ಮೈಸೂರು

ಪರಾಮರ್ಶನ ಕೃತಿಗಳು:

೧. ನಾಗಚಂದ್ರ	: ವಿಜಯಾದಬ್ಬೆ
೧. ಮಲ್ಲಿನಾಥ ಪುರಾಣ	: ಸಿ.ಪಿ. ಕೃಷ್ಣ ಕುಮಾರ್
೩. ನಾಗಚಂದ್ರ	: ಸಿ.ಪಿ. ಕೃಷ್ಣ ಕುಮಾರ್
೪. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ	: ರಂ.ಶ್ರೀ. ಮುಗಳಿ
೫. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ ಸಂ: ೧,೧,೩	: ಕನ್ನಡ ಅಧ್ಯಯನ ಸಂಸ್ಥೆ, ಮೈವಿವಿ, ಮೈಸೂರು
೬. ಸಮಗ್ರ ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ	: ಬೆಂಗಳೂರು ವಿಶ್ವವಿದ್ಯಾಲಯ

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KNA ____: ಪತ್ರಿಕೆ: ೧ ಪ್ರಾಚೀನ ಮತ್ತು ಮಧ್ಯಕಾಲೀನ ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಹಿನ್ನೆಲೆ

(೧:೧=೩ ಕ್ರೆಡಿಟ್)

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೧. ಭೌಗೋಳಿಕ ಮತ್ತು ಸಾಮಾಜಿಕ ಹಿನ್ನೆಲೆ

- ಅಷ್ಟಾದಶ ವರ್ಣನೆಗಳು, ಭೌಗೋಳಿಕ ಪರಿಸರ
- ಸಾಹಿತ್ಯ ರೂಪಗಳು, ತಂತ್ರಗಳು

೧. ಧಾರ್ಮಿಕ ಹಿನ್ನೆಲೆ

- ಬೌದ್ಧಧರ್ಮ, ಜೈನ ಧರ್ಮ
- ಶೈವಧರ್ಮ, ವೈಷ್ಣವ ಧರ್ಮ

೩. ರಾಜಕೀಯ ಹಿನ್ನೆಲೆ

- ಬಾದಾಮಿ ಚಾಲುಕ್ಯರು, ರಾಷ್ಟ್ರಕೂಟರು, ಗಂಗರು, ಹೊಯ್ಸ್ಸಳರು, ವಿಜಯನಗರದ ಅರಸರ ಕಾಲದ ರಾಜಕೀಯ ಪರಿಸರ
- ಪ್ರಭುತ್ವ ಮತ್ತು ಸಾಹಿತ್ಯ ಸಂಬಂಧ
- ಸಮಾಜ ಜನಮುಖಿ ಸಾಹಿತ್ಯ

೪. ಇತರ ಭಾಷೆಗಳ ಪ್ರಭಾವ ಪ್ರೇರಣೆ

- ಸಂಸ್ಕೃತ, ಪ್ರಾಕೃತ
- ತಮಿಳು, ತೆಲುಗು

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ಪರಾಮರ್ಶನ ಕೃತಿಗಳು:

೧. ಕನ್ನಡ ಅಧ್ಯಯನ ಸಂಸ್ಥೆಯ ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆಯ ಸಂಪುಟಗಳು ೧, ೨ ಮತ್ತು ೩

೨. ಸಮಗ್ರ ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ ಸಂಪುಟಗಳು, ಬೆಂಗಳೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ

೩. ಕನ್ನಡ ನಾಡಿನ ಧರ್ಮಗಳು : ಕಿ.ಚೆ. ನಂದೀಮಠ

೪. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ ಸಮೀಕ್ಷೆ : ಎಚ್. ತಿಪ್ಪೇರುದ್ರಸ್ವಾಮಿ

೫. ಕನ್ನಡ ಶಾಸನಗಳ ಸಾಂಸ್ಕೃತಿಕ ಅಧ್ಯಯನ : ಎಂ.ಚಿದಾನಂದಮೂರ್ತಿ

೬. ಜೈನಧರ್ಮ : ಮಿರ್ಜಿ ಅಣ್ಣರಾಯ

೭. ಭಾರತೀಯ ಸಂಸ್ಕೃತಿ : (ಸಂ) ಅ.ನ.ಕೃಷ್ಣರಾಯ

೮. ಕರ್ನಾಟಕ ಪರಂಪರೆ : ಭಾಗ ೧ ಮತ್ತು ೨, ಕನ್ನಡ ಮತ್ತು ಸಂಸ್ಕೃತಿ ಇಲಾಖೆ

೯. ಚಂಪೂ ಸಾಹಿತ್ಯ : ಪಿ.ವಿ. ನಾರಾಯಣ

೧೦. ಕರ್ನಾಟಕ ಸಾಹಿತ್ಯ ಅಕಾಡೆಮಿಯ ಕನ್ನಡ ಸಾಹಿತ್ಯ ಪುನರ್ ಮೌಲ್ಯೀಕರಣ ಮಾಲೆಯ ಸಂಪುಟಗಳು

೧೧. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚಾರಿತ್ರಿಕ ಬೆಳವಣಿಗೆ (ಮಧ್ಯಕಾಲೀನ) : ಸಿ.ವೀರಣ್ಣ

KNA ___ : ಪತ್ರಿಕೆ: ೩ ಕನ್ನಡ ಛಂದಸ್ಸಿನ ಅಧ್ಯಯನ : ಪಠ್ಯ (೩:೧=೪ ಕ್ರೆಡಿಟ್)

೧-೩. ಪಠ್ಯ: ನಾಗವರ್ಮನ ಛಂದೋಂಬುಧಿ, ಸಂ: ಡಾ. ಟಿ.ವಿ. ವೆಂಕಟಾಚಲಶಾಸ್ತ್ರಿ

೪. ಹೊಸಗನ್ನಡ ಛಂದಸ್ಸು ಪಠ್ಯ:

೧. ಕನ್ನಡದಲ್ಲಿ ಹೊಸಮಟ್ಟುಗಳಿಗಿರುವ ಅವಶ್ಯಕತೆ : ತೀನಂಶ್ರೀ

೨. ಶ್ರೀರಾಮಾಯಣದರ್ಶನಂ ಛಂದಸ್ಸು : ಡಾ. ಟಿ.ವಿ. ವೆಂಕಟಾಚಲಶಾಸ್ತ್ರಿ

೩. ಛಂದೋವಿಶ್ಲೇಷಣೆ : ಕೆ.ಜಿ. ನಾರಾಯಣಪ್ರಸಾದ

(ಶ್ರೀ ಶಿವಕುಮಾರಚರಿತಂ ವಿಮರ್ಶೆ: ಪಿ. ಬಸವಣ್ಣನವರಿಗೆ ಬರೆದ ಪತ್ರ)

ಪರಾಮರ್ಶನ ಕೃತಿಗಳು

೧. ಕನ್ನಡ ಛಂದಸ್ಸಂಪುಟ : (ಸಂ) ಎಲ್. ಬಸವರಾಜು

೨. ಕನ್ನಡ ಕೈಪಿಡಿ, ಸಂಪುಟ ೧ ಭಾಗ ೨ : ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ

೩. ಜಯದಾಮನ್ : (ಸಂ) ಎಚ್.ಡಿ. ವೇಲಣಕರ್

೪. ಕನ್ನಡ ಛಂದೋವಿಕಾಸ : ಡಿ.ಎಸ್. ಕರ್ಕಿ

೫. ಸಮಾಲೋಕನ : ತೀನಂಶ್ರೀ

೬. ಕನ್ನಡ ಛಂದಃಸ್ವರೂಪ : ಟಿ.ವಿ. ವೆಂಕಟಾಚಲಶಾಸ್ತ್ರಿ

೭. ಪೀರಿಕೆಗಳು, ಲೇಖನಗಳು : ಡಿ.ಎಲ್. ನರಸಿಂಹಾಚಾರ್

೮. ಕನ್ನಡ ಛಂದೋವಿಹಾರ : ಟಿ.ವಿ. ವೆಂಕಟಾಚಲಶಾಸ್ತ್ರಿ

೯. ಛಂದೋಗತಿ : ಸೇಡಿಯಾಪು ಕೃಷ್ಣಭಟ್ಟ

೧೦. ಕನ್ನಡ ಛಂದಸ್ಸು : ಸೇಡಿಯಾಪು ಕೃಷ್ಣಭಟ್ಟ

೧೧. ಹೊಸಗನ್ನಡ ಕವಿತೆಯ ಛಂದಸ್ಸು : ಕೆ.ಜಿ. ನಾರಾಯಣಪ್ರಸಾದ್

೧೨. ಭಾರತೀಯ ಛಂದಶ್ಯಾಸ್ತ್ರ : ಪ್ರ.ಗೋ. ಕುಲಕರ್ಣಿ

೧೩. ಛಂದೋತರಂಗ : ಎಂ. ಚಿದಾನಂದಮೂರ್ತಿ

೧೪. ಹೊಸಗನ್ನಡ ಕವಿತೆಯ ಮೇಲೆ ಇಂಗ್ಲಿಷ್ ಕಾವ್ಯದ ಪ್ರಭಾವ : ಎಸ್.ಅನಂತನಾರಾಯಣ

೧೫. The Commonness in the Meters of the Dravidian Languages : S.Subrahmanyan

೧೮. A Study of Metre : T.S. Omond

೧೮.Metre, Rhyme and Free verse : G.S. Fraser

KNA _____: ಪತ್ರಿಕೆ: ೪ ವಿಮರ್ಶೆಯ ಅಧ್ಯಯನ (೧:೧=೨ ಕ್ರೆಡಿಟ್)

೧. (ಅ) ಪ್ರಾಯೋಗಿಕ ವಿಮರ್ಶೆ, ಸ್ವರೂಪ, ವ್ಯಾಪ್ತಿ

    (ಆ) ಜಾನಪದ ಕಾವ್ಯಗಳು, ವಚನ, ಆಧುನಿಕ ಕಾವ್ಯಗಳು (ನವೋದಯ, ನವ್ಯ, ದಲಿತ, ಬಂಡಾಯ)

೨. ಮನೋವೈಜ್ಞಾನಿಕ ವಿಮರ್ಶೆ, ಚಾರಿತ್ರಿಕ ವಿಮರ್ಶೆ, ಮಾರ್ಕ್ಸ್ ವಾದಿ ವಿಮರ್ಶೆ, ಸ್ತ್ರೀವಾದಿ ವಿಮರ್ಶೆ

೩. ರೂಪನಿಷ್ಠ ವಿಮರ್ಶೆ, ರಾಚನಿಕ ವಿಮರ್ಶೆ, ನಿರಚನವಾದಿ ವಿಮರ್ಶೆ,

೪. ವಸಾಹತು– ವಸಾಹತೋತ್ತರ ವಿಮರ್ಶೆ

ಪರಾಮರ್ಶನ ಕೃತಿಗಳು:

೧. ಪಾಶ್ಚಾತ್ಯ ಕಾವ್ಯಮೀಮಾಂಸೆ : ವಿ.ಎಂ. ಇನಾಂದಾರ್

೨. ಸಾಹಿತ್ಯ ವಿಮರ್ಶೆಯ ತತ್ತ್ವಗಳು :ಎಚ್.ತಿಪ್ಪೇರುದ್ರಸ್ವಾಮಿ (ಸಂ.ಶೈಲಜ ಎಚ್.ಟಿ)

೩. ಇಂಗ್ಲಿಷ್ ಭಾಷೆಯಲ್ಲಿ ಆಧುನಿಕ ಸಾಹಿತ್ಯ ವಿಮರ್ಶೆ : ಎಲ್.ಎಸ್. ಶೇಷಗಿರಿರಾವ್

೪. ಪ್ರಮಾಣ : ಗಿರಿಡ್ಡಿ ಗೋವಿಂದರಾಜು

೫. ಕಾವ್ಯಾರ್ಥ ಚಿಂತನ : ಜಿ.ಎಸ್. ಶಿವರುದ್ರಪ್ಪ

೬. ಸಾಹಿತ್ಯ ವಿಮರ್ಶೆ : ಸಿ.ಎನ್. ರಾಮಚಂದ್ರನ್

೭. ವಿಮರ್ಶೆಯ ಪರಿಭಾಷೆ : ಓ.ಎಲ್. ನಾಗಭೂಷಣಸ್ವಾಮಿ

೮. ವಿಮರ್ಶೆಯ ತತ್ತ್ವಗಳು ವಿಧಾನಗಳು :(ಸಂ) ವಿ.ಕೃ ಗೋಕಾಕ್ & ಕುಲಕರ್ಣಿ

೯. ಪ್ರಾಯೋಗಿಕ ವಿಮರ್ಶೆ :(ಸಂ)ಜಿ.ಎಸ್. ಶಿವರುದ್ರಪ್ಪ

                              ಎನ್.ಎಸ್. ಲಕ್ಷ್ಮೀನಾರಾಯಣ ಭಟ್ಟ

೧೦. ಓದುಗರು ಮತ್ತು ಓದುವಿಕೆ : ಸಿ.ಎನ್. ರಾಮಚಂದ್ರನ್

೧೧. ವಸಾಹತೋತ್ತರ ಚಿಂತನೆ : ಸಿ.ಎನ್. ರಾಮಚಂದ್ರನ್

೧೨. ಸ್ತ್ರೀವಾದ : ಸುಮಿತ್ರಾಬಾಯಿ ಬಿ.ಎನ್

೧೩.Literary Criticism – A Short History : W.K.Wimsatt & Cleanth Brooks

೧೪. Contemporary Criticism : (Ed)Sethuraman V S

ಉಪಪ್ರಧಾನ ವಿಷಯಗಳು (Soft Core)

KNA 210: ಪತ್ರಿಕೆ: ಇ.೧ ಭಾಷಾ ವಿಜ್ಞಾನ ಅಧ್ಯಯನ :
ಭಾಷಾ ವಿಜ್ಞಾನದ ಮೂಲತತ್ತ್ವಗಳು (೩:೧=೩ ಕ್ರೆಡಿಟ್)

೧. ಭಾಷೆ: ವ್ಯಾಖ್ಯಾನಗಳು–ಲಕ್ಷಣಗಳು, ಸ್ವರೂಪ ;

ಭಾಷಾ ವಿಜ್ಞಾನದ ಸ್ವರೂಪ–ವ್ಯಾಪ್ತಿ–ಪ್ರಯೋಜನಗಳು,

ಭಾಷೆಯ ಉಗಮ ಸಿದ್ಧಾಂತಗಳು;

ಭಾಷೆಗಳ ವರ್ಗೀಕರಣದ ಕ್ರಮಗಳು, ಭಾರತೀಯ ಭಾಷೆಗಳ ವರ್ಗೀಕರಣ

೨. ಧ್ವನಿ–ಉಪಧ್ವನಿ :ವ್ಯಾಖ್ಯೆ, ಸ್ವರೂಪ ;

ಧ್ವನಿವಿಜ್ಞಾನದ ಶಾಖೆಗಳು, ಧ್ವನಿಮಾ : ವ್ಯಾಖ್ಯೆ, ಸ್ವರೂಪ– ಧ್ವನಿಮಾ ನಿರ್ಣಯದ ತತ್ತ್ವಗಳು

೩. ಆಕೃತಿಮಾ : ವ್ಯಾಖ್ಯೆ, ಸ್ವರೂಪ, ವ್ಯಾಪ್ತಿ,

ಆಕೃತಿಮಾ ನಿರ್ಣಯ, ನೈಡಾ ತತ್ತ್ವಗಳು

ಆಕೃತಿಮಾದ ಬಗೆಗಳು

೪. ವಾಕ್ಯ ಮತ್ತು ಅರ್ಥ ವಿಜ್ಞಾನ

ಭಾಷಿಕ ಬದಲಾವಣೆ ;

ಭಾಷಿಕ ಸ್ವೀಕರಣ, ಭಾಷೆ ಮತ್ತು ಬರಹ

ಪರಾಮರ್ಶನ ಕೃತಿಗಳು:

೧.ವರ್ಣನಾತ್ಮಕ ವ್ಯಾಕರಣ : ಎಚ್.ಎಸ್. ಬಿಳಿಗಿರಿ

೨. ಭಾಷಾವಿಜ್ಞಾನದ ಮೂಲತತ್ತ್ವಗಳು : ಎಂ. ಚಿದಾನಂದಮೂರ್ತಿ

೩.ಭಾಷೆ ಮತ್ತು ಭಾಷಾವಿಜ್ಞಾನ : ಕೆ.ಕೆಂಪೇಗೌಡ

೪.ಸಾಮಾನ್ಯ ಭಾಷಾವಿಜ್ಞಾನ : ಕೆ.ಕೆಂಪೇಗೌಡ

೫.ಆಧುನಿಕ ವರ್ಣನಾತ್ಮಕ ಭಾಷಾವಿಜ್ಞಾನ : ರಾಜೇಶ್ವರೀ ಮಹೇಶ್ವರಯ್ಯ

೬.ಭಾಷೆ : (ಸಂ) ಕೆ.ವಿ. ನಾರಾಯಣ

೭.Language : Leonard Bloomfield

೮.Language : Edward Sapir

೯.A Course in Modern Linguistics : C.F. Hackett

೧೦.Modern Linguistics : S Potter

೧೧. Introduction to theoretical Linguistics : J. Lyons

೧೨. Historical Linguistics An Introduction : W.P. Lehmann

KNA 210 : ಪತ್ರಿಕೆ ಝ.೧

ಜಾನಪದ ಅಧ್ಯಯನ: ಜಾನಪದ ಸಾಹಿತ್ಯದ ತಾತ್ತ್ವಿಕ ಅಧ್ಯಯನ

೧. ಜನಪದ – ಜಾನಪದ : ವ್ಯಾಖ್ಯಾನ, ಸ್ವರೂಪ, ವ್ಯಾಪ್ತಿ, ವರ್ಗೀಕರಣ ; ಆದಿವಾಸಿ (ಬುಡಕಟ್ಟು) ಮತ್ತು ನಗರ ಜಾನಪದ, ಜಾನಪದ ಮತ್ತು ಇತರ ವಿಜ್ಞಾನಗಳು, ಜಾನಪದ ಮತ್ತು ದೇಶೀವಾದ; ಜನಪದ ಸಾಹಿತ್ಯದ ವರ್ಗೀಕರಣ, ಶಿಷ್ಟ ಮತ್ತು ಜನಪದ ಸಾಹಿತ್ಯ

೨. ಜನಪದ ಗೀತೆ, ಕಥನ ಕಾವ್ಯ, ಲಾವಣಿ, ಜನಪದ ಮಹಾಕಾವ್ಯ, ಜನಪದ ಕಥೆಗಳು – ಇವುಗಳ ಸ್ವರೂಪ, ಲಕ್ಷಣ, ಹಿನ್ನೆಲೆ, ಪ್ರಕಾರ

೩. ಜನಪದ ಗಾದೆ – ಜನಪದ ಒಗಟು, ಒಡಪು, ದಂತಕಥೆ, ಐತಿಹ್ಯ, ಪವಾಡ, ಪುರಾಣ ಇವುಗಳ ಸ್ವರೂಪ, ಲಕ್ಷಣ, ಹಿನ್ನೆಲೆ, ಪ್ರಕಾರ

೪. ಜನಪದ ಕ್ಷೇತ್ರಕಾರ್ಯ : ಸ್ವರೂಪ – ಕ್ಷೇತ್ರಜ್ಞರ ವ್ಯಕ್ತಿತ್ವ ಮತ್ತು ಗುಣಗಳು – ಕ್ಷೇತ್ರಕಾರ್ಯದ ಪೂರ್ವಸಿದ್ಧತೆಗಳು– ಕ್ಷೇತ್ರಕಾರ್ಯದ ಪರಿಕರಗಳು

ಪರಾಮರ್ಶನ ಕೃತಿಗಳು:

೧. ಜಾನಪದ ತತ್ತ್ವಗಳು : (ಸಂ)ಅರವಿಂದ ಮಾಲಗತ್ತಿ

೨. ಜಾನಪದ ಅಧ್ಯಯನ : ದೇಜಗೌ

೩. ಜನಪದ ಪುರಾಣಗಳು : ರಾಗೌ

೪. ಜಾನಪದ : ಜೀ.ಶಂ.ಪರಮಶಿವಯ್ಯ

೫. ಜಾನಪದ ಸ್ವರೂಪ : ಹಾ.ಮಾ. ನಾಯಕ

೬. ಭಾರತೀಯ ಜಾನಪದ ಸಮೀಕ್ಷೆ : ದುರ್ಗಾಭಾಗವತ್ ಅನು: ಕೆ. ಮರುಳಸಿದ್ಧಪ್ಪ

೭ ಭಾರತೀಯ ಪರಂಪರೆ ಹಾಗೂ ಸಾಹಿತ್ಯದಲ್ಲಿ ಒಗಟು : ದುರ್ಗಾಭಾಗವತ್ ಅನು: ಬಿ.ಎ.ವಿವೇಕ ರೈ

೮. ನಮ್ಮ ಗಾದೆಗಳು : ರಾಗೌ

೯. ಜನಪದ ಕಥಾಮಾರ್ಗಗಳು : ಹಿ.ಶಿ. ರಾಮಚಂದ್ರಗೌಡ

೧೦. ಜನಪದ ಆಟಗಳು : ಕರ್ನಾಟಕ ಜಾನಪದ ಯಕ್ಷಗಾನ ಅಕಾಡೆಮಿ

೧೧. ಜಾನಪದ ಅಧ್ಯಯನ –ಸಂಕ್ಷಿಪ್ತ ಇತಿಹಾಸ : ನಂ. ತಪಸ್ವೀಕುಮಾರ್

೧೨. ಜಾನಪದ ಕೆಲವು ಮುಖಗಳು : ಜೀ.ಶಂ. ಪರಮಶಿವಯ್ಯ

೧೩. ಜಾನಪದ ಸಾಹಿತ್ಯ ರೂಪಗಳು : ರಾಗೌ

೧೪. ಜಾನಪದ ಪ್ರವೇಶ : ಚಂದ್ರು ಕಾಳೇನಹಳ್ಳಿ

೧೫. ಜಾನಪದ ಸಮಾವೇಶ :(ಸಂ) ಜೀ.ಶಂ. ಪರಮಶಿವಯ್ಯ

೧೬. ಜಾನಪದ ವಾಹಿನಿ : ದೇ. ಜವರೇಗೌಡ

೧೭. ದಕ್ಷಿಣ ಕರ್ನಾಟಕದ ಜನಪದ ಪ್ರಕಾರಗಳು : ಜೀ.ಶಂ. ಪರಮಶಿವಯ್ಯ

೧೮. ಜಾನಪದ ಸಮೀಕ್ಷೆ : ಅಂಬಳಿಕೆ ಹಿರಿಯಣ್ಣ

೧೯. ಕರ್ನಾಟಕ ಜಾನಪದ : (ಸಂ)ಜಿ.ಎಸ್.ಶಿವರುದ್ರಪ್ಪ

೨೦. ಜಾನಪದ ಮೂಲಭೂತ ತತ್ತ್ವಗಳು : ದೇವೇಂದ್ರಕುಮಾರ ಹಕಾರಿ

೨೧. ಕನ್ನಡ ಜಾನಪದ: ಕೆಲವು ಮುಖಗಳು : ಟಿ.ಎಸ್. ಸತ್ಯನಾಥ

೨೨. ಜಾನಪದ: ವೈಜ್ಞಾನಿಕ ಕ್ಷೇತ್ರಕಾರ್ಯ : ಸಿ.ಸಿ.ಎಫ್ಟೆ

೧೨. ದ್ರಾವಿಡ ಜಾನಪದ	:	(ಸಂ)ಎಚ್.ಜೆ. ಲಕ್ಕಪ್ಪ ಗೌಡ
೧೩. ಮಲೆನಾಡು ಜಾನಪದ	:	(ಸಂ)ಎಚ್.ಜೆ. ಲಕ್ಕಪ್ಪ ಗೌಡ
೧೪. ಜಾನಪದ ಸಾಹಿತ್ಯ ದರ್ಶನ ಸಂಪುಟಗಳು	:	ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಧಾರವಾಡ
೧೫. ಜಾನಪದದ ವಿವಿಧ ಮುಖಗಳು	:	(ಸಂ) ಪ್ರೊ. ಶ್ರೀಕಂಠಕೂಡಿಗೆ
೧೬. ಸೈದ್ಧಾಂತಿಕ ಜಾನಪದ	:	ಅಂಬಳಿಕೆ ಹಿರಿಯಣ್ಣ
೧೭. Folklore and Folk life	:	Ed. Richard M Dorson
೧೮. The study of Folklore	:	Ed: Alan Dundes
೧೯. Folklore Genres	:	Dass Ben Amos
೨೦. The Folktale	:	Stith Thompson
೨೦. Current Trends in Folklore	:	Jawaharlal Handoo
೨೧. Story Performance and Event	:	Richard Bauman

KNA 210: ಪತ್ರಿಕೆ ಇ.ಇ ಚಾರಿತ್ರಿಕ ಅಧ್ಯಯನ: ಕರ್ನಾಟಕ ಸಾಂಸ್ಕೃತಿಕ ಚರಿತ್ರೆ

೧. ಸಂಸ್ಕೃತಿ ಎಂದರೇನು? ಕರ್ನಾಟಕ ಸಾಂಸ್ಕೃತಿಕ ಚರಿತ್ರೆಯ ಅಧ್ಯಯನದ ಮೂಲ ಸಾಮಗ್ರಿಗಳು; ಕರ್ನಾಟಕದ ಪ್ರಾಚೀನತೆ – ದೊರೆಯುವ ಆಕರಗಳು ಮತ್ತು ಅವುಗಳ ಸ್ವರೂಪ

೨. ಕದಂಬರು : ಮಯೂರವರ್ಮ, ಕಾಕುತ್ಸವರ್ಮ ; ಗಂಗರು: ದುರ್ವಿನೀತ, ಶ್ರೀಪುರುಷ
ಬಾದಾಮಿಯ ಚಾಲುಕ್ಯರು: ಇಮ್ಮಡಿ ಪುಲಿಕೇಶಿ, ಇಮ್ಮಡಿ ವಿಕ್ರಮಾದಿತ್ಯ

೩. ರಾಷ್ಟ್ರಕೂಟರು : ಮುಮ್ಮಡಿ ಗೋವಿಂದ, ಅಮೋಘವರ್ಷ ನೃಪತುಂಗ, ಮುಮ್ಮಡಿ ಕೃಷ್ಣ
ಕಲ್ಯಾಣದ ಚಾಲುಕ್ಯರು :ಇಮ್ಮಡಿ ತೈಲಪ, ಇಮ್ಮಡಿ ಜಯಸಿಂಹ, ಆರನೆಯ ವಿಕ್ರಮಾದಿತ್ಯ
ಹೊಯ್ಸಳರು : ವಿಷ್ಣುವರ್ಧನ, ಇಮ್ಮಡಿ ಬಲ್ಲಾಳ

೪. ವಿಜಯನಗರ: ಇಮ್ಮಡಿ ದೇವರಾಯ, ಕೃಷ್ಣದೇವರಾಯ; ಮೈಸೂರು ಒಡೆಯರು,
ಚಿಕ್ಕದೇವರಾಯ, ಮುಮ್ಮಡಿ ಕೃಷ್ಣರಾಜ

೨, ೩ ಮತ್ತು ೪ನೇ ಘಟಕಗಳಲ್ಲಿ ಆಯಾ ರಾಜರ ಕಾಲದ ರಾಜಕೀಯ, ಧಾರ್ಮಿಕ ಸಾಮಾಜಿಕ, ಸಾಂಸ್ಕೃತಿಕ ಸ್ಥಿತಿಗತಿಗಳನ್ನ ಅಭ್ಯಾಸ ಮಾಡತಕ್ಕದ್ದು, ರಾಜಕೀಯ ಎಂದರೆ ಚಾರಿತ್ರಿಕ ವಿವರಗಳು ; ಧಾರ್ಮಿಕ ಎಂದರೆ ಬೌದ್ಧ, ಜೈನ, ವೈದಿಕ, ವೀರಶೈವ ಧರ್ಮಗಳ ವಿವರಗಳು; ಸಾಮಾಜಿಕ, ಸಾಂಸ್ಕೃತಿಕ, ಶಿಕ್ಷಣ, ಆಡಳಿತ, ಜನಜೀವನ, ಆತ್ಮಬಲಿದಾನ ಪದ್ಧತಿಗಳು; ದೇವಸ್ಥಾನಗಳ ವಾಸ್ತುಶಿಲ್ಪ

ಪರಾಮರ್ಶನ ಕೃತಿಗಳು:

೧.ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ ೧,೨,೩,೪,೫,	:	ಕುವೆಂಪು ಕನ್ನಡ ಅಧ್ಯಯನ ಸಂಸ್ಥೆ, ಮೈಸೂರು
೨. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ ಸಮೀಕ್ಷೆ	:	ಎಚ್. ತಿಪ್ಪೇರುದ್ರಸ್ವಾಮಿ
೩. ಕನ್ನಡ ಶಾಸನಗಳ ಸಾಂಸ್ಕೃತಿಕ ಅಧ್ಯಯನ	:	ಎಂ.ಚಿದಾನಂದಮೂರ್ತಿ
೪. ಮಾರ್ಗ ೧,೨,೩	:	ಎಂ.ಎಂ. ಕಲಬುರ್ಗಿ
೫. ಕರ್ನಾಟಕದ ಅರಸು ಮನೆತನಗಳು	:	ಎನ್. ಲಕ್ಷ್ಮೀನಾರಾಯಣರಾವ್ ಮತ್ತು ಆರ್.ಎಸ್., ಪಂಚಮುಖಿ
೬. ಕರ್ನಾಟಕ ಇತಿಹಾಸ	:	ಎಂ.ವಿ. ಕೃಷ್ಣರಾವ್ ಮತ್ತು ಕೇಶವಭಟ್ಟ

೮. ಕರ್ನಾಟಕ ಪರಂಪರೆ ೧,೨ : ಕನ್ನಡ ಮತ್ತು ಸಂಸ್ಕೃತಿ ಇಲಾಖೆ

ಲ. ಕರ್ನಾಟಕ ಚರಿತ್ರೆ : ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ

೯. ವಿಷಯ ವಿಶ್ವಕೋಶ : ಕರ್ನಾಟಕ : ಕುವೆಂಪು ಕನ್ನಡ ಅಧ್ಯಯನ ಸಂಸ್ಥೆ

೧೦. Karnataka Darshana : R.R. Diwakar

೧೧. The Heritage of Karnataka : R.S. Mugali

೧೨. A History of south India : K.A. Nilakntha Shastry

೧೩. Early History of Deccan I & II : Yazdani

೧೪. Administration and Social Life Under Vijaynagar : T.V. Mahlingam

ಮೊದಲನೆಯ ವರ್ಷ ಎಂ.ಎ. ಕನ್ನಡ

ಎರಡನೆಯ ಚತುರ್ಮಾಸ (ಜನವರಿ–ಮೇ ೧೦೧೨)

ಪ್ರಧಾನ ವಿಷಯಗಳು (**Hard core**)

KNB 010 : ಪತ್ರಿಕೆ : ೧ ಮಧ್ಯಕಾಲೀನ ಕನ್ನಡ ಸಾಹಿತ್ಯ: ವಚನ ಸಾಹಿತ್ಯ

(೨:೧=೪ ಕ್ರೆಡಿಟ್)

ಹಿನ್ನೆಲೆ, ಅಂದಿನ ಸಾಮಾಜಿಕ ಸಾಂಸ್ಕೃತಿಕ ಜೀವನ, ವಚನಾಂದೋಲನದ ಸ್ವರೂಪ,

ಜೇಡರ ದಾಸಿಮಯ್ಯ, ಬಸವಣ್ಣ, ಅಕ್ಕಮಹಾದೇವಿ, ಅಂಬಿಗರ ಚೌಡಯ್ಯ–ಈ ನಾಲ್ಕು ಮಂದಿ ವಚನಕಾರರ

ಹಿನ್ನೆಲೆ ಮತ್ತು ಇತಿವೃತ್ತ.

೧.ಜೇಡರ ದಾಸಿಮಯ್ಯನ ವಚನಗಳು – (ಆಯ್ದ ಇಪ್ಪತ್ತೈದು ವಚನಗಳು)

೭೯೧, ೭೯೧, ೮೪೧, ೮೪೪, ೮೬೪, ೮೬೫, ೮೬೭, ೮೮೪, ೮೯೫, ೮೯೬, ೮೯೯, ೮೦೦, ೮೦೨, ೮೦೦,

೮೧೧, ೮೩೧, ೮೩೨, ೮೪೧, ೮೫೨, ೮೯೧, ೮೯೨, ೮೨೦, ೮೮೦, ೮೮೪, ೮೯೩

೨.ಬಸವಣ್ಣನ ವಚನಗಳು (ಆಯ್ದ ಇಪ್ಪತ್ತೈದು ವಚನಗಳು)

೧೯, ೧೯, ೨೪, ೭೯, ೭೧, ೮೩, ೯೧, ೯೩, ೯೮, ೧೧೫, ೧೧೯, ೧೩೦, ೧೫೫, ೧೯೧, ೧೮೩, ೧೦೯, ೧೦೧,

೧೧೩, ೧೩೫, ೧೪೦, ೧೯೧, ೪೩೯, ೪೩೧, ೪೪೯, ೫೫೮,

೩.ಅಕ್ಕಮಹಾದೇವಿಯ ವಚನಗಳು (ಆಯ್ದ ಇಪ್ಪತ್ತೈದು ವಚನಗಳು)

೧೮, ೩೩, ೫೧, ೯೫, ೧೧೫, ೧೪೩, ೧೮೩, ೧೮೯, ೧೯೮, ೧೯೦, ೩೦೩, ೩೦೮, ೩೧೦, ೩೩೦, ೩೪೦, ೩೮೪,

೩೮೫, ೩೯೮, ೪೦೦, ೪೧೯, ೪೧೩, ೪೧೯, ೪೧೯, ೪೧೯, ೪೩೧

೪. ಅಂಬಿಗರ ಚೌಡಯ್ಯನ ವಚನಗಳು (ಆಯ್ದ ಇಪ್ಪತ್ತೈದು ವಚನಗಳು)

೨, ೮, ೯, ೧೮, ೧೫, ೧೮, ೩೫, ೫೨ ೫೪, ೮೯, ೮೮, ೧೦೮, ೧೧೦, ೧೩೯, ೧೫೮, ೧೫೮, ೧೯೯, ೧೮೮, ೧೮೯,

೧೪೧, ೧೪೩, ೧೪೪, ೧೪೫, ೧೪೮, ೫೫೧

ಪಠ್ಯ ಮೂಲ :

೧. ಸಂಕೀರ್ಣ ವಚನ ಸಂಪುಟ ೨ : (ಸಂ) ಎಸ್. ವಿದ್ಯಾಶಂಕರ, ಕನ್ನಡ ಮತ್ತು ಸಂಸ್ಕೃತಿ ಇಲಾಖೆ, ಬೆಂಗಳೂರು

೨. ಬಸವಣ್ಣನವರ ವಚನ ಸಂಪುಟ: (ಸಂ) ಎಂ.ಎಂ. ಕಲಬುರ್ಗಿ, ಕನ್ನಡ ಮತ್ತು ಸಂಸ್ಕೃತಿ ಇಲಾಖೆ, ಬೆಂಗಳೂರು

೩. ಶಿವಶರಣೆಯರ ವಚನ ಸಂಪುಟ: (ಸಂ) ವೀರಣ್ಣ ರಾಜೂರ, ಕನ್ನಡ ಪುಸ್ತಕ ಪ್ರಾಧಿಕಾರ, ಬೆಂಗಳೂರು

೪. ಸಂಕೀರ್ಣ ವಚನ ಸಂಪುಟ ೧: (ಸಂ) ಎಂ.ಎಂ. ಕಲಬುರ್ಗಿ, ಕನ್ನಡ ಮತ್ತು ಸಂಸ್ಕೃತಿ ಇಲಾಖೆ, ಬೆಂಗಳೂರು

ಪರಾಮರ್ಶನ ಕೃತಿಗಳು:

೧.ವಚನಧರ್ಮಸಾರ : ಎಂ.ಆರ್.ಶ್ರೀನಿವಾಸಮೂರ್ತಿ

೨.ವಚನಶಾಸ್ತ್ರ ರಹಸ್ಯ : ರಂ.ರಾ. ದಿವಾಕರ

೩.ಬಸವಣ್ಣನವರ ಷಟ್‌ಸ್ಥಲದ ವಚನಗಳು : ಎಲ್.ಬಸವರಾಜು

೪.ಬಸವಣ್ಣನವರ ವಚನಾಮೃತ ಭಾಗ ೧ ಮತ್ತು ೨ : ಎಲ್. ಬಸವರಾಜು

೫.ಬಸವಣ್ಣನವರ ವಚನಗಳು : ಫ.ಗು.ಹಳಕಟ್ಟಿ

೬.ಭಕ್ತಿ ಭಂಡಾರಿ ಬಸವಣ್ಣನವರು : ಎಂ.ಆರ್.ಶ್ರೀನಿವಾಸಮೂರ್ತಿ

೭.ಶರಣರ ಅನುಭಾವ ಸಾಹಿತ್ಯ : ಎಚ್. ತಿಪ್ಪೇರುದ್ರಸ್ವಾಮಿ

೮.ಬಸವೇಶ್ವರ ವಚನ ದೀಪಿಕೆ : ಎಚ್. ತಿಪ್ಪೇರುದ್ರಸ್ವಾಮಿ

೯.ಅಕ್ಕನ ವಚನ ಚಿಂತನ : ಅನ್ನದಾನೀಶ್ವರ ಸ್ವಾಮಿಗಳು

೧೦. Sri Basaveswara and His contemporaries : A R Jayaram

೧೧. The thoughts of Basava : N K Sanakalmath

೧೨. Hand book of Veerashavism : S C Nadimath

೧೩. Speaking of Siva : A.K. Ramanujan

KNB ___ : ಪತ್ರಿಕೆ: ೨ ಮಧ್ಯಕಾಲೀನ ಕನ್ನಡ ಸಾಹಿತ್ಯ : ಕಾವ್ಯ

(೨:೧=೨ ಕ್ರೆಡಿಟ್)

ರಾಘವಾಂಕ : ಹಿನ್ನೆಲೆ, ಇತಿವೃತ್ತ, ಕೃತಿಗಳು

ಹರಿಶ್ಚಂದ್ರಕಾವ್ಯ ಸಂಗ್ರಹ : ಸಂ: ಎ. ಆರ್. ಕೃಷ್ಣಶಾಸ್ತ್ರೀ

ಪರಾಮರ್ಶನ ಕೃತಿಗಳು:

೧. ರಾಘವಾಂಕ : ಆರ್.ಸಿ. ಹಿರೇಮಠ

೨. ರಾಘವಾಂಕ : ಒಂದು ಅಧ್ಯಯನ : ಸೂರ್ಯನಾರಾಯಣ

೩. ಹರಿಶ್ಚಂದ್ರ ಓದು ವಿಮರ್ಶೆ : ಜಿ.ಎಚ್. ನಾಯಕ

೪. ಹರಿಶ್ಚಂದ್ರ ಚಾರಿತ್ರ್ಯ-ಸಾಂಸ್ಕೃತಿಕ ಮುಖಾಮುಖಿ : ಸಂ: ಅಮರೇಶ ನುಗಡೋಣಿ

೫. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆಯ ಸಂಪುಟಗಳು : ಕನ್ನಡ ಅಧ್ಯಯನ ಸಂಸ್ಥೆ, ಮೈವಿ

೬. ಸಮಗ್ರ ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ : ಬೆಂಗಳೂರು ವಿ.

KNB 030: ಪತ್ರಿಕೆ: ೩ ದ್ರಾವಿಡ ಭಾಷಾವಿಜ್ಞಾನ (೨:೧=೨ ಕ್ರೆಡಿಟ್)

೧. ದ್ರಾವಿಡ ಪದದ ನಿಷ್ಪತ್ತಿ – ದ್ರಾವಿಡ ಭಾಷೆಗಳ ಸಂಖ್ಯೆ, ಸ್ವರೂಪ ಮತ್ತು ವರ್ಗೀಕರಣ

೨. ದ್ರಾವಿಡ ಭಾಷಾವಿಜ್ಞಾನದ ಇತಿಹಾಸ–ಸ್ವರವ್ಯತ್ಯಯ ವಿಚಾರ–ದ್ರಾವಿಡ ಧ್ವನಿಮಾಗಳ ಚರಿತ್ರೆ –ಕ್, ಚ್, ಟ್, ಪ್, ಜ್, ೞ್

೩. ಆಕೃತಿಮಾ ಅಧ್ಯಯನ : ಸರ್ವನಾಮ, ಲಿಂಗ, ವಚನ, ವಿಭಕ್ತಿ, ಸಂಖ್ಯಾವಾಚಕಗಳ ಸ್ಥೂಲಪರಿಚಯ, ಚರಿತ್ರೆ, ಕ್ರಿಯಾಪದ ಮತ್ತು ಕರ್ಮಣಿ ಪ್ರಯೋಗ

೪. ಭಾಷಾವಿಜ್ಞಾನದ ದೃಷ್ಟಿಯಿಂದ ಮುಖ್ಯವೆನಿಸಿದ ಕೆಲವು ಪದಗಳ ಇತಿಹಾಸ

ಪರಾಮರ್ಶನ ಕೃತಿಗಳು:

೧ ಭಾಷಾವಿಜ್ಞಾನದ ಮೂಲತತ್ತ್ವಗಳು : ಎಂ.ಚಿದಾನಂದಮೂರ್ತಿ

೧ ದ್ರಾವಿಡ ಭಾಷಾವಿಜ್ಞಾನ   : ಹಂಪ ನಾಗರಾಜಯ್ಯ

೨ ದ್ರಾವಿಡ ಸಂಖ್ಯಾವಾಚಕಗಳು   : ಹಂಪ ನಾಗರಾಜಯ್ಯ

೩ ದ್ರಾವಿಡ ಭಾಷಾವ್ಯಾಸಂಗ   : ಸಂಗಮೇಶ ಸವದತ್ತಿಮಠ

೪ ದ್ರಾವಿಡ ಭಾಷೆಗಳು   : ಸಂಗಮೇಶ ಸವದತ್ತಿಮಠ

೫ ಕನ್ನಡ ಭಾಷಾವ್ಯಾಸಂಗ   : ಸಂಗಮೇಶ ಸವದತ್ತಿಮಠ

೬ ಆಲೋಕ   : ಎಚ್.ಎಸ್. ಬಿಳಿಗಿರಿ

೭ ಕನ್ನಡ ಭಾಷೆಯ ರೂಪರೇಷೆಗಳು   : ವಿಲಿಯಂ ಮಾಡ್ತಾ

೮ ಕನ್ನಡ ಭಾಷೆಯ ಸಂಕ್ಷಿಪ್ತ ಚರಿತ್ರೆ   : ಡಿ.ಎನ್.ಶಂಕರಭಟ್ಟ

೯ ಕನ್ನಡ ಭಾಷೆಯ ಚರಿತ್ರೆ   : ಪ್ರ.ಗೋ. ಕುಲಕರ್ಣಿ

೧೦ ಕನ್ನಡ ಭಾಷೆಯ ಸ್ವರೂಪ   : ಕೆ.ಎಂ.ಕೃಷ್ಣರಾವ್

೧೧ ಐತಿಹಾಸಿಕ ಭಾಷಾವಿಜ್ಞಾನ   : ಜೆ.ಎಸ್.ಕುಳ್ಳಿ

೧೨ ವರ್ಣನಾತ್ಮಕ ಭಾಷಾವಿಜ್ಞಾನ   : ಜೆ.ಎಸ್.ಕುಳ್ಳಿ

೧೪ ದ್ರಾವಿಡ ಭಾಷೆಗಳ ತೌಲನಿಕ ಅಧ್ಯಯನ   : ಟಿ.ಮಣಿಯನ್

೧೫ ತಮಿಳು ಭಾಷಾಚರಿತ್ರೆ   : ಟಿ.ಮಣಿಯನ್

೧೬ ತೌಲನಿಕ ದ್ರಾವಿಡ ಭಾಷಾವಿಜ್ಞಾನ ಪರಿಚಯ   : ಕೆ.ಕೆಂಪೇಗೌಡ

೧೭ ಸಂಕ್ಷಿಪ್ತ ಕನ್ನಡ ಭಾಷಾ ಚರಿತ್ರೆ   : .ಎಂ.ಎಚ್.ಕೃಷ್ಣಯ್ಯ

೧೮ A Comparative Grammar of the Dravidian Languages : R. Caldwell

೧೯ History of Kannada Language   : R Narasimahacharaya

೨೦ Collected Papers on Dravidian Lingusistics : T. Burrow

೨೧ Dravidian Comparative Phonology – A sketch : M.B. Emeneau

೨೨ Dravidian Nouns   : S.V. Shanmugam

೨೩ Dravidian Verb Morphology   : P.S. Subramanyam

KNB 040: ಪತ್ರಿಕೆ : ೪ ಕನ್ನಡ ವಿಮರ್ಶೆ – ಪಠ್ಯ : ಆಯ್ದ ಲೇಖನಗಳು (೫:೧=೪ ಕ್ರೆಡಿಟ್)

ಆಧುನಿಕ ಕನ್ನಡ ವಿಮರ್ಶೆಯ ಸ್ವರೂಪ, ಬೆಳವಣಿಗೆ, ವಿವಿಧ ಪಂಥಗಳು–ಧೋರಣೆಗಳು

೧ ಸಾಹಿತ್ಯದಲ್ಲಿ ಅನಾದರ   :   ಟಿ.ಎಸ್. ವೆಂಕಣ್ಣಯ್ಯ

೨ ಪ್ರತಿಮಾ ಮತ್ತು ಪ್ರತಿಕೃತಿ   :   ಕುವೆಂಪು

೩ ನಾದಲೀಲೆ ಮುನ್ನುಡಿ   :   ಮಾಸ್ತಿ ವೆಂಕಟೇಶ ಅಯ್ಯಂಗಾರ್

೪ ಪ್ರಗತಿಶೀಲ ಸಾಹಿತ್ಯ ಗೊತ್ತು ಗುರಿಗಳು   :   ನಿರಂಜನ

೫ ಕಾದಂಬರಿ ಮತ್ತು ಹೊಸ ನೈತಿಕ ಪ್ರಜ್ಞೆ   :   ಯು. ಆರ್. ಅನಂತಮೂರ್ತಿ

೬ ಮತ್ತೆ ಮತ್ತೆ ಪಂಪ   :   ಜಿ. ಎಚ್. ನಾಯಕ

೭ ಬಂಡಾಯ ಸಾಹಿತ್ಯಮೀಮಾಂಸೆ   :   ಬರಗೂರು ರಾಮಚಂದ್ರಪ್ಪ   :

೮ ದಲಿತ ಸಾಹಿತ್ಯ : ಕೆಲವು ತಾತ್ವಿಕ ಚಿಂತನೆಗಳು   :   ದೇವಯ್ಯ ಹರವೆ

೯ ಹೊನ್ನಮ್ಮನ ಕಿವಿಮಾತಿಗೆ ಒಂದು ಪ್ರತಿಕ್ರಿಯೆ   :   ವಿಜಯಾ ದಬ್ಬೆ

೧೦ ನಾನು ಗಾಂಧಿಚಿತ್ರ ನೋಡಿದೆ ಅಥವಾ ಆಕಾಶಕ್ಕೆ ಎರಡು ಗೇಣುಕಮ್ಮಿ: ದೇವನೂರ ಮಹಾದೇವ

ಪರಾಮರ್ಶನ ಸಾಹಿತ್ಯ

೧ ಗಿರಡ್ಡಿ ಗೋವಿಂದರಾಜ   : ಪ್ರಮಾಣು, ಕವಿವಿ ಹಂಪಿ, ೨೦೦೨

೧ ಬಿ.ದಾಮೋದರರಾವ್ : ಆಯಾಮಗಳು, ಪರಿಸರ ಸಾಹಿತ್ಯ ಪ್ರ. ಶಿವಮೊಗ್ಗ, ೧೯೯೧

೨ ರಹಮತ್ ತರೀಕೆರೆ ಸಂ) : ಕನ್ನಡ ಸಾಹಿತ್ಯ ಮೀಮಾಂಸೆ, ಕವಿವಿ, ಹಂಪಿ, ೨೦೦೦

ಆ ರಹಮತ್ ತರೀಕೆರೆ (ಸಂ) : ಮಾತು ತಲೆ ಎತ್ತುವ ಬಗೆ, ಕವಿವಿ, ಹಂಪಿ, ೨೦೦೫

ಈ ಲಕ್ಷ್ಮಣ ಕೊಡಸೆ (ಸಂ) : ಕನ್ನಡ ವಿಮರ್ಶಾ ವಿವೇಕ, ಸುಮುಖ ಪ್ರ. ಬೆಂ, ೨೦೦೮

೨ ಕೀರ್ತಿನಾಥ ಕುರ್ತಕೋಟಿ : ಯುಗಧರ್ಮ ಮತ್ತು ಸಾಹಿತ್ಯ ದರ್ಶನ

೭. ಪ್ರಾಚೀನ ಸಾಹಿತ್ಯ : ಟಿ.ಎಸ್. ವೆಂಕಣ್ಣಯ್ಯ

ಲ. ನಾದಲೀಲೆ (೧೯೩೮) : ಅಂಬಿಕಾತನಯದತ್ತ

೯. ತಪೋನಂದನ (೧೯೫೦) : ಕುವೆಂಪು

೧೦. ಸಮಕ್ಷಮ (೧೯೮೦) : ಯು. ಆರ್. ಅನಂತಮೂರ್ತಿ

೧೧. ಎದೆಗೆ ಬಿದ್ದ ಅಕ್ಷರ : ದೇವನೂರ ಮಹಾದೇವ

೧೨. ಮಹಿಳ ಸಾಹಿತ್ಯ ಸಮಾಜ: ವಿಜಯಾ ದಬ್ಬೆ

ಉಪ ಪ್ರಧಾನ ವಿಷಯಗಳು (Soft Core)

KNB 210: <u>ಪತ್ರಿಕೆ: ೫.೧</u>

<u>ಭಾಷಾವಿಜ್ಞಾನ ಅಧ್ಯಯನ: ಕನ್ನಡ ವ್ಯಾಕರಣಗಳ ತೌಲನಿಕ ಸಮೀಕ್ಷೆ</u>

(೨:೧=೪ ಕ್ರೆಡಿಟ್)

ಈ ಕೆಳಗಿನ ಪದ್ಯ ವಿವರಗಳನ್ನು ಮಾತ್ರ ಪ್ರಧಾನವಾಗಿ ಶಬ್ದಮಣಿದರ್ಪಣದ ತತ್ಸಂಬಧಿತ ಸೂತ್ರಗಳನ್ನು ಆಧರಿಸಿ ಅಭ್ಯಾಸ ಮಾಡಬೇಕು. ಇತರ ವ್ಯಾಕರಣಗಳ ಸೂತ್ರಗಳನ್ನು ಆನುಷಂಗಿಕವಾಗಿ ಪ್ರಸ್ತಾಪಿಸಬೇಕು.

೧. ಹಳಗನ್ನಡ ವ್ಯಾಕರಣಗಳು : ಕರ್ತೃ, ಕಾಲ, ಸ್ವರೂಪ, ಸ್ಥಾನ, ವೈಶಿಷ್ಟ್ಯ
   ಕನ್ನಡ ವರ್ಣಸಮಾಮ್ನಯ– ಮಹಾಪ್ರಾಣಗಳು –ಋ-ಕುಳ-ಕ್ಷಳ ವಿಚಾರ, ಶಿಥಿಲದ್ವಿತ್ವ

೨. ಸ್ವರಸಂಧಿ – ವ್ಯಂಜನಸಂಧಿ;
   ಲಿಂಗ: ಲಕ್ಷಣ, ಸ್ವರೂಪ;
   ವಚನ : ಲಕ್ಷಣ, ಸ್ವರೂಪ,
   ಪ್ರತ್ಯಯಗಳು; ವಿಭಕ್ತಿ : ಲಕ್ಷಣ, ಸ್ವರೂಪ, ಪ್ರತ್ಯಯಗಳು.

೩. ಸಮಾಸ : ಲಕ್ಷಣ, ಸ್ವರೂಪ–ತತ್ಪುರುಷ, ಕರ್ಮಧಾರೆಯ, ದ್ವಿಗು,
   ಅಂಶಿ, ಬಹುವ್ರೀಹಿ, ದ್ವಂದ್ವ, ಗಮಕ ಮತ್ತು ಕ್ರಿಯಾ ಸಮಾಸ

೪. ಆಖ್ಯಾತ ಪ್ರತ್ಯಯ, ಪುರುಷತ್ರಯ, ಕಾಲತ್ರಯ – ತದ್ಧಿತ – ಸಮಸಂಸ್ಕೃತ – ಅಪಭ್ರಂಶ, ತತ್ಸಮ

ಪರಾಮರ್ಶನ ಕೃತಿಗಳು:

೧ ಪೀಠಿಕೆಗಳು, ಲೇಖನಗಳು : ಡಿ.ಎಲ್. ನರಸಿಂಹಾಚಾರ್

೨ ಆಲೋಕ : ಎಚ್.ಎಸ್. ಬಿಳಿಗಿರಿ

೩ ಪ್ರಾಚೀನ ಕನ್ನಡ ವ್ಯಾಕರಣಗಳು : ಎಂ.ವಿ. ಸೀತಾರಾಮಯ್ಯ

೪ ವ್ಯಾಕರಣಗಳು : ವಿ. ಸೀತಾರಾಮಯ್ಯ

KNB 210 : ಪತ್ರಿಕೆ: ಐ. ೧

ಜಾನಪದ ಅಧ್ಯಯನ: ಜನಪದ ಸಂಸ್ಕೃತಿಯ ತಾತ್ತ್ವಿಕ ಅಧ್ಯಯನ

(೩:೧=೪ ಕ್ರೆಡಿಟ್)

೧. ಸಂಸ್ಕೃತಿ ಎಂದರೇನು? ಸ್ವರೂಪ, ಕಾರ್ಯಗಳು, ನಾಗರಿಕತೆ ಮತ್ತು ಸಂಸ್ಕೃತಿ, ಜನಪದ ಸಂಸ್ಕೃತಿ ಮತ್ತು ಸಂಸ್ಕೃತೀಕರಣ, ಜನಪದ ಧರ್ಮ

೨. ಜಾನಪದರ ಆರಾಧನೆಯ ಪರಿಕಲ್ಪನೆ, ಸ್ವರೂಪ, ಮಹತ್ವ, ಜನಪದ ದೇವತೆಗಳು, ಭೂತಾರಾಧನೆ, ಜಾತ್ರೆ ಮತ್ತು ಹಬ್ಬಗಳು, ನಂಬಿಕೆ, ಸಂಪ್ರದಾಯ, ಆಚರಣೆ, ಮಂತ್ರ–ಮಾಟ

೩. (ಅ) ಕರ್ನಾಟಕ ಜನಪದ ಕಲೆಗಳು : ಹಿನ್ನೆಲೆ, ಸ್ವರೂಪ, ಮಹತ್ವದ ಪ್ರಕಾರಗಳು : ವೇಷಗಾರರು, ನೀಲಗಾರರು, ತೊಗಲುಗೊಂಬೆ, ಚೌಡಿಕೆಯವರು, ಡೊಳ್ಳುಕುಣಿತ, ಕಂಸಾಳೆ

(ಆ) ಕರ್ನಾಟಕ ಜನಪದ ರಂಗಭೂಮಿ – ಹಿನ್ನೆಲೆ, ಸ್ವರೂಪ, ಮಹತ್ವ, ಯಕ್ಷಗಾನ, ಬಯಲಾಟ, ದೊಡ್ಡಾಟ, ಸಣ್ಣಾಟ

೪. ಭೌತಿಕ ಜಾನಪದ, ಜನಪದ ಆಯಗಾರರು–ಕೈಕಸುಬುದಾರರು, ಜನಪದ ಆಟಗಳು, ಜನಪದ ವೈದ್ಯ, ಆಕಾಶ ಜಾನಪದ

ಪರಾಮರ್ಶನ ಕೃತಿಗಳು:

೧. ಕರ್ನಾಟಕ ಜಾನಪದ : ಕರ್ನಾಟಕ ಜಾನಪದ ಯಕ್ಷಗಾನ ಅಕಾಡೆಮಿ

೨. ಕರ್ನಾಟಕ ಜನಪದ ಕಲೆಗಳು : ಗೊ.ರು. ಚನ್ನಬಸಪ್ಪ

೩. ಕರ್ನಾಟಕ ಕಲೆಗಳು ೩ನೆಯ ಸಂಪುಟ ಕರಕುಶಲ ಕಲೆಗಳು : ಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಿಷತ್ತು, ಬೆಂಗಳೂರು

೪. ಸುವರ್ಣ ಜಾನಪದ ಭಾಗ – ೧, ೨ : ಕರ್ನಾಟಕ ಜಾನಪದ ಯಕ್ಷಗಾನ ಅಕಾಡೆಮಿ

೫. ನಮ್ಮ ಸುತ್ತಿನ ನಂಬಿಕೆಗಳು : ಡಿ. ಕೆ. ರಾಜೇಂದ್ರ

೬. ಕರ್ನಾಟಕದ ಜಾತ್ರೆಗಳು : ಸಿ.ಎಸ್. ಶಿವಕುಮಾರಸ್ವಾಮಿ

೭. ಜಾನಪದ ಸಾಹಿತ್ಯ ದರ್ಶನ ಸಂಪುಟಗಳು : ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯ ಧಾರವಾಡ

KNB 210: ಪತ್ರಿಕೆ: ಜಿ.ಇ

ಚಾರಿತ್ರಿಕ ಅಧ್ಯಯನ: ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ (೧೨ ನೆಯ ಶತಮಾನ)

(ಇ:೧=ಆ ಕ್ರೆಡಿಟ್)

ಪ್ರವೃತ್ತಿಗಳು ಮತ್ತು ಕವಿಗಳು

೧. ಪ್ರವೃತ್ತಿಗಳು : ಸ್ವತಂತ್ರ ಮನೋಧರ್ಮ, ಭಕ್ತಿ, ಮತನಿಷ್ಠೆ, ಧಾರ್ಮಿಕ ಶಾಸ್ತ್ರ ಒಲವು, ಪ್ರಸಾರಾಕಾಂಕ್ಷೆ, ಲೌಕಿಕಶಾಸ್ತ್ರ ಒಲವು, ಉಪಯುಕ್ತತೆ

೧. ಪ್ರಕಾರ : ಚಂಪೂ, ಷಟ್ಪದಿ, ರಗಳೆ ಇತ್ಯಾದಿ ನೆಲೆಯಲ್ಲಿ: ಜನ್ನ, ಕವಿಕಾಮ, ದೇವಕವಿ, ಹರಿಹರ, ಕೆರೆಯ ಪದ್ಮರಸ, ತ್ರಿಭುವನತಾತ, ಎರಡನೇ ಗುಣವರ್ಮ, ರಾಘವಾಂಕ

೩. ಕವಿಗಳು : ಆಂಡಯ್ಯ, ಮಲ್ಲಿಕಾರ್ಜುನ, ಮಹಾಬಲ, ಕೇಶಿರಾಜ, ಪುಲಿಗೆರೆಯ ಸೋಮ, ರಟ್ಟಕವಿ, ಚೌಂಡರಸ, ಪಾಲ್ಕುರಿಕೆ ಸೋಮನಾಥ

ಆ. ಹೆಚ್ಚು ಮಾಹಿತಿ ದೊರಕದ ಕವಿಗಳು : ಕೇಶಿಯಣ್ಣ, ಮುನಿಚಂದ್ರ, ನಯವರ್ಮ, ಅಮೃತನಂದಿ

ಪರಾಮರ್ಶನ ಕೃತಿಗಳು:

೧. ಕನ್ನಡ ಅಧ್ಯಯನ ಸಂಸ್ಥೆಯ ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ ಸಂಪುಟ ಆ, ಭಾಗ ೧	: ಮೈ.ವಿ.ವಿ,
೧. ಸಮಗ್ರ ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ ಸಂಪುಟಗಳು ಸಂಪುಟ ಆ	: ಬೆಂಗಳೂರು ವಿ.ವಿ
೩. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ	: ರಂ.ಶ್ರೀ.ಮುಗಳಿ
ಆ. ಚಂಪೂ ಕವಿಗಳು (ಸಾಮಾನ್ಯನಿಗೆ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ ಸಂ.೧)	: ಬೆಂಗಳೂರು ವಿ.ವಿ
ಇ. ಷಟ್ಪದಿ ಸಾಹಿತ್ಯ (ಸಾಮಾನ್ಯನಿಗೆ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ ಸಂ. ೩)	: ಬೆಂಗಳೂರು ವಿ.ವಿ
೬. ಶಾಸ್ತ್ರ ಸಾಹಿತ್ಯ (ಸಾಮಾನ್ಯನಿಗೆ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ ಸಂ.ಇ)	: ಬೆಂಗಳೂರು ವಿ.ವಿ
೭. ವೀರಶೈವ ಧರ್ಮದರ್ಶನ ಭಾಗ ೧ ಮತ್ತು ಇ	: ಜೆಎಸ್ಎಸ್ ಗ್ರಂಥಮಾಲೆ
ಲ. ಪೀಠಿಕೆಗಳು, ಲೇಖನಗಳು	: ಡಿ.ಎಲ್. ನರಸಿಂಹಾಚಾರ್
೯.ಹರಿಹರದೇವ	: ಕರ್ನಾಟಕ ಸಂಘ, ರಾಜಾರಾಮ ಕಾಲೇಜು, ಕೊಲ್ಲಾಪುರ
೧೦. ಋಷಿಕವಿ ರಾಘವಾಂಕ	: ಎಚ್. ತಿಪ್ಪೇರುದ್ರಸ್ವಾಮಿ
೧೧. ಸಾಹಿತ್ಯಾಲೋಕ	: ಎಂ.ಆರ್.ಶ್ರೀನಿವಾಸಮೂರ್ತಿ
೧೧. ಲಿಂಗಾಯತ ಅಧ್ಯಯನಗಳು	: ಎಂ. ಚಿದಾನಂದಮೂರ್ತಿ

ವಿಶೇಷ ಉಪ ಪ್ರಧಾನ ವಿಷಯಗಳು (Special Soft core)

KNB 220: ಪತ್ರಿಕೆ : ೩.೧. ಕನ್ನಡ ಸಂಸ್ಕೃತಿ ಚಿಂತನೆ (ಆಯ್ದ ಲೇಖನಗಳು) (ಇ:೧=ಆ ಕ್ರೆಡಿಟ್)

೧. ಸಂಸ್ಕೃತಿ ಎಂದರೇನು?	– ದೇವುಡು ನರಸಿಂಹಶಾಸ್ತ್ರಿ
೧. ಸಂಸ್ಕೃತಿ ಮತ್ತು ನಾಗರೀಕತೆ	– ಡಾ. ಎನ್. ಶ್ರೀಕಂಠಶಾಸ್ತ್ರಿ

ಚಿ. ಸಂಸ್ಕೃತಿ ಮತ್ತು ಸಾಹಿತ್ಯ   – ಎ.ಎನ್. ಮೂರ್ತಿರಾವ್

ಆ. ಕರ್ಣಾಟಕ ಸಂಸ್ಕೃತಿ   – ಎಚ್. ತಿಪ್ಪೇರುದ್ರಸ್ವಾಮಿ

ಇ. ವಿಚಾರ ಕ್ರಾಂತಿಗೆ ಆಹ್ವಾನ   – ಕುವೆಂಪು

ಈ. ಕನ್ನಡ ಮಾತು ತಲೆಯೆತ್ತುವ ಬಗೆ   – ಬಿ.ಎಂ.ಶ್ರೀ

ಉ. ಹೊಸ ದಿಗಂತದೆಡೆಗೆ ಮತ್ತು ಮಣ್ಣಿನ ವಾಸನೆ, ಸಮಕಾಲೀನ ಪ್ರಜ್ಞೆ, ಇತ್ಯಾದಿ – ಪೂಚಂತೇ

ಊ. ಜನಪದರು ಮತ್ತು ಇತಿಹಾಸ   – ಕೃಷ್ಣಮೂರ್ತಿ ಹನೂರು

ಋ. ಆಧುನಿಕ ಸಾಹಿತ್ಯ ಮತ್ತು ಸಾಮಾನ್ಯ ಮನುಷ್ಯ – ಡಿ.ಆರ್. ನಾಗರಾಜ್

೧೦ ಧರ್ಮ ಮತ್ತು ಮಹಿಳೆ   – ಸಾ.ರಾ. ಅಬೂಬಕರ್

ಪಠ್ಯ ಮೂಲ:

೧. ಸಂಸ್ಕೃತಿ, ಕನ್ನಡ ಮತ್ತು ಸಂಸ್ಕೃತಿ ಇಲಾಖೆ, ಕನ್ನಡ ಭವನ, ಜೆ.ಸಿ. ರಸ್ತೆ, ಬೆಂಗಳೂರು, ೧೦೦೬

೧. ಭಾರತೀಯ ಸಂಸ್ಕೃತಿ , ಡಾ. ಎಸ್. ಶ್ರೀಕಂಠಶಾಸ್ತ್ರಿ, ಪ್ರಸಾರಾಂಗ, ಮೈಸೂರು. ವಿ.ವಿ., ಮೈಸೂರು, ೧೯೬೯

ಚಿ. ಗದ್ಯ ವಿಹಾರ–೧, ಕನ್ನಡ ಅಧ್ಯಯನ ಸಂಸ್ಥೆ, ಮೈಸೂರು. ವಿ.ವಿ.,ಮೈಸೂರು, ೧೯೭೬

ಆ. **ಕರ್ಣಾಟಕ ಸಂಸ್ಕೃತಿ ಸಮೀಕ್ಷೆ** – ಎಚ್. ತಿಪ್ಪೇರುದ್ರಸ್ವಾಮಿ, ೧೦೧೧, ಡಿ.ವಿ.ಕೆ. ಮೂರ್ತಿ ಪ್ರಕಾಶನ, ಮೈಸೂರು

ಇ. **ಕುವೆಂಪು ಸಮಗ್ರ ಗದ್ಯ**, ಸಂಪುಟ–೧, ೧೦೦೨, ರಾಷ್ಟ್ರಕವಿ ಕುವೆಂಪು ಪ್ರತಿಷ್ಠಾನ, ಕುಪ್ಪಳ್ಳಿ, ಶಿವಮೊಗ್ಗ

೬.**ಮಾತು ತಲೆಯೆತ್ತುವ ಬಗೆ (ಕನ್ನಡ ಸಾಹಿತ್ಯ ಮೀಮಾಂಸೆ)** – ಸಂ: ರಹಮತ್ ತರೀಕೆರೆ; ಕವಿವಿ, ಹಂಪಿ, ೧೦೧೧,

೭. **ವಿಮರ್ಶೆಯ ವಿಮರ್ಶ** –ಕೆ.ಪಿ. ಪೂರ್ಣಚಂದ್ರ ತೇಜಸ್ವಿ, ಪುಸ್ತಕ ಪ್ರಕಾಶನ, ಮೈಸೂರು–೧೦೦೭

ಲ. **ಹೊನ್ನಾರು**, ಪ್ರೊ ಎಚ್.ಜೆ. ಲಕ್ಕಪ್ಪಗೌಡರ ಅಭಿನಂದನ ಗ್ರಂಥ, ೧೦೦೭, ತಳುಕಿನ ವೆಂಕಣ್ಣಯ್ಯ ಸ್ಮಾರಕ ಗ್ರಂಥಮಾಲೆ, ಮೈಸೂರು

೯. **ಅಮೃತ ಮತ್ತು ಗರುಡ**, ಡಿ.ಆರ್. ನಾಗರಾಜ್, ೧೦೦೬, ಅಕ್ಷರ ಪ್ರಕಾಶನ, ಹೆಗ್ಗೋಡು, ಸಾಗರ, ಕರ್ನಾಟಕ

೧೦. **ಮಹಿಳೆ ಮತ್ತು ಕನ್ನಡ ಸಾಹಿತ್ಯ**, ಸಂ: ಜಿ.ಎಸ್. ಶಿವರುದ್ರಪ್ಪ, ೧೯೬೯, ಪ್ರಸಾರಾಂಗ, ಬೆಂಗಳೂರು ವಿ.ವಿ, ಬೆಂಗಳೂರು

ಪರಾಮರ್ಶನ ಗ್ರಂಥಗಳು:

೧. ಕರ್ಣಾಟಕ ಸಂಸ್ಕೃತಿ ಸಮೀಕ್ಷೆ   : ಎಚ್.ತಿಪ್ಪೇರುದ್ರಸ್ವಾಮಿ

೧. ಶಕ್ತಿ ಶಾರದೆಯ ಮೇಳ   : ಡಿ.ಆರ್. ನಾಗರಾಜ್

ಚಿ. ಸಾಂಸ್ಕೃತಿಕ ಅಧ್ಯಯನ   : ರಹಮತ್ ತರೀಕೆರೆ

ಆ. ಶ್ರೀ ಸಾಹಿತ್ಯ   : ಬಿ.ಎಂ.ಶ್ರೀ

ಇ. ಸಂಸ್ಕೃತಿ   : ಡಿ.ವಿ.ಜಿ

೬. ಜೀವನ ಸೌಂದರ್ಯ ಮತ್ತು ಸಾಹಿತ್ಯ   : ಡಿ.ವಿ.ಜಿ

೭. ಸಂಸ್ಕೃತಿ ಕಥನ   : ಡಿ.ಆರ್. ನಾಗರಾಜ್

ಲ. ಭಾರತೀಯ ಸಂಸ್ಕೃತಿ   : (ಸಂ) ಅ.ನ.ಕೃಷ್ಣರಾಯ

KNB 220 : ಪತ್ರಿಕೆ ೯.೧ ಮಹಿಳೆ : ಸಮಾಜ – ಸಾಹಿತ್ಯ (ಆಯ್ದ ಲೇಖನಗಳು)

೧. ಮಹಿಳಾವಾದ ಮತ್ತು ಮಹಿಳಾ ಸಾಹಿತ್ಯ   –   ವಿಜಯಾದಬ್ಬೆ

೧. ಹೆಣ್ಣು ಮತ್ತು ಭಾಷೆ : ಅಭಿವ್ಯಕ್ತಿ   –   ಎಚ್.ಎಸ್.ರಾಘವೇಂದ್ರರಾವ್

ಚಿ. ಭಾರತೀಯ ಸ್ತ್ರೀವಾದ (ಪೀಠಿಕಾ ಭಾಗ-ಮೊದಲಭಾಗ)   –   ಮನು ಚಕ್ರವರ್ತಿ

ಆ. ಕಪ್ಪು ಸ್ತ್ರೀವಾದಿ ವಿಮರ್ಶೆ   –   ವಿಜಯಾದಬ್ಬೆ

ಇ. ಪಾಡ್ದನಗಳಲ್ಲಿ ಸ್ತ್ರೀತ್ವದ ಪ್ರತಿನಿಧೀಕರಣ   –   ಗಾಯತ್ರಿ ನಾವಡ

ೕ. ಜನ್ನನ ಕಾವ್ಯಗಳು : ಹೆಣ್ಣನ್ನು ಪಳಗಿಸುವ ವ್ಯವಸ್ಥೆಯ ಕನ್ನಡಿ   – ಸಬಿಹಾ ಭೂಮಿಗೌಡ

ೋ. ಚಕ್ರಾಧಿಪತ್ಯ, ರಾಷ್ಟ್ರ ಮತ್ತು ಸಾಹಿತ್ಯಕ ಪಠ್ಯ   –   ಸೂಸಿ ಥಾರು ಮತ್ತು ಕೆ. ಲಲಿತ

                                               ಅನು: ಎಚ್.ಎಸ್.ರಾಘವೇಂದ್ರರಾವ್

ಲ. ಮುಸ್ಲಿಂ ಮಹಿಳಾ ಸಂವೇದನೆ ಮತ್ತು ಪ್ರತಿಭಟನಾ ನೆಲೆಗಳು   –   ಕೆ. ಷರೀಫಾ

೯. ದಲಿತ ಸಾಹಿತ್ಯದಲ್ಲಿ ಮಹಿಳೆ   –   ಧರಣಿದೇವಿ ಮಾಲಗತ್ತಿ

೧೦.ವಾಸ್ತವತೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಲೇಖಿಕಿ   –   ಅನುಪಮಾ ನಿರಂಜನ

ಪಠ್ಯ ಮೂಲ:

೧. ನಾರಿ: ದಾರಿ-ದಿಗಂತ-ವಿಜಯಾದಬ್ಬೆ ೧೯೯೯, ರಚನಾ ಪ್ರಕಾಶನ, ಮೈಸೂರು

೨. ಭಾರತೀಯ ಸ್ತ್ರೀವಾದ – ಅಕ್ಷರ ಪ್ರಕಾಶನ, ೧೯೯೨, ಹೆಗ್ಗೋಡು, ಸಾಗರ

೩. ಹೆಣ್ಣು ಮತ್ತು ಭಾಷೆ- ಸಂ: ಎಚ್.ಎಸ್.ಶ್ರೀಮತಿ, ಶಿವಾನಂದ ಎಸ್. ವಿರಕ್ತಮಠ, ೨೦೦೮, ಕನ್ನಡ ವಿವಿ, ಹಂಪಿ

೪. ಸ್ತ್ರೀವಾದಿ ಪ್ರವೇಶಿಕೆ- ಸಂ: ಬಿ.ಎನ್. ಸುಮಿತ್ರಾಬಾಯಿ, ಎನ್.ಗಾಯತ್ರಿ, ೧೯೯೫, ಕರ್ನಾಟಕ ಲೇಖಕಿಯರ ಸಂಘ, ಬೆಂ.

೫. ವಿರಚನೆ- ಗಾಯತ್ರಿ ನಾವಡ, ೧೯೯೯, ಎನ್.ಆರ್.ಎ.ಎಂ.ಎಸ್. ಪ್ರಕಾಶನ, ಕೋಟೇಶ್ವರ, ದಕ್ಷಿಣ ಕನ್ನಡ

೬. ಬಗೆ – ಸಬಿಹಾ ಭೂಮಿಗೌಡ, ೨೦೦೦, ಲೋಹಿಯಾ ಪ್ರಕಾಶನ, ಬಳ್ಳಾರಿ

೭. ಸ್ತ್ರೀವಾದಿ ಸಾಹಿತ್ಯ ವಿಮರ್ಶೆ– (ಸಂ) ತೇಜಸ್ವಿನಿ ನಿರಂಜನ, ೧೯೯೩, ಕನ್ನಡ ಸಂಘ, ಕ್ರೈಸ್ಟ್ ಕಾಲೇಜ್,ಬೆಂಗಳೂರು

೮. ಮುಸ್ಲಿಂ ಮಹಿಳಾ ಸಂವೇದನೆ–ಕೆ.ಷರೀಫಾ, ೨೦೦೦, ಅಂಕಿತ ಪುಸ್ತಕ, ಬೆಂಗಳೂರು

೯. ಸ್ತ್ರೀವಾದ ಮತ್ತು ಭಾರತೀಯತೆ- ಧರಣೀದೇವಿ ಮಾಲಗತ್ತಿ, ೧೯೯೮, ಚೇತನ ಬುಕ್ ಹೌಸ್, ಮೈಸೂರು

೧೦. ಸಾಹಿತ್ಯ ಮತ್ತು ಪ್ರಗತಿ- ಅನುಪಮಾ ನಿರಂಜನ, ೨೦೦೮, ಡಿ.ವಿ.ಕೆ. ಮೂರ್ತಿ, ಮೈಸೂರು

ಪರಾಮರ್ಶನ ಗ್ರಂಥಗಳು

೧. ಮಹಿಳಾ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ   : (ಸಂ) ಎಚ್.ಎಸ್. ಶ್ರೀಮತಿ

೨. ಹೆಣ್ಣು ಮತ್ತು ಭಾಷೆ   : (ಸಂ) ಎಚ್ ಎಸ್. ಶ್ರೀಮತಿ, ಶಿವಾನಂದ ಎಸ್. ವಿರಕ್ತಮಠ

೩. ಸ್ತ್ರೀವಾದಿ ಪ್ರವೇಶಿಕೆ   : (ಸಂ) ಬಿ.ಎನ್. ಸುಮಿತ್ರಾಬಾಯಿ, ಎನ್. ಗಾಯತ್ರಿ

೪. ವಿರಚನೆ   : ಗಾಯತ್ರಿ ನಾವಡ

೫. ವಿಜಯಾನ್ವೇಷಣಂ   : (ಸಂ) ಎಸ್.ಡಿ. ಶಶಿಕಲಾ

<u>ಎರಡನೆಯ ವರ್ಷ ಕನ್ನಡ ಎಂ.ಎ</u>

<u>ಮೂರನೆಯ ಚತುರ್ಮಾಸ</u> (ಆಗಸ್ಟ್–ಡಿಸೆಂಬರ್ ೨೦೧೨)

ಪ್ರಧಾನ ವಿಷಯಗಳು (Hard Core)

KNC 050: <u>ಪತ್ರಿಕೆ: ೧</u>

<u>ತೌಲನಿಕ ಸಾಹಿತ್ಯ : ಪದ್ಯ : ಮಹಾಕಾವ್ಯ ಮತ್ತು ನಾಟಕ</u> (೨:೧=೩ ಕ್ರೆಡಿಟ್)

೧. ತೌಲನಿಕ ಸಾಹಿತ್ಯದ ಸೂತ್ರ ಸ್ವರೂಪ - ರಾಷ್ಟ್ರೀಯ ಸಾಹಿತ್ಯ, ಜಾಗತಿಕ ಸಾಹಿತ್ಯ ಮತ್ತು
ಸಾಮಾನ್ಯ ಸಾಹಿತ್ಯ - ತೌಲನಿಕ ಸಾಹಿತ್ಯದ ಪಂಥಗಳು, ಸ್ವೀಕಾರ ಮತ್ತು ಪ್ರಭಾವ

೨. ತುಘಲಕ್- ಕಾರ್ನಾಡ್, ಕ್ಯಾಲಿಗುಲ- ಆಲ್ಬರ್ಟ್ ಕಾಮು (ಅನು-ಡಿ.ಎ. ಶಂಕರ್)

೩. ಹ್ಯಾಮ್ಲೆಟ್– ಕೆ.ಎಸ್. ಭಗವಾನ್, ರಕ್ತಾಕ್ಷಿ- ಕುವೆಂಪು

೪. ವ್ಯಾಸಭಾರತ   - ವಿರಾಟ ಪರ್ವ
ಕುಮಾರವ್ಯಾಸ ಭಾರತ - ವಿರಾಟ ಪರ್ವ

ಪರಾಮರ್ಶನ ಕೃತಿಗಳು:

೧. ಪಾಶ್ಚಾತ್ಯ ಮಹಾಕಾವ್ಯಗಳು	: ಶ್ರೀಕಂಠಕೂಡಿಗೆ (ಸಂ) ಪ್ರ,ಮೈವಿವಿ
೨. ಮಹಾಕಾವ್ಯ ಸ್ವರೂಪ	: ಜಿ.ಎಸ್. ಶಿವರುದ್ರಪ್ಪ
೩. ಮಹಾಕಾವ್ಯ ಲಕ್ಷಣ	: ಟಿ.ವಿ. ವೆಂಕಟಾಚಲಶಾಸ್ತ್ರಿ
೪. Comparative Literary studies	: S.S. Pawar
೫. Comparative Literary and Literary Theory	: Ulrich Weisstein
೬. Comparative Literature Method & perspective	: (Ed) Newton P Stalknecht
೭. Method and perspective Discriminations	
(First two Essays on Comparative Literature)	: Horst Frenz

KNC 020: <u>ಪತ್ರಿಕೆ: ೨ ಆಧುನಿಕ ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಹಿನ್ನೆಲೆ</u> (೨:೧=೩ ಕ್ರೆಡಿಟ್)

೧. **ನವೋದಯ ಸಾಹಿತ್ಯ** : ಪ್ರಭಾವ, ಪ್ರೇರಣೆ, ರೊಮ್ಯಾಂಟಿಸಿಸಂ, ರಾಷ್ಟ್ರೀಯತೆ, ಸುಧಾರಣಾವಾದ, ದೇಶೀಯತೆ,
ನಾಡು-ನುಡಿ

೨. **ಪ್ರಗತಿಶೀಲ ಸಾಹಿತ್ಯ** : ಪ್ರಭಾವ, ಪ್ರೇರಣೆ, ಮಾರ್ಕ್ಸ್ ವಾದ, ವಾಸ್ತವವಾದ

೩. **ನವ್ಯ ಸಾಹಿತ್ಯ** : ಪ್ರಭಾವ, ಪ್ರೇರಣೆ, ಅಸ್ತಿತ್ವವಾದ, ಅಸಂಗತವಾದ

೪. **ದಲಿತ ಬಂಡಾಯ** : ಪ್ರಭಾವ, ಪ್ರೇರಣೆ, ಮಾರ್ಕ್ಸ್ ವಾದ, ಅಂಬೇಡ್ಕರ್ ವಾದ, ಲೋಹಿಯಾವಾದ, ಸ್ತ್ರೀವಾದ

ಪರಾಮರ್ಶನ ಕೃತಿಗಳು :

೧. ಹೊಸಗನ್ನಡದ ಅರುಣೋದಯ	: ಶ್ರೀನಿವಾಸ ಹಾವನೂರ
೨.ಹೊಸಗನ್ನಡದ ಕವಿತೆಯ ಮೇಲೆ ಇಂಗ್ಲಿಷ್ ಕಾವ್ಯದ ಪ್ರಭಾವ	: ಎಸ್. ಅನಂತನಾರಾಯಣ
೩ ಯುಗಧರ್ಮ ಹಾಗೂ ಸಾಹಿತ್ಯ ದರ್ಶನ	: ಕೀರ್ತಿನಾಥ ಕುರ್ತಕೋಟಿ
೪ ಪ್ರಗತಿಶೀಲ ಸಾಹಿತ್ಯ	: ಅನಕೃ (ಸಂ)
೫ ಭಾರತೀಯ ಪತ್ರಿಕೋದ್ಯಮ	: ನಾಡಿಗ ಕೃಷ್ಣಮೂರ್ತಿ
೬ ಹೊಸಗನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ	: ಎಲ್. ಎಸ್.ಶೇಷಗಿರಿರಾವ್
೭ ೨೦ನೆಯ ಶತಮಾನದ ಕನ್ನಡ ಸಾಹಿತ್ಯ :	: ಡಾ. ಬಸವರಾಜ ಸಾದರ
೮ ಕರ್ನಾಟಕ ಸಂಗಾತಿ	: ಕನ್ನಡ ಅಭಿವೃದ್ಧಿ ಪ್ರಾಧಿಕಾರ ಪ್ರಕಟಣೆ
೯ Impact of Marxism on Indian life and Literature	: H.M. Nayak (Ed)
೧೦ Heritage of Karnataka	: R.S. Mugali

KNC 030 : ಪತ್ರಿಕೆ: ೩ ಭಾರತೀಯ ಕಾವ್ಯಮೀಮಾಂಸೆ (೨:೧=೩ ಕ್ರೆಡಿಟ್)

೧. ಸಂಸ್ಕೃತ ಕಾವ್ಯಮೀಮಾಂಸೆ : ಕವಿ-ಕಾವ್ಯ-ಸಹೃದಯ, ಕವಿತೆಯ ಆಕರ-ಪ್ರತಿಭೆ, ಪರಿಕರ-ವೃತ್ತ್ತ್ತಿ, ಪ್ರಮುಖ ಸಿದ್ಧಾಂತಗಳು : ಅಲಂಕಾರ, ರೀತಿ, ಗುಣ, ರಸ-ಧ್ವನಿ, ಔಚಿತ್ಯ, ವಕ್ರೋಕ್ತಿ

೨. ಕನ್ನಡ ಕಾವ್ಯಮೀಮಾಂಸೆ : ಕವಿರಾಜಮಾರ್ಗ ಮತ್ತು ಇತರ ಪ್ರಾಚೀನ ಲಕ್ಷಣ ಗ್ರಂಥಗಳು, ಆಧುನಿಕ ಕನ್ನಡ ಕಾವ್ಯಮೀಮಾಂಸೆಯ ವಿವಿಧ ಚಿಂತನೆಗಳು: ನವೋದಯ, ನವ್ಯ, ಪ್ರಗತಿಶೀಲ, ದಲಿತ ಬಂಡಾಯ, ಸ್ತ್ರೀವಾದ

೩. ಕನ್ನಡ ಕವಿಗಳ ಕಾವ್ಯ ಕಲ್ಪನೆ-ಪ್ರಾಚೀನ, ಆಧುನಿಕ

೪. ತಮಿಳು ಕಾವ್ಯಮೀಮಾಂಸೆ ಮತ್ತು ಕನ್ನಡ ಜಾನಪದ ಕಾವ್ಯಮೀಮಾಂಸೆ

ಪರಾಮರ್ಶನ ಕೃತಿಗಳು:

೧ ಭಾರತೀಯ ಕಾವ್ಯಮೀಮಾಂಸೆ	:ತೀನಂಶ್ರೀ
೨ ತೌಲನಿಕ ಕಾವ್ಯಮೀಮಾಂಸೆ	: ಎಚ್. ತಿಪ್ಪೇರುದ್ರಸ್ವಾಮಿ
೩ ಕಾವ್ಯಾರ್ಥ ಚಿಂತನ	: ಜಿ.ಎಸ್.ಶಿವರುದ್ರಪ್ಪ
೪ ಕನ್ನಡ ಕವಿಗಳ ಕಾವ್ಯಕಲ್ಪನೆ	: ಜಿ.ಎಸ್. ಶಿವರುದ್ರಪ್ಪ
೫ ಕನ್ನಡದಲ್ಲಿ ಸರಸ್ವತೀ ತತ್ತ್ವ	: ಜಿ.ಎಸ್. ಶಿವರುದ್ರಪ್ಪ
೬ ಕಾವ್ಯಾರ್ಥ ಪದಕೋಶ	: ಜಿ.ಎಸ್ ಶಿವರುದ್ರಪ್ಪ
೭ ವಿಮರ್ಶೆಯ ಪರಿಭಾಷೆ	: ಓ.ಎಲ್. ನಾಗಾಭೂಷಣಸ್ವಾಮಿ
೮ ಕನ್ನಡ ಧ್ವನ್ಯಾಲೋಕ ಲೋಚನಸಾರ	: ಕೆ.ಕೃಷ್ಣಮೂರ್ತಿ
೯ ಔಚಿತ್ಯ ವಿಚಾರ ಚರ್ಚೆ	: ಕೆ.ಕೃಷ್ಣಮೂರ್ತಿ
೧೦ ತಮಿಳು ಕಾವ್ಯ ಮೀಮಾಂಸೆ	: ಡಾ.ಕಾರ್ಲೂಸ್

KNC ___ : ಪತ್ರಿಕೆ : ಘ : ಸಂಶೋಧನ ವಿಧಾನ (೨:೧=೩ ಕ್ರೆಡಿಟ್)

೧. ಸಂಶೋಧನೆ, ಅರ್ಥವ್ಯಾಪ್ತಿ, ಸ್ವರೂಪ, ಕನ್ನಡ ಸಂಶೋಧನೆಯ ಇತಿಹಾಸ, ಸಂಶೋಧನಾ ವಿಧಾನಗಳು, ಸಂಶೋಧನಾ ಪ್ರಕಾರಗಳು, ಸಂಶೋಧಕರ ಅರ್ಹತೆ ಹಾಗೂ ಮನೋಧರ್ಮ.

೨. ವಿಷಯ ಆಯ್ಕೆ: ಸಂಶೋಧನಾ ಪ್ರಸ್ತಾಪ (Proposal), ಪೂರ್ವ ಸಂಶೋಧನಾ ಸಾಹಿತ್ಯ ಪರಾಮರ್ಶೆ, ಕ್ಷೇತ್ರಕಾರ್ಯದ ಸ್ವರೂಪ ಹಾಗೂ ವಿಧಾನ, ಧನಸಹಾಯ ಸಂಸ್ಥೆಗಳು.

೩. ಸಂಶೋಧನ ಲೇಖನ (Research Paper), ನಿಬಂಧ (Dissertation), ಮಹಾಪ್ರಬಂಧ (Thesis)- ಇವುಗಳ ಸ್ವರೂಪ ಮತ್ತು ವ್ಯತ್ಯಾಸ, ಸಂಶೋಧನ ಸಾರಲೇಖ (Synopsis); ಸಂಶೋಧನೆಯ ಭಾಷೆ ಮತ್ತು ಶೈಲಿ, ಉದ್ಧರಣೆ, ಅಡಿಟಿಪ್ಪಣಿ, ಅನುಬಂಧ, ಗ್ರಂಥಸೂಚಿ, ಸಂಕ್ಷೇಪಸೂಚಿ.

೪. ಕನ್ನಡ ಸಂಶೋಧನೆಯ ಇತಿಹಾಸ ಮತ್ತು ಬೆಳವಣಿಗೆ, ಸಂಶೋಧನಾ ಲೇಖನಗಳು ಮತ್ತು ಮಹಾಪ್ರಬಂಧಗಳ ಸ್ವರೂಪದ ಪರಾಮರ್ಶೆ. (ನಾಡು ನುಡಿ ಶೋಧ, ಭಂಡಶೋಧ, ಚಾರಿತ್ರಿಕ ಶೋಧ, ಸಂಸ್ಕೃತಿ ಶೋಧ, ಜಾನಪದ ಶೋಧ, ಸಾಹಿತ್ಯ ಶೋಧ, ಮಹಿಳಾ ಶೋಧ, ದಲಿತ ಶೋಧ, ಭಾಷಾ ಶೋಧ ಕುರಿತ ಸಂಶೋಧನಾ ಮಹಾಪ್ರಬಂಧಗಳನ್ನು ಪರಾಮರ್ಶೆ ಮಾಡುವುದು)

ಪರಾಮರ್ಶನ ಕೃತಿಗಳು:

೧ ಸಂಶೋಧನೆ	: ಎಂ.ಚಿದಾನಂದಮೂರ್ತಿ
೨ ಕನ್ನಡ ಸಂಶೋಧನ ಶಾಸ್ತ್ರ	: ಎಂ.ಎಂ.ಕಲಬುರ್ಗಿ
೩ ಸಂಶೋಧನ ಸ್ವರೂಪ	: ಬಿ.ವಿ.ಶಿರೂರ
೪ ಸಂಶೋಧನ ಪ್ರಜ್ಞೆ	:(ಸಂ) ಹೇರಂಜೆ ಕೃಷ್ಣಭಟ್ಟ
೫ ಸಂಶೋಧನೆ ತಾತ್ತ್ವಿಕ ವಿಚಾರ	: ರಹಮತ್ ತರೀಕೆರೆ
೬ ಅಧ್ಯಯನದ ವಿಧಿವಿಧಾನಗಳು	: ಕೆ.ರವೀಂದ್ರನಾಥ
೭ ಮಹಾಮಾರ್ಗ	: ಎಂ.ಎಂ.ಕಲಬುರ್ಗಿ

ಉಪ ಪ್ರಧಾನ ವಿಷಯಗಳು (Soft Core)

KNC 210: ಪತ್ರಿಕೆ: ಇ.೧ ಭಾಷಾವಿಜ್ಞಾನ ಅಧ್ಯಯನ : ಉಪಭಾಷಾವಿಜ್ಞಾನ (ಕನ್ನಡ)
(೩:೧=೪ ಕ್ರೆಡಿಟ್)

೧. ಉಪಭಾಷಾ ವಿಜ್ಞಾನ : ಸ್ವರೂಪ ಮತ್ತು ವ್ಯಾಪ್ತಿ, ಭಾಷಾಭೂಗೋಳ, ಉಪಭಾಷಾಭೂಗೋಳ ಮತ್ತು ಭಾಷಾ ಭೂಪಟ- ಈ ಶಬ್ದಗಳ ಅರ್ಥ ಮತ್ತು ವ್ಯಾಪ್ತಿ: ಕನ್ನಡದ ಸಾಮಾಜಿಕ ಉಪಭಾಷೆಗಳು ಮತ್ತು ಪ್ರಾದೇಶಿಕ ಉಪಭಾಷೆಗಳು

೨. ಉಪಭಾಷಾ ವಿಜ್ಞಾನದ ಸಂಕ್ಷಿಪ್ತ ಇತಿಹಾಸ : ಭಾರತ, ಫ್ರಾನ್ಸ್, ಅಮೆರಿಕ, ಇಂಗ್ಲೆಂಡ್ ಮತ್ತು ಜರ್ಮನಿ ದೇಶಗಳಲ್ಲಿ ಉಪಭಾಷಾ ಅಧ್ಯಯನಗಳು, 'ಲಿಂಗ್ವಿಸ್ಟಿಕ್ ಸರ್ವೆ ಆಫ್ ಇಂಡಿಯಾ'ದ ಮಹತ್ವ; ಕರ್ನಾಟಕದಲ್ಲಿ ನಡೆದಿರುವ ಉಪಭಾಷಾ ಅಧ್ಯಯನಗಳು

೩. ಅ) ಭಾಷೆ, ಉಪಭಾಷೆ, ವ್ಯಕ್ತಿಭಾಷೆ, ಪ್ರಮಾಣ ಭಾಷೆ, ಭಾಷಾಗುಂಪು, ಪರಸ್ಪರ ಅರಿವು, ಸಾಮಾನ್ಯ ತಿರುಳು

ಆ) ಉಪಭಾಷಾವಿಜ್ಞಾನದ ವಿಧಾನಗಳು :ಏಕಕಾಲಿಕ, ದ್ವಿಕಾಲಿಕ

೪. ಭಾಷಾವಿಜ್ಞಾನದಲ್ಲಿ ಕ್ಷೇತ್ರಕಾರ್ಯದ ಸ್ವರೂಪ ಮತ್ತು ಪ್ರಯೋಜನ, ವಸ್ತು, ಪ್ರತಿವಸ್ತು-ಅರ್ಹತೆ ಕಾರ್ಯನಿರ್ವಹಣೆ, ದತ್ತಸಂಗ್ರಹ, ಸ್ವರೂಪ, ಉದ್ದೇಶ, ಪರಿಶೀಲನ ರೀತಿ ಮತ್ತು ಸಂಗ್ರಹದ ವಿವಿಧ ಹಂತಗಳು, ಸಂಗ್ರಹ ಕಾರ್ಯದಲ್ಲಿ ಪ್ರಶ್ನಾವಳಿಗಳು ಮತ್ತು ಇತರ ಉಪಕರಣಗಳು

ಪರಾಮರ್ಶನ ಕೃತಿಗಳು

೧. ಉಪಭಾಷೆ : ಕೃಷ್ಣ ಪರಮೇಶ್ವರ ಭಟ್ಟ
೨. ಉಪಭಾಷಾ ಅಧ್ಯಯನ : ಶಾಲಿನಿ ರಘುನಾಥ
೩. ಭಾಷಾಕ್ಷೇತ್ರಕಾರ್ಯ : ಎಸ್.ಎಸ್.ಅಂಗಡಿ
೪. ಕ್ಷೇತ್ರಕಾರ್ಯದ ಹಾದಿಯಲ್ಲಿ : ಕ್ಯಾತನಹಳ್ಳಿ ರಾಮಣ್ಣ
೫. ಹಾದಿಯೊಳಗಣ ಜ್ಯೋತಿ : ಹನೂರು ಕೃಷ್ಣಮೂರ್ತಿ
೬. ಸಾಮಾಜಿಕ ಉಪಭಾಷೆ : ಮಹಾದೇವಯ್ಯ
೭. ಸುವರ್ಣ ಸಂಚಯ : (ಸಂ) ದೇ ಜವರೇಗೌಡ
೮. ಕರ್ನಾಟಕ ಭಾರತಿ : (ಸಂ) ಸುಂಕಾಪುರ ಎಂ.ಎಸ್
೯. ಕನ್ನಡ ಉಪಭಾಷೆಗಳ ಅಧ್ಯಯನ : ಕೆ ಕೆಂಪೇಗೌಡ
೧೦. Field Linguistics : William J Samarien
೧೧.The Structure of Karnataka : R.C. Hiremath
೧೨. An Outline of Colloquial Kannada : William Bright
೧೩. Kannada –Literary and colloquial : H.M. Nayak
೧೪. Field Study : Sen Gupta
೧೫. World Geography of the Eastern United States : H Kurath
೧೬. Handbook of the Linguistic Geography of New England : H Kurath
೧೭. Reading in American Dialectology : Allen and Underwood
೧೮. The Study of dialect : K.M. Petyt
೧೯. A course in Modern Linguistics : Charles F Hockett

KNC 210 : ಪತ್ರಿಕೆ: ಇ.೨ ಜಾನಪದ ಅಧ್ಯಯನ: ಕರ್ನಾಟಕ ಜನಪದ ಕಲೆಗಳು
(೩:೧=೪ ಕ್ರೆಡಿಟ್)

೧. ತಾತ್ತ್ವಿಕತೆ : ಜನಪದ ಕಲೆಗಳ ಉಗಮ, ಸ್ವರೂಪ, ವ್ಯಾಪ್ತಿ, ಬುಡಕಟ್ಟು ಕಲೆಗಳು, ಗ್ರಾಮಾಂತರ ಜನಪದ ಕಲೆಗಳು, ಶಿಷ್ಟಕಲಾ ಪ್ರಕಾರಗಳು, ಜನಪದಕಲೆ, ಕಲಾವಿದರು ಮತ್ತು ಆಧುನಿಕತೆಯ ಮುಖಾಮುಖಿ

೨. ಪ್ರದರ್ಶನಾತ್ಮಕ ಕಲೆಗಳು : ವಾದ್ಯಪ್ರಧಾನ : ವೀರಗಾಸೆ, ಕರಪಾಲ, ತಮಟೆವಾದನ, ನೀಲಗಾರರು, ಮುಖವೀಣೆ

೩. ಆರಾಧನಾ ಪ್ರಧಾನ ಕಲೆಗಳು : ಮೊಹರಂ, ಆಟಿಕಳಂಜ, ವೀರಭದ್ರನ ಕುಣಿತ, ಗೊರವರ ಕುಣಿತ, ಗೊಂದಲಿಗರು, ಹಾಲಕ್ಕಿ ಕುಣಿತ, ಆಸಾದಿ ಹಾಡುಗಳು, ಭೂತಾರಾಧನೆ

೪. ರಂಗಭೂಮಿ : ಹಗರಣ, ಜಾಲಾಟ, ಬಹುರೂಪಿ, ಕೇಳಿಕೆ, ತಾಳಮದ್ದಳೆ, ಸೂತ್ರದಬೊಂಬೆಯಾಟ, ತೊಗಲುಬೊಂಬೆಯಾಟ, ಕೋಲಾಟ, ಮೂಡಲಪಾಯ, ಪಡುವಲಪಾಯ ಯಕ್ಷಗಾನ (ತೆಂಕುತಿಟ್ಟು, ಬಡಗುತಿಟ್ಟು)

ಪರಾಮರ್ಶನ ಕೃತಿಗಳು:

೧. ಉತ್ತರ ಕರ್ನಾಟಕದ ಜನಪದ ರಂಗಭೂಮಿ	: ಚಂದ್ರಶೇಖರ ಕಂಬಾರ
೨. ದಕ್ಷಿಣ ಕರ್ನಾಟಕದ ಜನಪದ ರಂಗಭೂಮಿ	: ಡಿ.ಕೆ. ರಾಜೇಂದ್ರ
೩. ಕರಪಾಲ ಮೇಳ	: ಡಿ.ಕೆ. ರಾಜೇಂದ್ರ
೪. ಕರ್ನಾಟಕ ಜನಪದ ಕಲೆಗಳ ಕೋಶ	: (ಸಂ) ಹಿ.ಚಿ. ಬೋರಲಿಂಗಯ್ಯ
೫. ಕರ್ನಾಟಕ ಜನಪದ ಕಲೆಗಳು	: ಗೊ.ರು. ಚನ್ನಬಸಪ್ಪ
೬. ಹೊನ್ನಬಿತ್ತೇವು ಹೊಲಕೆಲ್ಲ	: ಗೊ.ರು. ಚನ್ನಬಸಪ್ಪ
೭. ಕನ್ನಡ ಜಾನಪದ ವಿಶ್ವಕೋಶ	: (ಸಂ) ಚಂದ್ರಶೇಖರ ಕಂಬಾರ
೮. ಭೂತಾರಾಧನೆ	: ಕೆ.ಚಿನ್ನಪ್ಪಗೌಡ
೯. ಮೌಖಿಕ ಕಥನ	: ಜಿ.ಆರ್. ತಿಪ್ಪೇಸ್ವಾಮಿ
೧೦.ಜಾನಪದ ಪರಿಭಾವನೆ	: ಜಿ.ಆರ್. ತಿಪ್ಪೇಸ್ವಾಮಿ
೧೧.ದಕ್ಷಿಣ ಕರ್ನಾಟಕ ಜನಪದ ಕಾವ್ಯಪ್ರಕಾರಗಳು	: ಜೀ.ಶಂ.ಪರಮಶಿವಯ್ಯ
೧೨.ಯಕ್ಷಗಾನ	: ಕೆ.ಶಿವರಾಮಕಾರಂತ
೧೩.ಕನ್ನಡ ಜಾನಪದ ಕಲಾ ಪ್ರವೇಶ	: ಚಕ್ಕರೆ ಶಿವಶಂಕರ
೧೪.The Encyclopedia of folk culture of Karnataka	: Krishna Murthy Hanur

KNC 210: ಪತ್ರಿಕೆ: ಈ.೨ ಚಾರಿತ್ರಿಕ ಅಧ್ಯಯನ : ಶಾಸನಶಾಸ್ತ್ರ (ಆಯ್ದ ಪಠ್ಯಗಳೊಡನೆ)

(೨:೧=೪ ಕ್ರೆಡಿಟ್)

೧ ಶಾಸನ ಎಂದರೇನು? ಕರ್ನಾಟಕದಲ್ಲಿ ಶಾಸನ ಅಧ್ಯಯನದ ಇತಿಹಾಸ-ಶಾಸನಗಳ ಪ್ರಾಮುಖ್ಯ, ಶಾಸನಗಳ ವರ್ಗೀಕರಣ

೨ ಶಾಸನಕವಿ, ಲಿಪಿಕಾರ, ರೂವಾರಿ-ಶಾಸನಗಳ ವಿಷಯಾನುಪೂರ್ವಿ - ದಾನಶಾಸನ, ಕೂಟಶಾಸನ-ವೀರಗಲ್ಲು, ಮಾಸ್ತಿಗಲ್ಲು, ನಿಷದಿಗಲ್ಲು

೩ ಹಲ್ಮಿಡಿ ಶಾಸನ - ಬಾದಾಮಿಯ ಕಪ್ಪೆ ಅರಭಟ್ಟನ ಶಾಸನ - ಕುಕ್ರ್ಯಲದ ಜಿನವಲ್ಲಭನ ಶಾಸನ ಶಾಸನ

೪ ಲಕ್ಕುಂಡಿಯ ಅತ್ತಿಮಬ್ಬೆ ಶಾಸನ - ಬಳ್ಳಿಗಾವಿಯ ಕೋಡಿಮರದ ಶಾಸನ- ಶ್ರವಣಬೆಳಗೊಳದ ಬುಕ್ಕರಾಯನ ಶಾಸನ

ಪರಾಮರ್ಶನ ಕೃತಿಗಳು :

೧ ಶಾಸನ ವ್ಯಸಂಗ ೧,೨	: ಎಂ.ಎಂ. ಕಲಬುರ್ಗಿ
೨ ಕನ್ನಡ ಶಾಸನಗಳ ಸಾಂಸ್ಕೃತಿಕ ಅಧ್ಯಯನ	: ಎಂ. ಚಿದಾನಂದಮೂರ್ತಿ
೩ ಕರ್ನಾಟಕ ಶಾಸನ ಸಮೀಕ್ಷೆ	: ಕೆ.ವಿ. ರಮೇಶ
೪ ಕನ್ನಡ ಲಿಪಿಯ ಉಗಮ ಮತ್ತು ವಿಕಾಸ	: ಎ.ವಿ. ನರಸಿಂಹಮೂರ್ತಿ
೫ ಕನ್ನಡ ಶಾಸನ ಸಂಗ್ರಹ	: ಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಿಷತ್ತು
೬ ಶಾಸನಶಾಸ್ತ್ರ ಪ್ರವೇಶ	: ಸಿಡಿಕೆ
೭ ಭಾರತೀಯ ಶಾಸನಶಾಸ್ತ್ರ ಪರಿಚಯ	: (ಅನು) ಸಿಡಿಕೆ
೮ ಶಾಸನ ಪದ್ಯಮಂಜರಿ (ಪ್ರಸ್ತಾಪನೆ)	: (ಸಂ) ಎಂ. ಚಿದಾನಂದಮೂರ್ತಿ

೯ Indian Epigraphy   : D.C. Sircar

೧೦ Indian Epigraphy and South Indian Scripts : C. Shivaramamurthy

೧೧ Indian Paleography   : Ahmed Hussain Dani

೧೨ The Alphabet   : David Diringer

ಮುಕ್ತ ಐಚ್ಛಿಕ (Open Elective)

KNC 530: ಪತ್ರಿಕೆ: ೨.೧ ಕನ್ನಡ ಭಾಷೆ ಮತ್ತು ಸಾಹಿತ್ಯ (ಪ್ರಾಚೀನ, ಮಧ್ಯಕಾಲೀನ, ಆಧುನಿಕ)

(೨:೧=೪ ಕ್ರೆಡಿಟ್)

೧. ಪ್ರಾಚೀನ ಸಾಹಿತ್ಯ :

(ಅ) ಕವಿರಾಜಮಾರ್ಗ – ನಾಡು ನುಡಿಯ ವರ್ಣನೆ: ಪ್ರಥಮ ಪರಿಚ್ಛೇದದಲ್ಲಿ ಪದ್ಯ ಸಂಖ್ಯೆ: ೨೬,೨೮,೨೯,೩೬,೪೦.

ಮೂರನೆಯ ಪರಿಚ್ಛೇದದಲ್ಲಿ: ೧೮೪, ೧೮೬, ೧೮೮, ೧೮೯ನೇ ಪದ್ಯ, (ಸಂ): ಎಂ.ವಿ.ಸೀತಾರಾಮಯ್ಯ

(ಆ) ಪಂಪಭಾರತ: ಭೀಷ್ಮರ ಪಟ್ಟಾಭಿಷೇಕ ಪ್ರಸಂಗ – ವಿಕ್ರಮಾರ್ಜುನ ವಿಜಯ; (ಸಂ) ಟಿ.ವಿ.
ವೆಂಕಟಾಚಲಶಾಸ್ತ್ರೀ.; ದಶಮಾಶ್ವಾಸಂ ಭಾಗದಲ್ಲಿ ಪದ್ಯ ಸಂಖ್ಯೆ ೧೩ ರಿಂದ ೨೩ರವರೆಗೆ

(ಇ) ಗದಾಯುದ್ಧ: ದುರ್ಯೋಧನನ ವಿಲಾಪಂ ಭಾಗ. ರನ್ನ ಗದಾಯುದ್ಧ ಸಂಗ್ರಹಂ, ಸಂ: ತೀನಂಶ್ರೀ

೨. ಮಧ್ಯಕಾಲೀನ ಸಾಹಿತ್ಯ –೧ :

(ಅ) ಬಸವಣ್ಣನವರ ವಚನ ಸಂಪುಟ (ಸಂ) ಎಂ.ಎಂ.ಕಲಬುರ್ಗಿ

ವಚನಗಳ ಸಂಖ್ಯೆ: ೧೦೬, ೧೩೮, ೧೯೪, ೨೨೫, ೨೭೦, ೩೪೨, ೪೪೨, ೮೨೮,೮೩೧, ೫೮೦

(ಆ) ಅಕ್ಕಮಹಾದೇವಿ:ಶಿವಶರಣೆಯರ ವಚನ ಸಂಪುಟ (ಸಂ) ವೀರಣ್ಣ ರಾಜೂರ

ವಚನಗಳ ಸಂಖ್ಯೆ: ೮೭, ೧೪೨, ೧೯೬, ೧೯೮, ೨೦೬, ೨೧೧, ೨೩೭, ೨೮೪, ೨೮೬, ೪೧೨

೩. ಮಧ್ಯಕಾಲೀನ ಸಾಹಿತ್ಯ –೨ :

(ಅ) ಸರ್ವಜ್ಞ: ಸರ್ವಜ್ಞನ ವಚನಗಳು-(ಸಂ) ಉತ್ತಂಗಿ ಚೆನ್ನಪ್ಪ

ವಚನಗಳ ಸಂಖ್ಯೆ: : ೩೨೦, ೩೨೪, ೩೭೪೪, ೩೮೨, ೮೯೨, ೧೦೨೪, ೧೧೪೪, ೧೧೪೦, ೧೧೪೪,
೧೨೮೪

(ಆ) ಕೀರ್ತನೆಗಳು :

ಪುರಂದರದಾಸ: ಧರ್ಮವೇ ಜಯವೆಂಬ ದಿವ್ಯಮಂತ್ರ

ಕನಕದಾಸ: ಕುಲಕುಲ ಕುಲವೆಂದು ಹೊಡೆದಾಡದಿರಿ

೪. ಆಧುನಿಕ ಸಾಹಿತ್ಯ :

(ಅ) ಕಾವ್ಯಗಳು   :   ಕುವೆಂಪು   – ಅಖಂಡ ಕರ್ನಾಟಕ

                                ಜಿ.ಎಸ್. ಶಿವರುದ್ರಪ್ಪ   – ಮಬ್ಬಿನಿಂದ ಮಬ್ಬಿಗೆ

(ಆ) ಆಧುನಿಕ ಕತೆಗಳು :   ಬಸವರಾಜ ಕಟ್ಟೀಮನಿ   – ಗಿರಿಜಾ ಕಂಡ ಸಿನಿಮಾ

                                ಸಾ.ರಾ ಅಬೂಬಕ್ಕರ್   – ಚಪ್ಪಲಿಗಳು

ಪರಾಮರ್ಶನ ಕೃತಿಗಳು :

೧. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ : ರಂ.ಶ್ರೀ. ಮುಗಳಿ

೨. ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯದ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆಯ ಸಂಪುಟಗಳು

೩. ಸಾಮಾನ್ಯನಿಗೆ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆಯ ಸಂಪುಟಗಳು : ಬೆಂಗಳೂರು ವಿ.ವಿ

೪. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ : ಕೆ.ವೆಂಕಟರಾಮಪ್ಪ

೫. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ : ತ.ಸು. ಶಾಮರಾಯ

೬. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಇತಿಹಾಸ : ರಂ.ಶ್ರೀ. ಮುಗಳಿ

<u>ನಾಲ್ಕನೆಯ ಚತುರ್ಮಾಸ (ಜನವರಿ-ಮೇ ೧೦೧೪)</u>

ಪ್ರಧಾನ ವಿಷಯಗಳು (Hard core)

KND 050: ಪತ್ರಿಕೆ: ೧

ಆಧುನಿಕ ಕನ್ನಡ ಸಾಹಿತ್ಯ : ಪಠ್ಯ : ಕಾವ್ಯ ಮತ್ತು ಕಾದಂಬರಿ (೧:೧=೩ ಕ್ರೆಡಿಟ್)

ಕಾವ್ಯ: ೧೧ ನಿಗದಿತ ಕವನಗಳು

೧. ಶಿಶುನಾಳ ಶರೀಫ	:	ಗಿರಣಿ
೨. ದ.ರಾ.ಬೇಂದ್ರೆ	:	ನರಬಲಿ
೩. ಕುವೆಂಪು	:	ಕಲ್ಕಿ
೪. ಕೆಎಸ್ಎನ್	:	ಬಳೆಗಾರನ ಹಾಡು
೫. ಗೋಪಾಲಕೃಷ್ಣ ಅಡಿಗ	:	ಕಟ್ಟುವೆವು ನಾವು
೬. ಜಿಎಸ್ಎಸ್	:	ಸಂಜೆದಾರಿ
೭. ಕೆ.ಎಸ್.ನಿಸಾರ ಅಹಮದ್	:	ಕುರಿಗಳು ಸಾರ್ ಕುರಿಗಳು
೮. ರಂಜಾನ್ ದರ್ಗಾ	:	ಪ್ರಣಾಳಿಕೆ
೯. ಸಿದ್ದಲಿಂಗಯ್ಯ	:	ಸುಂಟರಗಾಳಿ
೧೦. ಶಶಿಕಲಾ ವಸ್ತ್ರದ	:	ಗುಬ್ಬೇಮನಿ
೧೧. ಪ್ರತಿಭಾ ನಂದಕುಮಾರ	:	ನಾವು ಹುಡುಗಿಯರೇ ಹೀಗೆ
೧೨. ಉಷಾ	:	ಹವಳ ಹಾರಿದ ಹೊತ್ತು

ಕಾದಂಬರಿ : ಪಠ್ಯ : : ಸಂಸ್ಕಾರ : ಯು.ಆರ್. ಅನಂತಮೂರ್ತಿ

ಪಠ್ಯ ಮೂಲ : (ಕವಿತೆಗಳು)

೧. ಶಿಶುನಾಳ ಶರೀಫರ ಗೀತೆಗಳು   :ಸಂ.ಡಾ. ಶಿವಾನಂದ ಗುಬ್ಬಣ್ಣನವರ, ಕನ್ನಡ ಮತ್ತು ಸಂಸ್ಕೃತಿ ನಿರ್ದೇಶನಾಲಯ, ಬೆಂ:೧೯೮೭

೨. ಶತಮಾನಗಳ ಬಾಯಾರಿಕೆ : ಸಂ.ಟಿ.ಶ್ರೀನಿವಾಸರಾಜು ಇತರರು, ನವಕರ್ನಾಟಕ ಪ್ರಕಾಶನ ಬೆಂ:೧೯೮೯

೩. ಕುವೆಂಪು ಸಮಗ್ರ ಕಾವ್ಯ ಸಂಪುಟ-೧ : ರಾಷ್ಟ್ರಕವಿ ಕುವೆಂಪು ಪ್ರತಿಷ್ಠಾನ (ರಿ), ಕುಪ್ಪಳ್ಳಿ, ೧೦೦೨

೪. ಬೆಳಗೆರೆ ಜಾನಕಮ್ಮ ಬದುಕು-ಬರಹ : ಸಂ.ನೇಮಿಚಂದ್ರ, ಕರ್ನಾಟಕ ಲೇಖಕಿಯರ ಸಂಘ, ಬೆಂಗಳೂರು :೧೯೮೮

೫. ಮಲ್ಲಿಗೆಯ ಮಾಲೆ :

೬. ಹೊಸಗನ್ನಡ ಕವಿತೆ : ಸಂ.ಜಿ.ಎಚ್.ನಾಯಕ, ಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಿಷತ್ತು, ಬೆಂಗಳೂರು : ೧೯೮೭

೭. ಅದೇ

೮. ಸುವರ್ಣ ಕಾವ್ಯ :ಸಂ ಬಿ.ಎ. ಸನದಿ, ಕನ್ನಡ ಸಂಸ್ಕೃತಿ ಇಲಾಖೆ, ಬೆಂ:೧೦೦೬

೯. ಬಂಡಾಯ ಕಾವ್ಯ : ಸಂ.ಬರಗೂರು ರಾಮಚಂದ್ರಪ್ಪ, ಕನ್ನಡ ಮತ್ತು ಸಂಸ್ಕೃತಿ ನಿರ್ದೇಶನಾಲಯ, ಬೆಂ :೧೯೯೦

೧೦. ಸುವರ್ಣ ಕಾವ್ಯ :ಸಂ ಬಿ.ಎ. ಸನದಿ, ಕನ್ನಡ ಸಂಸ್ಕೃತಿ ಇಲಾಖೆ, ಬೆಂ:೧೦೦೬

೧೧. ಹೊಸಗನ್ನಡ ಕವಿತೆ : ಸಂ.ಜಿ.ಎಚ್.ನಾಯಕ, ಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಿಷತ್ತು, ಬೆಂಗಳೂರು:೧೯೮೭

೧೧. On Deconstruction   : Jonathan Culler

೧೨. The Pursuit of Signs   : Jonathan Culler

೧೩. Linguistics and Poetics   : Roman Jacobson

೧೪. Principles of litatray Critisism : I A Richards

KND 040: ಪತ್ರಿಕೆ : ೩ ಸಮೂಹ ಮಾಧ್ಯಮ (೨:೧=೩ ಕ್ರೆಡಿಟ್)

೧. (ಅ) ಸಮೂಹ ಮಾಧ್ಯಮದ ಅರ್ಥ, ವ್ಯಾಖ್ಯೆ, ಮಹತ್ವ

  (ಆ) ಜಾನಪದ ಮತ್ತು ಆಧುನಿಕ ಸಮೂಹ ಮಾಧ್ಯಮಗಳು

  (ಇ) ಅಭಿವೃದ್ಧಿ, ಸಾಮಾಜಿಕ ಬದಲಾವಣೆ ಮತ್ತು ಸಮೂಹ ಮಾಧ್ಯಮ

೨. (ಅ) ಪುಸ್ತಕದ ಹುಟ್ಟು ಮತ್ತು ಬೆಳವಣಿಗೆ: ಮುದ್ರಣದ ಹಿನ್ನೆಲೆ ಮತ್ತು ವಿಕಾಸ, ಪ್ರಕಾಶನ ಮತ್ತು ಮಾರಾಟ

  (ಆ) ಪತ್ರಿಕೆ ಹುಟ್ಟು ಮತ್ತು ಬೆಳವಣಿಗೆ, ಪತ್ರಿಕೆಗಳ ಸ್ವರೂಪ, ಮಹತ್ವ, ಪ್ರಕಾರಗಳು, ವರದಿ, ಸಂಪಾದಕೀಯ, ಅಂಕಣ ಬರೆಹ, ಪುರವಣಿ, ಜಾಹೀರಾತು. ಸಾಹಿತ್ಯಿಕ ಪತ್ರಿಕೆಗಳು

  (ಇ) ಆಕಾಶವಾಣಿ- ಹುಟ್ಟು ಮತ್ತು ಬೆಳವಣಿಗೆ, ಧ್ವನಿ, ಉಚ್ಚಾರಣೆ, ಸ್ಪಷ್ಟತೆ, ಸಂಗೀತ

೩. (ಅ) ದೂರದರ್ಶನ - ಹುಟ್ಟು ಮತ್ತು ಬೆಳವಣಿಗೆ, ನಿರೂಪಣೆ, ಧ್ವನಿ, ಉಚ್ಚಾರಣೆ, ಕಾರ್ಯಕ್ರಮ ಸಂಯೋಜನೆ, ಉಡುಪು ಮತ್ತು ವಿನ್ಯಾಸ, ಸಾಹಿತ್ಯ- ಸಂಗೀತ ಮತ್ತು ವಿವಿಧ ಕಾರ್ಯಕ್ರಮಗಳ ಸ್ವರೂಪ.

  (ಆ) ಚಲನಚಿತ್ರ : ಹುಟ್ಟು ಮತ್ತು ಬೆಳವಣಿಗೆ, ನಿರ್ಮಾಣದ ಕಲೆ, ಸಾಹಿತ್ಯ- ಸಂಗೀತ, ಸಂಪಾದನೆ

  (ಇ) ಸಾಮಾಜಿಕ ಜಾಲತಾಣಗಳು ಮತ್ತು ಸಮೂಹ ಮಾಧ್ಯಮ; ಫೇಸ್‌ಬುಕ್, ವಾಟ್ಸ್‌ಆಫ್, ಟೆಲಿಗ್ರಾಮ್, ಇನ್ಸ್ಟಾಗ್ರಾಮ್, ಟ್ವಿಟರ್, ಕ್ಲಬ್‌ಹೌಸ್

೪. ಮುದ್ರಣಾಲಯಕ್ಕೆ ಭೇಟಿ ನೀಡಿ ವರದಿ ತಯಾರಿಸುವುದು; ಆಕಾಶವಾಣಿ ಕಾರ್ಯಕ್ರಮಗಳ ಅವಲೋಕನ ಮತ್ತು ವರದಿ; ಪುಸ್ತಕ ಪ್ರಕಾಶನ ಸಂಸ್ಥೆಗೆ ಭೇಟಿ ಮತ್ತು ಮುದ್ರಣ ಕಾರ್ಯದ ಬಗ್ಗೆ ವರದಿ; ನಿಯತಕಾಲಿಕೆ ಮತ್ತು ದಿನಪತ್ರಿಕೆಗಳಲ್ಲಿ ಬರೆಹಗಳ ಪ್ರಕಟಣೆ; ದೂರದರ್ಶನ ವೀಕ್ಷಣೆ, ಕಾರ್ಯಕ್ರಮಗಳ ಸ್ವರೂಪದ ಅವಲೋಕನ ಮತ್ತು ವರದಿ ತಯಾರಿಕೆ; ಚಲನಚಿತ್ರಗಳ ವೀಕ್ಷಣೆ ಮತ್ತು ವಿಮರ್ಶೆ.

ಪರಾಮರ್ಶನ ಕೃತಿಗಳು

೧. ಪತ್ರಿಕೆ/ ಸಾಹಿತ್ಯ   : ಸರಜೂ ಕಾಟ್ಕರ್, ಅನ್ವೇಷಣೆ ಪ್ರಕಾಶನ, ಬೆಂಗಳೂರು

೨. ಭಾರತೀಯ ಪತ್ರಿಕೋದ್ಯಮ   : ನಾಡಿಗ ಕೃಷ್ಣಮೂರ್ತಿ, ಪ್ರಸಾರಾಂಗ, ಬೆಂಗಳೂರು

೩. ಆಧುನಿಕ ಭಾರತದಲ್ಲಿ ಪತ್ರಿಕೋದ್ಯಮ : ರೋಲೆಂಟ್ ಇ ಉಲ್ಸ್ಲೀ (ಮೂಲ) ಶ್ರೀಕರ ಎಲ್. ಭಂಡಾರ್ಕರ್ (ಅನು) ಪ್ರಸಾರಾಂಗ. ಮೈಸೂರು ವಿ.ವಿ

೪. ಭಾರತದಲ್ಲಿ ಪುಸ್ತಕಗಳ ಬೆಳವಣಿಗೆ : ಅಬ್ದುಲ್ ಹಸನ್ (ಮೂಲ) ಜಿ.ಪಿ. ಶಿವರಾಮ (ಅನು), ಮೈ.ವಿ.ವಿ

೫. ಪ್ರಾಯೋಗಿಕ ಪತ್ರಿಕೋದ್ಯಮ   : (ಸಂ) ಬಿ.ವಿ. ವೈಕುಂಠರಾಜು, ಬೆಂಗಳೂರು ವಿ.ವಿ

೬. ಸಮೂಹ ಮಾಧ್ಯಮಗಳು   : ಡಿ.ಬಿ. ನಾಯಕ, ಗುಲಬರ್ಗಾ ವಿ.ವಿ

೭. ಬ್ರಿಟಿಷ್ ಪತ್ರಿಕೋದ್ಯಮ   : ನಾಡಿಗ ಕೃಷ್ಣಮೂರ್ತಿ, ಮೈವಿವಿ

೮. ಫ್ರೀಲಾನ್ಸ್ ಪತ್ರಿಕೋದ್ಯಮ   : ನಿರಂಜನ ವಾನಳ್ಳಿ, ಮೈವಿವಿ

೯. ಸಮೂಹ ಮಾಧ್ಯಮಗಳು ಮತ್ತು ರಾಷ್ಟ್ರೀಯ ಅಭಿವೃದ್ಧಿ : ಎ.ಎಸ್. ಬಾಲಸುಬ್ರಹ್ಮಣ್ಯ, ಕರ್ನಾಟಕ ವಿವಿ

೧೦. ಪತ್ರಿಕೋದ್ಯಮ   : ಎಂ.ಚಲಪತಿರಾವ್ (ಮೂಲ) ನಾಡಿಗ ಕೃಷ್ಣಮೂರ್ತಿ (ಅನು)

೧೧. ಗ್ರಂಥೋದ್ಯಮ   : ಸಂ.ಅರವಿಂದ ಮಾಲಗತ್ತಿ, ಪ್ರಸಾರಾಂಗ, ಮೈವಿವಿ

೧೨. ಕನ್ನಡ ಪತ್ರಿಕಾಸೂಚಿ   : ಸಂ.ಶ್ರೀನಿವಾಸ ಹಾವನೂರ, ಪ್ರಸಾರಾಂಗ ಮೈವಿವಿ

೧೩. ಜಾನಪದ ಮತ್ತು ಸಮೂಹ ಮಾಧ್ಯಮ : ಕರ್ನಾಟಕ ಜಾನಪದ ಯಕ್ಷಗಾನ ಅಕಾಡೆಮಿ, ಬೆಂಗಳೂರು

೧೪. ಸಂವಹನ ಮಾಧ್ಯಮ   : ಎಸ್.ಎಂ.ಹಿರೇಮಠ ಮತ್ತು ಡಿ.ಬಿ. ನಾಯಕ

೧೫. ಕರ್ನಾಟಕ ಸಂಗಾತಿ   : ಕನ್ನಡ ಅಭಿವೃದ್ಧಿ ಪ್ರಾಧಿಕಾರ ಪ್ರಕಟಣೆ

KND 040 : ಪತ್ರಿಕೆ:೪ : ಅವಧಿಕ ಕಾರ್ಯ / ಮೈನರ್ ಪ್ರಾಜೆಕ್ಟ್ (೦:೭=೩ ಕ್ರೆಡಿಟ್)

ಕ್ಷೇತ್ರಕಾರ್ಯ, ಮಾಹಿತಿ ಸಂಗ್ರಹ ಮತ್ತು ವರದಿ

ಘಟಕ ೧:   ಅ) ಅವಧಿಕ ಪ್ರಗತಿ ಮತ್ತು ವರದಿ

            ಆ) ವಿಚಾರಗೋಷ್ಠಿ / ಚರ್ಚೆ/ ಪ್ರದರ್ಶನ

ಘಟಕ ೨   ಅ) ಕರಡು ವರದಿ

            ಆ) ಫಲಿತಾಂಶಗಳು ಹಾಗೂ ಅಂತಿಮ ವರದಿ

ಘಟಕ ೩: ಸೆಮಿಸ್ಟರ್ ಅಂತ್ಯದಲ್ಲಿ ವರದಿಯ ಮೌಲ್ಯಮಾಪನ ಮತ್ತು ಮೌಖಿಕ ಪರೀಕ್ಷೆಯನ್ನು ಒಬ್ಬ ಆಂತರಿಕ ಹಾಗೂ ಒಬ್ಬ ಬಾಹ್ಯ ಪರೀಕ್ಷಕರನ್ನೊಳಗೊಂಡಂತೆ ಸಮಿತಿ ನಡೆಸುತ್ತದೆ – ೮೦ ಅಂಕಗಳಿಗೆ

ಉಪಪ್ರಧಾನ ವಿಷಯಗಳು (Soft core)

KND 210: ಪತ್ರಿಕೆ:

೫.೧ ಭಾಷಾವಿಜ್ಞಾನ ಅಧ್ಯಯನ : ಕನ್ನಡ ಭಾಷಾಸ್ವರೂಪ : ಆಯ್ದ ಪಠ್ಯಗಳು

(೩:೧=೪ ಕ್ರೆಡಿಟ್)

೧. ಶಂ.ಬಾ.ಜೋಷಿ   : ಕನ್ನಡಿಯ ಒಳ್ಗಂಪು

೨. ಎ.ಆರ್.ಕೃಷ್ಣಶಾಸ್ತ್ರೀ   : ಇಂದಿನ ಜನಜೀವನದಲ್ಲಿ ಕನ್ನಡ

೩. ಡಿ.ಎಲ್.ಎನ್   : ಪದಗಳ ಹುಟ್ಟು ಸಾವು

೪. ಕುವೆಂಪು   : ಸಂಸ್ಕೃತಿ ಕರ್ನಾಟಕ

೫. ಜಿ.ಎಸ್.ಶಿವರುದ್ರಪ್ಪ   : ಕನ್ನಡ ಸಾಹಿತಿ ಮತ್ತು ಕನ್ನಡ

೬. ಜಿ. ವೆಂಕಟಸುಬ್ಬಯ್ಯ   : ಇಗೋ ಕನ್ನಡ

೭. ಯು.ಆರ್.ಅನಂತಮೂರ್ತಿ   : ಕನ್ನಡದ ಮೂರು ಹಸಿವುಗಳು

೮. ಕೆ.ವಿ.ನಾರಾಯಣ   : ತಂತ್ರಜ್ಞಾನ ಮತ್ತು ಕನ್ನಡ

೯. ಕೆ.ವಿ. ತಿರುಮಲೇಶ್   : ಕನ್ನಡತನ ನನ್ನ ದೃಷ್ಟಿಯಲ್ಲಿ

೧೦.ಬರಗೂರು ರಾಮಚಂದ್ರಪ್ಪ   : ಕನ್ನಡಾಭಿಮಾನ

ಪಠ್ಯ ಮೂಲ :

೧. ಶಂ.ಬಾ.ಜೋಶಿ	: ಕನ್ನಡಿಯ ಹುಟ್ಟು, ಸಮಾಜ ಪುಸ್ತಕಾಲಯ, ಧಾರವಾಡ :೧೯೪೬
೨. ಎ.ಆರ್.ಕೃಷ್ಣಶಾಸ್ತ್ರಿ	: ಭಾಷಣಗಳು ಲೇಖನಗಳು, ಶಾರದಾ ಮಂದಿರ, ಮೈಸೂರು
೩. ಡಿಎಲ್ಎನ್	: ಪೀಠಿಕೆಗಳು ಲೇಖನಗಳು
೪. (ಸಂ) ಶಿವಾರೆಡ್ಡಿ	: ಕುವೆಂಪು ಸಮಗ್ರ ಗದ್ಯ, ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ
೫. ಸಂ.ರಹಮತ್ ತರೀಕೆರೆ	: ಮಾತು ತಲೆಯೆತ್ತುವ ಬಗೆ, ಸಂಪುಟಗಳು ೧, ಕವಿವಿ, ಹಂಪಿ ೨೦೧೧
೬. ಸಂ. ಎಸ್.ಎಸ್. ತಾರಾನಾಥ	: ಶತಮಾನದ ಸಂಶೋಧನೆ, ಕರ್ನಾಟಕ ಸಾಹಿತ್ಯ ಅಕಾಡೆಮಿ, ಬೆಂ
೭. ಯು.ಆರ್. ಅನಂತಮೂರ್ತಿ	: ವಾಲ್ಮೀಕಿಯ ನೆಪದಲ್ಲಿ
೮. ಕೆ.ವಿ. ನಾರಾಯಣ	: ಕನ್ನಡ ಜಗತ್ತು :ಅರ್ಧಶತಮಾನ, ಕನ್ನಡ ವಿವಿ
೯. ಕೆ.ವಿ. ತಿರುಮಲೇಶ್	: ನಮ್ಮ ಕನ್ನಡ
೧೦. ಹೆಚ್.ಎಸ್.ಬಿಳಿಗಿರಿ	: ಮೂರು ದತ್ತಿ ಉಪನ್ಯಾಸಗಳು

KND 210: ಪತ್ರಿಕೆ : ೫.೧

ಜಾನಪದ ಅಧ್ಯಯನ : ಕನ್ನಡದ ಜನಪದ ಸಾಹಿತ್ಯ (ಆಯ್ದ ಪಠ್ಯಗಳು)

(೩:೧=೪ ಕ್ರೆಡಿಟ್)

೧. ತಾತ್ವಿಕ : ಜಾನಪದ ಸಾಹಿತ್ಯ ಪ್ರಕಾರಗಳ ಕುರಿತು ಈವರೆಗೆ ನಡೆದ ಅಧ್ಯಯನದ ಸ್ವರೂಪ, ಪ್ರತಿಯೊಂದು ಸಾಹಿತ್ಯ ಪ್ರಕಾರದಲ್ಲಿ ಅಧ್ಯಯನ ಮಾಡಿದ ಪ್ರಮುಖ ವಿದ್ಯಾಂಸರ ಪರಿಚಯ

ಪಠ್ಯಗಳು:

೨. ಅ) ಕನ್ನಡ ಜನಪದ ಕತೆಗಳು : ಜೀ.ಶಂ.. ಪರಮಶಿವಯ್ಯ (ಪ್ರತಿ ಗುಂಪಿನ ಮೊದಲ ಎರಡು ಕತೆಗಳು)

ಆ) ಗರತಿಯ ಹಾಡು : ಹಲಸಂಗಿ ಗೆಳೆಯರು

೩. ಅ) ಗರಿಗೆದರಿದ ನವಿಲು : (ಸಂ) ಕಾಳೇಗೌಡ ನಾಗವಾರ – ಜಿ.ವಿ. ಆನಂದಮೂರ್ತಿ

ನಿಗದಿತ ಭಾಗ ಪುಟ ೧ ರಿಂದ ೧೦೮ ಮತ್ತು ೧೫೧ ರಿಂದ ೨೦೦ ರವರೆಗೆ)

೪. ಅ) ನಮ್ಮ ಸುತ್ತಿನ ಗಾದೆಗಳು : ಸುಧಾಕರ

ಆ) ಸಾವಿರದ ಒಗಟುಗಳು : ಸೋಮಶೇಖರ ಇಮ್ರಾಪುರ

KND 210 : ಪತ್ರಿಕೆ:೫.೨   ಚಾರಿತ್ರಿಕ ಅಧ್ಯಯನ: ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ: ಆಯ್ದ ಪಠ್ಯಗಳು

೧. ಕವಿರಾಜಮಾರ್ಗಂ : ನಾಡು-ನುಡಿ ವರ್ಣನೆ

(ಆಶ್ವಾಸ-೧, ಪದ್ಯಗಳು ೧ ರಿಂದ ೪೬, ಆಶ್ವಾಸ –೧೨ ಪದ್ಯ ೧ಲ)

೨. ವಡ್ಡಾರಾಧನೆ : ಭದ್ರಬಾಹು ಭಟಾರರ ಕಥೆ

೩. ಅಜಿತಪುರಾಣ : ಅತ್ತಿಮಬ್ಬೆ ವೃತ್ತಾಂತ

(ಆಶ್ವಾಸ–೧, ಪದ್ಯಗಳು ೧೦ ರಿಂದ ೮೫)

೪. ಬಸವಣ್ಣನವರ ನಿಗದಿತ ೧೨ ವಚನಗಳು

ಂ. ಸಗಣೆಯ ಬೆನಕನ ಮಾಡಿ

೨. ಲೋಕದ ಡೊಂಕ ನೀವೇಕೆ

೩. ಹಬ್ಬಕ್ಕೆ ತಂದ ಹರಕೆಯ ಕುರಿ

೪. ಹಾವು ತಿಂದವರ ನುಡಿಸಬಹುದು

೫. ದೇವಲೋಕ ಮರ್ತ್ಯಲೋಕವೆಂಬುದು

೬. ಮರ್ತ್ಯಲೋಕವೆಂಬುದು ಕರ್ತಾರನ ಕಮ್ಮಟವಯ್ಯ

೭. ವ್ಯಾಧನೊಂದು ಮೊಲನ ತಂದರೆ

೮. ಕಲ್ಲನಾಗರ

೯. ವೇದಕ್ಕೆ ಒರೆಯನಿಕ್ಕುವೆ

೧೦. ಅಪ್ಪನು ಡೋಹರ ಕಕ್ಕಯ್ಯ

೧೧. ಉತ್ತಮ ಕುಲದಲಿ ಹುಟ್ಟಿದನೆಂಬ

೧೨.ಅರಸರ ಮನೆಯಲ್ಲಿ ಅರಸಿಯಾಗಿಪ್ಪುದರಿಂದ

೧. ಕೇಶಿರಾಜ ದಣ್ಣಾಯಕರ ರಗಳೆ (ಹರಿಹರ)

೨. ಸಿದ್ಧರಾಮ ಚಾರಿತ್ರ್ಯ : ನಾಲ್ಕನೆಯ ಸಂಧಿ

೩. ಬಸವಪುರಾಣ : ಸುಗ್ಗಲದೇವಿ ಹಾಗೂ ದಾಸಿಮಯ್ಯನ ಕತೆ (ಸಂಧಿ ೫೧)

೪ ರಾಮಧಾನ್ಯ ಚರಿತೆ : ಕನಕದಾಸ

೫. ರಾಮನಾಥ ಚರಿತೆ : ಶೂಲದಹಬ್ಬ (ಆಶ್ವಾಸ ೫, ಸಂಧಿ ೨, ಪದ್ಯ ೧ ರಿಂದ ೧೦೪)

೬. ರಾಜಾವಳಿ ಕಥಾಸಾರ : ನವಮಾಧಿಕಾರ

೭. ಫೀಟರು ಸಂಗ್ರಹಿಸಿದ ಐದು ಐತಿಹಾಸಿಕ ಲಾವಣಿಗಳು : ಹಲಗಲಿಯ ಬೇಡರು

೮. ಕೈಫಿಯತ್ತು : ಉಪ್ಪಲಿ ಬಣಜಿಗರ ಕೈಫಿಯತ್ತು

ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನ: (೩೦ ಅಂಕಗಳು)

ಪ್ರತಿ ಚತುರ್ಮಾಸ ವಿದ್ಯಾರ್ಥಿಗಳ ಇಡೀ ತಂಡಕ್ಕೆ ಒಂದೇ ರೀತಿಯ ಮೌಲ್ಯಮಾಪನ ಚಟುವಟಿಕೆಗಳು ಮತ್ತು ಮಾನದಂಡಗಳನ್ನು ಅನುಸರಿಸಬೇಕು

ಟೆಸ್ಟ್	ಅವಧಿ	ಅಂಕಗಳು
ಟೆಸ್ಟ್–1	ಪ್ರತಿ ಚತುರ್ಮಾಸ 2ನೆ ತಿಂಗಳ ಅಂತ್ಯದಲ್ಲಿ (ಒಂದು ಗಂಟೆ)	10
ಟೆಸ್ಟ್–2	ಪ್ರತಿ ಚತುರ್ಮಾಸ 4ನೆ ತಿಂಗಳ ಅಂತ್ಯದಲ್ಲಿ (ಒಂದು ಗಂಟೆ)	10
	ಪ್ರತಿ ಚತುರ್ಮಾಸ ಆರಂಭದ ಎರಡು ತಿಂಗಳ ಅವಿರತ ಮೌಲ್ಯಮಾಪನ (ಟ್ಯುಟೋರಿಯಲ್)	05
	ಪ್ರತಿ ಚತುರ್ಮಾಸ ಅಂತಿಮ ಎರಡು ತಿಂಗಳ ಅವಿರತ ಮೌಲ್ಯಮಾಪನ (ಟ್ಯುಟೋರಿಯಲ್)	05
	ಒಟ್ಟು	30

3. ವಿಚಾರಗೋಷ್ಠಿ / ಚರ್ಚಾಗೋಷ್ಠಿ / ಪ್ರದರ್ಶನ - ಇಂತಹ ಸದೃಶ ಚಟುವಟಿಕೆಗಳು

ವಿಷಯ ಸಂಗ್ರಹಣೆ, ಪ್ರಬಂಧ ರಚನೆ, ಮಂಡನೆ ಮತ್ತು ಚರ್ಚೆಯಲ್ಲಿ ಭಾಗವಹಿಸುವಿಕೆ - ಗರಿಷ್ಠ 5 ಅಂಕಗಳು

1. ಮೌಲ್ಯಮಾಪನ ಘಟಕ : 3 : ವಿಶ್ವವಿದ್ಯಾನಿಲಯ ಚತುರ್ಮಾಸ ಅಂತ್ಯದಲ್ಲಿ ಮೂರು ಗಂಟೆ ಅವಧಿಯ ಗರಿಷ್ಠ 70 ಅಂಕಗಳ ಪರೀಕ್ಷೆ ನಡೆಸುತ್ತದೆ.

2. ಅ) ಅವಧಿಕ ಕಾರ್ಯ / ಮೈನರ್ ಪ್ರಾಜೆಕ್ಟ್ (4 ಕ್ರೆಡಿಟ್ ಗಳು) ಮೌಲ್ಯಮಾಪನ ಕ್ಷೇತ್ರಕಾರ್ಯ, ಮಾಹಿತಿ ಸಂಗ್ರಹಣೆ ಮತ್ತು ವರದಿ

ಘಟಕ 1:   ಅ) ಅವಧಿಕ ಪ್ರಗತಿ ಮತ್ತು ವರದಿ   – 7.5 ಅಂಕಗಳು

               ಆ) ವಿಚಾರಗೋಷ್ಠಿ / ಚರ್ಚೆ / ಪ್ರದರ್ಶನ   – 7.5 ಅಂಕಗಳು

ಘಟಕ 2:   ಅ) ಕರಡು ವರದಿ   – 7.5 ಅಂಕಗಳು

               ಆ) ಫಲಿತಾಂಶಗಳು ಹಾಗೂ ಅಂತಿಮ ವರದಿ   – 7.5 ಅಂಕಗಳು

ಘಟಕ 3:   ಚತುರ್ಮಾಸ ಅಂತ್ಯದಲ್ಲಿ ವರದಿಯ ಮೌಲ್ಯಮಾಪನ ಮತ್ತು ಮೌಖಿಕ ಪರೀಕ್ಷೆಯನ್ನು ಒಬ್ಬ ಆಂತರಿಕ ಹಾಗೂ ಒಬ್ಬ ಬಾಹ್ಯ ಪರೀಕ್ಷಕರನ್ನೊಳಗೊಂಡಂತೆ ಸಮಿತಿ ನಡೆಸುತ್ತದೆ-70 ಅಂಕಗಳಿಗೆ

ಘಟಕ 4:   ವಿದ್ಯಾರ್ಥಿಯ ಮೂರನೆಯ ಚತುರ್ಮಾಸದಲ್ಲಿ ವಿಭಾಗದ ಅಧ್ಯಾಪಕರೊಂದಿಗೆ ಚರ್ಚಿಸಿ ವಿಷಯ ಆಯ್ಕೆ ಮಾಡಿಕೊಂಡು ನಾಲ್ಕನೆಯ ಚತುರ್ಮಾಸ ಅಂತ್ಯದಲ್ಲಿ ವಿಭಾಗಕ್ಕೆ ಸಲ್ಲಿಸಬೇಕು. ಎ-4

ಅಳತೆಯ ಕಾಗದದಲ್ಲಿ 14 ಪಾಯಿಂಟ್ ಅಕ್ಷರಗಳಲ್ಲಿ 50 ಪುಟಗಳಿಗೆ ಕಡಿಮೆ ಇಲ್ಲದಂತೆ ಮತ್ತು 80 ಪುಟಗಳಿಗೆ ಮೀರದಂತೆ ಅವಧಿಕ ಕಾರ್ಯವಿರಬೇಕು

ಘಟಕ 5:   ಚತುರ್ಮಾಸ ಅಂತ್ಯದಲ್ಲಿ ವರದಿಯ ಮೌಲ್ಯಮಾಪನ ಮತ್ತು ಮೌಖಿಕ ಪರೀಕ್ಷೆಯನ್ನು ಅಧ್ಯಯನ ಮಂಡಳಿ / ಅಧ್ಯಯನ ವಿಭಾಗ / ಪರೀಕ್ಷಾ ಮಂಡಳಿ ಅಧ್ಯಕ್ಷರು ಅಥವಾ ಅವರ ನಾಮಾಂಕಿತರು ಮೇಲ್ವಿಚಾರಕರು ಹಾಗೂ ಇತರ ವಿಶ್ವವಿದ್ಯಾಲಯ / ಉದ್ಯಮ / ಸಮಾಜ / ಸಮುದಾಯದಿಂದ ಆಹ್ವಾನಿತರಾದ ಒಬ್ಬ ಬಾಹ್ಯ ಪರೀಕ್ಷಕರನ್ನೊಳಗೊಂಡ ಸಮಿತಿ ನಡೆಸುತ್ತದೆ.– **10 ಅಂಕಗಳು (60+10=70)**

4ನೇ ಚತುರ್ಮಾಸದ ವಿಷಯವಾದ 'ಅವಧಿಕ ಕಾರ್ಯ' ಬರಹದ ಮೌಲ್ಯಮಾಪನವನ್ನು 60 ಅಂಕಗಳಿಗೆ ನಡೆಸಲಾಗುವುದು. 10 ಅಂಕಗಳಿಗೆ ಮೌಖಿಕ ಪರೀಕ್ಷೆಯನ್ನು ನಡೆಸಲಾಗುವುದು.

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ಮಾದರಿ ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆ

2022–23 ನೇ ಸಾಲಿನ ಸ್ನಾತಕೋತ್ತರ ಎಂ.ಎ ಕನ್ನಡ ಚತುರ್ಮಾಸ ಪರೀಕ್ಷೆಗಳು

(ಸಿಬಿಸಿಎಸ್-ಸಿಎಜಿಪಿ ಮಾದರಿ)

ಪತ್ರಿಕೆಯ ಶೀರ್ಡಿಕೆ:

ಸಮಯ: 3 ಗಂಟೆಗಳು   ಅಂಕಗಳು: 70

ಸೂಚನೆ : ಎಲ್ಲಾ ಪ್ರಧಾನ ಪ್ರಶ್ನೆಗಳು ಕಡ್ಡಾಯ

(ಎ) ಅಥವಾ (ಬಿ)   ಅಂಕಗಳು : 14

(ಸಿ) ಅಥವಾ (ಡಿ)   ಅಂಕಗಳು : 14

(ಇ) ಅಥವಾ (ಎಫ್)   ಅಂಕಗಳು: 14

(ಜಿ) ಅಥವಾ (ಎಚ್)   ಅಂಕಗಳು : 14

ಯಾವುದಾದರೂ ಏಳು ಪ್ರಶ್ನೆಗಳಿಗೆ ಉತ್ತರಿಸಿ   ಅಂಕಗಳು :   7X2=14

(ಐ)   (ಒ)

(ಜೆ)   (ಪಿ)

(ಕ)   (ಕ್ಯೂ)

(ಎಲ್)   (ಆರ್)

(ಎಮ್)   (ಎಸ್)

(ಎನ್)   (ಟಿ)

ಪ್ರಶ್ನೆಗಳನ್ನು ಪಠ್ಯಕ್ರಮದ ಎಲ್ಲಾ ಘಟಕಗಳನ್ನು ಒಳಗೊಂಡಂತೆ ತಯಾರಿಸುವುದು.

JSS MAHA VIDYAPEETHA

JSS College of Arts, Commerce and Science

Ooty Road, Mysuru - 570 025

Department of Master of Computer Applications

OVERALL COURSE GRID OF

Master of Computer Applications

2021-2022

Master of Computer Applications

2 Years / 4 Semesters

1. Introduction:

MCA is Masters of Computer Application is a PG course of two years and has it is a master Course in Computer Application the MCA subjects are related to computer languages computer software and the MCA syllabus is divided into 4 semesters has the MCA subjects consists 5 number but their brief knowledge is given in two years so the MCA syllabus is made in such a way that the students learn MCA subjects in two years in such a pattern that the gain all the knowledge

The MCA course includes classroom teaching, practical assignments, and project work which is a mandate in the MCA course syllabus. MCA course syllabus emphasis the latest programming languages and tools to develop better and faster applications. Some colleges encourage students to spend a full semester working in the industry to explore and understand how IT works.

To train MCA course subjects offered by the universities are Data Structures and files using C, Project Visual C++, Computer Networks and Java programming etc. MCA syllabus varies from university to university and some of them are- Internet & JAVA Programming, Modeling and Simulation, Computer and 'C' Programming, Management Information System, and many others.

The MCA course list also emphasis certain specialization topics like Troubleshooting, System Engineering, Software Development, Hardware Technology, etc.

2. Lecture-Practical/Project-Tutorial (L-P-T)

A course shall have either or all the three components, i.e. a course may have only lecture component, or only practical/project component or a combination of any two/three components

> Lecture (L): Classroom sessions delivered by faculty in an interactive mode. It should be conducted as per the scheme of lectures indicated in respective course.

> Practical/Project(P): Practical / Project Work consisting of Hands-on experience /Field Studies / Case studies that equip students to acquire the much required skill component. Besides separate Practical/Project course, three course in each semester include few practical assignment and it will be evaluated under internal evaluation

> Tutorial (T): Session consisting of participatory discussion/ self-study/ desk work/ brief seminarpresentations by students and such other novel methods that make a student to absorb and assimilatemore effectively the contents delivered in the Lecture sessions

A Mini project is an assignment that the student needs to complete at the end of every semester in order to strengthen the understanding of fundamentals through effective application of thecourses learnt. The details guidelines have been given in the course structure.

The Project Work to be conducted in the FINAL Semester and evaluated at the end of the semester. The detail guidelines have been in the respective course structure.

The teaching / learning as well as evaluation are to be interpreted in a broader perspective asfollows:

i) Teaching – Learning Processes: Classroom sessions, Group Exercises, Seminars, Small Group Projects, Self-study, etc.

ii) Evaluation: Tutorials, Class Tests, Presentations, Field work, Assignments, competency based Activity, etc.

The MCA Programme is a combination of:

a. Four-Credit Courses (100 Marks each): 4 Credits each

b. One-Credit Courses (50 Marks each):

Following are the session details per credit for each of L-P-T model

1) Every ONE-hour session per week of L amounts to 1 credit per Semester,

2) Minimum of TWO hours per week of P amounts to 1 credit per Semester

3) Minimum of ONE hours per week of T amounts to 1 credit per Semester

Scheme and Syllabus

Semester I					
Course Title	**Course Code**	**Credits**	**Contact hours**	**EXT**	**INT**
Java Programming	IT11	4:0:0	4	70	30
Data Structure and Algorithms	IT12	4:0:0	4	70	30
Computer Organisation and Architecture	IT13	4:0:0	4	70	30
Operating System Concepts	IT14	4:0:0	4	70	30
Computer Networks	IT15	4:0:0	4	70	30
Management Information System	BT11	4:0:0	4	70	30
Mathematical foundations	MT11	4:0:0	4	70	30
Java Programming Lab	IT11L	0:0:1	2	30	20
Data Structure and Algorithms Lab	ITC11	0:0:1	2	30	20
	TOTAL	30	32	550	250

Semester II						
Sl. No.	Course Title	Course Code	Credits	Contact Hours	EXT	INT
1	Python Programming	IT21	4:0:0	4	70	30
2	Software Architecture	IT22	4:0:0	4	70	30
3	Optimization Techniques	MT21	4:0:0	4	70	30
4	Advanced Internet Technologies	IT23	4:0:0	4	70	30
5	Analysis and Design of Algorithms	IT24	4:0:0	4	70	30
6	DBMS	IT 25	4:0:0	4	70	30
7	Elective	ET2X	4:0:0	4	70	30
8	Python Programming Lab	IT21L	0:0:1	2	30	20
9	Advanced Internet Technologies Lab	IT23L	0:0:1	2	30	20
			30	32	550	250

ELECTIVES:

Machine Intelligence Stream		Data Sciences Stream		Applications Stream	
ET21	Artificial Intelligence and Robotics	ET22	NOSQL	ET23	Enterprise Resource Planning

Semester III							

Sl. No.	**Course Title**	**Course Code**	**Credits**	**Contact Hours**	**EXT**	**INT**
1	Mobile Application Development	IT31	4:0:0	4	70	30
2	Data Warehousing and Data Mining	IT32	4:0:0	4	70	30
3	Software Testing and Quality Assurance	IT33	4:0:0	4	70	30
4	.NET Technologies	IT34	4:0:0	4	70	30
5	Cloud Computing	IT35	4:0:0	4	70	30
6	Cryptography and Network Security	IT36	4:0:0	4	70	30
7	Elective	OC32	4:0:0	4	70	30
8	Mobile Application Development Lab	IT31L	0:0:1	2	30	20
9	Data Warehousing and Data Mining Lab	IT32L	0:0:1	2	30	20
			30	32	550	250

ELECTIVES:

Machine Intelligence Stream		Data Sciences Stream		Applications Stream	
ET31	Soft Computing	ET32	Big Data Analytics	ET33	Software Project Management and Practices

Semester IV					
Sl. No.	Course Title	Course Code	CP	EXT	INT
1	Business Intelligence	BM41	4:0:0	70	30
2	Project	ITC41	0:0:12	150	100
			16	220	130

Semester	Credit	IE	UE
Semester I	30	260	540
Semester II	30	260	540
Semester III	30	260	540
Semester IV	16	130	220
Total	106	910	1840
			2750

IT : Information Technology

BT: Business Technology

MT: Mathematics Technology

Semester I

Course Code: IT-11
Course Name: Java Programming

Credit Scheme			Evaluation Scheme				
Lecture	Practical	Credit	Internal			External	Total
			Written	Practical	Tutorial		
4 Hrs./Week	-	4	30	-	-	70	100

Course Description:

COURSE OUTCOMES:
Upon successful completion of this course, students will be able to: CO1:   Demonstrate and implement programs using components and constructs of a Java language CO2:   Identify classes, objects, members of a class and use packages and interfaces appropriately. CO3:   Demonstrate for Java program for multithread, synchronization and exception handling concepts. CO4:   Use the concept of string, event handling, simple data structures like arrays and members of classes of Java API in application development CO5:   Design and develop Java based UI and Networking applications using applets, swing components and networking concepts.
TOPICS COVERED:

UNIT 1 – Java Basics 10 Hours

History of Java, Java buzzwords, data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program, concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, parameter passing, recursion, nested and inner classes, exploring string class

UNIT 2 – OOP Concepts in Java, Packages and Interfaces   10 Hours

Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance-specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance. Member access rules, super uses, using final with inheritance, polymorphism- method overriding, abstract classes, the Object class.

Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces. Exploring java.io.

UNIT 3 - Exception Handling and Multi Threading 10 Hours

Concepts of exception handling, benefits of exception handling, Termination or presumptive models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes. String handling, Exploring java.util.

Differences between multi threading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads; inter thread communication, thread groups, daemon threads. Enumerations, auto boxing, annotations, generics.

UNIT 4 - String and Event Handling 10 Hours

String fundamentals, String Constructors, Three string related language features, The Length() method, Obtaining the characters within the string, String comparison, using index Of() and lastindexOf(), changing the case of the characters within the string, String buffer and String builder.

Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes. The AWT class hierarchy, user interface components- labels, button, canvas, scrollbars, text components, check box, check box groups, choices, lists panels – scroll pane, dialogs, menu bar, graphics, layout manager – layout manager types – border, grid, flow, card and grid bag.

UNIT 5 – Applets, Swings and Networking with Java.Net 12 Hours

Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets.

Swings- Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing- JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons – The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

Networking fundamentals, Networking Classes & Interfaces, The InetAddress class, The Socket class, URL class, URL connection class, Http URL connection class, Exploring collection frame work, Collection overview, Collection classes and interfaces, Array class.

TEXT BOOKS / REFERENCES:

1. Herbert Schildt. Java - The Complete Reference, Ninth Edition. Oracle Press, McGraw Hill Education (India) Edition- 2014.

Reference books:

1. Cay S. Horstmann, Gary Cornell. Core Java, Core Java Volume-1 – Fundamentals, 9th edition, Pearson Education, 2014.
2. Timothy Budd, "Understanding Object-oriented programming with Java", Updated Edition, Pearson Education, 2000.

ADDITIONAL LEARNING SOURCES:

1. http://www.oracle.com/technetwork/java/index-jsp-135888.html
2. http://www.javaworld.com/article/2074929/core-java
3. http://www.javaworld.com/
4. http://www.learnjavaonline.org/
5. https://www.codecademy.com/learn/learn-java
6. http://www.tutorialspoint.com/java/
7. http://www.java-examples.com/
8. http://www.homeandlearn.co.uk/java/java.html

Course Code: IT-12
Course Name: Data Structure and Algorithms

Credit Scheme			Evaluation Scheme				
Lecture	Practical	Credit	Internal			External	Total
			Written	Practical	Tutorial		
4 Hrs./Week	-	4	30	-	-	70	100

COURSE OUTCOMES:

Upon successful completion of this course, the student will be able to:

CO1:   Design and analyze programming problem statements.
CO2:   Choose appropriate data structures and algorithms, understand the ADT/libraries, and use it to design algorithms for a specific problem.
CO3:   Apply mathematical abstraction to solve problems.
CO4:   Demonstrate various methods of organizing large amounts of data.
CO5:   Analyze algorithms and to determine algorithm correctness and time efficiency class.
CO6: demonstrate linear data structures linked list, stack and queue (apply)
CO7: implement tree, graph, hash table and heap data structures (apply)
CO8: apply brute force and backtracking techniques (apply)
CO9: demonstrate greedy and divide-conquer approaches (apply)
CO10: implement dynamic programming technique (apply)

UNIT 1 - Introduction and overview of C Programming   12 Hours

Introduction to C programming, Variables, Data types, Constants, Declarations, Operators, Precedence, Associativity, Order of evaluation. Input and output statements; Control Statements, Arrays – Single dimension, Two dimensional, Multi dimensional Arrays, Strings. Functions, Categories of functions. Examples Pointers, Pointer arithmetic, Call by value, Pointer Expression, Pointer as function arguments, recursion, passing strings to functions, Call by reference, Functions returning pointers, Pointers to functions, Programming Examples. Structures and Unions.

UNIT 2 - Introduction to Data Structures   8 Hours

Information and its meaning: Abstract Data Types, Sequences as Value Definitions, ADT for Varying length character Strings, pointers and review of Pointers, Dynamic Memory Allocation - definition, malloc, calloc, and realloc, free. Data Structures: Array as an ADT, Arrays as Parameters, String as an ADT.

UNIT 3 - The Stack   12 Hours

Definition and examples, Primitive operations, Example, The stack as an ADT, Representing
stacks, Implementing the pop, push operations using function overloading, Examples for infix,
postfix, and prefix expressions, Basic definition and Examples. Applications of Stacks: Expression
Evaluations, Expression conversion, Recursion as application of stack, Properties of recursive
definition or algorithm. Binary search, Towers of Hanoi problem.

UNIT 4 - Queues and Linked List   12 Hours

The queue and its sequential representation, the queue as ADT, Basic operations using
polymorphism and inheritance, Priority queue, Array implementation of a priority queue. Linked
lists, inserting and removing nodes from a list, Linked implementations of stacks, Linked
implementation of queues, linked list as a data Structure. Example of list operations.

UNIT 5 - Linked Lists and Trees   8   Hours

Other list structures: Circular lists, Stack as circular lists, doubly linked lists. Application of linked
lists: Stacks, Queues, double-ended queues, priority queues. Sorting and Searching: Applications
and implementation with function overloading. Tree: Definition and representation, Types of trees,
Basic operations on Tree.

TEXT BOOKS/ REFERENCES :
Text Books :
  1. Programming in ANSI C, Third Edition, E. Balaguruswamy. 6th Edition (2013).
  2. Data Structures Using C and C++ by Aaron.M. Tenenbaum, Yedidyah Langsam and Moshe J.
     Augustine, PHI, Edition, 2011.

  Reference Books :
1. Data structures, Algorithms and Applications in C++, S. Sahani, University Press (India) Pvt Ltd,
   2nd Edition.
2. The complete reference C, Herbert Schildt, Fifth Edition, Tata McGraw Hill.

ADDITIONAL LEARNING SOURCES:
  1. http://www.tutorialspoint.com/Data-Structures-in-C-Online-Training/classid=13
  2. http://nptel.ac.in/datastructures_c
  3. www.javatpoint.com
  4. www.oracle.com
  5. www.geeksforgeeks.org/java

Course Code: IT-13
Course Name: Computer Organisation and Architecture

Credit Scheme			Evaluation Scheme				
Lecture	Practical	Credit	Internal			External	Total
			Written	Practical	Tutorial		
4 Hrs./Week	-	4	30	-	-	70	100

Upon Successful Completion of this Course, Student will know
CO1: Computer Architecture-Hardware, software
CO2: Design of Interfaces
CO3: Addressing Modes

UNIT-1   **12 Hours**
 Principles of Computer design - Software, hardware interaction layers in computer architecture. Central processing unit. Machine language instructions, Addressing modes, instruction types, Instruction set selection, Instruction cycle and execution cycle.

UNIT-2   **12 Hours**
Control unit, Data path and control path design, Microprogramming V s hardwired control, RISC Vs CISC, Pipelining in CPU design: Superscalar processors.

UNIT-3   **12 Hours**
Memory system, Storage technologies, Memory array organization, Memory   hierarchy, interleaving, cache and virtual memories and architectural aids to implement these.

UNIT-4   **8 Hours**
Input-output devices and characteristics. Input-output processing, bus interface, data transfer techniques, I/O interrupts, channels.

UNIT-5   **8 Hours**
 Performance evaluation - SPEC marks, Transaction Processing benchmarks.

TEXT BOOKS/ REFERENCES :
1.Pal Chauduri, P., "Computer Organisation and Design", Prentice Hall of India, New Delhi, 1994.
2.Rajaraman,V., and Radhakrishnan, T., "Introduction to Digital Computer Design" (4thedition). Prentice Hall of India, New Delhi, 1997.
3. Stallings. W, "Computer Organization and Architecture, (2nd edition) Prentice Hall of India, New Delhi

Course Code: IT-14
Course Name: Operating System and Linux

Credit Scheme			Evaluation Scheme				
Lecture	Practical	Credit	Internal			External	Total
			Written	Practical	Tutorial		
4 Hrs./Week	-	4	30	-	-	70	100

COURSE OUTCOMES:
Upon successful completion of this course, the student will be able to: **CO1:** Recognize the structure of operating system, interaction of an operating system and application programs. **CO2**: Analyze the various programming paradigms viz., multi-process and multi-threaded programming. **CO3**: Examine the various resource and memory management techniques. **CO4**: Distinguish the different features of real time and mobile operating systems. **CO5**: Identify current issues in system security; demonstrate various factors can influence the overall performance of an operating system.
TOPICS COVERED:

UNIT 1- Computer and Operating Systems Structure   11 Hours

Basic Elements, Processor Registers, Instruction Execution, The Memory Hierarchy, Cache Memory, I/O Communication Techniques, Introduction to Operating System, Mainframe Systems, Desktop Systems, Multiprocessor Systems, Distributed Systems, Clustered Systems, Real - Time Systems, Handheld Systems, Feature Migration, Computing Environments.
System Structures: System Components, Operating – System Services, System Calls, System Programs, System Structure, Virtual Machines, System Design and Implementation, System Generation

UNIT 2 - Process Management and Mutual Execution   10 Hours

Process, Process States, Process Description, Process Control, Execution of the Operating System, Security Issues, Processes and Threads, Symmetric Multiprocessing(SMP), Micro kernels, CPU Scheduler and Scheduling. Principles of Concurrency, Mutual Exclusion: Hardware Support, Semaphores, Monitors, Message Passing, Readers/Writes Problem.

UNIT 3 - Deadlock and Memory Management   11 Hours

Principles of Deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, An Integrated Deadlock Strategy, Dining Philosophers Problem Memory Management: Swapping, Contiguous Memory Allocation, Paging, Segmentation, Segmentation with Paging, Demand Paging, Process Creation, Page Replacement, Allocation of Frames, Thrashing

UNIT 4 - File System and Secondary Storage   10 Hours

File Concept, Access Methods, Directory Structure, File System Mounting, File Sharing, Protection, File – System Structure, File – System Implementation, Directory Implementation, Allocation Methods, Free–Space Management**,** Disk Structure, Disk Scheduling, Disk Management.

UNIT 5 - Computer Security and Case study of Linux Operating system   10 Hours

The Security Problem, User Authentication, Program Threats, System Threats. Linux System Linux history, Design Principles, Kernel modules, Process, management, scheduling, Memory management, File systems, Input and output, Inter-process communications.

TEXT BOOKS/REFERENCES:
TEXT BOOKS :   1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne: Operating System Principles, 8th edition, Wiley India, 2009.   2. William Stallings, "Operating System Internals and Design Principles" Pearson, 6thedition, 2012   REFERENCES: 1. Dhananjay M. Dhamdhere, "Operating Systems – A Concept – Based Approach", TataMcGraw – Hill, 3rd Edition, 2012.   2. Harvey M Deital: Operating systems, 3rd   Edition, Pearson Education, 1990.   3. Chakraborty , "Operating Systems" Jaico Publishing House, 2011
ADDITIONAL RESOURCES:
1. https://www.tutorialspoint.com/operating_system/os_linux   2. https://www.cs.uic.edu/~jbell/CourseNotes/OperatingSystems.

Course Code: IT-15
Course Name: Computer Networks

Credit Scheme			Evaluation Scheme				
Lecture	Practical	Credit	Internal			External	Total
			Written	Practical	Tutorial		
4 Hrs./Week	-	4	30	-	-	70	100

COURSE OUTCOMES:
Upon successful completion of this course, students will be able to: **CO1:** Analyze and distinguish the basic concepts, principles and techniques of data communication along with the layers of OSI and TCP/IP model. CO2: Independently understand and distinguish the concept of links, nodes and data transmission issues in the network. **CO3:** Capability to categorize wired LANs: Ethernet, IPv4 addresses and performance of The network-layer. **CO4:** Design and demonstrate the services of TCP and UDP. **CO5:** Ability to summarize and interpret the basic concepts of Application-Layer paradigms and standard client-server protocols.

TOPICS COVERED:

UNIT 1 - Basics of Data Communications and Physical Layer   10 Hours

Data Communications: Components, Data Representation, Data Flow, Networks; Network Criteria, Physical Structures, Network Types: LAN, WAN, Switching, Network Models: Protocol Layering: Principles of Protocol Layering, Logical Connections, TCP/IP Protocol Suite: Layered Architecture, Layers in the TCP/IP Protocol Suite, Encapsulation and Decapsulation, Addressing, Multiplexing and Demultiplexing, The OSI Model; OSI versus TCP/IP, Lack of OSI Model's Success, Introduction to Physical Layer, Data and Signals, Periodic Analog Signals, Digital Signals, Transmission Impairment, Data Rate Limits, Performance, Switching: Circuit-Switched Networks, Packet Switching, Datagram Networks, Virtual Circuit Networks.

UNIT 2 - Data Link Layer   10 Hours

Introduction to Data-Link Layer, Link-Layer Addressing: Address Resolution Protocol (ARP), Error Detection and Correction: Introduction, Types of Errors, Redundancy, Detection versus Correction, Coding, Block coding: Error Detection, Cyclic Code: Cyclic Redundancy Check,

Polynomials, Cyclic Code Analysis and its Advantages, Checksum, Forward Error Correction: Using Hamming Distance, Using XOR, Chunk Interleaving.

UNIT 3 - LANs and Network Layer 10 Hours

Ethernet Protocol, Standard Ethernet: Characteristics, Addressing, Access Method, Efficiency of Standard Ethernet, Implementation, Changes in the Standard, Fast Ethernet (100 MBPS): Access Method, Physical Layer, 10 Gigabit Ethernet, Introduction to Network Layer, Network- Layer Services: Packetizing, Routing and Forwarding, Packet Switching: Datagram Approach, Virtual-Circuit Approach, Network Layer Performance: delay Throughput, Packet loss, Congestion Control, IPv4 addresses.

UNIT 4 - Transport Layer   10 Hours

Introduction to Transport-Layer: Transport-Layer Services; Transport-Layer Protocols: Port Numbers, User Datagram Protocol: User Datagram, UDP Services, UDP Applications, Transmission Control Protocol: TCP Services, TCP Features, Segment, A TCP Connection, State Transition Diagram, Windows in TCP, Flow Control, Error Control, TCP Congestion Control, TCP Timers.

UNIT 5 - Application Layer and Standard Client-Server Protocols 12 Hours

Introduction to Application Layer, Services, Application-Layer Paradigms, Client-Server Programming: Application Programming Interface, Using Services of the Transport Layer, Iterative Communication using UDP, Iterative Communication using TCP, Concurrent Communication, World Wide Web and HTTP: FTP: Two Connections, Control Connection, Data Connection, Security for FTP, E-Mail: Architecture, Web-Based Mail, TELNET: Local versus Remote Logging, Secure Shell (SSH): Components, Applications, Domain Name System (DNS): Name Space, DNS in the Internet, Resolution, Caching, Resource Records, DNS Messages, Registrars, DDNS, Security of DNS.

TEXT BOOKS / REFERENCES:

Text books:
B. A. Forouzan, Data Communications and Networking, 5th Edition, McGraw Hill Education (India) Private Limited, 2013.

Reference books:
1. William Stallings, Data and Computer Communications, 10th Edition, Pearson, 2013.
2. Larry L. Peterson and Bruce S. David: Computer Networks – A Systems Approach, 5th Edition, Elsevier, 2011.
3. Andrew S. Tanenbaum, Computer Networks, Fourth Edition, PHI, 2008.

4. Fred Halsall, Data Communications, Computer Networks and Open Systems, 4th Edition, Pearson Education, 2005.

1. www.nptel.ac.in/courses
2. http://freevideolectures.com/Course/2276/Computer-Networks

Course Code: BT-11
Course Name: Management Information System

Credit Scheme			Evaluation Scheme				
Lecture	Practical	Credit	Internal			External	Total
			Written	Practical	Tutorial		
4 Hrs./Week	-	4	30			70	100

Course Description:

COURSE OUTCOMES:
Upon successful completion of this course, the student will be able to: CO1: Apply the different strategies for the management of business to formulate business process. CO2: Analyze the need for business process re-engineering, and the process of making. CO3: Analyze and examine business information needs to facilitate evaluation of strategic alternatives. CO4: Apply Management Information Systems knowledge and skills learned to facilitate the acquisition, development, deployment, and management of information systems. CO5: Effectively communicate strategic alternatives to facilitate decision-making.
TOPICS COVERED:

UNIT 1- Systems Engineering, Information and Knowledge   12 Hours

System concepts, system control, types of systems, handling system complexity, Classes of systems, General model of MIS, Need for system analysis, System analysis for existing system & new requirement, system development model, MIS & system analysis. Information concepts, classification of information, methods of data and information collection, value of information, information: A quality product, General model of a human as information processor, Knowledge, Introduction of MIS: MIS: Concept, Definition, Role of the MIS, Impact of MIS, MIS and the user, Management as a control system, MIS support to the management, Management effectiveness and MIS, Organization as system. MIS: organization effectiveness.

UNIT 2- Decision Making and DSS 10 Hours

Decision making concepts; decision making process, decision-making by analytical modeling, and Behavioral concepts in decision making, organizational decision-making, Decision structure, DSS components, and Management reporting alternatives
Technology of Information System : Introduction, Data processing, Transaction processing, Application processing, information system processing, TQM of information systems, Human factors & user interface, Strategic nature of IT decision, MIS choice of information technology.

UNIT 3- Electronic Business systems   10 Hours

Enterprise business system – Introduction, cross-functional enterprise applications, real world case, Functional business system, - Introduction, marketing systems, sales force automation, CIM, HRM, online accounting system, Customer relationship management, ERP, Supply chain management (real world cases for the above)
E-business Technology: Introduction to E-business, model of E-business, internet and World Wide Web, Intranet/Extranet, Electronic, Impact of Web on Strategic management, Web enabled business management, MIS in Web environment.

UNIT 4- Strategic Management of Business & Developing Business/IT Strategies /IT Solutions 10 Hours

Concept of corporate planning, Essentiality of strategic planning, Development of the business strategies, Type of strategies, short-range planning, tools of planning, MIS: strategic business planning. Planning fundamentals (real world cases), Organizational planning, planning for competitive advantage, (SWOT Analysis), Business models and planning. Business/IT planning, identifying business/IT strategies, Implementation Challenges, Change management., Developing business systems, (real world case), SDLC, prototyping, System development process, implementing business system .

UNIT 5: E-Commerce Introduction 10 Hours

Introduction to e-commerce, E-commerce Business Models and Concepts, Ecommerce Infrastructure: The Internet and World Wide Web, Web design, JavaScript Internet Information Server (IIS); Personal Web Server (PWS).
E-Commerce techniques and Issues: Introduction to Active Server Pages (ASP), Building an E-Commerce Web Site, E-Commerce Payment Systems, E-Commerce Marketing Techniques, Building product catalogue, Search product catalogue, Web Spider and search agent, Ethical, Social and Political Issues in E-Commerce.

TEXT BOOKS /REFERENCES:

Text Books :
1. Waman S Jhawadekar: Management Information System, 3rd Edition, Tata McGraw Hill.
2. James A O'Brien and George M Marakas: Management Information System, 7th Edition, Tata McGraw Hill, 2006
3. Turban, Rainer, and Potter, Introduction to E-Commerce, second edition, 2003
4. H. M. Deitel, P. J. Deitel and T. R. Nieto, E-Business and E-Commerce: How to Program, Prentice hall, 2001

Reference Books:
1. Ralph M Stair and George W Reynolds: Principles of Information Systems, 7th Edition, Thomson, 2010.
2. Steven Alter: Information Systems - The Foundation of E-Business, 4th Edition, Pearson Education, 2001
3. Elizabth Chang: E-Commerce Fundamentals and Applications, Wile India Edition.

ADDITIONAL LEARNING RESOURCES:
1. http://mbaexamnotes.com/management-information-system-notes
2. https://www.tutorialspoint.com/management_information_system

Course Code: MT-11
Course Name: Mathematical Foundations

Credit Scheme			Evaluation Scheme				
Lecture	Practical	Credit	Internal			External	Total
			Written	Practical	Tutorial		
4 Hrs./Week	-	4	30			70	100

COURSE OUTCOMES:
Upon successful completion of this course, students will be able to: **CO1:** Implement statistical measures and explore its applications   **CO2:** Analysis of computational errors and design of algorithms to solve a set of linear equations.   **CO3:** Applying the concepts of vector and linear functions in real time applications.   **CO4:** Apply the notion of relations on finite structures, like strings and analyze algorithms using the concept of functions.   **CO5:** Explore the properties of Graph theory and its applications in computer science.
TOPICS COVERED:

UNIT 1- Statistics   10 hours

Univariate data – different measures of location, dispersion, relative dispersion, skewness and kurtosis, Moments, Measures based on them – comparison with moment measures, Correlation and Regression Analysis.

UNIT 2 – Number Systems and Vector & Matrix Algebra   10 hours

Errors in Numerical Computations, Types of Errors, Analysis and Estimation of Errors, Vector Algebra: Vector spaces with real field, Basis and dimension of a vector space, Orthogonal vectors, Properties of Matrices and Determinants: Matrix Operations, Elementary Matrices, Inverse Matrix, Diagonal Matrix, Symmetric Matrix, and Determinant Matrix.

UNIT 3 - Linear Algebraic Systems 11 hours

Numerical methods for Linear Systems, Direct Methods for Linear Systems: Cramer's Rule, Gauss Elimination Method, Gauss Jordan Elimination Method, Pivoting Strategies, Gauss- Jordon Method, LU Decomposition Method, Tridiagonal Systems of Linear Equations, Iterative Methods

for Solving Linear Systems, Jacobis Iteration Method, Gauss-Seidel Iterative Method, Convergence Criteria, Eigen Values and Eigen Vectors.

UNIT 4 – Relations and Functions   10 hours

Cartesian products and Relations, Properties of Relations, Functions: Plain and One-to-One, Onto Functions: Stirling Numbers and the Second Kind, Special functions, The Pigeon-hole principle, Function composition and inverse functions.

UNIT 5 - Graph Theory   11 Hours

Definitions and Examples, Subgraphs, Complements, and Graph Isomorphism, Vertex Degree: Euler Trails and Circuits, Planar Graphs, Hamilton Paths and Cycles, Graph Coloring and Chromatic Polynomials.

TEXT BOOKS / REFERENCES:

TEXT BOOKS :
1. Sant Sharan Mishra, "Computer Oriented Numerical and Statistical Methods", PHI Learning Private Limited, 2013.
2. Rizwan Butt, "Introduction to Numerical Analysis Using Matlab", Infinity Science Press LLC, 2008
3. Ralph P Grimaldi, B.V.Ramana, "Discrete & Combinatorial Mathematics, An Applied Introduction" 5th Edition, Pearson Education, 2009.

REFERENCES:
1. D.S. Chandrasekharaiah, Discrete Mathematical Structures, 4th Edition, PRISM Pvt. Ltd. 2012.
2. Bondy and U.S.R.Murty: Graph Theory and Applications (Freely downloadable from Bondy's website; Google-Bondy)
3. S. Kumarsean, "Linear Algebra A geometric approach", Prentice Hall of India Private Limited, 2001
4. Kenneth H Rosen, "Discrete Mathematics & its Applications" 7th edition, McGraw- Hill, 2010.

ADDITIONAL LEARNING SOURCES:
1. http://www.personal.kent.edu/~rmuhamma/GraphTheory/graphTheory.htm
2. http://www.tutorialspoint.com/discrete_mathematics/
3. http://nptel.iitm.ac.in/
4. http://www.maths.lu.se/english/library/e-resources/
5. http://sunzi.lib.hku.hk/ER/detail/hkul/3743848
6. https://www.**math**.ucdavis.edu/~**linear/linear**-guest.pd

Course Code: IT11L
Course Name: Java Programming Practicals

Credit Scheme			Evaluation Scheme				
Lecture	Practical	Credit	Internal			External	Total
			Written	Practical	Tutorial		
--	3 Hrs./Week	1		50		50	100

Upon successful completion of this course, students will be able to:

CO1: Demonstrate and implement programs using components and constructs of a Java language
CO2: Identify classes, objects, members of a class and exhibit use packages and interfaces appropriately.
CO3: Demonstrate for Java program for multithread, synchronization and exception handling concepts.
CO4: Use the concept of string, event handling, simple data structures like arrays and members of classes of Java API in application development
CO5: Design and develop Java based UI and Networking applications using applets, swing components and networking concepts.

LIST OF PROGRAMS TO BE COVERED:
1. Display Hello world
2. Check entered number is ODD or EVEN
3. Find factorial of number
4. Find the sum of the digits of a given number
5. Swap two numbers without using a temporary variable
6. Accept a name and display the name with greeting message using Class.
7. Generate a salary for an employee using class, object, constructors, methods and access control. Different parameters to be considered are Emp_No, Emp_Name, Age, Basic, DA, HRA, CA, PT, IT.
8. Generate a sales report for a sales executive using class, object, constructors, methods and access control. Different parameters to be considered are Emp_No, Emp_Name, Sales_Q1, Sales_Q2, Sales_Q3, Sales_Q4.
9. Demonstrate Constructor Overloading and Method Overloading.
10. Implement Inner class and demonstrate its Access protection.
11. Write a program in Java for String handling which performs the following:
    a. Checks the capacity of String Buffer objects.
    b. Reverses the contents of a string given on console and converts the resultant string in upper case.
    c. Reads a string from console and appends it to the resultant string of ii.
12. Demonstrate Inheritance.

13. Simple Program on Java for the implementation of Multiple inheritance using
    a. interfaces to calculate the area of a rectangle and triangle.
14. Write a JAVA program which has
    a. A Class called Account that creates account with 500Rs minimum balance, a deposit() method to deposit amount, a withdraw() method to withdraw amount and also throws Less Balance Exception if an account holder tries to withdraw money which makes the balance become less than 500Rs.
    b.   A Class called Less Balance Exception which returns the statement that says withdraw amount (Rs) is not valid.
    c.   A Class which creates 2 accounts, both account deposit money and one account tries to withdraw more money which generates a Less Balance Exception take appropriate action for the same.
15. Write a JAVA program using Synchronized Threads, which demonstrates Producer Consumer concept.
16. Write a JAVA program to implement a Queue using user defined Exception Handling (also make use of throw, throws.).
17. Complete the following:
    a. Create a package named shape.
    b. Create some classes in the package representing some common shapes like Square,
    c. Triangle and Circle. Import and compile these classes in other program.
18. Write a JAVA Program
    a. Create an enumeration Day of Week with seven values SUNDAY through SATURDAY. Add a method is Workday( ) to the Day of Week class that returns true if the value on which it is called is MONDAY through FRIDAY. For example, the call Day Of Week SUNDAY is Workday ( ) returns false.
19. Write a JAVA program which has
    a. A Interface class for Stack Operations
    b. A Class that implements the Stack Interface and creates a fixed length Stack.
    c. A Class that implements the Stack Interface and creates a Dynamic length Stack.
    d. A Class that uses both the above Stacks through Interface reference and does the Stack operations that demonstrates the runtime binding.
20. Print a chessboard pattern.
21. Write a JAVA Program which uses File Input Stream / File Output Stream Classes.
22. Demonstrate utilities of Linked List Class.
23. Write a JAVA applet program, which handles keyboard event.
24. Write a JAVA Swing program, to design a form.
25. Create a simple Student Registration application using Swings, JDBC and MySQL.
26. Write a JAVA program which uses Datagram Socket for Client Server Communication.

TEXT BOOKS / REFERENCES:

Text books:

1. Herbert Schildt. Java - The Complete Reference, Ninth Edition. Oracle Press, McGraw Hill Education (India) Edition- 2014.

Reference books:
1. Cay S. Horstmann, Gary Cornell. Core Java, Core Java Volume-1 – Fundamentals, 9th edition, Pearson Education, 2014.
2. Timothy Budd, "Understanding Object-oriented programming with Java", Updated Edition, Pearson Education, 2000.

ADDITIONAL LEARNING SOURCES:
1. http://www.oracle.com/technetwork/java/index-jsp-135888.html
2. http://www.javaworld.com/article/2074929/core-java
3. http://www.javaworld.com/
4. http://www.learnjavaonline.org/
6. https://www.codecademy.com/learn/learn-java
7. http://www.tutorialspoint.com/java/
8. http://www.java-examples.com/
5. http://www.homeandlearn.co.uk/java/java.html

Course Code: IT12L
Course Name: Data Structure and Algorithms Practicals

Credit Scheme			Evaluation Scheme				
Lecture	Practical	Credit	Internal			External	Total
			Written	Practical	Tutorial		
--	3 Hrs./Week	1		50		50	100

COURSE OUTCOMES:
Upon successful completion of this course, the student will be able to: CO1:   Design and analyze programming problem statements. CO2:   Choose appropriate data structures and algorithms, understand the ADT/libraries, and use it to design algorithms for a specific problem. CO3:   Apply mathematical abstraction to solve problems. CO4:   Demonstrate various methods of organizing large amounts of data. CO5:   Analyze algorithms and to determine algorithm correctness and time efficiency class.
LIST OF EXPERIMENTS COVERED:

PROGRAMS ON C.
1. Programs to learn and explore C data types, looping and decision making structures. {mean, median, lcm, gcd, min max}
2. Calculate the salary of an employee given his basic pay, HRA = 10% of basic pay, TA=5% of his basic pay and deductions IT = 2.5% of his basic pay.
3. Solve quadratic equations to find the roots of the equation.
4. Programs to implement arrays and structures.{Ex: Students marks calculation, matrix operations}
5. Calculate the average marks of the student test marks and display the result using structure.
6. Programs to implement dynamic memory allocation: malloc, calloc, realloc and free.

STACK
7. Write a C program to evaluate the validity of an expression
8. Write a C program to evaluate a postfix expression.
9. Write a C program to convert an expression from infix to postfix.
10.   Write a C program to implement multiple stack of integers.

QUEUES
11.   Write a C program to perform basic operations on queue of integers, the program should provide the appropriate message to handle all concerned conditions
12.   Write a C program to perform basic operations on list of students information stored in circular queue.

Let student information include regno, course title, year of study

13.   Write a C program to implement dual queue.

LINKED LIST

14.   Write a C program to implement stack operations using linked list.
15.   Write a C program to implement queue operations using linked list.
16.   Write a C program to create the students mark list based on the rank. Let the student record contain student-id, name, total marks.

17.   Write a C program to perform operations.
 a. Creation of list.
 b. Insertion of new element [At Front, from rear, based on the position]
 c. Deletion of a node [At Front, from rear, based on the position]
 d. Display the list.
 e. Replace the content of one element by another element.
 f. Swap two nodes

18. Write a C program to perform the following operations on doubly linked list.
 a. Creation of list by :
Insertion [At beginning, At end, In between] Deletion [At beginning, At end, In between]
 b. Display all the nodes.
 c. Swap two nodes based on specific criteria.

TREES

19. Write a C program to perform / implement the binary tree using array and hence perform the following
 a. To print the left and right child of specified node
 b. To print all the ancestors of a specified node
 c. To print all the node in a specific level
 d. To print only the leaf node

20. Write a C program to perform / implement the binary tree using linked list and hence perform the following
 a. To print the left and right child of specified node
 b. To print all the ancestors of a specified node
 c. To print all the node in a specific level
 d. To print only the leaf node

21. Write a C program with recursive routines to traverse the binary tree in all possible orders
 a. Create a tree
 b. Pre-Order traversal
 c. In-Order traversal
 d. Post-Order traversal

22. Write a C program to construct a heap of n integers and hence sort them using heap sort Algorithm

23. Implement the search techniques
   a. Linear Search
   b. Binary Search

Text Books :
   1. Programming in ANSI C, Third Edition, E. Balaguruswamy. 6th Edition (2013).
   2. Data Structures Using C and C++ by Aaron.M. Tenenbaum, Yedidyah Langsam and Moshe J. Augustine , PHI, Edition, 2011.

Reference Books :
   1. Data structures, Algorithms and Applications in C++, S. Sahani, University Press (India) Pvt Ltd, 2nd Edition.
   2. The complete reference C, Herbert Schildt, Fifth Edition, Tata McGraw Hill.

1. http://www.tutorialspoint.com/Data-Structures-in-C -Online-Training/classid=13
2.http://nptel.ac.in/datastructures_c

Semester II

Course Code: IT-21
Course Name: Python Programming

Credit Scheme			Evaluation Scheme				
Lecture	Practical	Credit	Internal			External	Total
			Written	Practical	Tutorial		
4 Hrs./Week	-	4	30			70	100

COURSE OUTCOMES:
Upon successful completion of this course, students will be able to: CO1:   Design and apply a solution clearly, accurately in a program using python. CO2:   Comprehend and Apply knowledge in real time situational problems and think creatively about solutions. CO3:   Apply the best features of mathematics, engineering and natural sciences to program using python. CO4:   Apply object-oriented programming concepts to develop dynamic interactive Python applications. CO5:   Demonstrate how to build and package python modules for reusability.
TOPICS COVERED:

UNIT 1 - Introduction to Python   10 Hours

Python Basics: Data Types, Operators, Input/Output Statements, Creating Python Programs, Python Flow Control statements: Decision making statements, Indentation, Conditionals, loops, break, continue, and pass statements. Strings, lists, Tuples, Dictionaries

UNIT 2 - Python Functions   10 Hours

Defining functions, DOC strings, Function parameters: default, keyword required and variable length arguments, key-word only parameters, local and global variables, pass by reference versus value, Anonymous functions, Recursion. Functional Programming:
Mapping, Filtering and Reduction, Lambda Functions, List Comprehensions.

UNIT 3 - Object Oriented Programming   10 Hours

Definition and defining a class, Constructor, Destructor, self and del keywords, Access to Attributes and Methods, geattr and hasattr attributes, Data Attributes and Class Attributes, Data Hiding, Inheritance, Static Members. Regular Expressions: Defining Regular Expressions and String Processing.

UNIT 4 - File Handling and Python GUI Programming   10 Hours

File object attributes, Read and Write into the file, Rename and Delete a File, Exceptions Handling: Built-in Exceptions and User defined Exceptions GUI Programming, Introduction to Python GUI Programming, Tkinter Programming, Tkinter widgets, Events and Bindings

UNIT 5 - Working with Django   12 Hours

Rendering Templates into HTML and Other Formats, Understanding Models, Views, and Templates, Separating the Layers (MVC) - Models, Views, Templates, Overall Django Architecture, Defining and Using Models, Using Models, Templates and Form Processing, Setting up the Database, Using a Database Server, Using SQLite, Creating the Tables

TEXT BOOKS / REFERENCES:
Text books:
1. Timothy A. Budd: Exploring Python, Tata McGraw-Hill, 2011.

2. Jeff Forcier, Paul Bissex, Wesley Chun: Python Web Development with Django, Addison-Wesley, 2008.

Reference books:
1. Ascher, Lutz: Learning Python, 4th Edition, O'Reilly, 2009.
2. Wesley J Chun: Core Python Applications Programming, Pearson Education, 3rd Edition, 2013.
3. Paul Gries, Jennifer Campbell, Jason Montojo , Practical Programming: An introduction to Computer Science Using Python, second edition, Pragmatic Bookshelf.
4. Allen Downey , Jeffrey Elkner , Learning with Python: How to Think Like a Computer Scientist Paperback –, 2015

ADDITIONAL LEARNING SOURCES:
http://www.network-theory.co.uk/docs/pytut/ http://docs.python.org/tutorial/
http://zetcode.com/tutorials/pythontutorial/ http://www.sthurlow.com/python/
http://www.tutorialspoint.com/python/ http://www.djangoproject.com/
http://www.djangobook.com/

Course Code: IT-22
Course Name: Software Architecture

Credit Scheme			Evaluation Scheme				
Lecture	Practical	Credit	Internal			External	Total
			Written	Practical	Tutorial		
4 Hrs./Week	-	4	30			70	100

COURSE OUTCOMES:

Upon successful completion of this course, the student will be able to:
CO1: Comprehend the need and importance of software architectures.
CO2: Differentiate various architectural styles based on requirement.
CO3: Implement system qualities during architecture development for the application.
CO4: Apply pattern oriented architecture by understanding patterns and their descriptions.
CO5: Design and document the software architecture.

TOPICS COVERED:

UNIT 1 - Introduction, Architectural Styles 12 Hours

The Architecture Business Cycle: Where do architectures come from? Software processes and the architecture business cycle; What makes a "good" architecture? What software architecture is and what it is not; Other points of view; Architectural patterns, reference models and reference architectures; Importance of software architecture; Architectural structures and views.
Architectural styles; Pipes and filters; Data abstraction and object-oriented organization; Event-based, implicit invocation; Layered systems; Repositories; Interpreters; Process control; Other familiar architectures; Heterogeneous architectures.

UNIT 2 - Understanding and Achieving Quality Attributes 10 Hours

Functionality and architecture; Architecture and quality attributes; System quality attributes; Quality attribute scenarios in practice; Other system quality attributes; Business qualities; Architecture qualities.
Achieving Quality: Introducing tactics; Availability tactics; Modifiability tactics; Performance tactics; Security tactics; Testability tactics; Usability tactics; Relationship of tactics to architectural patterns; Architectural patterns and styles.

UNIT 3 - Architectural Patterns – From Mud to Structures, Distributed Systems   12 Hours
Introduction: From mud to structure: Layers, Pipes and Filters, Blackboard. Distributed Systems: Broker; Interactive Systems: MVC, Presentation-Abstraction-Control.

UNIT 4 - Adaptable Systems & Other systems   08 Hours

Adaptable Systems: Microkernel; Reflection. Structural decomposition: Whole – Part; Organization of work: Master – Slave; Access Control: Proxy.

UNIT 5 - Designing and Documenting Software Architecture   10 Hours

Architecture in the life cycle; Designing the architecture; Forming the team structure; Creating a skeletal system. Uses of architectural documentation; Views; Choosing the relevant views; Documenting a view; Documentation across views.

TEXT BOOKS / REFERENCES:

1. Len Bass, Paul Clements, Rick Kazman: Software Architecture in Practice, 3d Edition, Pearson Education, 2013.
2. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal: Pattern-Oriented Software Architecture, A System of Patterns, Volume 1, John Wiley and Sons, 2012.
3. Mary Shaw and David Garlan: Software Architecture -Perspectives on an Emerging Discipline, Prentice Hall of India, 2010.

Reference books:

1. Richard N. Taylor, Nenad Medvidovic and Eric M. Dashofy: Software Architecture: Foundations, Theory, and Practice, Wiley- India 2012.

ADDITIONAL LEARNING SOURCES:
1. http://www.sei.cmu.edu/architecture/
2. http://handbookofsoftwarearchitecture.com/
3. https://leanpub.com/software-architecture-for-developers/read
4. http://www.hillside.net/patterns/

Course Code: MT-21
Course Name: Optimization Techniques

Credit Scheme			Evaluation Scheme				
Lecture	Practical	Credit	Internal			External	Total
			Written	Practical	Tutorial		
4 Hrs./Week	-	4	30			70	100

Prerequisite: Basic mathematical knowledge is essentials.

Course Objectives:
1. To understand the role and principles of optimization techniques in business world.
2. To understand the process of problem statement formulation of the business scenario.
3. To understand the implementation of various decision-making techniques in the process of decision making.
4. To gain the techniques and skills on how to use optimization techniques to support the decision making in business world.

Course Outcomes:
Student will be able to
CO1: Understand the role and principles of optimization techniques in business world (Understand)
CO2: Demonstrate specific optimization technique for effective decision making (Apply)
CO3: Apply the optimization techniques in business environments (Apply)
CO4: Illustrate and infer for the business scenario (Analyze)
CO5: Analyze the optimization techniques in strategic planning for optimal gain. (Analyze)

UNIT 1 Linear Programming   10 Hours

Various definitions, statements of basic theorems and properties, Advantages and Limitations application areas of Linear programming ,Linear Programming – Concept
Formulation of Linear programming, Solution of LPP using Graphical method
Simplex Method and Problems, Two Phase Simplex Method and problems

UNIT 2 Markov Chains & Simulation Techniques: 12 Hours

Markov chains: Applications related to technical functional areas,
Steady state Probabilities and its implications, Decision making based on the inferences   Monte Carlo Simulation. Application of Markov chain in Queuing theory, Simulation techniques used in Machine learning and bioinformatics.

UNIT 3 Sequential model and related Problems   10 Hours

        Processing n jobs through 2 machines ,Processing n jobs through 3 machines
Processing n jobs through m machine. PERT and CPM: Basic differences between PERT and
CPM. Network diagram:Time estimates (Forward Pass Computation, Backward Pass
Computation ,Critical Path,Probability of meeting scheduled date of completion, Calculation
on CPM network. Various floats for activities, Event Slack: calculation on PERT network.
Application of schedule based on cost analysis and crashing Case study-based problems

UNIT 4 Game Theory   12 Hours

Introduction,n X m zero sum game with dominance ,Solution using Algebraic, Arithmetic
and Matrix strategy
Decision Analysis
        Introduction to Decision Analysis, Types of Decision-making environment
Decision making under uncertainty and under   risk, Concept of Decision Tree.

 Text Books:
 1. Operations Research by Pannerselvam
 2. Operations Research Theory and Application by J. K. Sharma –Mac-Millan Publication
 3. Statistical and Quantitative Methods – Mr. Ranjit Chitale

Reference Books:
    1. Statistical Methods – S.P.Gupta, Sultan Chand, New Delhi
    2. Operation Research by V. k. Kapoor
    3. Operations Research by Kanti Swaroop, P. K. Gupta and Man Mohan
    4. Introduction to Operations Research by Hiller & Lieberman, Tata Mc Graw Hill
    5. Operations Research by H. A. Taha
    6. Operation Research by Hira & Gupta
    7. What is Game Theory?, David K. Levine, Economics, UCLA

Practicals to be conducted on the following topics. It is expected that, Applications to be
covered using Python and /or R
        1. Linear Programming
        2. Markov Chain and Simulation Techniques
        3. Sequential models and related problems
        4. CPM and PERT
        5. Game Theory
        6. Decision Analysis

Course Code: IT-23
Course Name: Advanced Internet Technologies

Credit Scheme			Evaluation Scheme				
Lecture	Practical	Credit	Internal			External	Total
			Written	Practical	Tutorial		
4 Hrs./Week	-	4	30	-	-	70	100

Course Description:

Course Outcomes:

Student will be able to
CO1: Outline the basic concepts of Advance Internet Technologies (Understand)
CO2: Design appropriate user interfaces and implements webpage based on given problem Statement (Apply)
CO3: Implement concepts and methods of NodeJS (Apply)
CO4: Implement concepts and methods of Angular (Apply)
CO5: Build Dynamic web pages using server-side PHP programming with Database Connectivity (Apply)

Course Structure:

UNIT 1 Introduction to HTML5
Basics of HTML5 – Introduction, features, form new elements, attributes and semantics in HTML5, <canvas>, <video>, <audio>.
Introduction to Scalable Vector Graphics (SVG), Introduction to Version compatibility Installation of Apache Tomcat (Xampp/Lampp/MySQL)

UNIT 2 Introduction to CSS3
Architecture of CSS, CSS Modules, CSS Framework, Selectors and Pseudo Classes, Fonts and Text Effects, Colors, Background Images, and Masks, Transitions, Transforms and Animations Embedding Media, Gradients, Bootstrap

UNIT 3 Node JS
        introduction and how it works, installation of node js, REPL, NPM, How modules work, Webserver Creation, Events
Extra Reading: Node.js with MySQL

UNIT 4 Angular (Latest Stable Version)

Introduction (Features and Advantage), Type Script , Modules, Components, Directives, Expression, Filters, Dependency Injection, Services, Routing, SPA (Single Page Application)

UNIT 5 PHP

Installing and Configuring PHP

Introduction, PHP and the Web Server Architecture, PHP Capabilities, PHP and HTTP, Environment Variables, Variables, Constants, Data Types, Operators
Working with Arrays, Decision Making, Flow Control and Loops, Introduction to Laravel, Creating a Dynamic HTML Form with PHP, Database Connectivity with MySQL, Performing basic database operations (CRUD), Using GET, POST, REQUEST, SESSION, and COOKIE Variables
Extra Reading: Sending Emails, PHP with AJAX and XML, Payment Gateway Integration

Text Books:
1. Complete reference HTML, TMH
2. HTML5 & CSS3, Castro Elizabeth 7th Edition
3. Beginning Node.js by Basarat Ali Syed
4. Angular: Up and Running- Learning Angular, Step by Step by Shyam   Seshadri
5. Beginning PHP, Apache, MySQL web development Reference Books
6. Introducing HTML5 - Bruce Lawson, Remy Sharp
7. Node.js in Action, 2ed by Alex Young, Bradley Meck
8. Mastering Node.js by Pasquali Sandro
9. Angular Essentials by Kumar Dhananjay Complete Ref. PHP

Course Code: IT-24
Course Name: Advanced DBMS

Credit Scheme			Evaluation Scheme				
Lecture	Practical	Credit	Internal			External	Total
			Written	Practical	Tutorial		
4 Hrs./Week	-	4	30		-	70	100

Course Description:

1. Introduction DBMS – Concepts & Architectures

Database and Need for DBMS, Characteristics of DBMS
Database 3-tier schema (ANSI/SPARC) and system architecture of DBMS
Views of data- Schemas and instances, Data Independence
Centralized, Client-Server system, Transaction servers, Data servers, Cloud based servers
Indexing and Hashing - Basic concepts of indexing, ordered index, B+ tree index, B+ tree extensions, Multiple key access, Hashing concepts, types of hashing, Bitmap indices.

2. Data Modelling and Relational Database Design

Data Modelling using ER Diagram: Representation of Entities, Attributes, Relationships and their Type, Cardinality, Generalization, Specialization, Aggregation.
Relational data model: Structure of Relational Database Model, Types of keys, Referential Integrity Constraints, Codd's rules, Database Design using E-R, E-R to Relational
Normalization – Normal forms based on primary (1 NF, 2 NF, 3NF, BCNF)
Note: Case studies based on E-R diagram & Normalization

Extra Reading: Database languages - Relational Algebra, Relational database languages, Data definition in SQL, Views and Queries in SQL, Joins, specifying constraints and Indexes in SQL, Specifying constraints management systems Postgres/ SQL/MySQL.

3. Transaction and Concurrency control

Concept of transaction, ACID properties, States of transaction
Concurrency control, Problems in concurrency controls
Scheduling of transactions, Serializability and testing of serilaizibity
Lock-based Protocol and Time stamp-based ordering protocols, Deadlock Handling

4. Parallel Databases

Introduction to Parallel Databases, Parallel Database Architectures
I/O parallelism, Inter-query and Intra-query parallelism
Inter-operational and Intra-operational parallelism
Key elements of parallel database processing: Speed-up, Scale-up Synchronization and Locking

5. Distributed Databases

Introduction to Distributed Database System, Homogeneous and Heterogeneous Databases, Distributed data storage (Fragmentation and Replication), Distributed transactions, Concurrency control schemes in DDBMS
Commit protocols 2 phase and 3 Phase Commit Protocol

6. Object Oriented Databases & Applications

Overview of Object- Oriented Database concepts & characteristics
Database design for OODBMS – Objects, OIDs and reference type
Spatial data and Spatial indexing (Any two techniques)
Mobile Database: Need, Structure, Features, Limitations and Applications
Temporal databases, temporal aspects valid time, transaction time or decision time
Multimedia Database: Architecture, Type and Characteristics.

7. Crash Recovery and Backup, Failure classifications, Recovery & Atomicity, Log based recovery, Checkpoint and Shadow Paging in Data recovery, Database backup and types of backups

8. Security and Privacy

Database security issues,Discretionary access control based on grant & revoking privilege,Mandatory access control and role-based access control for multilevel security, Encryption & public key infrastructures

9. NO-SQL Database
Introduction, Types of NOSQL, Need of NoSQL databases, Use Cases

Recommended Books:
1. Introduction to database systems C.J. Date, Pearson.
2. Fundamentals of Database Systems by Elmasri Navathe
3. Principles of Database Management James Martin, PHI
4. Database System Concepts by Abraham Silberschatz, H. Korth, Sudarshan

Reference Books:

Database Management System by Raghu Ramakrishnan / Johannes Gherke

Database Management System (DBMS)A Practical Approach. By Rajiv Chopra

Database system practical approach to design, implementation & management by Connoly & Begg,

NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence   Martin Fowler

List of Practicals (if any)

To install and configure database software (ORACLE/MYSQL)

To design a database (logical & physical database)

To Perform all SQL operations and queries on designed physical database

To install and configure NO-SQL database and practice for core operations

To perform experiments on database crash and recovery

To perform experiments on database Backup – restoring operations on database server

To perform some operations on Object oriented databases

Course Code: IT-25
Course Name: Analysis and Design of Algorithms

Credit Scheme			Evaluation Scheme				
Lecture	Practical	Credit	Internal			External	Total
			Written	Practical	Tutorial		
4 Hrs./Week	-	4	30		-	70	100

COURSE OUTCOMES:
Upon successful completion of this course, students will be able to: **CO 1:** Apply object oriented techniques to solve bigger computing problems **CO 2:** Explore the knowledge of computational complexity, approximation and randomized algorithms **CO 3:** Analyze the range of the algorithm and the notion of tractable and intractable problems **CO 4:** Design and analyze a wide range of searching and sorting algorithms **CO 5:** Implementation of graph and matching algorithms
TOPICS COVERED:

UNIT 1 - Introduction and overview of C++ Programming 12 Hours

C++ Class Overview- Class Definition, OOPs concepts ,Objects, Class Members, Access Control, Class Scope, Inheritance and Polymorphism ,Constructors and destructors, parameter passing methods, Inline functions, static class members, this pointer, friend functions, dynamic memory allocation and deallocation (new and delete), Exception handling.

UNIT 2 - Introduction and the fundamentals of the Analysis of Algorithm Efficiency 12 Hours

Notion of Algorithm, Fundamentals of Algorithmic Problem Solving, Important Problem Types, Fundamental data Structures. Analysis Framework, Asymptotic Notations and Basic efficiency classes, Mathematical analysis of Recursive and Non-recursive algorithms, Examples

UNIT 3 - Brute Force and Divide and Conquer   10 Hours

Selection Sort and Bubble Sort, Sequential Search and String Matching, Exhaustive Search, Merge- sort, Quick-sort, Binary Search, Binary tree Traversals and related properties.

UNIT 4 - Decrease-and-Conquer, Transform-and-Conquer 10 Hours

Insertion Sort, Depth First search and Breadth First Search, Topological sorting, Algorithms for Generating Combinatorial Objects. Presorting, Balanced Search Trees, Heaps and Heap sort, Problem Reduction.

UNIT 5 - Space and Time Tradeoffs and Dynamic Programming   10 Hours

Sorting by Counting, Input Enhancement in String Matching, Computing a binomial coefficient, Warshall's and Floyd's Algorithms, The Knapsack Problem and Memory Functions.

Text Book:
1. Anany Levitin: Introduction to the Design and Analysis of Algorithms, Pearson
     Education, 2003.
2. Herbert Scheldt: The Complete Reference C++, 6th Edition, Tata McGraw Hill
   2013.

References:
1. Coremen T.H., Leiserson C.E., and Rivest R.L.: Introduction to Algorithms, PHI,
   1998.
2. Horowitz E., Sahani S., Rajasekharan S.: Computer Algorithms, Galgotia
   Publications, 2001.

ADDITIONAL LEARNING SOURCES:
1. https://www.tutorialspoint.com/data_structures_algorithms/
2. http://nptel.ac.in/courses/106101060/

Course Code: IT-21L
Course Name: Practicals

Credit Scheme			Evaluation Scheme				
Lecture	Practical	Credit	Internal			External	Total
			Written	Practical	Tutorial		
-	10 Hrs./Week	5	-	75	-	50	125

Course Description:

This Practical course contains 2 sections. –
1. List of Practicals – Python Programming
2. List of Practicals – Advanced Internet Technologies

Course Outcomes:
Student will be able to
CO1: implement python programming concepts for solving real life problems. (Apply)
CO2: Implement Advanced Internet Technologies (Apply)

Course Structure:
List of Practicals – Python Programming
Note:
- Recommended IDE for python – IDLE
- Exception handling concepts should be used with file handling programs.
    1. Python installation and configuration with windows and Linux
    2. Programs for understanding the data types, control flow statements, blocks and loops
    3. Programs for understanding functions, use of built in functions, user defined functions
    4. Programs to use existing modules, packages and creating modules, packages
    5. Programs for implementations of all object-oriented concepts like class, method, inheritance, polymorphism etc. (Real life examples must be covered for the implementation of object- oriented concepts)
    6. Programs for parsing of data, validations like Password, email, URL, etc.
    7. Programs for Pattern finding should be covered.
    8. Programs covering all the aspects of Exception handling, user defined exception, Multithreading should be covered.
    9. Programs demonstrating the IO operations like reading from file, writing into file from different file types like data file, binary file, etc.
    10. Programs to perform searching, adding, updating the content from the file.
    11. Program for performing CRUD operation with MongoDB and Python

12. Basic programs with NumPy as Array, Searching and Sorting, date & time and String handling
13. Programs for series and data frames should be covered.
14. Programs to demonstrate data pre-processing and data handling with data frame
15. Program for data visualization should be covered.

List of Practicals – Advanced Internet Technologies

1. Program to implement Audio and Video features for your web page.
2. Program to design form using HTML5 elements, attributes and Semantics.
3. Programs using Canvas and SVG.
4. Programs to demonstrate external and internal styles in the web page using font, text, background, borders, opacity and other CSS 3 properties.
5. Implement Transformation using Translation, Rotation and Scaling in your web page.
6. Program to show current date and time using user defined module
7. Program using built-in modules to split the query string into readable parts.
8. Program using NPM which will convert entered string into either case
9. Write a program to create a calculator using Node JS. (Install and configure Node JS and Server)
10. Write Program for Form validation in Angular.
11. Program to demonstrate the ngif, ngfor, ngswitch statements.
12. Create angular project which will demonstrate the usage of component directive, structural directive and attribute directives
13. Create angular project which has HTML template and handle the click event on click of the button (Installation of Angular and Bootstrap 4 CSS Framework)
14. Program for basic operations, array and user interface handling.
15. Program to demonstrate session management using various techniques.
16. Program to perform the CRUD Operations using PHP Script.

Course Code: ET-21
Course Name: Artificial Intelligence and Robotics

Credit Scheme			Evaluation Scheme				
Lecture	Practical	Credit	Internal			External	Total
			Written	Practical	Tutorial		
4 Hrs./Week	-	4	30		-	70	100

Upon successful completion of this course, students will be able to:

CO1: Find appropriate idealizations for converting real world problems into AI problems formulated using the appropriate search algorithm.
CO2: Formulate and implement the appropriate search algorithms to find the solutions for real time and heuristics problems.
CO3: Represent and debug knowledge in an appropriate first order logic representation with the understanding of the fundamentals of knowledge representation.
CO4: Choose and Implement the appropriate algorithms for a real world supervised learning problem.
CO5: Inculcate the basic knowledge of Robotics along with the Artificial Intelligence

TOPICS COVERED:

UNIT: 1 – Introduction to AI, Informed Search and Exploration   10 Hours

Intelligent Agents: Agents and environment; Rationality; the nature of environment; the structure of agents. Problem-solving: Problem solving agents; Example problems; Searching for solution; uninformed search strategies.
Informed search strategies; Heuristic functions; On-line search agents and unknown environment.

UNIT: 2 - Constraint Satisfaction, Adversial Search, Logical Agent   10 Hours

Constraint satisfaction problems; Backtracking search for CSPs. Adversial search: Games; Optimal decisions in games; Alpha-Beta pruning.Knowledge-based agents; The wumpus world as an example world; Logic; propositional logic Reasoning patterns in propositional logic; Effective propositional inference; Agents based on propositional logic.

UNIT: 3 - First-Order Logic, Inference in First-Order Logic: 12
Hours

Representation revisited; Syntax and semantics of first-order logic; Using first-order logic; Knowledge engineering in first-order logic. Propositional versus first-order inference; Unification and lifting; Forward chaining; Backward chaining; Resolution.

UNIT: 4 - Knowledge Representation and Learning, AI: Present and Future   10 Hours

Ontological engineering; Categories and objects; Actions, situations, and events; Mental events and mental objects; The Internet shopping world; Reasoning systems for categories; Reasoning with default information; Truth maintenance systems.
Learning: Forms of Learning; Inductive learning; Learning decision trees; Ensemble learning; Computational learning theory. AI: Present and Future: Agent components; Agent architectures; Are we going in the right direction? What if AI does succeed? Game theory.

UNIT: 5 – Introduction to Robotics :   10 Hours

Introduction; Robot Hardware: sensors and Effectors; Robotic Perception: localization, mapping, other types of perception; Planning to Move: configuration space, cell decomposition methods and skeletonization methods; Planning uncertain movements: robust methods; Moving: dynamics and control, potential field control and reactive control; Robotic Software: architectures, subsumption architecture , three-layer architecture and robotic programming languages ; Application domains.

TUTORIALS:
    1. Program to design tic-tac-toe game.
    2. Program for breadth first and depth first search.
    3. Program to N-Queeens Problem.
    4. To implement max-min problem.
    5. To implement simulated Annealing Algorithm.
    6. Write a program to implement A* program.
    7. To implement Hill-Climbing Algorithm.

Text Book / References:
Text Book:
1. Stuart Russel, Petr Norvig: Artificial Intelligence A Modern Approach, 2nd Edition,
Pearson Education, 2003.

References:
    1. Elaine Rich, Kevin Knight: Artificial Intelligence, 2nd Edition, Tata McGraw Hill,
       1991.
    2. Nils J. Nilsson: Principles of Artificial Intelligence, Elsevier, 1980.

Course Code: ET-22
Course Name: NOSQL

Credit Scheme			Evaluation Scheme				
Lecture	Practical	Credit	Internal			External	Total
			Written	Practical	Tutorial		
4 Hrs./Week	-	4	30		-	70	100

Upon successful completion of this course, students will be able to :

CO1: Demonstrate competency in describing how NoSQL databases differ from relational databases from a theoretical perspective.
CO2: Demonstrate competency in designing NoSQL database management systems
CO3: Use of a number of NoSQL databases to store and retrieve data and perform aggregation functions
CO4: Demonstrate competency in selecting a particular NoSQL database for different applications.
CO5: Execute various CRUD operations with MongoDB.

TOPICS COVERED:

UNIT 1 – An Overview and Characteristics of NoSQL   10 Hours
Introduction to NoSQL : An Overview of NoSQL , Defining NoSQL, History, What NoSQL is and what it is not, Why NoSQL?, List of NoSQL Databases. Characteristics of NoSQL: Application, RDBMS approach, Challenges, NoSQL approach.

UNIT 2 – NoSQL Storage Types   12 Hours
Modifying and managing NOSQL, Data stores, Indexing and ordering datasets (MongoDB/ CouchDB / Cassandra) NoSQL Storage Types : Storage types, Column-oriented databases, Document store, key-value store, graph store, multi-storage type databases, comparing the models.

UNIT 3 – Advantages and Drawbacks   10 Hours
Advantages and Drawbacks : Transactional application, Computational application, Web-scale application. Performing CURD operations : Creating records, accessing data, updating and deleting data.

UNIT 4 - Querying SQL   10 Hours

Querying NoSQL stores : similarities between NoSQL and MongoDB query features. Managing data stores and managing evolutions.

UNIT 5 – Indexing and Ordering   10 Hours

Indexing and ordering data sets: Essential concepts behind database index, indexing and ordering in MongoDB, indexing and ordering in CouchDB, Comparative Study of NoSQL Products Comparison: Technical comparison, Implementation language, Engine types, Speed, Features, Limits, Bulk operations, Bulk read, Bulk insert, Bulk update, Bulk delete, Query options.

TUTORIAL
Case Study
1. Application definition, Requirement analysis, Implementation using MongoDB, Features and constraints.
2. Database design, Database queries, Database modeling, Schema definition, Writing queries.
3. Queries for a single entity, simple result, Queries for a single entity, Aggregate, Queries for a one to one relationship.
4. Queries for a one to many relationship, Queries for a many to many relationship, Miscellaneous queries.
5. Pagination, Limiting items in an array in result set.
6. Plug-in and dynamic data support, Model refinements.
7. Reference using non-ID property, Demoralizations and document embedding.
8. Complete document embedding and Partial document embedding.
9. Bucketing, Cache document approach, Miscellaneous changes.

TEXT BOOKS / REFERENCES:

TEXT BOOKS :
1. Shanshank Tiwari "Professional NOSQL", WROX Press, 2011
Pramod.J.Sadalage and Martin Fowler, "NoSQL Distilled : A Brief guide to the emerging world of polygot persistence", Pearson Education corporation, I Edition, 2014.

Reference Books :
1. 1. The definitive guide to MONGODB, The NOSQL Database for cloud and desktop computing, Apress 2010.
ADDITIONAL LEARNING SOURCES:
1. https://www.mongodb.com/nosql-explained
2. http://www.dbta.com/Editorial/Trends-and-Applications/NoSQL-for-the-Enterprise-80198.aspx
3. http://www.oracle.com/technetwork/database/databasetechnologies/nosqldb/overview/in dex.html

Course Code: ET-23
Course Name: Enterprise Resource Planning

Credit Scheme			Evaluation Scheme				
Lecture	Practical	Credit	Internal			External	Total
			Written	Practical	Tutorial		
4 Hrs./Week	-	4	30		-	70	100

COURSE OUTCOMES:
Upon successful completion of this course, students will be able to,   CO1: Comprehend the basics and concepts of ERP   CO2: Apply different ERP related technologies   CO3: Implement ERP system by utilizing various concepts of ERP   CO4: Analyze different business models of ERP   CO5: Analyze the present and future trends of ERP.
TOPICS COVERED:

UNIT 1 - Introduction   10 Hours

Enterprise—An Overview, Business Processes, Introduction to ERP, Basics ERP Concepts, Justifying ERP Investments, Risks of ERP, Benefits of ERP.

UNIT 2 - ERP and Technology   10 Hours

ERP and Related Technologies, Business Intelligence (BI) and Business Analytics (BA), E-Commerce and E-Business, Business Process Reengineering (BPR), Data Warehousing and Data Mining, On-line Analytical Processing (OLAP).

UNIT 3 - ERP and Technology   10 Hours

Product Life Cycle Management (PLM), Supply Chain Management (SCM), Customer Relationship Management (CRM), Geographic Information System (GIS), Advanced Technology and ERP Security.

UNIT 4 - ERP Implementation   10 Hours

To be or not to be…, Implementation Challenges, ERP Implementation (Transition) Strategies, ERP Implementation Life Cycle, Pre Implementation Tasks: Getting Ready, Requirements Definition, Implementation Methodologies, ERP Development Methods, Process Definition, Contracts with Vendors, Consultants and Employees, Training and

Education, Data Migration, Project Management and Monitoring, Post-Implementation Activities, Success and Failure Factors of an ERP Implementation

UNIT 5 - The Business Modules   12 Hours

Business Modules of an ERP Packages, Financials, Manufacturing (Production), Human Resource Management, Plant Maintenance, Materials Management, Quality Management, Marketing, Sales, Distribution and Services.
TEXT BOOKS / REFERENCES:

Text books:
1. Alexis Leon, "ERP Demystified", Tata McGraw Hill, 14 Aug 2014.

Reference books:
1. Joseph A. Brady, Ellen F. Monk, Bret J. Wangner, "Concepts in Enterprise Resource Planning", Thomson Learning, 2001.
2. Vinod Kumar Garg and N.K .Venkata Krishnan, "Enterprise Resource Planning – concepts and Planning", Prentice Hall, 1998.
3. Jose Antonio Fernandz, "The SAP R /3 Hand book", Tata McGraw Hill, 2006.

TUTORIALS:
Developing Following Applications. Using any Database Systems.
    1. Financial System.
    2. Manufacturing System.
    3. Human Resource Planning.
    4. Plant Maintenance.
    5. Materials Management System.
    6. Quality Management System.
    7. Marketing, Sales, & Distributing System etc..

ADDITIONAL LEARNING SOURCES:
    1. http://www.netsuite.com/portal/resource/articles/erp/what-is-erp.shtml
    2. https://www.managementstudyguide.com/enterprise-resource-planning-1-articles.htm

Semester III

Course Code: IT-31
Course Name: Mobile Applications

Credit Scheme			Evaluation Scheme				
Lecture	Practical	Credit	Internal			External	Total
			Written	Practical	Tutorial		
4 Hrs./Week	-	4	30		-	70	100

Upon successful completion of this course, students will be to:

CO1: Gain broad understanding of the discipline of Mobile Application Development using J2ME Technology.

CO2: Develop User Interface for a J2ME application

CO3: Manage data on both service-side components and client-side applications and Address Portability and Compatibility issues between PDA'S and Cell phones.

CO4: Implement the design using Android SDK.

CO5: Implement the design using Objective C and Ios

TOPICS COVERED:

Unit 1 - J2ME Overview, Architecture and Development Environment   12 Hours

Java 2 micro edition and the world of java, inside J2ME, J2ME and wireless devices. small computing technology: wireless technology , radio data networks, microwave technology, mobile radio Networks, messaging, personal digital assistants.

J2ME architecture, small computing device requirements, run time environment, midlet programming, java language for J2ME, J2ME software development kits, hello world J2ME style, multiple midlets in a midlet suite, J2ME wireless toolkit.

Unit 2 - J2ME Best Practices and Patterns   10 Hours

The reality of working in a J2ME world, best practices commands, items, and event processing: J2ME user interfaces , display class, the palm OS emulator, C command class, item class, exception handling. high level display screens: screen class, alert class, form class, item class, list class, text box class, ticker class. low-level display canvas:
The Canvas, User Interactions, Graphics, Clipping Regions, Animation.

Unit 3 - Record Management System 10 Hours

Record storage, writing and reading records, record enumeration, sorting records, searching records, record listener. JDBC objects: The concept of JDBC, JDBC driver types, JDBC packages, overview of the JDBC process, database connection, statement objects, result set, transaction processing, metadata, data types, and exception.

Unit 4 - Technology-I Android-12   10 Hours

Introduction – establishing the development environment – android architecture – activities and views
– interacting with UI – persisting data using SQLite – packaging and deployment – Interaction with server side applications – Using Google Maps, GPS and Wifi – Integration with social media applications.

Unit 5 - Technology-II IOS-12   10 Hours

Introduction to objective C – iOS features – UI implementation – Touch frameworks – Data persistence using Core Data and SQLite – Location aware applications using Core Location and Map Kit – Integrating calendar and address book with social media application – Using Wifi - iPhone marketplace.

TEXT BOOKS / REFERENCES:
Text Books:
  1. James Keogh , J2ME The Complete Reference , Tata McGrawHill.
  2. Charlie Collins, Michael Galpin and Matthias Kappler, "Android in Practice", DreamTech, 2012.
  3. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, "Beginning iOS.

Reference Books:
  1. Michael Juntao Yuan, Enterprise J2ME, Developing Mobile Java Applications Pearson Education , 2011.
  2. Sing Li, Jonathan B. Knudsen, Beginning J2ME: From Novice to Professional, Third Edition, Apress, 2015.
  3. Development: Exploring the iOS SDK", Apress, 2013.
ADDITIONAL LEARNING SOURCES:
1. http://developer.android.com/develop/index.html.

Course Code: IT-32
Course Name: Software Testing and Practices

Credit Scheme			Evaluation Scheme				
Lecture	Practical	Credit	Internal			External	Total
			Written	Practical	Tutorial		
4 Hrs./Week	-	4	30		-	70	100

Course Description:

Upon successful completion of this course, students will be able to:
CO1: Gain knowledge on basics of Software Testing, Test case selection and creation
. CO2: Illustrate various perspectives of testing with examples.
CO3: Use by differentiating boundary value testing, Equivalence class testing, Decision table based testing.
CO4: Implement Path testing and Data flow testing based on the requirements
CO5: Comprehend different levels of testing, Integration testing and Fault based testing.

TOPICS COVERED:

UNIT 1- Basics of Software Testing 12 Hours
Humans, Errors and Testing, Software Quality; Requirements, Behavior and Correctness, Correctness Vs Reliability; Testing and Debugging; Test Metrics; Software and Hardware Testing; Testing and Verification; Defect Management; Execution History;Test Generation Strategies; Static Testing; Test Generation from Predicates.
Basic Principles, Test case selection and Adequacy
Sensitivity, Redundancy, Restriction, Partition, Visibility and Feedback, Test Specification and cases, Adequacy Criteria, Comparing Criteria

UNIT 2- A perspective on Testing, Examples   8 Hours
Basic definitions, Test cases, Insights from a Venn diagram, Identifying test cases, Error and fault taxonomies, Level of testing, Examples: Generalized pseudocode, The triangle problem, theNextDate function, The commission problem, The SATM (Simple Automation Teller Machine) problem, The currency converter, Saturn windshield wiper.

UNIT 3 - Boundary value, Equivalence class and Decision table based testing   8 Hours
Boundary value analysis, Robustness testing, Worst-case testing, special value testing, Examples, Random testing, Equivalence classes, Equivalence test cases for triangle problem, Next Date function and commission problem, Guidelines and observations, Decision tables, Test cases for triangle problem.

UNIT 4 - Path Testing, Data flow testing, Levels and Integration Testing   12 Hours
DD Paths, Test coverage metrics, Basis path testing, guidelines and observations, Definition Use testing, Slice based testing, Guidelines and observations. Traditional view of testing

levels, Alternative life cycle models, the SATM systems, separating integration and system testing, Guidelines and observations.

UNIT 5 - Fault Based Testing   12 Hours
Assumptions in fault-based testing, Mutation Analysis, Fault-based Adequacy Criteria; Variations on mutation Analysis; From Test case specification to Test Cases, Scaffolding, Generic vs specific Scaffolding, Test Oracles, Self checks as oracles, Capture and Replay.
Agile Testing
Definition and description, how is it different from traditional testing, ten principals for testers, business-facing the test that support the testing.

TEXT BOOKS / REFERENCES:
TEXT BOOKS :
1. Adithya P. Mathur " Foundations of Software Testing – Fundamental Algorithms and Techniques", Pearson Education India, 2011
2. Mauro Pezze, Michael Young, Software testing and Analysis- Process, Principles and Techniques", Wiley India, 2012
3. Paul C Jourgensen, "Software Testing A Craftmans Approach", Aueredach publications, 3rd edition, 2011
4. Lisa Crisping, Janet Gregory, "Agile Testing : A Practical Guide for Testers and Agile Team", The Addison Wesley Signature Series, 2009.

REFERENCE BOOKS:
1. KshirasagaraNaik, PriyadarshiTripathy: Software Testing and Quality Assurance, Wiley India 2012
2. M.G.Limaye: Software Testing-Principels, Techniques and Tools – McGrawHill, 2009
3. Brain Marick: The Craft of Software Testing, Pearson Education India, 2008
4. Ron Patton: Software Testing, 2nd Edition, Pearson Education, India, 2013

ADDITIONAL LEARNING SOURCES:
1. http://www.softwaretestinghelp.com/agile-scrum-methodology-for-development-and-testing/
2. http://crbtech.in/Testing/agile-model-software-testing/
3. https://www.getzephyr.com/**test**-management/**agile-model-**in-**software-testing**
4. http://www.mountaingoatsoftware.com/
5. http://www.testingexperience.com/
6. http://www.infoq.com/ http://www.qasymphony.com/

Course Code: IT-33
Course Name: Cloud Computing

Credit Scheme			Evaluation Scheme				
Lecture	Practical	Credit	Internal			External	Total
			Written	Practical	Tutorial		
4 Hrs./Week	-	4	30		-	70	100

COURSE OUTCOMES:
Upon successful completion of this course, the student will be able to:
CO1: Interpret the basic concepts, principles and techniques of data mining.
CO2: Apply knowledge discovery techniques while mining the data; recognize & fixing the issues in data mining.
CO3: To apply the techniques of clustering, classification, association finding, feature selection and visualization of real world data.
CO4: Demonstrate the real world problem has a data mining solution.
CO5: Apply evaluation metrics to select data mining techniques.
Topics Covered:

UNIT 1- Introduction to Cloud Computing   11 Hours

Defining Cloud Computing, Cloud types, The NIST model, The Cloud Cube Model, Deployment models, Service models, Examining the Characteristics of Cloud Computing, paradigm shift, Benefits of cloud computing, Disadvantages of cloud computing, Assessing the role of open standards. Assessing the Value Proposition: Measuring the Cloud's Value, Early adopters and new application, The laws of cloudonomics, Cloud computing obstacles, Behavioral factors relating to cloud adoption, Measuring cloud computing costs, Avoiding Capital Expenditures, Right-sizing, Computing the total cost of ownership, Specifying service level agreements, Defining licensing models. Understanding Cloud Architecture: Exploring the cloud computing stack, Composability, Infrastructure, Platforms. Virtual Appliances, Communication Protocols, Applications, Connecting to the Cloud, The Jolicloud Netbook OS, Chromium OS: The browser as an Operating System.

UNIT 2- Understanding Service and Application by Type   10 Hours

Defining Infrastructure as a service (IaaS), Defining Platform as a Service (PaaS), Defining Software as a Service (SaaS), Defining Identity as a Service (IDaaS), and Defining Compliance as a Service (CaaS). Understanding Abstraction and Virtualization: Using Virtualization technologies, Load Balancing and Virtualization, Understanding Hypervisors,

Understanding Machine Imaging, Porting Applications. Capacity Planning: Capacity Planning, Defining Baseline and Metrics, Network Capacity, Scaling.

UNIT 3 - Exploring Platform as a Service   10 Hours

Defining Services, Using PaaS Application Frameworks Using Google Web Services: Exploring Google Applications, Surveying the Google Application Portfolio, Exploring the Google Toolkit, Working with the Google App Engine. Managing the Cloud: Administrating the Clouds, Cloud Management Products, Emerging Cloud Management Standards.

UNIT 4 - Understanding Cloud Security   10 Hours

Securing the cloud, Securing data, Establishing identity and Presence. Moving Application to the Cloud: Application in the Cloud, Applications and cloud APIs. Working with cloud-based storage: Measuring the digital universe, Provisioning Cloud Storage, Exploring Cloud Backup Solutions, Cloud Storage Interoperability.

UNIT 5: Using Webmail Services   10 Hours

Using Webmail Services: Exploring the cloud Mail Services, Working with syndication services. Communicating with the cloud: Exploring instant messaging, Exploring collaboration technologies, Using social networks. Working with Mobile Devices: Defining the Mobile Market, Using Smart phones with the Cloud.

Text Books/ References:
Text Books:
1. Barrie Sosinsky "Cloud Computing Bible" 2011 by Wiley Publishing, Inc.

Reference Books:
1. Cloud Computing Principles and Paradigms by Rajkumar Buyya 2011, Published by John Wiley & Sons
2. Cloud Computing Theory and Practice by Dan C.Marinescu, 2013, Published by Morgan Kaufmann.
   Additional Resource :
   1. https://cloudacademy.com/ebooks
   2. www.freebookcentre.net › Networking Books

Course Code: IT-34
Course Name: Data Warehousing

Credit Scheme			Evaluation Scheme				
Lecture	Practical	Credit	Internal			External	Total
			Written	Practical	Tutorial		
4 Hrs./Week	-	4	30		-	70	100

COURSE OUTCOMES:
Upon successful completion of this course, students will be able to: **CO1:** Design a data warehouse or data mart to present information needed by management in a form that is usable for management client & Comprehend several data preprocessing methods. **CO2:** Ability to do Conceptual, Logical, and Physical design of Data Warehouse **CO3:** Able to produce and document dimensional models for a data warehouse based on an informal domain description. **CO4:** Utilize the concept of data warehouse and OLAP for data Warehousing and tools. **CO5:** xtrapolate knowledge and skills to design a data warehouse to support and provide business solutions
TOPICS COVERED:

Unit 1 - Introduction 12 Hours
Introduction to Data Warehouse. A Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Data Cube Technology, From Data warehousing to Data Mining. The need for data warehousing, paradigm shift, business problem definition, operational and informational data stores, characteristics.Overview of client/server architecture, server specialization in client/server computing environments, server functions, server hardware architecture, system considerations, risc versus cisc, multiprocessor systems.

Unit 2 - Data Warehousing Components   10 Hours
Overall Architecture, data warehouse database, sourcing, acquisition, cleanup and transformation tools, metadata, access tools, data marts, data warehouse administration and management. Business Considerations, design considerations, technical considerations, implementation considerations, benefits of data warehousing.

Unit 3 - Mapping the data warehouse 10 Hours
Relational database technology for data warehouse, types, database architectures for parallel processing, parallel RDBMS features, alternative technologies, parallel dbms vendors, data layouts for best access, multidimensional data models, bitmapped indexing, complex data types.

Unit 4 - Data Extraction, Cleanup and Transformation Tools   12 Hours

Tool requirements, vendor approaches, access to legacy data, vendor solutions, transformation engines. Meta data: defined, meta data interchange initiative, metadata repository, metadata management, implementation examples, meta data trends. Need for OLAP, OLAP Guidelines, Categorization of OLAP Tools.

Unit 5 - Business Analysis   08 Hours

Tool Categories, Need for applications, cognos impromptu, applications, methodology, business intelligence market definition, situation overview, future outlook, essential guidance.

Tutorials:

Case Studies:

1. Data Warehousing Solution for One of Europe's Largest Financial Services Groups.
2. Data Warehousing for a Health Benefits Company
3. Data warehousing solution for banking system.
4. Data warehousing solutions for tax fraud with advanced analytics.
5. Data warehousing solutions for international satellite TV service provider.
6. Data warehousing solutions for Correlating data across the business.
7. Business Reporting & Customer Information Datamart Architecture Setup & Roll-out for a global technology company.
8. Global Planning Data Automation.
9. COTS-Anti Money Laundering.
10. Management Information System for Trade Finance.

TEXT BOOKS / REFERENCES:

Text books:

1. Alex Berson, Stephen J smith : Data Warehousing,Data Mining, & OLAP, Tata Mcgraw- Hill, 2012.
2. Gajendra Sharma: Data Mining, Data Warehousing and OLAP, Katson Books, 2010.
3. Jiawei Han and Micheline Kamber: Data Mining - Concepts and Techniques, 2nd Edition, Morgan Kaufmann Publisher, 2012.

Reference books:

1. Paulraj Ponnaiah : Data Warehousing fundamentals for IT professionals, wiley student publishers, second edition , 2014.
2. Ralph Kimball, Margy Ross : The data warehouse toolkit, third edition , wiley publishers, 2012.

ADDITIONAL LEARNING SOURCES:

1. https://www.coursera.org/specializations/data-warehousing.

2. www.knowledge-management-tools.net/data-warehousing.htm.
3. www.slideshare.net/2cdude/data-warehousing.
4. https://www.edx.org/course/delivering-relational-data-warehouse-microsoft-dat216x.

Course Code: IT-35
Course Name: NET Technologies

Credit Scheme			Evaluation Scheme				
Lecture	Practical	Credit	Internal			External	Total
			Written	Practical	Tutorial		
4 Hrs./Week	-	4	30		-	70	100

COURSE OUTCOMES:
Upon successful completion of this course, the student will be able to: CO1:   Develop application using the concept of .NET framework and basics of C# .NET. CO2: Create server side applications using C#.NET.   CO3:   Develop web applications using the ASP.NET.   CO4:   Comprehend ASP.NET web form, state management and error handling mechanism.   CO5:   Access and manipulate data in a database by using Microsoft ADO.NET
TOPICS COVERED:

UNIT 1 –Introduction to .NET and Basics of C#.NET   12 Hours

The .NET Framework: The Evolution of Web Development-HTML and HTML Forms, Server-Side Programming, Client-Side Programming. The .NET Framework - C#, VB, and the .NET Languages, The Common Language Runtime, The .NET Class Library, Visual Studio. The .NET Languages, C# Language Basics, Case Sensitivity, Commenting, Statement Termination, Blocks, Variables and Data Types-Assignment and Initializes, Strings and Escaped Characters, Arrays, Enumerations, Variable Operations- Advanced Math, Type Conversions. Object-Based Manipulation- String, DateTime and TimeSpan Types, The Array Type. Conditional Logic-The if, switch Statement. Loops- The for, foreach, while loop, Methods-Parameters, Method Overloading, Optional and Named Parameters, Delegates.

UNIT 2 – C#.NET Types, Objects, and Namespaces10 Hours

The Basics About Classes-Static Members, A Simple Class, Building a Basic Class-Creating an Object, Adding Properties, Automatic Properties, Adding a Method, Adding a Constructor, Adding an Event, Testing the Product Class. Value Types and Reference Types-Assignment Operations, Equality Testing, Passing Parameters by Reference and by Value, Reviewing .NET Types. Understanding Namespaces and Assemblies- Using Namespaces, Importing Namespaces, Assemblies. Advanced Class Programming-Inheritance, Static Members, Casting Objects, Partial Classes, Generics.

UNIT 3 - Developing ASP.NET Applications   10 Hours

Visual Studio: Creating Websites-Creating an Empty Web Application, Websites and Web Projects, The Hidden Solution Files, The Solution Explorer, Adding Web Forms, Designing a Web Page-Adding Web Controls, The Properties Window, and The Anatomy of a Web Form-The Web Form Markup, The Page Directive, The Doctype, The Essentials of XHTML. Writing Code-The Code-Behind Class, Adding Event Handlers, Outlining, IntelliSense, Code Formatting and Coloring, Visual Studio Debugging-The Visual Studio Web Server, Single-Step Debugging, Variable Watches, The Anatomy of an ASP.NET Application-ASP.NET File Types, ASP.NET Application Directories. Introducing Server Controls-HTML Server Controls, Converting an HTML Page to an ASP.NET Page, View State, The HTML Control Classes, Adding the Currency Converter Code, Event Handling, Error Handling

UNIT 4 – ASP.NET Web Form Basics, State Management & Error Handling   10 Hours

ASP.NET Configuration- The web.config File, Nested Configuration, Storing Custom Settings in the web.config File, The Website Administration Tool (WAT), Web Controls-Basic Web Control Classes, The Web Control Tags, Web Control Classes, List Controls, Table Controls, Web Control Events and AutoPostBack, A Simple Web Page. The Problem of State-View State, Transferring Information Between Pages, Cookies, Session State, Session State Configuration, Application State, An Overview of State Management Choices. Error Handling, Logging, and Tracing-Common Errors, Exception Handling-The Exception Class, The Exception Chain, Handling Exceptions, Throwing Your Own Exceptions, Logging Exceptions, Page Tracing.

UNIT 5 – ADO.NET Fundamentals 10 Hours

Understanding Databases, Configuring Your Database-SQL Server Express, Browsing and Modifying Databases in Visual Studio, The *sqlcmd* Command-Line Tool. SQL Basics - Running Queries in Visual Studio, The Select, Update, Insert, Delete statement. The Data Provider Model: Direct Data Access-Creating a Connection, The Select Command, The DataReader, Putting It All Together, Updating Data. Disconnected Data Access-Selecting Disconnected Data, Selecting Multiple Tables, Defining Relationships. Introducing Data Binding-Types of ASP.NET Data Binding, How Data Binding Works, Single-Value Data Binding, Repeated-Value Data Binding, Data Source Controls.

TEXT BOOKS / REFERENCES:

Text books:
1. Matthew MacDonald. Beginning ASP.NET 4 in C# 2010, APRESS, 2010

Reference books:

1. Joseph Mayo. Visual studio 2010 - A beginners guide – BPB Publications 2010
2. Greg Buczek: ASP.Net Developer's Guide, Tata McGraw Hill Edition 4th Edition, 2005.
3. Pro ASP.NET 4 in C# 2010, MacDonald and Freeman

ADDITIONAL LEARNING SOURCES:

1. https://msdn.microsoft.com/en-us/library/4w3ex9c2.aspx
2. http://www.asp.net/
3. http://www.aspfree.com/
4. http://www.devx.com/dotnet
5. asp.net-tutorials.com/localization/local-and-global-resources/
6. https://www.tutorialspoint.com/asp.net/asp.net_ado_net.htm
7. www.w3schools.com/asp/ado_intro.asp
8. https://www.tutorialspoint.com/soa/index.htm

Course Code: IT-36
Course Name: Cryptography and Network Security

Credit Scheme			Evaluation Scheme				
Lecture	Practical	Credit	Internal			External	Total
			Written	Practical	Tutorial		
4 Hrs./Week	-	4	30		-	70	100

Upon successful completion of this course, students will be able to:

CO 1: Explore the need for computer security concepts.
CO 2: Apply the principles and techniques of symmetric key encryption and public key encryption.
CO 3: Demonstrate the specifics of message authentication codes and hash algorithms.
CO 4: Analyze the facts of e-mail security and IP security evolution.
CO 5: Comprehend Web Security, Secure Electronic Transaction, Intruder detection and Firewalls.

TOPICS COVERED:

UNIT 1 – Introduction and Classical Encryption Technique   9 Hours

Computer Security Concepts, OSI Security Architecture, Security Attacks, Security Services, Security Mechanism, Model for Network Security.   Symmetric   Cipher   Model, Substitution Techniques, Transposition Techniques.

UNIT 2 - Block Ciphers, Public Key Cryptography and Key Management   11 Hours

Traditional Block Cipher Structure, The Data Encryption Standard, A DES Example, The strength of DES, Block Cipher Design Principles, AES Structure, AES Transformation Functions, AES Key Expansion, An AES Example, Principles of Public Key Cryptosystem, The RSA Algorithm, Key Management, Diffie Hellman Key Exchange.

UNIT 3 - Cryptographic Hash Functions, Message Authentication Codes
12 Hours

Applications of Cryptographic Hash Functions, Message Authentication, Digital Signatures, Two Simple Hash Functions, Requirements and Security, Security Requirements for Cryptographic Hash Functions, Brute-Force Attacks, Cryptanalysis, Hash Functions Based on Cipher Block Chaining, Secure Hash Algorithm (SHA), SHA-3, Message Authentication Requirements, Message Authentication Functions, Requirements for Message Authentication Codes, Security of MACs.

UNIT 4 – Electronic Mail Security and IP Security   10 Hours

 Pretty Good Privacy (PGP), S/MIME, IP Security Overview; IP Security Architecture; Authentication Header; Encapsulating Security Payload; Combining Security Associations.

UNIT 5 - User Authentication Protocols and Entity Authentication   10 Hours

Web Security Considerations; Secure Socket Layer (SSL) and Transport Layer Security (TLS); Secure Electronic Transaction (SET), Intruders, Intrusion Detection, Firewall Design Principles- Characteristics, Types of Firewall and Firewall Configuration.

Text books:
1. William Stallings, "Cryptography and Network Security – Principles and Practices", 6th Edition, Pearson Education, 2014.
2. Behrouz A. Forouzan and Debdeep Mukhopadhyay: "Cryptography and Network Security", 2nd Edition, Tata McGraw-Hill, 2014.

Reference books:
1.   Atul Kahate, "Cryptography and Network Security" 2nd Edition, Tata McGraw-Hill Publishing Company, 2010.
2. Network Security Private Communication in a public world, Charlie Kaufman, Radia Perlman & Mike Speciner, Prentice Hall of India Private Ltd., New Delhi, 2011.
3. Network Security Essentials Applications and Standards, William Stallings, Pearson Education, New Delhi, 2010.
4. Network Security Complete Reference by Roberta Bragg, Mark Phodes-Ousley, Keith Strassberg Tata Mcgraw-Hill, 2009.

ADDITIONAL LEARNING SOURCES:
    1. https://mrajacse.wordpress.com/2012/01/06/cryptography-network-security-ebooks/
    2. www.williamstallings.com/Crypto/Crypto4e.html

Course Code: ET-31
Course Name: Soft Computing

Credit Scheme			Evaluation Scheme				
Lecture	Practical	Credit	Internal			External	Total
			Written	Practical	Tutorial		
4 Hrs./Week	-	4	30		-	70	100

Upon successful completion of this course, students will be able to,

CO1: Identify and describe soft computing techniques and their roles in building intelligent machines.

CO2: Recognize the feasibility of applying a soft computing methodology for a particular problem.

CO3: Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems.

CO4: Apply genetic algorithms to combinatorial optimization problems.

  CO5: Apply neural networks to pattern classification and regression problems .

TOPICS COVERED:

UNIT 1 - Introduction 10 Hours

Artificial neural network: Introduction, characteristics- learning methods – taxonomy – Evolution of neural networks- basic models – important technologies – applications. Fuzzy logic: Introduction – crisp sets- fuzzy sets crisp relations and fuzzy relations: Cartesian product of relation – classical relation, fuzzy relations, tolerance and equivalence relations, non-iterative fuzzy sets. Genetic algorithm- Introduction – biological background – traditional optimization and search techniques – Genetic basic concepts.

UNIT 2 - Neural Networks   10 Hours

McCulloch-Pitts neuron – linear separability – hebb network – supervised learning network: perceptron networks adaptive linear neuron, multiple adaptive linear neuron, BPN, RBF, TDNN- associative memory network: auto- associative memory network, hetero-associative memory network, BAM, hopfield networks, iterative autoassociative memory network & iterative associative memory network – unsupervised learning networks: Kohonenself organizing feature maps, LVQ – CP networks, ART network.

UNIT 3 - Fuzzy Logic 10 Hours
Membership functions: features, fuzzification, methods of membership value assignments-Defuzzification: lambda cuts – methods – fuzzy arithmetic and fuzzy measures: fuzzy arithmetic – extension principle – fuzzy measures – measures of fuzziness -fuzzy integrals –

fuzzy rule base and approximate reasoning : truth values and tables, fuzzy propositions, formation of rules-decomposition of rules, aggregation of fuzzy rules, fuzzy reasoning- fuzzy inference systems-overview of fuzzy expert system-fuzzy decision making.

UNIT 4 – Genetic Algorithm 10 Hours

Genetic algorithm and search space – general genetic algorithm – operators – Generational cycle – stopping condition – constraints – classification genetic programming – multilevel optimization – real life problem- advances in GA.

UNIT 5 – Hybrid Soft computing Techniques and Applications   12 Hours

Neuro-fuzzy hybrid systems – genetic neuro hybrid systems – genetic fuzzy hybrid and fuzzy genetic hybrid systems – simplified fuzzy ARTMAP – Applications: A fusion approach of multispectral images with SAR, optimization of traveling salesman problem using genetic algorithm approach, soft computing based hybrid fuzzy controllers.

TUTORIALS:

Solving simple programs using MATLAB in the following areas:

1. FUZZY Logic techniques.
2. Neural networks techniques.
3. Genetic Algorithm techniques.
4. Hybrid Soft Computing Techniques.

TEXT BOOKS / REFERENCES:

Text books:

1. J.S.R.Jang, C.T. Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI / Pearson Education,2004.
2. S.N.Sivanandam and S.N.Deepa, "Principles of Soft Computing", Wiley India Pvt Ltd, 2011.

Reference books:

1. S.Rajasekaran and G.A.Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis & Applications", Prentice-Hall of India Pvt. Ltd., 2006.
2. David E. Goldberg, "Genetic Algorithm in Search Optimization and Machine Learning" Pearson Education India, 2013.

ADDITIONAL LEARNING SOURCES:

1. http://www.myreaders.info/html/soft_computing.html
2. http://www.soft-computing.de/

Course Code: ET-32
Course Name: Big data Analytics

Credit Scheme			Evaluation Scheme				
Lecture	Practical	Credit	Internal			External	Total
			Written	Practical	Tutorial		
4 Hrs./Week	-	4	30		-	70	100

COURSE OUTCOMES:
Upon successful completion of this course, students will be **CO1:** Demonstrate the knowledge, significance structure and sources of Big Data. **CO2:** Ability to think critically in making decisions based on data analytics, specific to Big Data. **CO3:** Apply the technical skills in predicative and perspective modelling to support business decisions. **CO4:** Comprehend decision tools and techniques for data streaming using various algorithms.   **CO5:** Demonstrate the Knowledge gained on mining social network data.
TOPICS COVERED:

UNIT 1 - Introduction to Big Data   12Hours

What is big data? Is the "big" part or the "data" art more important? How is big data different? How is big data more of the same? Risks of big data -why you need to tame big data -the structure of big data- exploring big data, most big data doesn't matter- filtering big data effectively -mixing big data with traditional data- the need for standards-today's big data is not tomorrow's big data. Web data: the original big data -web data overview -what web data reveals -web data in action? A cross-section of big data sources and the value they hold.

UNIT 2 : Data Analysis   08 Hours

Evolution of analytic scalability – convergence – parallel processing systems – cloud computing – grid computing – map reduce – enterprise analytic sand box – analytic data sets – analytic methods – analytic tools – cognos – microstrategy - pentaho. Analysis approaches – statistical significance – business approaches – analytic innovation – traditional approaches – iterative

UNIT 3 - Mining Data Streams   10 Hours

Introduction to streams concepts, stream data model and architecture, stream computing, sampling data in a stream, filtering streams, counting distinct elements in a stream, estimating

moments, counting oneness in a window, decaying window, realtime analytics platform(rtap) applications, case studies, real time sentiment analysis, stock market predictions.

UNIT 4 - Frequent Item sets and Clustering   10 Hours

Mining frequent itemsets - market based model – apriori algorithm – handling large data sets in main memory – limited pass algorithm – counting frequent itemsets in a stream – clustering techniques – hierarchical – k- means – clustering high dimensional data – clique and proclus – frequent pattern based clustering methods – clustering in non-euclidean space – clustering for streams and parallelism.

UNIT 5 : Frameworks and Visualization   10 Hours

Mapreduce – hadoop, hive, mapr – sharding – nosql databases - s3 - hadoop distributed file systems –visualizations - visual data analysis techniques, interaction techniques; systems and applications.

TUTORIALS
Case Studies:
1. Medicare and Medicaid Services : Integrity of health care data and secure payment processing.
2. Tesco PLC.
3. American Express Co.
4. Mobile Telecom Harnesses Big Data with Combined Actuate and Hadoop Solution.
5. Re-engineering a Telecom Market Share Analytical Application.
6. Telco Case Study: Vodafone and Argyle Data on using big data to combat fraud.
7. MTS India relies on HP Vertica in a highly competitive telecom market.
8. Mclaren's Formula One racing team : real time car sensor data during car races.

TEXT BOOKS / REFERENCES:

Text books:
1. Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with advanced analytics, John Wiley & sons, 2013.
2. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press, 2014

Reference books:
1. Paul Zikopoulos, Chris Eaton, Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data: Analytics for Enterprise Class Hadoop and Streaming Data, McGraw Hill Professional, 2012.
2. Glenn J. Myatt, Making Sense of Data, John Wiley & Sons, Pete Warden, Big Data Glossary, O"Reilly.

3. Chuck Lam, "Hadoop in Action", Dreamtech Press.

ADDITIONAL LEARNING SOURCES:
1. https://www.tutorialspoint.com/big_data_tutorials.html.
2. https://www.lynda.com/Big-Data-training-tutorials/2061-0.html.
3. https://www.tutorialspoint.com/hadoop/hadoop_big_data_overview.html.
4. https://bigdatauniversity.com.

Course Code: ET-33
Course Name: SOFTWARE PROJECT MANAGEMENT

Credit Scheme			Evaluation Scheme				
Lecture	Practical	Credit	Internal			External	Total
			Written	Practical	Tutorial		
4 Hrs./Week	-	4	30		-	70	100

COURSE OUTCOMES:
Upon successful completion of this course, students will be able to: CO1:   Comprehend software project management basics and approaches   CO2:   Analyze different project management initiation techniques   CO3:   Apply proper project planning and scheduling techniques   CO4:   Execute software projects with efficient control mechanisms   CO5:   Decide on closure of projects using standard and agile methodologies
TOPICS COVERED:

UNIT 1 -Software Project Basics   10 Hours

Introduction, Types of Software Projects, Classifications of Software Projects, Based on Software Development Life Cycle, Approach Driven, Maintenance, Web Application, Agile Development, Conclusion
Approaches to Software Project Management:Alignment of Software Engineering Methodology with Project Management Methodology, The Ad Hoc Methods-Based Approach, The Process-Driven Approach, So, What Is the Right Approach?, The Ad Hoc Approach, The Process-Driven Approach, But Is a Process-Driven Approach the Right Choice?, In a Process-Driven Approach: What Process and How Much?
Software Project Acquisition:From an External Client, The Request for Proposal, The Proposal, Negotiation, Contract Acceptance, From an Internal Client, The Feasibility Study, Preparing the Proposal, Finalizing the Proposal, Reference.

UNIT2 -Software Project Initiation   10 Hours

Introduction, Initiation Activities, Project Management Office-Level Activities, Identifying the Software Project Manager, Preparing/Handing Over the Project Dossier to the Software Project Manager, Coordinating Allocation of Project Resources, Assisting the Software Project Manager in Obtaining Necessary Service Level, Agreements from Departments in the Organization, Assisting the Software Project Manager with the Project Kickoff Meeting, Software Project Manager-Level Activities, Ensuring that Project Specifications Are

Complete,Reviewing Estimates and Revisions/Updates of Estimates, Identifying Necessary Resources and Raising Requests, Preparing Project Plans, Setting Up the Development Environment,Arranging for Project- Specific Skill Training, Organizing the Project Team, Training the Project Team on the Project Plans, Conducting a Project Kickoff Meeting, Arranging for a Phase-End Audit, Common Pitfalls in Project Initiation, Identifying the Wrong Software Project Mana, Identifying Inappropriate Resources, Incurring Delays in Software Project Initiation Activities.

UNIT3 -Software Project Planning   10 Hours

Introduction, Planning Defined, Plans Prepared in Software Project Management, The Project Management Plan, Resources, Skill Sets, Computer Systems, Project Management Method,The Configuration Management Plan, Naming Conventions, Change Management, The Quality Assurance Plan, The Schedule Plan, The Induction Training Plan, The Risk Management Plan, The Build Plan, The Deployment Plan, The User Training Plan,The Handover Plan, The Software Maintenance Plan, The Documentation Plan, Roles in Planning.
Scheduling: Introduction, The Initial Work Breakdown Structure, A Work Breakdown Structure with Predecessors Defined, A Work Breakdown Structure with Initial Dates, A Work Breakdown Structure with Resource Allocation, Scheduling in Practice, Graphic Representation of a Schedule

UNIT 4 -Software Project Execution   10 Hours

Introduction, Work Management, Work Registers, De-allocation, Configuration Management, Information Artifacts, Code Artifacts, Configuration Registers, Configuration Management Tools, Quality Management, Verification Techniques, Validation Techniques, Product Testing, Allocation of Quality Assurance Activities, Productivity Management, Stakeholder Expectations Management, Product Integration Management.
Software Project Execution Control: Introduction, Aspects of Control in Project Execution, Scope Control, Cost Control, Schedule/Progress Control, Quality Control, Effort Control, Productivity Monitoring, Control Mechanisms, Progress Assessment: Earned Value Analysis.

UNIT 5 - Software Project Closure   12 Hours

Introduction, Identifying Reusable Code Components, Documenting the Best Practices, Documenting the Lessons Learned, Collecting/Deriving and Depositing the Final Project Metrics in the Organizational, Knowledge Repository, Conducting Knowledge-Sharing Meetings with Peer Software Project Managers, Depositing Project Records with the Project Management Office, Depositing Code Artifacts in the Code Repository, Conducting the Project Postmortem, Releasing the Software Project Manager, Closing the Project, The Role of the Organization in Project Closure, The Project Management Office, The Configuration Control Board, The Systems Administration Department, Reference.

Agile Project Management: Introduction, Project Management Roles, Agile Project Management Characteristics, Metaphor, Teamwork and Collaboration, Guiding Principles, Open Information, Use a Light Touch, Monitoring and Adjustment, The Nuts and Bolts of Agile Project Management, Planning the Work, Controlling the Work, Process Improvement, Reference.

TUTORIALS:

Writing Cases for the following.

1. Writing requirement Proposal.
2. WritingNegotiationProposal.
3. Writing Feasibility Study Proposal.
4. Software Project Planning Proposal.
5. Software Project Execution Control Proposal.
6. WritingSchedules
7. Software Project Closure

TEXT BOOKS / REFERENCES:
Text books:
1. **"**Mastering Software Project Management: Best Practices, Tools and Techniques**"**, MuraliChemuturi, Thomas M. Cagley, J. Ross Publishing, 2010,

Reference books:
1. "IT Project MAnagement – On track from Start to Finish", Book by Joseph Phillips, 2002.
2. "Managing the unmanageable" by Mantle and Lichty, 2012.
3. Making Things Happen: Mastering Project Managementby Scott Berkun, 2008.

ADDITIONAL LEARNING SOURCES:
1. https://www.tutorialspoint.com/software_engineering/software_project_management.htm
2. http://searchsoftwarequality.techtarget.com/tutorials/Software-Project-Management-Process

Course Code: BM-41
Course Name: BUSINESS INTELLIGENCE

Credit Scheme			Evaluation Scheme				
Lecture	Practical	Credit	Internal			External	Total
			Written	Practical	Tutorial		
4 Hrs./Week	-	4	30		-	70	100

COURSE OUTCOMES:
Upon successful completion of this course, students will be able to,
CO1:   Comprehend the basics and fundamentals of BI with its business and technical needs
CO2:   Use the requirements and architectural framework of BI
CO3:   Know and differentiate different components of the BI framework
CO4: Design BI concepts by understanding the requirement needs
CO5: Analyze and implement advanced BI techniques and analytics

TOPICS COVERED:

UNIT 1-The Business Demand for Data, Information, and Analytics   10 Hours

Just One Word:Data, Welcome to the Data Deluge, Data Volume, Variety, and Velocity, Taming the Analytics Deluge, The Importance of Analytics, Analytics Challenge, Analytics Strategy, Too Much Data, Too Little Information, The Difference Between Data and Information, The Role of BI in Creating Actionable Information, The Information Backbone, Data Capture versus Information Analysis, The Roles of BI and Operational Systems, Operational BI Blurs the Lines, Where Data Warehousing Fits in, The Five Cs of Data, Common Terminology from Our Perspective, References.
Justifying BI: Building the Business and Technical Case:Why Justification is Needed, Building the Business Case, Review Organization's Business Initiatives and Processes, Solicit BI Sponsorship, Enlist BI Stakeholders, Identify Business Processes Affected by BI, Document Business Benefits, Determine Business Value(Tangible Benefits), Business the Technical Case, Technology and Product Short Lists, Convincing Business People, Convincing the Technologists, Assessing Readiness, Data and Data Quality, Expertise and Experience, Organizational and Cultural Change, Financial and Resource Commitment, Creating a BI Road Map, Developing Scope, Preliminary Plan and Budget, Project Scope, Project Plan, Project Budget, Calculating Benefits and ROI, Obtaining Approval, Common Justification Pitfalls, Overzealous Business Sponsor, CIO is Sole Sponsor, Intangible or Too High-Level Benefits, Confusion Between BI Technology and Business Value.

UNIT 2-Defining Requirements-Business, Data and Quality   10 Hours

The Purpose of Defining Requirements, Goals, Deliverables, Roles, BI Team Participants, Business Participants, Other IT Participants, Defining Requirements Workflow, Business Requirements, Data(and Data Quality) Requirements,Functional Requirements, Regulatory/Compliance Requirements, Technical Requirements, Reverse Engineering(When Necessary), Putting It All Together, Prioritizing Requirements, Interviewing, Preparation for Interviews, Conducting the Interviews, Reviewing Interview Content, Interview Follow-ups, Documenting Requirements.

Architecture Framework:The Need for Architectural Blueprints, Architectural Framework, Information Architecture, Data Architecture, The Rise of the Enterprise Data Warehouse, Data Warehousing Replaces the Data Warehouse, Technical Architecture, Business Intelligence, Data Warehouse and BI Data Stores, Data Integration, Source Systems, BI Technology Keeps Evolving, Product Architecture, Metadata, What is It?, What to do About It, Security and Privacy, Getting Started, Implementing the Plan, Avoiding Accidents with Architectural Planning, The Signs of Accidental Architectural Planning, Recovering from an Accidental Architecture, Do Not Obsess over the Architecture.

UNIT 3-Information Architecture   10 Hours

The Purpose of an Information Architecture, Data Integration Framework, DIF Information Architecture, Data Preparation, Data Franchising, BI and Analytics, Data Management, Metadata Management, Operational BI versus Analytical BI, Shift All Reporting to the Application-Specific Environment, Shift All Reporting to the DW- Based BI Environment, Blend Application-Specific and DW BI Environments, Master Data Management, Identify the Data, Find the Problem Areas, Assess a Solution.

Data Architecture: The Purpose of a Data Architecture, History, Prehistory, In the Beginning, Data Warehousing Goes Public, The Data Mart, Multiple Data Marts, Operational Data Store(ODS), Federated DWs, BI Accidental Architecture, Hub-and-Spoke, Data Architectural Choices, Data Categories, Selecting a Data Architecture, The Same But Different, Analytical Data Architecture(ADA),Data Integration Workflow, Data Integration Workflow— Hub-and-Spoke, Data Workflow of the System of Integration(SOI), Data Workflow of the System of Analysis(SOA), Data Workflow—Rise of EDW Again, Operational Data Store, The Relational for an ODS, ODS Reexamined, ODS is Dead, Long Live ODS, References.

UNIT 4-Technology & Product Architectures   10 Hours

Where are the Product and Vendor Names?, Evolution Not Revolution, Technology Platforms, Enterprise Applications, Data Management, Technology Architecture, Business Intelligence and Analytics, Information Access and Data Integration, Databases, Product and Technology Evaluations, BI Product Vendors, Dazed and Confused, Technology and Product Evaluations, Product Migration.

Business Intelligence Applications: BI Content Specifications, Revise BI Applications List, BI Personas, Casual Consumers, Analyst, Power Users, Data Scientists, BI Design Layout—

Best Practices, Focus on the Purpose, Design Layout, Data Design for self-Services BI, The Last Data Preparation Step, When Inconsistency is Reintroduced, OLAP Cubes and In-Memory Columnar Databases, Matching types of analysis to Visualizations, Comparative Analysis, Time-series or Trending Analysis, Contribution Analysis, Correlation Analysis, Geographic Data, Distribution Analysis.

UNIT 5-BI Design and Development   12 Hours

BI Design, BI User Interface(UI) Standards, Create Privacy, Security and Access Standards, Designing Each BI Application, BI Development, Prototyping Lifecycle, BI Application Development Tasks, BI Application Testing.
Advanced Analytics: Advanced Analytics Overview and Background, The Window to the Future, Don't Ignore the Past, Advanced Analytics in Action, Predictive Analytics and Data Mining, Setting Up a Predictive Analytics or Data Mining Program, Tasks for Developing and Using Models, Selecting Tools, Architecture for Predictive Analytics and Data Mining, Techniques for Predictive Analytics and Data Mining, Resources and Skills, Roadblocks to Success, Analytical Sandboxes and Hubs, Analytical Sandboxes, Analytical Hubs, Hub and Sandbox Design Principles, Hub and Sandbox Architecture Options, Advice for Hubs and Sandboxes, Big Data Analytics, Scope, The Program, Hybrid Architecture, The Big Data Team, Big Data Analytics Worst Practices, Data Visualization, Why Data Visualization is Needed, Why Data Visualization is Not, References.

TUTORIALS:
1. Case study on requirement specification.
2. Defining a requirement workflow.
3. Writing technical requirement specification.
4. Prioritizing the requirements.
5. Writing a BIE roadmap.
6. Writing & Defining scope objectives & outcomes.
7. Writing a plan & budget.
8. Writing Data Management techniques.
9. Creating data marts & operational data stores.
10. Creating OLAP Cubes.

TEXT BOOKS / REFERENCES:
Text books:
1. **"Business Intelligence Guidebook: From Data Integration to Analytics"** Book by Rick Sherman, 1st Edition, 2014.

Reference books:
1. Business Intelligence Roadmap: The Complete Project Lifecycle for Decision-Support Applications by Larissa T. Moss and ShakuAtre, February 25th 2003.

2. Successful Business Intelligence, Second Edition: Unlock the Value of BI & Big DataHardcover– Import, 1 Nov 2013.

3. Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die, Revised and UpdatedPaperback– 22 Feb 2016.

ADDITIONAL LEARNING SOURCES:

1. https://thebipalace.com/

2. https://www.analyticsvidhya.com/learning-paths-data-science-business-analytics-business-intelligence- big-data/tableau-learning-path/

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)**
2022-23 (With PO,PSO and Co's)

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	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

Paper Code	Paper	HC/SC/EL/OE	L	T	P	Total
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. Realize 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. To Imbibe 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.   Solve the Newton equations for simple configurations
CO2.   Use conservation to solve dynamics problems.
CO3.   Represent the equations of motion for complicated mechanical systems
CO4.   Derive and solve the equations of motions for systems subject to the Principle of Least Action
CO5.   Calculate conserved quantities from symmetries
CO6.   Acquire a deep knowledge of the Lagrangean and Hamiltonian formalism
CO7.   Understand theory of small oscillations

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 be

CO1. Familiar with mathematical methods for solving advanced problems in physics.
CO2. Familiar with Tensors, algebra of tensors and Tensor Calculus and its applications in applied sciences and engineering;
CO3. Able to solve abstract mathematical problems, recognize real-world problems and to formulate mathematical models for such problems.
CO4. Familiar with Hermite and Laguerre polynomials solutions
CO5. Familiar with generating function of the polynomials
CO6. Able to Use Legendre polynomials, associated Legendre polynomials in Physics
CO7. Able to Use Bessel functions, Spherical harmonics in Physics

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, 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. Explain the concepts of Linear vector space.
CO2. Express conditions for transformations.
CO3. Explain matrix representation of a linear transformation, Matrix representations
CO4. Explain concepts of eigenvalues and eigenvectors of a matrix.
CO5. Use matrices and determinants to solve sets of simultaneous linear equations
CO6. Understand the concepts of inner product, orthogonality and orthnormality
CO7. Recognize real-world problems and formulation of mathematical models of such problems.
CO8. Understand linear representations of groups and Rotation groups and applications in Physics
CO9. Apply Fourier transforms and Integral equations in Physics

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^1representation 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. Have theoretical foundations of electromagnetic phenomena.
CO2. Be able to solve the Maxwell equations for simple configurations.
CO3. Formulate and solve electromagnetic problems with the help of electrodynamic potentials and super potentials
CO4. make a detailed account for gauge transformations and their use
CO5. Learn the techniques of deriving and evaluating formulae for the electromagnetic fields from general charge and current distributions
CO6. calculate the electromagnetic radiation from radiating systems, formulate and solve electrodynamics problems, covariant form in 4 dimensional space-time
CO7. Formulate self-consistent models for the interaction between matter and em fields,
CO8. Covariant formulation of electrodynamics, Lagrange formalism
CO8. Apply the concept of Sspecial theory of relativity for relativistic electrodynamics

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. Learn scientific typesetting with LaTeX program.
CO2. Plot the functions and data with Gnuplot program,
CO3. Solve problems with Octave program

- 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. Maintain digital and analog devices and circuits.
CO2. Analyze components associated with digital and analog electronic systems.
CO3. Demonstrate proficiency in the use of electronic equipment and devices.
CO4. Assist in the design, operation, and troubleshooting of electronic systems.
CO5. Analyse electronics devices and circuits using computer simulations.
CO6. Realise electronic circuits using electronic devices and mathematical concepts.
CO7. Accept professional and ethical responsibilities of the engineering technology

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.   Internal response of materials to external loading
CO2.   Development of physical intuition for the behaviour of solids and fluids
CO3.   Unique connections between solid and fluid mechanics.
CO4.   The non-existence ether through Michelson-Morley experiments
CO5.   Minkowski space-time
CO6.   The true nature of Newtonian mechanics and Lorentz Transformations
CO7.   The concept of constant relative motion of different bodies in different frames
CO8.   The calculation of proper time, dilated time, proper length and contracted length
CO9.   Principles of the special theory of relativity, Covariant form of Newton laws
CO10. Einstein field equations, their underlying mathematical structure and solutions
CO11. Lagrangean formulation of General Relativity.
CO12. Derivation of testable physical consequences of General Relativity

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. Basic concepts of Thermodynamics
CO2. Formulation of the first law of thermodynamics for a closed systems
CO3. Mode of heat transfer, the amount of heat energy transferred and conservation of mass and energy equations.
CO4. Second law of thermodynamics; thermal efficiency & coefficient of performance.
CO5. concept of ensemble, phase space & conservation of phase-space density(Liouville's theorem)
CO6. Solution to statistical mechanics problems for simple non-interacting systems,
CO7. Phase transitions, Statistical equilibrium,. Entropy and probability
CO10. Microcanonical ensemble, Partition function, Gibbs paradox, canonical ensemble
CO11. Quantum statistical mechanics. Symmetry of wave functions.
CO12. Quantum distribution functions (BE and FD), 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. The Basic concepts and mathematical foundations of quantum mechanics

CO2. Solutions to the Schrödinger equation for simple potentials.

CO3. The effect of symmetries in quantum mechanics

CO4. The significance of wave function, normalization, uncertaintyPrinciple

CO5. The Physical significance of eigen functions and eigen vectors

CO6. Formalism; Hilbert space,, Dirac notation, concepts of Dynamical variables and operators

CO7. General Uncertainty relation. Matrix representation of wave functions & operators.

CO8. The Schrödinger equation and time evolution of a system.

CO9. The Schrödinger picture and Heisenberg picture

CO10. Schrodinger equation in three dimensions, Hydrogen atom.

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 $\mathbf{L_z}$. Particle on a sphere and the rigid rotator. General angular momentum. The spectrum of $\mathbf{J}^2$ and $\mathbf{J_z}$. 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.   Explain the applications of spectroscopic methods for qualitative & quantitative analysis.

CO2.   Compare and contrast atomic and molecular spectra.

CO3.   Understand the molecular absorption & scatter from particulate matter in atomic absorption spectroscopy

CO4.   Recognise the effect of changing the slit width on qualitative & quantitative analysis.

CO5.   Explain the selection rule for infrared-active transitions

CO6.   design a non-dispersive infrared spectrophotometer

CO7.   Understand the Fourier Transform infrared spectroscopy

CO8.   understand Raman spectroscopy

CO9.   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. $^2_{3/2}D - ^2_{1/2}P$ **2)** $^2_{5/2}D - ^2_{3/2}P$ **3)** $^3P - ^2S$.

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. & 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. Learn Computer Programming,
CO2. Have Hands on experience with C programming language and its syntax,
CO3. Apply C techniques for physics problem solving and data analysis.
CO4. Learn PERL scripting language

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. Have hands on experience of experiments using spectrometer
CO2. Use the principles of superposition to explain interference, diffraction and polarisation
CO3. Describe the operation of optical devices, including, polarisers and interferometers.
CO4. Solve problems in optics by selecting the appropriate equations & performing numerical or analytical calculations.
CO5. Follow instructions to perform experiments & document their results, using correct procedures and protocols.
CO6. Analyse, interpret and communicate results from laboratory experiments, orally or in a written laboratory report.

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.   Understand the effect of symmetries in quantum mechanics
CO2.   Understand the significance of wave function, normalization, uncertainty principle, Physical significance of eigenfunctions and eigenvectors
CO3.   Time-independent perturbation theory: Non degenerate Perturbation Theory
CO4.   Degenerate Perturbation Theory; Fine Structure of Hydrogen, Zeeman Effect.
CO5.   The Variational Principle: Theory, the Ground State of Helium.
CO6.   WKB Approximation: The Classical Region, Tunneling; connection formulae, α- decay
CO7.   The time-dependent perturbation theory
CO8.   Adiabatic approximation and scattering phenomena
CO9.   Have a basic understanding of relativistic effects in quantum mechanics.
CO10. Mathematical foundations of quantum mechanics & Schrödinger equation for simple cases.
CO11. Relativistic quantum mechanics using Klein-Gordon equation & Dirac equation

The time-independent perturbation theory: Non degenerate 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: 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, Addison Wesley, 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.   Understand the principles of Condensed Matter Physics, Mathematical descriptions of physical phenomena.
CO2.   Understand the principles of crystal structure of elements Instrumentation for crystal studies
CO3.   Evaluation of crystals data and their suitability for single crystal structure analysis.
CO4.   Crystal growth techniques
CO5.   Liquid crystals; Classification and structures
CO6.   Understand the Structural, Magnetic, Electrical and Semiconductor Properties
CO7.   Theoretical and practical experience in the Condensed Matter Physics

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.   Understand the relation between the standard model and QCD.
CO2.   Understanding strong interactions with many-body physics.
CO3.   Quantitatively estimates for nuclear phenomena
CO4.   Understand the Standard Model
CO5.   Familiarise with theoretical and experiments used in particle physics.
CO6.   Stabilise the nucleus, nuclear forces, interactions and models,.
CO7.   Critically assess a range of applications of nuclear technology.
CO8.   Develop Theoretical & practical experience in the scattering experiments &
 gamma-ray spectroscopy.

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, page717-721.)
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. Understand the Dielectrics properties of Solids;
CO2. Understand Physics of Ferroelectric Properties of Solids
CO3. Quantitatively estimate the Magnetic properties of solids
CO4. Compute the magnetic relaxation time
CO5. Understand BCS theory of Superconductors
CO6. Understand the fundamentals of nanomaterials
CO7. Understand the 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, R S Krishnan, R J Asero]** **[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.
7. R S Krishnan, Progress in Crystal Physics, Vol 1, Central Art Presst, Chennai
8. R J Asero, Mechanics of Solids and Mateials, Uni. Of Caifornia,

PHC 260: Nuclear Physics 1

Course Outcome:

After completing this course the student will

CO1. Conceptualise the Nuclear Detectors, Nuclear Pulse techniques and Nuclear models

CO2. Develop Theoretical and practical experience in the scattering experiments and gamma-ray spectroscopy.

CO3. Learn High-energy nuclear physics, the behaviour of nuclear matter under extreme conditions.

CO4. Learn Low-energy nuclear physics, structure & dynamics of nuclei, nuclear reactions and their probabilities;

CO5. Understand development of sensors, detectors, and larger complex Nuclear instruments

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 & conclusions in written and verbal form of the ideas in Theoretical Physics

CO3.   Evaluate complex problems & 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 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. LHC experiment, consequences. Higgs Boson.   **[16 hours]**

Tutorial   **[32 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   **[32 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. Independently collect single crystal XRD data and evaluate the crystal structure,
CO2. Analyse Diffraction data and their suitability for single crystal structure.
CO3. Independently work on raw diffraction data and Solve and refine crystal data
CO4. Understand the properties of Condensed Materials such as Structural, Magnetic, Electrical and Semiconducting Properties
CO5. Acquire theoretical and practical experience in the Condensed Matter Physics

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.   Be familiar with theoretical concepts & experimental techniques of Nuclear & particle physics,.
CO2.   Be able to make quantitative estimates of phenomena in elementary particles
CO3.   Understand stability of the nucleus, nuclear forces, interactions & models, Critically assess a range of applications of nuclear technology.
CO4.   Acquire Theoretical & practical experience in the scattering experiments and gamma-ray spectroscopy.
CO5.   Be able to realise the 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

*For those who have opted for **Solid State Physics Specialisation***
Course Outcome:
After completing this course the student will
CO1.   Be able to make quantitative estimates for phenomena in solid state physics.
CO2.   Describe thermal & vibrational properties of solids,
CO3.   Compute band structures using the tight-binding approximation
CO4.   Compute trajectories in real and reciprocal space, Characterize magnetism
CO5.   Characterize intrinsic and doped semiconductors
CO6.   Describe superconductivity
CO7.   Understand the mechanism and working of semiconductor devices.

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. Curie temperature of a ferroelectric material.
8. Dielectric constant and its temperature variation.
9. Determination of the polarisabilities of the molecules of an uniaxial crystal using spectrometer.
10. Determination of Stefan's constant using Photo Cell
11. Calibration of Si Diode

12. Measurement of Electrical and Thermal Conductivity of Copper
13. Verification of Curie-Weiss law
14. 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

*For those who have opted for **Nuclear Physics Specialisation***

Course Outcome:

After completing this course the student will

CO1.   Be familiar with Nuclear Detectors, Pulse techniques, nuclear models, timing spectroscopy and nuclear technology.

CO2.   Be familiar with Theoretical & practical experience in the scattering experiments and gamma-ray spectroscopy.

CO3.   Learn Instrumentation, development of sensors, detectors, & larger complex instruments.

CO4.   Familiarise in Fundamentals of reactor theory and nuclear decay mechanisms

CO5.   Learn Accelerator physics, research and development for the next generation of particle accelerators.

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

*For those who have opted for **Theoretical Physics Specialisation***

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

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. Gain an overall idea about X-ray diffraction method Solid State Physics
CO2. Get the understanding about X-ray diffraction (XRD) by Crystals.
CO3. Understand the Physical phenomena and significance of XRD
CO4. Be able to make quantitative estimates for structural phenomena of solids.
CO5. Describe thermal and vibrational properties of solids
CO6. Understand the concepts of Dislocations, Imperfections and Defects in Solids
CO7. Appreciate the Luminescent effects and colour centres in ionic crystals

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 deposition, chemical vapor deposition. 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.   Have overall idea about properties of Solids.
CO2.   Be provided with the understanding about free electron theory of metals
CO3.   Understand the properties of impurity semiconductors.
CO4.   Learn Semiconductor phenomena; Hall effect, Magneto-resistance phenomenon
CO5.   Be able to make quantitative estimates of semiconducting phenomena of solids.
CO6.   Describe the effect of excess carriers in semiconducting solids
CO7.   Understand the mechanism and working of semiconductor devices.

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. Understand the phenomenon of nuclear fission and its application in energy production.
CO2. Gain an overview on the neutron physics and nuclear reactor theory.
CO3. Develop the understanding of quantum theory beta decay.
CO4. Learn about the multipole transition involving gamma decay and internal conversion.

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.& 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.   Know about the two particle nuclear bound system like deuteron.
CO2.   Learn the theory of nucleon-nucleon scattering processes.
CO3.   Get an understanding of plane wave theory of nuclear reactions.
CO4.   Acquire knowledge on optical model and heavy ion physics.

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. Know about different types of ion sources and their working.
CO2. Learn ion optics and focussing.
CO3. Know about different particle accelerators.
CO4. Get theory behind electron accelerator.

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_{N-1}^i. 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 fields. 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 Gausselimination 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 **[32 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 inQuantum 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   **[32 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. Learn analyzing digital and analog devices and circuits.
CO2. Analyze components associated with digital and analog electronic systems.
CO3. Demonstrate proficiency in the use of electronic equipment and devices.
CO4. Assist in the design, operation, and troubleshooting of electronic systems.
CO5. Analyze electronics devices and circuits using computer simulations.
CO6. Solve electronic devices and systems using mathematical concepts.

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 **[32 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.

PHD 090: Nuclear and Particle Physics Lab

For those who have completed Condensed Matter Physics Lab PHY311

Course Outcome:

After completing this course the student will
CO1. Be familiar with theoretical concepts & experimental techniques of Nuclear &particle Physics,.
CO2. Be able to make quantitative estimates of phenomena in elementary particles
CO3. Understand stability of the nucleus, nuclear forces, interactions and nuclear models; critically assess applications of nuclear technology.
CO4. Acquire Theoretical and practical experience in the scattering experiments and gamma-ray spectroscopy.
CO5. Be able to realise the 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

*For those who have completed **Nuclear Physics Lab PHY 312***

Course Outcome:

After completing this course the student will
CO1.   Independently collect single crystal XRD data and evaluate the crystal structure,
CO2.   Analyse Diffraction data and their suitability for single crystal structure.
CO3.   Independently work on raw diffraction data and Solve and refine crystal data
CO4.   Understand the properties of Condensed Materials such as Structural, Magnetic, Electrical and Semiconducting Properties.
CO5.   Acquire theoretical and practical experience in the Condensed Matter Physics

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

*For those who opted for **Solid State Physics Specialisation***

Course Outcome:

After completing this course the student will
CO1.   Be able to make quantitative estimates for phenomena in solid state physics.
CO2.   Describe characteristics of thermal and vibrational properties of solids, Compute Band structures
CO3.   Compute trajectories in real and reciprocal space, Characterize magnetism
CO4.   Characterize intrinsic and doped semiconductors
CO5.   Describe superconductivity
CO6.   Understand the mechanism and working of semiconductor devices.

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

*For those who opted for **Nuclear Physics Lab Specialisation***

Course Outcome:

After completing this course the student will
CO1. Be familiar with Concepts of Nuclear Detectors, Pulse techniques, nuclear models, timing spectroscopy and nuclear technology.
CO2. Be familiar with Theoretical and practical experience in the scattering experiments and gamma-ray spectroscopy.
CO3. Learn Instrumentation, development of sensors, detectors, and larger complex instruments.
CO4. Familiarise in Fundamentals of reactor theory and nuclear decay mechanisms
CO5. Learn Accelerator physics, research and development for the next generation of particle accelerators.

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 —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

*For those who opted **Theoretical Physics Lab Specialisation***

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

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**

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

8.   **5 Marks**

9.   **6 Marks**

OR

10.   **6 Marks**

11.   **5 Marks**

OR

12.   **5 Marks**

JSS MAHAVIDYAPEETHA

JSS COLLEGE OF ARTS, COMMERCE & SCIENCE

(An Autonomous College of University of Mysore)
B.N. ROAD, MYSURU-570 025 KARNATAKA
Re-accredited by NAAC with 'A' grade
Recognised by UGC as "College with Potential for Excellence"

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PG DEPARTMENT OF COMPUTER SCIENCE

Proceedings of the B.O.S Meeting -11ᵗʰ Jan -2022

Reviewed the Syllabus of Hardcore, Softcore and Open Elective Courses.

MEMBERS

Sl. No	Name	Signature
1	Dr. Guru D S Chairperson and Professor DOS in Computer Science University of Mysore, Mysuru	11/1/22
2	Dr. Pushpalatha.M.P Professor and H.O.D Department Of Computer Science and Engineering Sri Jayachamarajendra College of Engineering, Mysuru – 570 006. JSS Science and Technology University, Mysuru. mppvin@gmail.com	11/1/2022
3	Dr. M.T. SOMASHEKARA Assistant Professor Dept of Computer Science and Applications JB Campus,Bangalore University Bengaluru – 560 056 e-mail: somashekar_mt@hotmail.com 9880450894	
4	Smt. S Apoorva Assistant Professor PG Department of Computer Science JSS College of Arts, Commerce and Science, Ooty Road, Mysuru	11/1/22
5	Smt. Y S Sumanashree Assistant Professor and H.O.D PG Department of Computer Science JSS College of Arts, Commerce and Science, Ooty Road, Mysuru	Y.S.d 11/1/2022

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PG DEPARTMENT OF COMPUTER SCIENCE

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SL No	Name	Signature
6	Mr. Sarmad Farhan khan Software Development Engineer-2 Maveric Systems,Bengaluru	
7	Dr.Mahamad Suhil Technical Manager AI Standard Charted . GBS,Bengaluru	Absent

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

2021-23

Postgraduate Department of Computer Science

JSS College of Arts, Commerce and Science

Ooty Road, Mysore-25

2021-2023

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**.**

JSSCACS

MSc. in Computer Science 2021-23

I Semester

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

II Semester

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

JSSCACS

III Semester

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

IV Semester

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

****** Open Elective Course: III Semester**

Course	L:T:P	Credit Value
OE- Computer Fundamentals / Programming with C	2:0:2	4

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HARD CORE:

Sl. No.	Course	L:T:P	Credit Value
1	Data Structures and Algorithms	3:0:1	4
2	System Software	2:1:1	4
3	Computer Networks	2:1:1	4
4	Analysis and Design of Algorithms	2:1:1	4
5	Operating System and Unix	2:0:2	4
6	Computer Graphics	3:0:1	4
7	Software Engineering	3:1:0	4
8	Theory of Languages	3:0:1	4
9	DBMS	2:1:1	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

JSSCACS

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

JSSCACS

SCHEME OF EXAMINATION   AND ASSESMENT:

In view of the CBCS syllabus, Each Course is Assess 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 Outcomes: 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

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SYSTEM SOFTWARE   2:1:1

Course Code:CSA110

Course Outcomes:

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 Outcomes:

At the end of the course students will be able to:

CO1. Master the terminology and concepts of the OSI reference model and the TCP-IP reference model.

CO2. Study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model.

CO3. Master the concepts of protocols, network interfaces, and design/performance issues in local area networks and wide area networks

CO4. Acquire knowledge of Application layer and Presentation layer paradigms and protocols.

CO5. Study Session layer design issues, Transport layer services, and protocols.

CO6. Gain core knowledge of Network layer routing protocols and IP addressing.

CO7. Study data link layer concepts, design issues, and protocols.

CO8. Read the fundamentals and basics of Physical layer, and will apply them in real time applications.

CO9. Familiar with wireless networking concepts

CO10. Familiar with contemporary issues in networking technologies
CO11. Familiar with network tools and network programming

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

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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

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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

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ANALYSIS AND DESIGN OF ALGORITHMS   2:1:1

Course Code:CSB060

Course Outcomes:

 At the end of the course students will be able to:

CO1.   Analyze different scenarios for running time of algorithms using asymptotic notations and Design using Recursion.

CO2.   Apply divide and conquer strategy for design of various algorithms.

CO3.   Develop algorithms for well known problems using greedy methods.

CO4.   Describe and apply dynamic-programming approach for designing graph and matrix based algorithms.

CO5.   Understand the concept of backtracking for traversal and search algorithms.

CO6.   Apply the knowledge earned to determine the efficiency of algorithms considering time and space tradeoffs.

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

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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.

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OPERATING SYSTEM and UNIX   2:0:2

Course Code:CSB070

Course Outcomes:

   At the end of the course student will be able to:

CO1.   Understand device drivers
CO2.   Write applications with improved performance and stability
CO3.   Write set of small commands and utilities that do specific tasks well
CO4.   Run multiple programs each at the same time without interfering with each other
      or crashing the system.
CO5.   Implement   Commands of UNIX.
CO6.   Implement various file processing commands and shell Programming.

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.

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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.

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COMPUTER GRAPHICS   **3:0:1**

Course code:CSB080

Course Outcomes:

At the end of the course students will be able to:

CO1. Utilize the components of a graphics system and become familiar with building approach of graphics system components and algorithms related with them.

CO 2. Learn the basic principles of 3- dimensional computer graphics.

 CO3. Provide an understanding of how to scan convert the basic geometrical primitives, how to transform the shapes to fit them as per the picture definition.

 CO4. Provide an understanding of mapping from a world coordinates to device coordinates, clipping, and projections.

CO 5.   Implement   the applications of computer graphics concepts in the development of computer games, information visualization, and business applications.

 CO6. Comprehend and analyze the fundamentals of animation, virtual reality, underlying technologies, principles

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.

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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

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SOFTWARE ENGINEERING 3:1:0

Course Code:CSC040

Course Outcomes:

At the end of the course students will be able to:

CO1. Understand the nature of software development and software life cycle process models, agile software development, SCRUM and other agile practices.

CO2   Learn methods of capturing, specifying, visualizing and analyzing software requirements.

CO3. Understand concepts and principles of software design and user-centric approach and principles of effective user interfaces.

CO 4. Basics of testing and understanding concept of software quality assurance and software configuration management process.

CO 5. Understand need of project management and project management life cycle.

CO 6. Understand project scheduling concept and risk management associated to various types of projects.

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.

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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:CSC070

Course Outcomes:

At the end of the course students will be able to:

CO1. Design different types of Finite Automata and Machines as Acceptor, Verifier and Translator.

CO2. Understand, design, analyze and interpret Context Free languages, Expression and Grammars.

CO3. Design different types of Push down Automata as Simple Parser.

CO4. Design different types of Turing Machines as Acceptor, Verifier, Translator and Basic computing machine.

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 Outcomes:

At the end of the course students will be able to:

CO1. Explain the features of database management systems and Relational database.
CO2. Design conceptual models of a database using ER modelling for real life applications and also construct queries in Relational Algebra.
CO3.   Create and populate a RDBMS for a real life application, with constraints and keys, using SQL.
CO4. Retrieve any type of information from a data base by formulating complex queries in SQL.
CO5.   Analyze the existing design of a database schema and apply concepts of normalization to design an optimal database.
CO6. Build indexing mechanisms for efficient retrieval of information from a database

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

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4. Database Management System- Raghuramakrishnan.

5. An Introduction to Database System- Bipin Desai

6. Principles of Database System- J D Ullman

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Softcore:

PRINCIPLES OF PROGRAMMING LANGUAGES AND 'C'   **2:1:1**

Course Code:

Course Outcomes:

At the end of the course students will be able to:

CO1.   Analyzing semantic issues associated with function implementations, including variable binding, scoping rules, parameter passing, and exception handling.

CO2.   Implementation 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 Outcomes:

At the end of the course students will be able to:

CO1. Develop analytical ability in network technology.

CO2. Create quality websites

CO3. Work individually as a web designer and set up their own business

CO4. Get the job opportunities in most companies for professional web designers and build websites more visually elegant and interactive

CO5. Implement interactive web page(s) using HTML, CSS and JavaScript.

CO6. Design a responsive web site using HTML5 and CSS3.

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, <span> and <div> 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.

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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

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JAVA Programming 2:0:2

Course Code:CSA270

Course Outcomes:

At the end of the course students will be able to:

C01.   Understand concept of Object Oriented Programming & Java Programming Constructs.

C02.   Understand basic concepts of Java such as operators, classes, objects, inheritance, packages ,Enumeration and various keywords.

C03.   Understand the concept of exception handling and Input/Output operations.

C04.   Design the applications of Java & Java applet.

C05.   Analyze & Design the concept of Event Handling and Abstract Window Toolkit.

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:

Course Outcomes:

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

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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

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MICROCONTROLLERS 3:1:0

Course Code:

 Course Outcomes:

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

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DISCRETE MATHEMATICS   3:1:0

Course Code:CSA260

Course Outcomes:

 At the end of the course students will be able to:

CO1.   Construct simple mathematical proofs and possess the ability to verify them.

CO2.   Have substantial experience to comprehend formal logical arguments .

CO3.   skillfull in expressing mathematical properties formally via the formal language of propositional logic and predicate logic.

CO4.   Specify and manipulate basic mathematical objects such as sets, functions, and relations and will also be able to verify simple mathematical properties that these objects possess.

CO5.   Apply basic counting techniques to solve combinatorial problems .

CO6.   Use various techniques of mathematical induction (weak, strong and structural induction) to prove simple mathematical properties of a variety of discrete structures

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.

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SIMULATION & MODELLING   3:1:0

Course Code:

 Course Outcomes:

At the end of the course students will be able to:

CO1. Understand the definition of simulation and 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

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OPERATIONS RESEARCH 3:1:0

Course Code:

Course Outcomes:

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 and 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.

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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.

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MOBILE COMMUNICATION 3:1:0

Course Code:

Course Outcomes:

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.

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C++ 2:0:2

Course Code:

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

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PATTERN RECOGNITION   3:0:1

Course Code:

Course Outcomes:

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

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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:

Course Outcomes:

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:

Course Outcomes:

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.

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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.

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GRAPH THEORY   3:1:0

Course Code:CSB270

Course Outcomes:

At the end of the course students will be able to:

CO1. Explain basic concepts in combinatorial graph theory

CO2. Define how graphs serve as models for many standard problems

CO3. Discuss the concept of graph, tree, Euler graph, cut set and   Combinatorics.

CO4. See the applications of graphs in science, business and industry.

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.

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OOAD   **2:1:1**

Course Code:

Course Outcomes

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:

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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:

Course Outcomes

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 Outcomes:

At the end of the course students will be able to:

CO1. Demonstrate an understanding of the importance of data mining and the principles of business intelligence

CO2. Organize and Prepare the data needed for data mining using pre preprocessing techniques

CO3. Perform exploratory analysis of the data to be used for mining.

CO4. Implement the appropriate data mining methods like classification, clustering or Frequent Pattern mining on large data sets.

CO5. Define and apply metrics to measure the performance of various data mining algorithms.

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.

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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:

Course Outcomes

CO 1. At the end of the course students will be able to:

CO 1. Create appreciation and understanding of both the achievements of AI and the theory underlying those achievements.

CO 2. Know concepts of a Rational Intelligent Agent and the different types of Agents that can be designed to solve problems

CO 3. Review the different stages of development of the AI field from human like behavior to Rational Agents.

 CO4. 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.

 CO5. 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.

 CO6. 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

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.NET TECHNOLOGIES 2:0:2

Course Code:CSB280

Course Outcomes

At the end of the course students will be able to:

CO1. Design web applications using .NET
CO2. Use .NET controls in web applications.
CO3. Debug and deploy .NET web applications
CO4. Create database driven .NET web applications and web services

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/

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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:

Course Outcomes

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

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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.

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ANDROID APPLICATION DEVELOPMENT   **2:0:2**

Course Code:

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

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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

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ADVANCED DATABASE MANAGEMENT SYSTEM 2:1:1

Course Code:

Course Outcomes

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:

Course Outcomes

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.

CO5.   Determine FIRST intersect FIRST constraint satisfaction - determine if a BNF grammar satisfies the constraint on intersection of FIRST sets required for single-symbol-lookahead, top-down, lookahead parsing ()

CO6.   Determine FIRST intersect FOLLOW constraint satisfaction - determine if a BNF grammar satisfies the constraint on intersection of FIRST and FOLLOW sets required for single-symbol-lookahead, top-down, lookahead parsing ()

Unit-1

Introduction,   Classification of grammars. Context free 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:

Course Outcomes:

At the end of the course students will be able to:

CO1. Use technology ethically, safely, securely, and legally.
CO2. Identify and analyze computer hardware, software, and network components.
CO3. Design basic business web pages using current HTML/CSS coding standards.
CO4. Install, configure, and remove software and hardware.
CO5. Use systems development, word-processing, spreadsheet, and presentation software to solve basic information systems problems.

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.

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JSS COLLEGE OF ARTS COMMERCE & SCIENCE
(Autonomous)
Ooty Road, Mysuru – 25

DEPARTMENT OF COMMERCE AND MANAGEMENT

BBA Programme
(II & II Year)
Syllabus as per NEP
(Modified)

w.e.f
2023-24

BBA PROGRAM

Semester I

Sl. No.	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week (L + T + P)	SEE	CIE	Total Marks	Credits
1	Lang.1.1	Language - I	AECC	3+1+0	60	40	100	3
2	Lang.1.2	Language - II	AECC	3+1+0	60	40	100	3
3	BBA.1.1	Management Principles & Practice	DSC	4+0+0	60	40	100	4
4	BBA.1.2	Fundamentals of Business Accounting	DSC	3+0+2	60	40	100	4
5	BBA.1.3	Marketing Management	DSC	4+0+0	60	40	100	4
6	BBA.1.4	Digital Fluency	SEC-SB	1+0+2	50	50	100	2
7	BBA.1.5	Business Organization and Management / Skills For Management	OEC	3+0+0	50	50	100	3
		Sub –Total (A)			450	250	700	23

Semester II

Sl. No.	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week (L + T + P)	SEE	CIE	Total Marks	Credits
8	Lang.2.1	Language - I	AECC	3+1+0	60	40	100	3
9	Lang.2.2	Language - II	AECC	3+1+0	60	40	100	3
10	BBA.2.1	Financial Accounting and Reporting	DSC	3+0+2	60	40	100	4
11	BBA.2.2	Human Resource Management	DSC	4+0+0	60	40	100	4
12	BBA.2.3	Business Environment/ Business Mathematics	DSC	4+0+0/ 3+0+2	60	40	100	4
13	BBA.2.4	Health Wellness/ Social & Emotional Learning	SEC-VB	1+0+2	-	100	100	2
14	BBA.2.5	Environmental Studies	AECC	2+0+0	50	50	100	2
15	BBA.2.6	People Management / Functional Areas of Management	OEC	3+0+0	50	50	100	3
		Sub –Total (B)			450	350	800	25

EXIT OPTION WITH CERTIFICATION - with ability to solve well defined problems

Notes:

- One Hour of Lecture is equal to 1 Credit.
- One Hour of Tutorial is equal to 1 Credit (Except Languages).
- Two Hours of Practical is equal to 1 Credit

Acronyms Expanded

- AECC : Ability Enhancement Compulsory Course
- DSC © : Discipline Specific Core (Course)
- SEC-SB/VB : Skill Enhancement Course-Skill Based/Value Based
- OEC : Open Elective Course
- DSE : Discipline Specific Elective
- SEE : Semester End Examination
- CIE : Continuous Internal Evaluation
- L+T+P : Lecture+Tutorial+Practical(s)

Note: Practical Classes may be conducted in the Business Lab or in Computer Lab or in Class room depending on the requirement. One batch of students should not exceed half (i.e., 30 or less than 30 students) of the number of students in each class/section. 2 Hours of Practical Class is equal to 1 Hour of Teaching, however, whenever it is conducted for the entire class (i.e., more than 30 students) 2 Hours of Practical Class is equal to 2 Hours of Teaching.

Revised Syllabus for 1ˢᵗ And 2ⁿᵈ Semester BBA Degree as Per NEP Regulations to be implemented From the Academic Year 2023-2024

I. OBJECTIVES OF THE COURSE:

1. To develop the skills required for the application of business concepts and techniques learnedin the classroom at the workplace.
2. To provide competent and technical skills personnel to the industry in the area of Marketing, Finance, Human Resource, Data Analytics, Retailing and Logistics And Supply Chain Management. To enhance the employability skills of the management students.
3. To enhance the capability of the students improve their decision-making skills.
4. To encourage entrepreneurship among students pursuing education in the field of BusinessAdministration.
5. To empower students for pursuing professional courses like MBA, Chartered Accountancy, Company Secretary, etc.,
6. To ensure holistic development of Business administration students.

II. ELIGIBILITY FOR ADMISSION:

Candidates who have passed Two Year Pre University Course of Karnataka State in any discipline or its equivalent (viz., 10+2 of other states, ITI, Diploma etc.) are eligible for admission into this program.

III. DURATION OF THE PROGRAM:

The program of study is Four years of Eight Semesters. A candidate shall complete his/her degree within eight academic years from the date of his/her admission to the first semester. The NEP 2020 provides multiple exit options for students as specified below:

EXIT OPTION:

a. The students who successfully complete ONE year/ 2 Semesters and leave the program, will be awarded Certificate in Business Administration.
b. The students who successfully complete TWO years/ 4 Semesters and leave the program, will be awarded Diploma in Business Administration.
c. The students who successfully complete THREE years/ 6 Semesters and leave the program, will be awarded Bachelors Degree in Business Administration (BBA)

IV. MEDIUM OF INSTRUCTION

The medium of instruction shall be English.

V. ATTENDANCE

a. For the purpose of calculating attendance, each semester shall be taken as a Unit.
b. A student shall be considered to have satisfied the requirement of attendance for the semester, if he/she has attended not less than 75% in aggregate of the number of working periods in eachof the subjects compulsorily.

c. A student who fails to complete the course in the manner stated above shall not be permitted totake the University Examination.

VI.   TEACHING AND EVALUATION

MBA graduates with BBM/BBA, B.Com and BBS as basic degree from a recognized University are only eligible to teach and to evaluate all the Business Administration courses except Languages, Constitution of India, Environmental Studies, Health Wellness/Social and Emotional learning, Sports/NCC/NSS/Other)

VII.   SKILL DEVELOPMENT / RECORD MAINTENANCE

a. Every college is required to establish a dedicated business lab for the purpose of conducting practical/ assignments to be written in the record.
b. In every semester, the student should maintain a record book in which a minimum of 5exercise or activities per course are to be recorded.

VIII.   SCHEME OF EXAMINATION

a. There shall be an University examination at the end of each semester. The maximum marks for the university examination in each paper shall be 60 marks for DSC, DSE, Vocational,SEC and OEC.
b. Internal Assessment 40 marks for DSC, DSE, Vocational, SEC and OEC.

IX.   GUIDELINES FOR CONTINUOUS INTERNAL EVALUATION AND SEMESTER END EXAMINATION:

The CIE and SEE will carry 40% and 60% weightage each, to enable the course to be evaluated for a total of 100 marks, irrespective of its credits. The evaluation system of the course is comprehensive & continuous during the entire period of the Semester. For a course, the CIE and SEE evaluation will be on the following parameters:

Sl No.	Parameters for the Evaluation	Marks
	Continuous Internal Evaluation (CIE)	
1	Continuous and Comprehensive Evaluation (CCE) – (A)	20 Marks
2	Internal Assessment test (IAT) – (B)	20 Marks
	Total of CIE (A+B)	**40 Marks**
3	Semester End Examination (SEE) – (C)	60 Marks
	Total of CIE and SEE (A+B+C)	**100 Marks**

Continuous Internal Evaluation (CIE)

a. **Continuous & Comprehensive Evaluation (CCE):** The CCE will carry a maximum of 20% weightage (20 marks) of total marks of a course. Before the start of the academic session in each semester, a faculty membershould choose for his/her course, minimum of the following assessment methods with 5markse each (4x5=20 marks)

    i.   Individual Assignments

    ii.   Seminars/Class room Presentations/Quizzes

iii. Group Discussions/Class Discussion / group assignments

iv. Casestudies/ Caselets

v. Participatory &Industry-Integrated Learning/Industrial visits

vi. Practical Activities / Problem Solving Exercises

vii. Parucipation in seminars/ academic events /symposia

viii. Mini project / Capstone projects

b. Internal Assessment Test (IAT):

The IAT will carry a maximum of 20% weightage (20 marks) of total marks of a course. Under this component, two tests will have to be conducted in a semester for 30 marks each and the same is to be scaled down to 10 marks each.

c. Semester End Examination (SEE):

The semester end examination for all the students for which students who get registered during the semester shall be conducted for 60 marks. SEE of the course shall be conducted subject to their fulfillment of minimum attendance requirement as per the university norms. The BOS of the university shall prepare the SEE framework and the question paper pattern.

d. Minimum marks for a Pass:

Candidates who have obtained 35% marks in semester end examination i.e., 21 marks out of 60 marks of theory examination and 40% in aggregate i.e., total 40 marks out of 100 marks of semester end examination marks and continuous internal evaluation marks.

Name of the Program: Bachelor of Business Administration (BBA)		
Course Code: BBA 1.1		
Name of the Course: Management Principles & Practice		
Course Credits	**No. of Hours per Week**	**Total No. of Teaching Hours**
4 Credits	**4 Hrs**	**56 Hrs**
Pedagogy: Classrooms lecture, tutorials, Group discussion, Seminar, Case studies & field work etc.,		

Course Outcomes: On successful completion of the course, the Students will demonstrate

a) The ability to understand concepts of business management, principles and functionof management.
b) The ability to explain the process of planning and decision making.
c) The ability to create organization structures based on authority, task and responsibilities.
d) The ability to explain the principles of direction, importance of communication,barrier of communication, motivation theories and leadership styles.
e) The ability to understand the requirement of good control system and control techniques.

Syllabus:	Hours
Module No. 1: INTRODUCTION TO MANAGEMENT	**10**
Introduction –Meaning, Evolution of management thought, Pre-Scientific Management Era, Classical Management Era, Neo-Classical Management Era, Modern Management Era; Nature and Characteristics of Management - Scope and Functional areas of Management; Management as a Science, Art or Profession; Management and Administration; Principles of Management.	
Module No. 2: PLANNING AND DECISION MAKING	**08**
Nature, Importance and Purpose of Planning - Planning Process; Objectives; Types of plans (Meaning only); Decision making- Importance and steps; MBO and MBE (Meaning only)	
Module No. 3: ORGANIZING AND STAFFING	**12**
Nature and purpose of Organization; Principles of Organizing; Delegation of Authority; Types of Organization - Departmentation, Centralization vs Decentralization ofAuthority and Responsibility, Span of Control; Nature and importance of Staffing	
Module No. 4: DIRECTING AND COMMUNICATING	**12**
Meaning and Nature of Direction, Principles of Direction; Communication - Meaning and Importance, Communication Process, Barriers to Communication, Steps to overcome Communication Barriers, Types of Communication; Motivation theories – Maslow's Need Hierarchy Theory, Herzberg's Two Factor Theory, Mc.Gregor's X and Y theory. Leadership – Meaning, Formal and Informal Leadership, Characteristics of Leadership; Leadership Styles – Autocratic Style, Democratic Style, Participative Style, Laissez Faire Leadership Styles, Transition Leadership, Charismatic Leadership Style.	
Module No. 5: COORDINATING AND CONTROLLING	**10**
Coordination–Meaning, Importance and Principles. Controlling-Meaning and steps in controlling, Essentials of Effective Control system, Techniques of Control (in brief).	
Module No. 6: BUSINESS SOCIAL RESPONSIBILITY AND MANAGERIAL ETHICS	**04**

Business Social Responsibility - Meaning, Arguments for and against Business Social Responsibility; Green management - Meaning, Green Management Actions; Managerial Ethics – Meaning - Importance of Ethics in Business, Factors that determine Ethical or Unethical behavior.

Skill Developments Activities:
1. Two cases on the above syllabus should be analyzed by the teacher in the classroom and the same needs to be recorded by the student in the Skill Development Book.
2. Draft different types of Organization structure.
3. Draft Control charts.

Text Books:

1. Stephen P. Robbins, Management, Pearson
2. Koontz and O‟Donnell, Management, McGraw Hill.
3. L M Prasad, Principles of management, Sultan Chand and Sons
4. V.S.P Rao/Bajaj, Management process and organization, Excel Books.GH25
5. Appanniah and Reddy, Management, HPH.
6. T. Ramaswamy : Principles of Management, HPH.

Note: Latest edition of text books may be used.

Name of the Program: Bachelor of Business Administration (BBA)		
Course Code: BBA 1.2		
Name of the Course: Fundamentals of Business Accounting		
Course Credits	**No. of Hours per Week**	**Total No. of Teaching Hours**
4 Credits	**4 Hrs**	**56 Hrs**

Pedagogy: Classrooms lecture, tutorials, and problem solving.

Course Outcomes: On successful completion of the course, the Students will demonstrate
  a) Understand the framework of accounting as well accounting standards.
  b) The Ability to pass journal entries and prepare ledger accounts
  c) The Ability to prepare subsidiaries books
  d) The Ability to prepare trial balance and final accounts of proprietary concern.
  e) Construct final accounts through application of tally.

Syllabus:	Hours
Module No. 1: INTRODUCTION TO FINANCIAL ACCOUNTING	**08**
Introduction – Meaning and Definition – Objectives of Accounting – Functions of Accounting – Users of Accounting Information – Limitations of Accounting – Accounting Cycle - Accounting Principles – Accounting Concepts and Accounting Conventions. Accounting Standards – objectives- significance of accounting standards. List of Indian Accounting Standards.	
Module No. 2: ACCOUNTING PROCESS	**12**
Meaning of Double entry system − Process of Accounting − Kinds of Accounts − Rules - Transaction Analysis − Journal − Ledger − Balancing of Accounts − Trial Balance − Problems on Journal, Ledger Posting and Preparation of Trial Balance.	
Module No. 3: SUBSIDIARY BOOKS	**14**
Meaning − Significance − Types of Subsidiary Books −Preparation of Purchases Book, Sales Book, Purchase Returns Book, Sales Return Book, Bills Receivable Book, Bills Payable Book. Types of Cash Book- Simple Cash Book , Double Column Cash Book , Three Column Cash Book and Petty Cash Book(Problems only on Three Column Cash Book and Petty Cash Book), Bank Reconciliation Statement − Preparation of Bank Reconciliation Statement (Problems on BRS)	
Module No. 4: FINAL ACCOUNTS OF PROPRIETARY CONCERN	**10**
Preparation of Statement of Profit and Loss and Balance Sheet of a proprietary concern with special adjustments like depreciation, outstanding and prepaid expenses, outstanding and received in advance of incomes, provision for doubtful debts, drawings and interest on capital.	
Module No. 5: ACCOUNTING SOFTWARE	**12**

Introduction-meaning of accounting software, types accounting software-accounting software Tally-Meaning of Tally software − Features − Advantages, Creating a New Company, Basic Currency information, other information, Company features and Inventory features. Working in Tally: Groups, Ledgers, writing voucher, different types of voucher, voucher entry Problem on Voucher entry - Generating Basic Reports in Tally-Trail Balance, Accounts books, Cash Book, Bank Books, Ledger Accounts, Group Summary, Sales Register and Purchase Register, Journal Register, Statement of Accounts, and Balance Sheet**.**

Skill Developments Activities:
1. List out the accounting concepts and conventions.
2. Prepare a Bank Reconciliation Statement with imaginary figures
3. Collect the financial statement of a proprietary concern and record it.
4. Prepare a financial statement of an imaginary company using tally software.

Text Books:

1. Hanif and Mukherjee, Financial Accounting, Mc Graw Hill Publishers
2. Arulanandam & Raman; Advanced Accountancy, Himalaya Publishing House
3. S.Anil Kumar,V.Rajesh Kumar and B.Mariyappa–Fundamentals of Accounting,
4. Himalaya Publishing House.
5. Dr. S.N. Maheswari, Financial Accounting, Vikas Publication
6. S P Jain and K. L. Narang, Financial Accounting, Kalyani Publication
7. Radhaswamy and R.L. Gupta, Advanced Accounting , Sultan Chand
8. M.C. Shukla and Goyel, Advaced Accounting , S Chand.

Note: Latest edition of text books may be used.

Name of the Program: Bachelor of Business Administration (BBA)		
Course Code: BBA 1.3		
Name of the Course: Marketing Management		
Course Credits	**No. of Hours per Week**	**Total No. of Teaching Hours**
4 Credits	**4 Hrs**	**56 Hrs**

Pedagogy: Classrooms lecture, tutorials, Group discussion, Seminar, Case studies & field work etc.,

Course Outcomes: On successful completion of the course, the Students will demonstrate
  a) Understand the concepts and functions of marketing.
  b) Analyse marketing environment impacting the business.
  c) Segment the market and understand the consumer behaviour
  d) Describe the 4 p's of marketing and also strategize marketing mix
  e) Describe 7 p's of service marketing mix.

Syllabus:	Hours
Module No. 1: INTRODUCTION TO MARKETING	**10**
Meaning and Definition, Concepts of Marketing, Approaches to Marketing, Functions of Marketing. **Recent trends in Marketing**-E- business, Tele-marketing, M-Business, Green Marketing, Relationship Marketing, Concept Marketing, Digital Marketing, social media marketing and E-tailing (Meaning only).	
Module No. 2: MARKETING ENVIRONMENT	**10**
Micro Environment – The company, suppliers, marketing intermediaries competitors, public and customers; **Macro Environment**- Demographic, Economic, Natural, Technological, Political, Legal, Socio-Cultural Environment.	
Module No. 3: MARKET SEGMENTATION AND CONSUMER BEHAVIOUR	**10**
Meaning and Definition, Bases of Market Segmentation, Requisites of Sound Market Segmentation; Consumer Behavior-Factors influencing Consumer Behavior; Buying Decision Process.	
Module No. 4: MARKETING MIX	**20**
Meaning, Elements of Marketing Mix (Four P's) – Product, Price, Place, Promotion. Product-Product Mix, Product Line, Product Lifecycle, New Product Development, Reasons for Failure of New Product, Branding, Packing and Packaging, Labeling, Pricing – Objectives, Factors influencing Pricing Policy, Methods of Pricing; Physical Distribution–Meaning, Factors affecting Channel Selection, Types of Marketing Channels. Promotion – Meaning and Significance of Promotion, Personal Selling and Advertising (Meaning Only)	
Module No. 5: SERVICES MARKETING	**06**
Meaning and definition of services, difference between goods and services, features of services, seven P's of services marketing (concepts only).	

Skill Developments Activities:

1. Two cases on the above syllabus should be analyzed and recorded in the skill development
2. Design a logo and tagline for a product of your choice
3. Develop an advertisement copy for a product.
4. Prepare a chart for distribution network for different products.

Text Books:

1. Philip Kotler, Marketing Management, Prentice Hall.
2. Lovelock Christopher, Services Marketing: People, Technology, Strategy, PHI
3. William J. Stanton, Michael J.Etzel, Bruce J Walker, Fundamentals of Marketing, McGraw Hill Education.
4. Bose Biplab, Marketing Management, Himalaya Publishers.
5. J.C. Gandhi, Marketing Management, Tata McGraw Hill.
6. Ramesh and Jayanti Prasad: Marketing Management, I.K. International
7. Sontakki, Marketing Management, Kalyani Publishers.
8. P N Reddy and Appanniah, Marketing Management

Note: Latest edition of text books may be used.

Name of the Program: Bachelor of Business Administration (BBA)		
Course Code: BBA 1.5 (OEC)		
Name of the Course: Business Organization and Management		
Course Credits	**No. of Hours per Week**	**Total No. of Teaching Hours**
3 Credits	**3 Hrs**	**45 Hrs**

Pedagogy: Classrooms lecture, tutorials, Group discussion, Seminar, Case studies & field work etc.,

Course outcomes: on successful completion of the course, the Students will demonstrate:
a) To Understand the concepts of Business organizations and Social Responsibilities of Business
b) To Describe the various forms of Business organization
c) To Understand the levels of managements and Describe the contribution of management thinkers
d) To demonstrate the functions of management effectively
e) To describe the technology driven work Place and some recent trends in Management

Syllabus:	Hours
Module No. 1: NATURE AND SCOPE OF BUSINESS	**08**
Meaning and Definition of Business, Characteristics, Objectives. Classification of Business Activities; Manufacturing, Trading and Services Organizations. Relationship between Trade, Industry and Commerce. Social Responsibilities of business towards stake holders.	
Module No. 2: FORMS OF BUSINESS ORGANISATIONS	**12**
Meaning and Features of Sole Proprietorship, Partnership, One Person Company, Limited Liability Partnerships, Hindu Undivided Family and Joint Stock Companies: Difference between Private and Public companies	
Module No. 3: NATURE OF MANAGEMENT	**08**
Definition , Characteristics- Management as an Art, Science or Profession - Levels of Management – Management Thoughts of FW Taylor , Henry Fayol, Max Weber and Peter Drucker.	
Module No. 4: FUNCTIONS OF MANAGEMENT	**10**
Planning – Importance, Steps in planning, Types of plans. Organising - Meaning, Organisation structure. Directing – Motivation, Leadership, Communication and Coordination – Definition and Meaning. Controlling: Concept and Process	
Module No 5: CURRENT TRENDS IN MANAGEMENT	**07**
Technology Driven Work place, Learning Organisations, Diversity of Work Force, Public Consciousness, Global market place, Community of stake holders	

Skill Developments Activities:
1. Collection of Partnership Deed
2. Collect the nature of business activities of any 10 Private and Public Companies
3. Collect the profiles of FW Taylor and Henry Fayol
4. Preparation of Imaginary Business plan
5. List the latest trends in Management

Text Books:
1. C B. Guptha - Business Organisation and Management, Sultan Chand & Sons.
2. Dr. S. C. Saxena - Business Administration & Management, Sahitya Bhawan.
3. M. C. Shukla - Business Organisation and Management. S Chand & Company Pvt. Ltd.
4. S.A Sherlekar - Business Organization, Himalaya Publishing House.
5. Y.K. Bhushan. Fundamentals of Business Organisation and Management, Sultan Chand& Sons.
6. R.K. Sharma, Business Organisation & Management Kalyani Publishers
7. Dr. I.M. Sahai, Dr. Padmakar Asthana,' Business Organisation & Administration', Sahitya Bhawan Publications Agra.
8. Richard L. Daft – Principles of management

Name of the Program: Bachelor of Business Administration (BBA)		
Course Code: BBA 1.5(OEC)		
Name of the Course: Skills For Management (OEC)		
Course Credits	**No. of Hours per Week**	**Total No. of Teaching Hours**
3 Credits	**3 Hrs**	**45 Hrs**

Pedagogy: Classrooms lecture, tutorials, Group discussion, Seminar, Case studies & field work etc.,

Course Outcomes: On successful completion of the course, the Students will demonstrate

a) The Ability to communicate and Present effectively by inculcating listing skills
b) To Understand the value of Time through various Time Management tips and strategies
c) To take the right decisions of the enterprise for success and to achieve its predetermined goals
d) To Identify as a Responsible team member and carry out the team activates effectively and abili understand need leadership in management
e) To apply Emotional Intelligence at organization and Overcoming the conflicts using various techniques

Syllabus:	Hours
Module No. 1: COMMUNICATION AND PRESENTATION	08
Fundamentals, Types - Horizontal, Vertical, Oral, Written, Email Etiquettes; Virtual Meetings; Listening, Importance and Need, Features of a Good Listening**;** Presentation skills, Etiquettes for Effective Presentation	
Module No. 2: TIME MANAGEMENT	10
Importance of Discipline & Punctuality – The Pareto Principle, Time Management Matrix – Scheduling - Grouping of Activities, Overcoming Procrastination – Time Circle Planner, Time Management Tips and Strategies.	
Module No. 3: DECISION MAKING	10
Decision making, Importance, Types of Decisions, Programmed and Non- programmed decisions - Steps in decision making Process - Decision Making Styles -Participation in decision making.	
Module No. 4: TEAM BUILDING AND LEADERSHIP	10
Teams – Types of Teams, Characteristics of an effective team- Stages of team Development- Team cohesiveness and its importance. Leadership- Nature of Leadership, Leadership vs Management-Leadership traits - Leadership styles	
Module No. 5 : EMOTIONAL INTELLIGENCE AND CONFLICT MANAGEMENT	07
Emotional Intelligence- Concept, Components and Application of Emotions Intelligence in organizations. Conflict- Types of conflict, Sources of Conflict, Conflict resolution techniques.	

Skill Developments Activities:

1. Preparation of Business presentation
2. Team Building Practices through group exercises, team task.
3. Practice by Game play & other learning methodology for achieving Given targets
4. Writing Business Letters through E-mails

Text Books:
  1. Alex K., Managerial Skills, S. Chand
  2. V.S.P. Rao Managerial Skills Excel Books, New Delhi
  3. David A Whetten, Cameron Developing Management skills, PHI 2008
  4. Ramnik Kapoor Managerial Skills Path Makers, Bangalore
  5. Kevin Gallagher, Skills development for Business and Management Students,Oxford
  6. Monipally,Muttthukutty Business Communication Strategies Tata McGraw Hill.

Note: Latest edition of text books may be used.

Name of the Program: Bachelor of Business Administration (BBA)		
Course Code: BBA 2.1		
Name of the Course: Financial Accounting and Reporting		
Course Credits	**No. of Hours per Week**	**Total No. of Teaching Hours**
4 Credits	**4 Hrs**	**56 Hrs**

Pedagogy: Classrooms lecture, tutorials, and Problem Solving.

Course Outcomes: On successful completion of the course, the Students will demonstrate
  a) The ability to prepare final accounts of partnership firms
  b) The ability to understand the process of public issue of shares and accounting for the same
  c) The ability to prepare final accounts of joint stock companies.
  d) The ability to prepare and evaluate vertical and horizontal analysis of financial statements
  e) The ability to understand company's annual reports.

Syllabus:	Hours
Module No. 1: FINAL ACCOUNTS OF PARTNERSHIP FIRM	**10**
Meaning of Partnership Firm, Partnership deed-clauses in partnership deed, Preparation of Final accounts of partnership firm-Trading and Profit and Loss Account, Profit and Loss Appropriation Account, Partners capital account and Balance sheet. Goodwill- Nature, Factors influencing goodwill and methods of valuation of goodwill (Average and super profit methods)	
Module No. 2: ISSUE OF SHARES	**08**
Meaning of Share, Types of Shares – Preference shares and Equity shares – Issue of Shares at par, at Premium, at Discount: Pro-Rata Allotment; Journal Entries relating to issue of shares; Preparation of respective ledger accounts; Preparation of Balance Sheet in the Vertical form (Practical Problems).	
Module No. 3: FINAL ACCOUNTS OF JOINT STOCK COMPANIES	**12**
Statutory Provisions regarding preparation of Company Final Accounts – Treatment of Special Items, Managerial Remuneration, Tax deducted at source, Advance payment of Tax, Provision for Tax, Depreciation, Interest on debentures, Dividends, Rules regarding payment of dividends, Transfer to Reserves, Preparation of Profit and Loss Account and Balance Sheet (Vertical Form Schedule -III) (Practical Problems).	
Module No. 4: FINANCIAL STATEMENTS ANALYSIS	**12**
Comparative Statements - Comparative Income Statement, Comparative Balance Sheet; Common size Statements – Common Size Income Statement, Common Size Balance Sheet – Trend Percentages. (Analysis and Interpretation)	
Module No. 5: CORPORATE FINANCIAL REPORTING PRACTICES	**10**

Corporate Financial Reporting - meaning, types, characteristics of Corporate financial report, users of corporate financial report; Components corporate financial report– general corporate information, financial highlights, management's discussion and analysis; Financial Statements-balance sheet, income statement, cash flow statement, and notes to the financial statements; Auditor's report; Significant Accounting Policies; Corporate Governance Report; Corporate Social Responsibility Report (Discuss only Role and Significance of above components of corporate financial report).

Skill Developments Activities:
1. Collect financial statement of a company for five years and analyse the same using trend analysis.
2. Refer annual reports of two companies and list out the components.
3. Draft a partnership deed as per Partnership Act.
4. List out the accounting policies in annual report of the company

Text Books:

1. Stephen P. Robbins, Management, Pearson
2. Koontz and O"Donnell, Management, McGraw Hill.
3. L M Prasad, Principles of management, Sultan Chand and Sons
4. V.S.P Rao/Bajaj, Management process and organization, Excel Books.GH25
5. Appanniah and Reddy, Management, HPH.
6. T. Ramaswamy : Principles of Management, HPH.

Note: Latest edition of text books may be used.

Name of the Program: Bachelor of Business Administration (BBA)		
Course Code: BBA 2.2		
Name of the Course: Human Resource Management		
Course Credits	**No. of Hours per Week**	**Total No. of Teaching Hours**
4 Credits	**4 Hrs**	**56 Hrs**

Pedagogy: Classroom's lecture, tutorials, Group discussion, Seminar, Case studies & field work etc.,

Course Outcomes: On successful completion of the course, the students will be able to demonstrate

 a) Ability to describe the role and responsibility of Human resources management functions on business
 b) Ability to describe HRP, Recruitment and Selection process
 c) Ability to describe to induction, training, and compensation aspects.
 d) Ability to explain performance appraisal and its process.
 e) Ability to demonstrate Employee Engagement and Psychological Contract.

Syllabus:	Hours
Module No. 1: Introduction to Human Resource Management	**10**

Meaning and Definition of HRM – Features Objectives, Differences between Human Resource Management and Personnel Management, Importance, Functions and Process of HRM, Role of HR Manager, Trends influencing HR practices

Module No. 2: Human Resource Planning, Recruitment & Selection	**14**

Human Resource Planning: Meaning and Importance of Human Resource Planning, Process of HRP
HR Demand Forecasting- Meaning and Techniques (Meanings Only) and HR supply forecasting.
Succession Planning – Meaning and Features
Job Analysis: Meaning and Uses of Job Analysis, Process of Job Analysis – Job Description, Job Specification**,** Job Enlargement, Job Rotation, Job Enrichment (Meanings Only)
Recruitment – Meaning, Methods of Recruitment, Factors affecting Recruitment, Sources of Recruitment
Selection – Meaning, Steps in Selection Process, Psychometric tests for Selection, Barriers to effective Selection, Making Selection effective; Placement, Gamification – Meaning and Features

Module No. 3: Induction, Training and Compensation	**10**

Induction: Meaning, Objectives and Purpose of Induction, Problems faced during Induction, Induction Program Planning.
Training: Need for training, Benefits of training, Assessment of Training Needs and Methods of Training and Development; Kirkpatrick Model; Career Development.
Compensation: Direct and Indirect forms of Compensation (Meaning Only), Compensation Structure.

Module No. 4: Performance Appraisal, Promotion & Transfers	**14**

Performance appraisal: Meaning and Definition, Objectives and Methods of Performance Appraisal – Uses and Limitations of Performance Appraisal, Process of Performance Appraisal

Promotion: Meaning and Definition of Promotion, Purpose of Promotion, Basis of Promotion **ransfer:** Meaning of Transfer, Reasons for Transfer, Types of Transfer, Right Sizing ofWork Force, Need for Right Sizing

Module No. 5: Employee Engagement and Psychological Contract	08

Employee Engagement (EE): Meaning and Types of EE, Drivers of Engagement - Measurement of EE, Benefits of EE. **Psychological contract**: Meaning and features

Skill Developments Activities:

1. Preparation of Job Descriptions and Job specifications for a Job profile
2. Choose any MNC and present your observations on training program
3. Develop a format for performance appraisal of an employee.
4. Discussion of any two Employee Engagement models.
5. Analysis of components of pay structure based on the CTC sent by the Corporate to the institute for the various jobs of different sectors.

Textbooks:

Aswathappa, Human Resource Management, McGraw Hill

Edwin Flippo, Personnel Management, McGraw Hill

C.B.Mamoria, Personnel Management, HPH

Subba Rao, Personnel and Human Resources Management, HPH

Reddy & Appanniah, Human Resource Management, HPH

Madhurimalal, Human Resource Management, HPH

S.Sadri & Others: Geometry of HR, HPH

Rajkumar: Human Resource Management I.K. Intl

Michael Porter, HRM and Human Relations, Juta & Co.Ltd.

K. Venkataramana, Human Resource Management, SHBP

Note: Latest edition of textbooks may be used.

<table>
<tr><td colspan="3" align="center">**Name of the Program:** Bachelor of Business Administration (BBA)
Course Code: BBA 2.3
Name of the Course: BUSINESS ENVIRONMENT</td></tr>
<tr><td align="center">**Course Credits**</td><td align="center">**No. of Hours per Week**</td><td align="center">**Total No. of Teaching Hours**</td></tr>
<tr><td align="center">**4 Credits**</td><td align="center">**4 Hrs**</td><td align="center">**56 Hrs**</td></tr>
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Pedagogy: Classrooms lecture, tutorials, Group discussion, Seminar, Case studies.

Course Outcomes: On successful completion Student will demonstrate

a) An Understanding of components of business environment.
b) Ability to analyse the environmental factors influencing business organisation.
c) Ability to demonstrate Competitive structure analysis for select industry.
d) Ability to explain the impact of fiscal policy and monetary policy on business.
e) Ability to analyse the impact of economic environmental factors on business.

Syllabus:	Hours
Module No. 1: INTRODUCTION BUSINESS ENVIRONMENT	**12**

Meaning of business, scope and objectives Business, business environment, Micro and Macro-environment of business (social, cultural, economic, political, legal technological and natural) Impact of these factors on decision making in business, Environmental analysis.

Module No. 2: GOVERNMENT AND LEGAL ENVIRONMENT	**16**

Government Functions of the State, Economic role of government, State intervention in business- reasons for and types of state intervention in business. Impact of Monetary policy, Fiscal policy, Exim policy and industrial policy on business.
Legal environment - Various laws affecting Indian businesses

Module No. 3: ECONOMIC ENVIRONMENT AND GLOBAL ENVIRONMENT	**13**

An overview of economic environment, structure of economy, factors affecting economic environment.
Globalisation of business; meaning and dimensions, stages, essential conditions of globalisation, foreign market entry strategies, merits and demerits of globalisation of business, Impact of Globalisation on Indian businesses, Forms of globalisation of businesses - MNCs, TNCs etc..

Module No. 4: TECHNOLOGICAL ENVIRONMENT	**10**

Meaning and features; types of innovation, Impact of Technological changes on business, Technology and Society, Technological Acquisition modes, IT revolution and business, Management of Technology.

Module No. 5: NATURAL ENVIRONMENT	**05**

Meaning and nature of physical environment. Impact of Natural environment on business.

Skill Developments Activities:

a) List out key features of recent Monetary policy published by RBI impacting businesses.
b) Give your observation as to how technology has helped society.
c) Draft Five Forces Model for Imaginary business.
d) Identify the benefits of Digital transformation in India.

Text Books:

1. Dr. K Ashwatappa: Essentials Of Business Environment
2. Sundaram & Black: The International Business Environment; Prentice Hall
3. Chidambaram: Business Environment; Vikas Publishing
4. Upadhyay, S: Business Environment, Asia Books
5. Chopra, BK: Business Environment in India, Everest Publishing
6. Suresh Bedi: Business Environment,Excel Books
7. Economic Environment of Business by M. Ashikary.
8. Business Environment by Francis Cherrinulam

Note: Latest edition of text books may be used.

Name of the Program: Bachelor of Business Administration (BBA)		
Course Code: BBA 2.3		
Name of the Course: Business Mathematics		
Course Credits	**No. of Hours per Week**	**Total No. of Teaching Hours**
4 Credits	**4 Hrs**	**56 Hrs**

Pedagogy: Classroom's lecture, tutorials, Problem solving.

Course Outcomes: On successful completion of the course, the students will demonstrate
   a) The Understanding of the basic concepts of business maths and apply them to create solve and interpret application problems in business
   b) Ability to solve problems on various types of equation.
   c) Ability to solve problems on Matrices and execute the laws of indices, law of logarithm and evaluate them.
   d) Ability to apply the concept of simple interest and compound interest bills discounted etc. and apply them in day-to-day life.
   e) Ability to solve problems on Arithmetic progression, Geometric progression and construct logical application of these concepts.

Syllabus:	Hours
Module No. 1: NUMBER SYSTEM	**04**
Introduction – Natural Numbers - Even Numbers – Odd Numbers – Integers – Prime Numbers – Rational and Irrational numbers, Real Numbers, HCF and LCM (Simple problems).	
Module No. 2: THEORY OF EQUATIONS	**10**
Introduction – Meaning - Types of Equations – Simple/ Linear Equations and Simultaneous Equations (only two variables), Elimination and Substitution Methods only. Quadratic Equation - Factorization and Formula Method ($ax^2 + bx + c = 0$ form only). Simple problems.	
Module No.3: INDICIES, MATRICES AND LOGARITHMS	**16**
Meaning – types – operation on matrices – additions – subtractions and multiplication of two matrices – transpose – determinants – minor of an element – co-factor of an element – inverse – crammers rule in two variables – problems. Indices and Logarithms: Meaning- Basic Laws of Indices and their application for simplification. Laws of Logarithms –Common Logarithm, Application of Log Table for Simplification.	
Module No. 4: COMMERCIAL ARITHMETIC	**16**
Simple Interest, Compound Interest including yearly and half yearly calculations, Annuities, Percentages, Bills Discounting, Ratios and proportions, duplicate-triplicate and sub-duplicate of a ratio. Proportions: third, fourth and inverse proportion - problems.	
Module No. 5: PROGRESSIONS	**10**
PROGRESSIONS: Arithmetic Progression - Finding the 'nth' term of AP and Sum to nth term of AP. Insertion of Arithmetic Mean Geometric Progression – Finding the 'nth' term of GP and sum to 'nth' term of GP and insertion of Geometric Mean.	

Skill Developments Activities:

1. Develop an Amortization Table for Loan Amount – EMI Calculation.
2. Secondary overhead distribution summary using Simultaneous Equations Method.
3. Application of Matrix In Business Problems

Text Books:

1. Saha: Mathematics for Cost Accountants, Central Publishers
2. R.G. Saha and Others – Methods and Techniques for Business Decisions, VBH
3. Dr. SanchetiandKapoor: Business Mathematics and Statistics, Sultan Chand
4. Zamarudeen: Business Mathematics, Vikas
5. R.S Bhardwaj :Mathematics for Economics and Business
6. Madappa, mahadi Hassan, M. IqbalTaiyab – Business Mathematics, Subhash
7. G.R. Veena and Seema : Business Mathematics and Statistics I.K. Intl Publishers

Note: Latest edition of text books may be used.

Name of the Program: Bachelor Business Administration (BBA)		
Course Code: BBA.2.6 (OEC)		
Name of the Course: People Management		
Course Credits	**No. of Hours per Week**	**Total No. of Teaching Hours**
3 Credits	**3 Hrs**	**45 Hrs**

Pedagogy: Classroom's lecture, tutorials, Group discussion, Seminar, Case studies.

Course outcome: On successful completion of the course, student will demonstrate:

1. Ability to examine the difference between People Management with Human resource Management
2. Ability to explain the need for and importance of People Management.
3. Ability to explain role of manager in different stages of performance management process
4. Ability to list modern methods of performance and task assessment.
5. Ability to analyse the factors influencing the work life balance of an working individual.

Syllabus:	Hours
Module No. 1: Introduction to People Management	**06**
Diversity in organisation: age, gender, ethnicity, race, and ability. People Management: Meaning, Features, Significance of people management, Difference between People Management and Human Resource Management, impact of individual and organizational factors on people management.	
Module No. 2: Getting Work Done and Assessment and Evaluation	**12**
Getting work done: Challenges of getting work done, significance of prioritization and assigning work to team members. Performance Management: meaning, role of a manager in the different stages of the performance management process, Types of Performance assessment, Assessment and Evaluation Process of evaluation of tasks in the organisation. Modern tools of assessment and evaluation of tasks and performance.	
Module No. 3: Building Peer Networks and Essentials of Communication	**12**
Building Peer Networks: Understanding the importance of peer networks in an organization; being able to influence those on whom you have no authority; challenges Peer networking and different types of people networking in the workplace. **Essentials of Communication**: Concept of the communication process with reflection on various barriers to effective communication and ways to overcome, Types of Communication and Channels of Communication.	
Module No. 4: Motivation	**08**
Meaning, Importance and need for motivation, team motivation- meaning, importance team motivation, types of Motivators and Modern methods of motivation	
Module No. 5: Managing Self	**07**
Reflection on what does it mean to be a people manager; building a personal development plan for oneself, Self-Stress Management: Causes for stress, work life Balance, Importance of Work life balance, Factors influencing Work life Balance.	

Skill Developments Activities:

1. Analyse two cases on any of the above content indicated above.
2. List out the modern tools to performance assessment and evaluation.
3. Conduct a survey of work life balance of working individuals
4. Draft a Career development of working individual in the middle level management.

Text Books:

1. McShane, Steven L. and Mary Ann Von Glinow, Organizational Behavior: Emerging Knowledge and Practice for the Real World. McGraw-Hill, latest edition, ISBN: 0-07-115113-3.
2. Bernardin, H. John and Joyce E. A. Russell. Human Resource Management: An Experiential Approach. McGraw-Hill, 6/e. ISBN: 0078029163
3. Argyris, C. (1974). Personality vs. Organization. Organizational Dynamics. Vol. 3. No. 2, Autumn.
4. Blume, B. Baldwin, T. and Ryan, K. (2013). Communication Apprehension. A barrier to students leadership, adaptability and multicultural appreciation. Academy of Management Learning & Education, Jun, Vol. 12 Issue 2, p158-172.
5. Colquitt, J.A., LePine, J.A., & Wesson, M.J. (2009) Organizational Behavior: Improving Performance and Commitment in the Workplace (International edition). New York: McGraw-Hill.
6. Goleman, D. (1998). Working with Emotional Intelligence. Bantam Books,
Note: Latest edition of text books may be used.

Name of the Program: Bachelor of Business Administration		
Course Code: BBA 2.6 (OEC)		
Name of the Course: Functional Areas of Management		
Course Credits	**No. of Hours per Week**	**Total No. of Teaching Hours**
3 Credits	**3 Hrs**	**45 Hrs**

Pedagogy: Classroom's lecture, tutorials, Group discussion, Seminar, Case studies.

Course Outcomes: On successful completion Student will demonstrate ;
   a) Understand the concepts and functions of marketing and analyzing the Marketing Mix.
   b) Ability to describe Man power Planning and Implement Recruitment, Selection process and Evaluate Performance
   c) Understanding various functions of Financial Management
   d) Understanding the basics of production and operations management
   e) Understanding the need for Information Systems in organization.

Syllabus:	Hours
Module No. 1: MARKETING MANAGEMENT	10
Meaning and Definitions-Evolution of marketing-Marketing Vs Selling-Marketing concepts-Nature and Scope of Marketing-Functions of Marketing, Elements of Marketing Mix (7Ps)	
Module No. 2: HUMAN RESOURCE MANAGEMENT	10
Meaning and Definitions-Functions of HR-Man power planning-Recruitment-Selection-Training and development- Placement-Compensation-Incentives-monetary and non monetary-Performance Appraisal	
Module No. 3: FINANCIAL MANAGEMENT	10
Meaning-Definitions-Objectives-Profit maximization vs. Wealth maximization-Scope of Financial management-Investment decisions- Financing decisions, Dividend decisions-Working capital decisions	
Module No. 4: PRODUCTION AND OPERATIONS MANAGEMENT	08
Meaning, Objectives and Functions -Plant Location -Plant Layout-Factors-Types- Production Planning and Control-Inventory Management-Total Quality Management-Concept of Supply Chain management	
Module No. 5: INFORMATION SYSTEM	07
Introduction, Data Vs Information, Information system in an Organisation, Importance of Information System in Decision making - Information system and sub systems	

Skill Developments Activities:
   1. List the sources of recruitment and draw a Selection process chart of an organisation
   2. Draw a chart showing a Plant layout operations
   3. List out the current trends in Marketing and Human Resource Management
   4. List out the Factors Influencing Financing and Investment Decisions

Books Recommended:
1. Richard Pettiger. Introduction to Management, Palgrave Macmillan, New York
2. M.J.Mathew,Functional Management, RBSA Publishers, Jaipur.
3. Meenakshy Gupta . Principles of Management, PHI, New Delhi.
4. Koonts and Heinz Weihrich. Essentials of Management, Tata McGraw-Hill Publishing Co.Ltd.
5. Modern Production Management Buffa Ekwood. S, and Rakesh K. Saren, John wiley and Sonss., 2003
6. Operations Management K.N. Krishnaswamy
7. Management Information System – C.S.V Murthy

JSS COLLEGE OF ARTS COMMERCE & SCIENCE
(Autonomous)
Ooty Road, Mysuru – 25

DEPARTMENT OF COMMERCE AND MANAGEMENT

BBA Programme
(II Year)
Syllabus as per NEP
(Modified)

w.e.f
2023-24

SYLLABUS FOR BBA DEGREE AS PER NEP – 2020 REGULATIONS IMPLEMENTED FROM THE ACADEMIC YEAR 2021-22

I. OBJECTIVES:

1. To develop the skills required for the application of business concepts and techniques learned in the classroom at the workplace.

2. To provide competent and technical skills personnel to the industry in the area of Marketing, Finance, Human Resource, Data Analytics, Retailingand Logistics And Supply Chain Management. To enhance the employability skills of the management students.

3. To enhance the capability of the students improve their decision-making skills.

4. To encourage entrepreneurship among students pursuing education in the field of Business Administration.

5. To empower students for pursuing professional courses like MBA,Chartered Accountancy, Company Secretary, etc.,

6. To ensure holistic development of Business administration students.

II. ELIGIBILITY FOR ADMISSION:

Candidates who have passed Two Year Pre University Course of Karnataka State in any discipline or its equivalent (viz., 10+2 of other states, ITI, Diploma etc.) are eligible for admission into this program.

III. DURATION OF THE PROGRAM:

The program of study is Four years of Eight Semesters. A candidate shall complete his/her degree within eight academic years from the date of his/her admission to the first semester. The NEP 2020 provides multiple exit options for students as specified below:

EXIT OPTION:

a. The students who successfully complete ONE year/ 2 Semesters and leave the program, will be awarded Certificate in Business Administration.

b. The students who successfully complete TWO years/ 4 Semesters and leave the program, will be awarded Diploma in Business Administration.

c. The students who successfully complete THREE years/ 6 Semesters and leave the program, will be awarded Bachelors Degree in Business Administration (BBA)

d. An option is given to the students to continue their education to the Fourth year and those who successfully complete FOUR years/ 8 Semesters will be awarded Bachelors Degree in Business Administration (Hons). [BBA (Hons)]

IV. MEDIUM OF INSTRUCTION

The medium of instruction shall be English. .

V. ATTENDANCE

a. For the purpose of calculating attendance, each semester shall be taken as a Unit.

b. A student shall be considered to have satisfied the requirement of attendance for the semeste if he/she has attended not less than 75% in aggregate of the number of working periods in eac of the subjects compulsorily.

c. A student who fails to complete the course in the manner stated above shall not be permitted t take the University Examination.

VI. TEACHING AND EVALUATION

MBA graduates with B.Com, BBM/BBA and BBS as basic degree from a recognized university ar only eligible to teach and to evaluate all the Business Administration courses except Languages Constitution of India, Environmental Studies, Health Wellness/Social and Emotional learning Sports/NCC/NSS/Other)

VII. SKILL DEVELOPMENT / RECORD MAINTENANCE

a. Every college is required to establish a dedicated business lab for the purpose of conductin practical/ assignments to be written in the record.

b. In every semester, the student should maintain a record book in which a minimum of exercise or activities per course are to be recorded.

VIII. SCHEME OF EXAMINATION

a. There shall be an University examination at the end of each semester. The maximum mark for the university examination in each paper shall be 60 marks for DSC, DSE, Vocationa SEC and OEC.

b. Internal Assessment 40 marks for DSC, DSE, Vocational, SEC and OEC.

Guidelines for Continuous Internal Evaluation and Semester End Examination:

TheCIEandSEE will carry 40% and 60% weightage each, to en ble evaluated atotalof100marks,irrespectiveofitscredits.Theevaluationsystemofthe cou e& continuousduring the entire period of the Semest r. theCIEandSEEevaluationwillbeonthefollowingparameters:

Sl. No	Parametersfor theEvaluation	Marks
	ContinuousInternalEvaluation(CIE)	
1	Continuous&ComprehensiveEv lu ion(CCE) — (A)	20Marks
2	InternalAssessmentTests(IAT) –(B)	20Marks

	TotalofCIE(A+B)	40Marks
3	SemesterEndExamination(SEE) − (C)	60Marks
	TotalofCIEandSEE(A+B+C)	100Marks

ContinuousInternalEvaluation:

a. **Continuous&ComprehensiveEvaluation(CCE):** TheCCEwillcarryamaximum of20%weightage(20marks)oftotalmarksofacourse.Before the start of the academicsessionin each semester, a faculty member shouldchooseforhis/hercourse,minimumoffourofthefollowingassessmentmethodswith5markse ach (4x5=20 marks)

    i.   IndividualAssignments
    ii.   Seminars/ClassRoomPresentations/Quizzes
    iii.   GroupDiscussions/ClassDiscussion/GroupA ss
    iv.   Casestudies/Caselets
    v.   Participatory&Industry-IntegratedLearning/ n
    vi.   Practicalactivities/ProblemSolvingExercise s
    vii.   ParticipationinSeminars/AcademicEvents/S n
    viii.   MiniProjects/CapstoneProjects

b. **InternalAssessmentTests(IAT):** TheIATwillcarryamaximumof20%weightage(20marks)ofto talmarksofacourse.Underthiscomponent,twotests will have to be conducted in a semester for30 markseachand the sameistobescaleddownto1 0 markseach.

InternalAssessmentTest

CourseCode: **NameoftheCourse:**

Duration:1Hour   TotalMarks:30

PART-A

Answeranyoneofthefollowingquestions (1x5= 5) marks

    1.----------------------------
    2...

PART-B

Answeranyoneofthefollowingquestions (1x10 10) marks

    3.-----------------------------

4. ....

SECTION-C

Answer any one of the following questions (1×15=15) marks

    5,----------------------------

    6.----------------------------

SEMESTER END EXAMINATION (SEE):

TheSemesterEndExaminationforallthecoursesforwhic ingthesemestershallbeconducted.SEEofthecourseshall inimumattendancerequirementaspertheUniversity no has prepared the SEE framework and the questi presented below for 60 marks.

PATTERN OF QUESTION PAPER

TIME : 3 HOURS   **MARKS: 60**

PART – A

Answer any FIVE of the following questions. Each question carries 2 marks.

                                          (5x2= 10)

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

PART – B

Answer any TWO of the following questions. Each question carries 10 Marks.

                                          (2x10 =20)

8. --
9. --
10. --
11. --

PART – C

Answer any TWO of the following questions. Each question carries 15 Marks

                                          (2x15=30)

12. --
13. --
14. --
15. --

Minimum Marks for a Pass:

Candidates who have obtained a minimum of 35% ma
marks out of 60 marks of theory examination and 40% in
marks of Semester End Examination marks and Continuo

BBA PROGRAM

**Proposed Scheme of Teaching & Evaluation for BBA (Basic/Hons) with
Business Administration as Core subject**

Semester I								
Sl. No.	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week (L + T + P)	SEE	CIE	Total Marks	Credits
1	Lang.1.1	Language - I	AECC	3+1+0	60	40	100	3
2	Lang.1.2	Language - II	AECC	3+1+0	60	40	100	3
3	BBA.1.1	Management Principles & Practice	DSC	3+2+0	60	40	100	4
4	BBA.1.2	Fundamentals of Business Accounting	DSC	3+2+0	60	40	100	4
5	BBA.1.3	Marketing Management	DSC	3+2+0	60	40	100	4
6	BBA.1.4	Digital Fluency	SEC-SB	1+0+2	25	25	50	2
7	BBA.1.5	Business Organization / Office Organization and Management	OEC	3+0+0	60	40	100	3
		Sub–Total (A)			**385**	**265**	**650**	**23**

Semester II								
Sl. No.	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week (L + T + P)	SEE	CIE	Total Marks	Credits
8	Lang.2.1	Language - I	AECC	3+1+0	60	40	100	3
9	Lang.2.2	Language - II	AECC	3+1+0	60	40	100	3

10	BBA.2.1	Financial Accounting and Reporting	DSC	3+2+0	60	40	100	4
11	BBA.2.2	Human Resource Management	DSC	3+2+0	60	40	100	4
12	BBA.2.3	Business Environment/ Business Mathematics	DSC	3+2+0	60	40	100	4
13	BBA.2.4	Health &Wellness/ Social & Emotional Learning	SEC-VB	1+0+2	25	25	50	2
14	BBA.2.5	Environmental Studies	AECC	2+0+0	30	20	50	2
15	BBA.2.6	People Management /Retail Management	OEC	3+0+0	60	40	100	3
Sub–Total (B)					**415**	**285**	**700**	**25**

EXIT OPTION WITH CERTIFICATION with ability to solve well defined proble

Sl. No.	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week (L + T + P)	SEE	CIE	Total Marks	Credits
16	Lang.1.1	Language - I	AECC	3+1+0	60	40	100	3
17	Lang.1.2	Language - II	AECC	3+1+0	60	40	100	3
18	BBA.3.01	Cost Accounting	DSC	3+2+0	60	40	100	4
19	BBA.3.02	Organizational Behavior	DSC	3+2+0	60	40	100	4
20	BBA.3.03	Statistics for Business Decisions	DSC	3+2+0	60	40	100	4
21	BBA.3.4	Artificial Intelligence/Critical thinking& Problem Solving	SEC	1+0+2	25	25	50	2
22	BBA.3.5	Social Media Marketing/ Rural Marketing	OEC	3+0+0	60	40	100	3
Sub–Total (C)					**385**	**265**	**650**	**23**

	Semester IV							
Sl. No.	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week (L + T + P)	SEE	CIE	Total Marks	Credits
23	Lang.1.1	Language - I	AECC	3+1+0	60	40	100	3
24	Lang.1.2	Language - II	AECC	3+1+0	60	40	100	3
25	BBA.4.1	Management Accounting	DSC	3+2+0	60	40	100	4
26	BBA.4.2	Business Analytics / Financial Markets & Services	DSC	3+2+0	60	40	100	4
27	BBA.4.3	Financial Management	DSC	3+2+0	60	40	100	4
28	BBA.4.4	Constitution of India	AECC	2+0+0	30	20	50	2
29	BBA.4.5	Sports/NCC/NSS/YOGA	SEC-VB	1+0+2	25	25	50	2
40	BBA.4.6	Business Leadership Skills/Personal Wealth Management	OEC	3+0+0	60	40	100	3
Sub–Total (D)					**415**	**285**	**700**	**25**

EXIT OPTION WITH DIPLOMA to solve broadly defined problems

Semester V

Sl. No.	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week (L + T + P)	SEE	CIE	Total Marks	Credits
31	BBA.5.1	Production And Operations Management/ International Business	DSC	3+2+0	60	40	100	4
32	BBA.5.2	Income Tax	DSC	3+2+0	60	40	100	4
33	BBA.5.3 Elective	Elective-1(PAPER 1)	DSE	3+2+0	60	40	100	4
34	BBA.5.4 Elective	Elective-2 (PAPER1)	DSE	3+2+0	60	40	100	4
35	BBA.5.5	Information Technology for Managers	Vocational - 1	3+0+2	50	50	100	4
36	BBA.5.6	Cyber Security/Ethics & Self-Awareness	SEC - VB	1+0+2	25	25	50	2
		Sub–Total (E)			315	235	550	22

Semester VI

Sl. No.	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week (L + T + P)	SEE	CIE	Total Marks	Credits
37	BBA.6.1	Business Laws	DSC	4+0+0	60	40	100	4
38	BBA.6.2	Entrepreneurship & Startup Management	DSC	3+2+0	60	40	100	4
39	BBA Elective	Elective-1(PAPER2)	DSE	3+2+0	60	40	100	4
40	BBA.6.4 Elective	Elective-2(PAPER2)	DSE	3+2+0	60	40	100	4
41	BBA.6.5	Goods & Services Tax(GST)	Vocational-2	4+0+0	60	40	100	4
42	BBA.6.6	Professional Communication	SEC - SB	2+0+0	30	20	50	2
		Sub–Total (F)			330	220	550 Total	22 140

Students have to select dual electives out of the list of electives given in Fifth and Sixth Semester. Electives selected in the fifth semester should be continued in the sixth semester. However they can change the electives in the seventh semester. The electives selected in the seventh semester will continue in the eighth semester.

EXIT OPTION WITH BACHELOR DEGREE -Ability to solve complex problems that are ill-structured requiring multi-disciplinary skills to solve them.

Semester VII

Sl. No.	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week (L + T + P)	SEE	CIE	Total Marks	Credits
44	BBA.7.1	Business Ethics & Corporate Governance	DSC	4+0+0	60	40	100	4
45	BBA.7.2	E Commerce	DSC	4+0+0	60	40	100	4
46	BBA.7.3	Advance Statistics for Business Research	DSC	3+2+0	60	40	100	4
47	BBA.7.4	One Course from the Selected Elective Group	DSE	3+2+0	60	40	100	4
48	BBA.7.5	Application of Statistical Software (Any one Statistical Software)	Vocational	2+0+2	50	50	100	3
49	BBA.7.6	Research Methodology	DSC	3+0+0	60	40	100	3
		Sub–Total (G)			350	250	600	22

Semester VIII

Sl. No.	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week (L + T + P)	SEE	CIE	Total Marks	Credits
50	BBA.8.1	Strategic Management	DSC	4+0+0	60	40	100	4
51	BBA.8.2	Operations Research and Quantitative Techniques	DSC	4+0+0	60	40	100	4
52	BBA.8.3	Project Management	DSC	4+0+0	60	40	100	4
53	BBA.8.5	Digital Marketing	Vocational	2+0+2	50	50	100	3
54	BBA.8.5	Research Projects/Internship with Viva – voce	DSC	-	100+20(viva)	80	200	6
		OR Elective Paper (Two Courses from the Selected Elective Group)	DSE	3+2+0	60*	40*	100*	3*
			DSE	3+2+0	60*	40*	100*	3*
		Sub–Total (H)			350	250	600	21
		Grand Total Honors			3440	1520	4950	183

* Students who do not opt for Research Project / Internship shall take two elective courses.

BACHELOR DEGREE WITH HONORS **Experience of workplace problem solving in the form of research experience preparing for higher education or entrepreneurship experience.**

Notes:
- One Hour of Lecture is equal to 1 Credit.
- Two Hours of Tutorial is equal to 1 Credit (Except Languages).
- Two Hours of Tutorial is equal to 2 Hours of Teaching
- Two Hours of Practical is equal to 1 Credit.
- Two Hours of Practical is equal to 1 Hour of Teaching
- Practical Classes may be conducted in the Business Lab or in Computer Lab or in Class room

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depending on therequirement. One batch of students should not exceed half (i.e., 30 or less than 30 students) of the number of students ineach class/section. 2 Hours of Practical Class is equal to 1 Hour of Teaching, however, whenever it is conducted for theentireclass(i.e., morethan30students)2HoursofPractical Classisequal to2HoursofTeaching.

Acronyms Expanded
- ➢ AECC : Ability Enhancement CompulsoryCourse
- ➢ DSC© : Discipline Specific Core(Course)
- ➢ SEC-SB/VB : Skill Enhancement Course-Skill Based/ValueBased
- ➢ OEC : Open ElectiveCourse
- ➢ DSE : Discipline Specific Elective
- ➢ SEE : Semester EndExamination
- ➢ CIE : Continuous InternalEvaluation
- ➢ L+T+P : Lecture+Tutorial+Practical(s)

ELECTIVE GROUPS AND COURSES:

Discipline Specific Ele-V Semes

Sl. No	Finance	Marketing	Human Resource Management	Data Analytics	Retailing	Logistics And Supply Chain Management
Paper-1	Advanced Corporate Financial Management	Consumer Behavior	Compensation and Performance Management	Financial Analytics	Retail Operations Management	Freight Transport Management

Discipline Specific Ele-VI Semes

Sl. No	Finance	Marketing	Human Resource Management	Data Analytics	Retailing	Logistics And Supply Chain Management
Paper-2	Security Analysis and Portfolio Management	Advertising Management & Sales promotion	Employee Welfare & Social Security	Marketing Analytics	Strategic Brand Management	Sourcing for Logistics and SCM

Discipline Specific Ele-VII Semes

Sl. No	Finance	Marketing	Human Resource Management	Data Analytics	Retailing	Logistics And Supply Chain Management
Paper-3	Strategic Financial Management	Brand Management / Rural Marketing	Labor Laws & IR	HR Analytics	Merchandising Planning and Buying	Managing Procurement contract and relationship

Discipline Specific Ele-VIII Seme

Sl. No	Finance	Marketing	Human Resource Management	Data Analytics	Retailing	Logistics And Supply Chain Management
Paper-4	Derivatives and Risk Management	B to B Marketing (Industrial Marketing)	HRD	Web and Social Intelligence	IT applications in Retail Business	Global Environment for Supply chain Management

Paper-5	International Financial Management	Sales & Distribution Management	International HRM	Machine Learning in Business	Visual Merchandising	International Supply Chain

NOTE: Student shall continue with the same elective group in V and VI semesters, however, he/she may change the elective group in VII semester, but shall continue in the same group in VIII semester.

The regulations of the University of Mysore is applicable wherever required.

Name of the Program: Bachelor of Business Administration (BBA)		
Course Code: BBA 1.1		
Name of the Course: Management Principles & Practice		
Course Credits	No. of Hours per Week	Total No. of Teaching Hours
4 Credits	5 Hrs	70 Hrs

Pedagogy: Classrooms lecture, tutorials, Group discussion, Seminar, Case studies & field work etc.,

Course Outcomes: On successful completion of the course, the Students will demonstrate

a) The ability to understand concepts of business management, principles and function of management.
b) The ability to explain the process of planning and decision making.
c) The ability to create organization structures based on authority, task and responsibilities.
d) The ability to explain the principles of direction, importance of communication, barrier of communication, motivation theories and leadership styles.
e) The ability to understand the requirement of good control system and control techniques.

Syllabus:	Hours
Module No. 1: INTRODUCTION TO MANAGEMENT	14
Introduction –Meaning, Evolution of management thought, Pre-Scientific Management Era, Classical Management Era, Neo-Classical Management Era, Modern Management Era; Nature and Characteristics of Management - Scope and Functional areas of Management; Management as a Science, Art or Profession; Management and Administration; Principles of Management.	
Module No. 2: PLANNING AND DECISION MAKING	12
Nature, Importance and Purpose of Planning - Planning Process; Objectives; Types of plans (Meaning only); Decision making- Importance and steps; MBO and MBE (Meaning only)	
Module No. 3: ORGANIZING AND STAFFING	14
Nature and purpose of Organization; Principles of Organizing; Delegation of Authority; Types of Organization - Departmentation, Committees; Centralization vs Decentralization of Authority and Responsibility, Span of Control; Nature and importance of Staffing	
Module No. 4: DIRECTING AND COMMUNICATING	16
Meaning and Nature of Direction, Principles of Direction; Communication - Meaning and Importance, Communication Process, Barriers to Communication, Steps to overcome Communication Barriers, Types of Communication; Motivation theories – Maslow's Need Hierarchy Theory, Herzberg's Two Factor Theory, Mc.Gregor's X and Y theory. Leadership – Meaning, Formal and Informal Leadership, Characteristics of Leadership; Leadership Styles – Autocratic Style, Democratic Style, Participative Style, Laissez Faire Leadership Styles, Transition Leadership, Charismatic Leadership Style.	
Module No. 5: COORDINATING AND CONTROLLING	16
Coordination–Meaning, Importance and Principles. Controlling-Meaning and steps in controlling, Essentials of Effective Control system, Techniques of Control (in brief).	
Business Social Responsibility - Meaning, Arguments for and against Business Social Responsibility; Green management - Meaning, Green Management Actions; Managerial Ethics – Meaning - Importance of Ethics in Business, Factors that determine Ethical or Unethical behavior.	

Skill Developments Activities:
1. Two cases on the above syllabus should be analyzed by the teacher in the classroom and the same needs to be recorded by the student in the Skill Development Book.
2. Draft different types of Organization structure.
3. Draft Control charts.

Text Books:
1. Stephen P. Robbins, Management, Pearson
2. Koontz and O‟Donnell, Management, McGraw Hill.
3. L M Prasad, Principles of management, Sultan Chand and Sons
4. V.S.P Rao/Bajaj, Management process and organization, Excel Books.GH25
5. T. Ramaswamy : Principles of Management, HPH.

Name of the Program: Bachelor of Business Administration (BBA)		
Course Code:BBA 1.2		
Name of the Course: Fundamentals of Business Accounting		
Course Credits	No. of Hours per Week	Total No. of Teaching Hours
5 Credits	5 Hrs	70 Hrs

Pedagogy: Classrooms lecture, tutorials, and problem solving.

Course Outcomes: On successful completion of the course, the Students will demonstrate
  a) Understand the framework of accounting as well accounting standards.
  b) The Ability to pass journal entries and prepare ledger accounts
  c) The Ability to prepare subsidiaries books
  d) The Ability to prepare trial balance and final accounts of proprietary concern.
  e) Construct final accounts through application of tally.

Syllabus:	Hours
Module No. 1: INTRODUCTION TO FINANCIAL ACCOUNTING	**12**
Introduction – Meaning and Definition – Objectives of Accounting – Functions of Accounting – Users of Accounting Information – Limitations of Accounting – Accounting Cycle - Accounting Principles – Accounting Concepts and Accounting Conventions. Accounting Standards – objectives- significance of accounting standards. List of Indian Accounting Standards.	
Module No. 2: ACCOUNTING PROCESS	**14**
Meaning of Double entry system − Process of Accounting − Kinds of Accounts − Rules - Transaction Analysis − Journal − Ledger − Balancing of Accounts − Trial Balance − Problems on Journal, Ledger Posting and Preparation of Trial Balance.	
Module No. 3: SUBSIDIARY BOOKS	**16**
Meaning − Significance − Types of Subsidiary Books −Preparation of Purchases Book, Sales Book, Purchase Returns Book, Sales Return Book, Bills Receivable Book, Bills Payable Book. Types of Cash Book- Simple Cash Book , Double Column Cash Book , Three Column Cash Book and Petty Cash Book(Problems only on Three Column Cash Book and Petty Cash Book), Bank Reconciliation Statement − Preparation of Bank Reconciliation Statement (Problems on BRS)	
Module No. 4:FINAL ACCOUNTS OF PROPRIETARY CONCERN	**16**
Preparation of Statement of Profit and Loss and Balance Sheet of a proprietary concern with special adjustments like depreciation, outstanding and prepaid expenses, outstanding and received in advance of incomes, provision for doubtful debts, drawings and interest on capital.	
Module No. 5: ACCOUNTING SOFTWARE	**22**
Introduction-meaning of accounting software, types accounting software-accounting software Tally-Meaning of Tally software − Features − Advantages, Creating a New Company, Basic Currency information, other information, Company features and Inventory features. Configuring Tally - General Configuration, Numerical symbols, accounts/inventory info − master configuration -voucher entry configuration. Working in Tally: Groups, Ledgers, writing voucher, different types of voucher, voucher entry Problem on Voucher entry - Generating Basic Reports in Tally-Trail Balance, Accounts books, Cash Book, Bank Books, Ledger Accounts, Group Summary, Sales Register and Purchase Register, Journal Register, Statement of Accounts, and Balance Sheet**.**	
Skill Developments Activities:	

1. List out the accounting concepts and conventions.
2. Prepare a Bank Reconciliation Statement with imaginary figures
3. Collect the financial statement of a proprietary concern and record it.
4. Prepare a financial statement of an imaginary company using tally software.

Text Books:

1. Hanif and Mukherjee, Financial Accounting, Mc Graw Hill Publishers
2. Arulanandam & Raman; Advanced Accountancy, Himalaya Publishing House
3. S.Anil Kumar,V.Rajesh Kumar and B.Mariyappa–Fundamentals of Accounting, Himalaya Publishing House.
4. Dr. S.N. Maheswari, Financial Accounting, Vikas Publication
5. S P Jain and K. L. Narang, Financial Accounting, Kalyani Publication
6. Radhaswamy and R.L. Gupta, Advanced Accounting , Sultan Chand
7. M.C. Shukla and Goyel, Advaced Accounting , S Chand.

Name of the Program: Bachelor of Business Administration (BBA)		
Name of the Program: Bachelor of Business Administration (BBA) **Course Code:** BBA 1.3 **Name of the Course:** Marketing Management		
Course Credits	**No. of Hours per Week**	**Total No. of Teaching Hours**
4 Credits	**5 Hrs**	**70 Hrs**

Pedagogy: Classrooms lecture, tutorials, Group discussion, Seminar, Case studies & field work etc.,

Course Outcomes: On successful completion of the course, the Students will demonstrate
   a) Understand the concepts and functions of marketing.
   b) Analyse marketing environment impacting the business.
   c) Segment the market and understand the consumer behaviour
   d) Describe the 4 p's of marketing and also strategize marketing mix
   e) Describe 7 p's of service marketing mix.

Syllabus:	Hours
Module No. 1: INTRODUCTION TO MARKETING	**14**
Meaning and Definition, Concepts of Marketing, Approaches to Marketing, Functions of Marketing.**Recent trends in Marketing**-E- business, Tele-marketing, M-Business, Green Marketing, Relationship Marketing, Concept Marketing, Digital Marketing, social media marketing and E-tailing (Meaning only).	
Module No. 2: MARKETING ENVIRONMENT	**14**
Micro Environment – The company, suppliers, marketing intermediaries competitors, public and customers; **Macro Environment**- Demographic, Economic, Natural, Technological, Political, Legal, Socio-Cultural Environment.	
Module No. 3: MARKET SEGMENTATION AND CONSUMER BEHAVIOUR	**12**
Meaning and Definition, Bases of Market Segmentation, Requisites of Sound Market Segmentation; Consumer Behavior-Factors influencing Consumer Behavior; Buying Decision Process.	
Module No. 4:MARKETING MIX	**20**
Meaning, Elements of Marketing Mix (Four P's) – Product, Price, Place, Promotion. Product-Product Mix, Product Line, Product Lifecycle, New Product Development, Reasons for Failure of New Product, Branding, Packing and Packaging, Labeling, Pricing – Objectives, Factors influencing Pricing Policy, Methods of Pricing; Physical Distribution–Meaning, Factors affecting Channel Selection, Types of Marketing Channels. Promotion – Meaning and Significance of Promotion, Personal Selling and Advertising (Meaning Only)	
Module No. 5: SERVICES MARKETING	**12**
Meaning and definition of services, difference between goods and services, features of services, seven P's of services marketing (concepts only).	

Skill Developments Activities:
   1. Two cases on the above syllabus should be analyzed and recorded in the skill development
   2. Design a logo and tagline for a product of your choice
   3. Develop an advertisement copy for a product.
   4. Prepare a chart for distribution network for different products.

Text Books:

1. Philip Kotler, Marketing Management, Prentice Hall.

2. Lovelock Christopher, Services Marketing: People, Technology, Strategy, PHI
3. William J. Stanton, Michael J.Etzel, Bruce J Walker, Fundamentals of Marketing, McGraw Hill Education.
4. Bose Biplab, Marketing Management, Himalaya Publishers.
5. J.C. Gandhi, Marketing Management, Tata McGraw Hill.
6. Ramesh and Jayanti Prasad: Marketing Management, I.K. International
7. Sontakki, Marketing Management, Kalyani Publishers.

Name of the Program: Bachelor of Business Administration (BBA)
Course Code:BBA 1.5 (OEC)
Name of the Course: Business Organization

Course Credits	No. of Hours per Week	Total No. of Teaching Hours
3 Credits	3 Hrs	45 Hrs

Pedagogy: Classrooms lecture, tutorials, Group discussion, Seminar, Case studies & field work etc.,

Course Outcomes: On successful completion of the course, the Students will demonstrate:
   a) An understanding of the nature, objectives and social responsibilities of business
   b) An ability to describe the different forms of organisations
   c) An understanding of the basic concepts of management
   d) An understanding of functions of management.
   e) An understanding of different types of business combinations

Syllabus:	Hours
Module No. 1: INTRODUCTION TO BUSINESS	10
Business: Meaning, Nature, Scope and Social responsibility of Business, Objectives, Essentials of successful business; Functional areas of business. Concept of Business Organisation.	
Module No. 2: FORMS OF BUSINESS ORGANIZATION:	12
Sole proprietorship: Definitions, Features, Merits and Demerits. Partnership: Definitions, partnership deed, Features, Merits andDemerits. Joint Stock Company: Definitions, Features, Merits and Demerits. Co-operatives: Definitions, Features, Merits and Demerits.	
Module No. 3: PUBLIC ENTERPRISES	08
Departmental Undertaking: Definitions, Features, Merits and Demerits. Public Corporations: Definitions, Features, Merits and Demerits. Government Companies: Definitions, Features, Merits and Demerits	
Module No. 4: BUSINESS COMBINATIONS	08
Meaning Definitions, Causes, Types, Forms, merits and demerits of Business Combinations, Recent Trends in Business Combinations.	
Module No 5: MANAGEMENT OF ORGANIZATIONS	07
Management-Meaning, Definitions, Difference between Management and Administration, Levels of Management, Objectives of Management, Functions of management- planning, organizing, staffing, directing, coordinating, controlling, Principles of Management.	

Skill Developments Activities:
   1. Preparation of partnership deed
   2. Draw a business tree
   3. Make a list of 10 PSUs
   4. Prepare a list of different types of business combinations

Text Books:

1. C B. Guptha - Business Organisation and Management, Sultan Chand & Sons.
2. Dr. S. C. Saxena - Business Administration & Management, Sahitya Bhawan.
3. M. C. Shukla - Business Organisation and Management. S Chand & Company Pvt. Ltd.
4. S.A Sherlekar - Business Organization, Himalaya Publishing House.
5. Y.K. Bhushan. Fundamentals of Business Organisation and Management, Sultan Chand & Sons.
6. R.K. Sharma, Business Organisation & Management Kalyani Publishers
7. Dr. I.M. Sahai, Dr. Padmakar Asthana,' **Business Organisation & Administration',** Sahitya Bhawan Publications Agra.

Name of the Program: Bachelor of Business Administration (BBA)		
Course Code:BBA 1.5		
Name of the Course: Office Organization and Management (OEC)		
Course Credits	No. of Hours per Week	Total No. of Teaching Hours
3 Credits	3 Hrs	45 Hrs

Pedagogy: Classrooms lecture, tutorials, Group discussion, Seminar, Case studies & field work etc.,

Course Outcomes: On successful completion of the course, the Students will demonstrate

  a) An understanding of basic knowledge of office organisation and management
  b) Demonstrate skills in effective office organisation
  c) Ability to maintain office records
  d) Ability to maintain digital record.
  e) Understanding of different types of organisation structures and responsibilities as future office managers.

Syllabus:	Hours
Module No. 1: FUNDAMENTALS OF OFFICE MANAGEMENT	08
Introduction: Meaning, importance and functions of modern office **Modern Office Organisation**: Meaning; Steps in office organisation; Principles of Office organisation, Organisation structure types, **Nature of office services**: Types of services in a modern office, decentralisation and centralisation of office services, Departmentation of Office **Office management**: Meaning, Elements and major processes of Office management **Office Manager:** Functions and qualifications of Office manager.	
Module No. 2: ADMINISTRATIVE ARRANGEMENT AND FACILITIES	07
Office Accommodation and its Importance: Location of Office, Choice of Location: Urban vs Suburban, Factors to be Considered in Selecting the Site, Securing Office Space, **Office Lay-out**: Objectives of Office Lay-out, Principles of Office Lay-out, Steps in Lay-out Planning, Advantages of a Good Lay-out. **Types of offices**: Open Office and Private Office- advantages and disadvantages.	
Module No. 3: OFFICE ENVIRONMENT:	10
Meaning and Components of Office Environment **Interior Decoration**: Colour Conditioning, Floor Coverings, Furnishings, **Furniture and Fixtures:** Types of Furniture, Choice between Wooden and Steel Furniture, Principles Governing Selection of Furniture **Lighting** and Ventilation, **Noise:** Internal Noise, External Noise **Cleanliness, Sanitation and Health** **Safety and Security**	
Module No. 4:RECORDS MANAGEMENT	10
Introduction to records: Importance of Records, types of office records, **Records Management:** Meaning, Principles of Record Keeping, Functions of 'Records Management **Filing:** Elements of Filing and Filing Functions, Objectives and Importance of Filing, Advantages of Filing, Essentials of a Good Filing System, Classification of Files, Filing Procedure or Routine.	

Filing Methods: Horizontal Filing -meaning, types and advantages, Vertical Filing- meaning, equipment used, advantage and disadvantages.

Centralisation and Decentralisation of Filing- Centralised filing and Decentralised Filing

Office manual: contents, Importance, types of office manuals.

Indexing: Meaning, importance, advantages and essentials of good indexing, type of index

Retention and disposal of files: Meaning and benefits of record retention, need for disposal of files, life-cycle stages of files.

Module No. 5: OFFICE MECHANISATION AND DATA PROCESSING	**10**

Meaning, Importance and Objectives of Office Mechanisation, Advantages and disadvantages of Office Mechanisation, Factors Determining Office Mechanisation

Kinds of Office Machines: Duplicating Machines and Photocopying Machines, Accounting, tabulating and computing machines, communication machines

Introduction to Data and Information: Distinction between Data and Information, Importance of Data and Information, Classification of Data, Classification of Information, Data Lifecycle (chart), **Data Collection Methods-** Primary and secondary data collection methods

Data presentation Methods of Presentation of Data

Data processing using computers: Components of Computers, Input and Output Devices, Software used in Computers (names and uses only), Computer Applications in Office' Management, Advantages and Limitations of Computerisation

Skill Developments Activities:
1. Visit an office and enlist the different types of machines used in the office
2. Identify the different types of stationery used in offices today
3. Draw a data life cycle chart
4. Draw charts indicating different types of office layouts.

Text Books:

1. S.P Arora, Office Organisation and Management, Vikas Publishing House Pvt Ltd

2. M.E Thakuram Rao, Office organisation and Management, Atlantic

3. Judith Read, Mary Lea Ginn, Record Management, 10th Edition, Cengage Learning.

Name of the Program: Bachelor of Business Administration (BBA)		
Course Code:BBA 2.1		
Name of the Course: Financial Accounting and Reporting		
Course Credits	**No. of Hours per Week**	**Total No. of Teaching Hours**
4 Credits	**5 Hrs**	**70 Hrs**

Pedagogy: Classrooms lecture, tutorials, and Problem Solving.

Course Outcomes: On successful completion of the course, the Students will demonstrate

 a) The ability to prepare final accounts of partnership firms
 b) The ability to understand the process of public issue of shares and accounting forthe same
 c) The ability to prepare final accounts of joint stock companies.
 d) The ability to prepare and evaluate vertical and horizontal analysis of financial statements
 e) The ability to understand company's annual reports.

Syllabus:	Hours
Module No. 1: FINAL ACCOUNTS OF PARTNERSHIP FIRM	**14**
Meaning of Partnership Firm, Partnership deed-clauses in partnership deed, Preparation of Final accounts of partnership firm-Trading and Profit and Loss Account, Profit and Loss Appropriation Account, Partners capital account and Balance sheet. Goodwill-Nature, Factors influencing goodwill and methods of valuation of goodwill (Average and super profit methods)	
Module No. 2: ISSUE OF SHARES	**12**
Meaning of Share, Types of Shares – Preference shares and Equity shares – Issue of Shares at par, at Premium, at Discount: Pro-Rata Allotment; Journal Entries relating to issue of shares; Preparation of respective ledger accounts; Preparation of Balance Sheet in the Vertical form (Practical Problems).	
Module No. 3: FINAL ACCOUNTS OF JOINT STOCK COMPANIES	**14**
Statutory Provisions regarding preparation of Company Final Accounts – Treatment of Special Items, Managerial Remuneration, Tax deducted at source, Advance payment of Tax, Provision for Tax, Depreciation, Interest on debentures, Dividends, Rules regarding payment of dividends, Transfer to Reserves, Preparation of Profit and Loss Account and Balance Sheet (Vertical Form Schedule -III) (Practical Problems).	
Module No. 4:FINANCIAL STATEMENTS ANALYSIS	**16**
Comparative Statements - Comparative Income Statement, Comparative Balance Sheet; Common size Statements – Common Size Income Statement, Common Size Balance Sheet – Trend Percentages. (Analysis and Interpretation)	
Module No. 5: CORPORATE FINANCIAL REPORTING PRACTICES	**14**
Corporate Financial Reporting - meaning, types, characteristics of Corporate financial report, users of corporate financial report; Components corporate financial report– general corporate information, financial highlights, letter to the shareholders from the CEO, management's discussion and analysis; Financial Statements-balance sheet, income statement, cash flow statement, and notes to the financial statements; Auditor's report; Significant Accounting Policies; Corporate Governance Report; Corporate Social Responsibility Report (Discuss only Role and Significance of above components of	

corporate financial report).

Skill Developments Activities:

1. Collect financial statement of a company for five years and analyse the same using trend analysis.
2. Refer annual reports of two companies and list out the components.
3. Draft a partnership deed as per Partnership Act.
4. List out the accounting policies in annual report of the company

Text Books:

1. B S Raman, Financial Accounting, HPH.
2. RL GUPTHA & Radha swamy M. , Advanced Accounting. S Chand and co., NewDelhi
3. C Shukla and T S Grewal, Advanced accounting, S Chand and co., NewDelhi
4. S P Jain and Narang K L, Financial Accounting,Tenth Edition, Kalyani Publishers, New. Delhi.

Name of the Program: Bachelor of Business Administration (BBA)		
Course Code:BBA 2.2		
Name of the Course:Human Resource Management		
Course Credits	No. of Hours per Week	Total No. of Teaching Hours
4 Credits	5 Hrs	70 Hrs

Pedagogy: Classroom's lecture, tutorials, Group discussion, Seminar, Case studies & field work etc.,

Course Outcomes: On successful completion of the course, the students will be able to demonstrate

a) Ability to describe the role and responsibility of Human resources management functions on business
b) Ability to describe HRP, Recruitment and Selection process
c) Ability to describe to induction, training, and compensation aspects.
d) Ability to explain performance appraisal and its process.
e) Ability to demonstrate Employee Engagement and Psychological Contract.

Syllabus:	Hours
Module No. 1: Introduction to Human Resource Management	14
Meaning and Definition of HRM – Features Objectives, Differences between Human Resource Management and Personnel Management, Importance, Functions and Process of HRM, Role of HR Manager, Trends influencing HR practices	
Module No. 2: Human Resource Planning, Recruitment & Selection	16

Human Resource Planning: Meaning and Importance of Human Resource Planning, Process of HRP

HR Demand Forecasting- Meaning and Techniques (Meanings Only) and HR supply forecasting.

Succession Planning – Meaning and Features

Job Analysis: Meaning and Uses of Job Analysis, Process of Job Analysis – Job Description, Job Specification, Job Enlargement, Job Rotation, Job Enrichment (Meanings Only)

Recruitment – Meaning, Methods of Recruitment, Factors affecting Recruitment, Sources of

1

Recruitment

lection – Meaning, Steps in Selection Process, Psychometric tests for Selection, Barriers to effective Selection, Making Selection effective; Placement, Gamification – Meaning and Features

Module No. 3: Induction, Training and Compensation	14

Induction: Meaning, Objectives and Purpose of Induction, Problems faced during Induction, Induction Program Planning.

aining: Need for training, Benefits of training, Assessment of Training Needs and Methods of Training and Development; Kirkpatrick Model; Career Development.

mpensation: Direct and Indirect forms of Compensation (Meaning Only), Compensation Structure.

Module No. 4: Performance Appraisal, Promotion & Transfers	16

rformance appraisal: Meaning and Definition, Objectives and Methods of Performance Appraisal – Uses and Limitations of Performance Appraisal, Process of Performance Appraisal

omotion: Meaning and Definition of Promotion, Purpose of Promotion, Basis of promotion

Transfer: Meaning of Transfer, Reasons for Transfer, Types of Transfer, Right Sizing of Work Force, Need for Right Sizing

Module No. 5: Employee Engagement and Psychological Contract	10

ployee Engagement (EE): Meaning and Types of EE, Drivers of Engagement - Measurement of EE, Benefits of EE.

ychological contract: Meaning and features

Skill Developments Activities:
1. Preparation of Job Descriptions and Job specifications for a Job profile
2. Choose any MNC and present your observations on training program
3. Develop a format for performance appraisal of an employee.
4. Discussion of any two Employee Engagement models.
5. Analysis of components of pay structure based on the CTC sent by the Corporate to the institute for the various jobs of different sectors.

Textbooks:

Aswathappa, Human Resource Management, McGraw Hill

Edwin Flippo, Personnel Management, McGraw Hill

C.B.Mamoria, Personnel Management, HPH

Subba Rao, Personnel and Human Resources Management, HPH

Madhurimalal, Human Resource Management, HPH

Rajkumar: Human Resource Management I.K. Intl

Michael Porter, HRM and Human Relations, Juta & Co.Ltd.

K. Venkataramana, Human Resource Management, SHBP

Chartered Accountants of India, New Delhi.

Name of the Program: Bachelor of Business Administration (BBA)		
Course Code:BBA 2.3		
Name of the Course:BUSINESS ENVIRONMENT		
Course Credits	**No. of Hours per Week**	**Total No. of Teaching Hours**
4 Credits	**5 Hrs**	**70 Hrs**

Pedagogy: Classrooms lecture, tutorials, Group discussion, Seminar, Case studies.

Course Outcomes: On successful completion Student will demonstrate

 a) An Understanding of components of business environment.
 b) Ability to analyse the environmental factors influencing business organisation.
 c) Ability to demonstrate Competitive structure analysis for select industry.
 d) Ability to explain the impact of fiscal policy and monetary policy on business.
 e) Ability to analyse the impact of economic environmental factors on business.

Syllabus:	Hours
Module No. 1: INTRODUCTION BUSINESS ENVIRONMENT	**14**
Meaning of business, scope and objectives Business, business environment, Micro and Macro-environment of business (social, cultural, economic, political, legal technological and natural) Impact of these factors on decision making in business, Environmental analysis, and Competitive structure analysis of Business.	
Module No. 2: GOVERNMENT AND LEGAL ENVIRONMENT	**18**
Government Functions of the State, Economic role of government, State intervention in business- reasons for and types of state intervention in business. Impact of Monetary policy, Fiscal policy, Exim policy and industrial policy on business. **Legal environment -** Various laws affecting Indian businesses	

Module No. 3: ECONOMIC ENVIRONMENT AND GLOBAL ENVIRONMENT	16

An overview of economic environment, nature of the economy, structure of economy, factors affecting economic environment.

Globalisation of business; meaning and dimensions, stages, essential conditions of globalisation, foreign market entry strategies, merits and demerits of globalisation of business, Impact of Globalisation on Indian businesses, Forms of globalisation of businesses - MNCs, TNCs etc..

Module No. 4:TECHNOLOGICAL ENVIRONMENT	14

Meaning and features; types of innovation, Impact of Technological changes on business, Technology and Society, Technological Acquisition modes, IT revolution and business, Management of Technology.

Module No. 5: NATURAL ENVIRONMENT	08

Meaning and nature of physical environment.   Impact of Natural environment on business.

Skill Developments Activities:

a) List out key features of recent Monetary policy published by RBI impacting businesses.
b) Give your observation as to how technology has helped society.
c) Draft Five Forces Model for Imaginary business.
d) Identify the benefits of Digital transformation in India.

Text Books:

1. Dr. K Ashwatappa: Essentials Of Business Environment
2. Sundaram & Black: The International Business Environment; Prentice Hall
3. Chidambaram: Business Environment; Vikas Publishing
4. Upadhyay, S: Business Environment, Asia Books
5. Chopra, BK: Business Environment in India, Everest Publishing
6. Suresh Bedi: Business Environment,Excel Books
7. Economic Environment of Business by M. Ashikary.
8. Business Environment by Francis Cherrinulam

Name of the Program: Bachelor of Business Administration (BBA)
Course Code:BBA 2.3
Name of the Course: Business Mathematics

Course Credits	No. of Hours per Week	Total No. of Teaching Hours
4 Credits	5 Hrs	70 Hrs

Pedagogy: Classroom's lecture, tutorials, Problem solving.

Course Outcomes: On successful completion of the course, the students will demonstrate

a) The Understanding of the basic concepts of business maths and apply them to create solve and interpret application problems in business
b) Ability to solve problems on various types of equation.
c) Ability to solve problems on Matrices and execute the laws of indices, law of logarithm and evaluate them.
d) Ability to apply the concept of simple interest and compound interest bills discounted etc. and apply them in day-to-day life.
e) Ability to solve problems on Arithmetic progression, Geometric progression and construct logical application of these concepts.

Syllabus:	Hours
Module No. 1: NUMBER SYSTEM	**06**
troduction – Natural Numbers - Even Numbers – Odd Numbers – Integers – Prime Numbers – Rational and Irrational numbers, Real Numbers, HCF and LCM (Simple problems).	
Module No. 2: THEORY OF EQUATIONS	**14**
Introduction – Meaning - Types of Equations – Simple/ Linear Equations and Simultaneous Equations (only two variables), Elimination and Substitution Methods only. Quadratic Equation - Factorization and Formula Method ($ax^2 + bx + c = 0$ form only). Simple problems.	
Module No.3: INDICIES, MATRICES AND LOGARITHMS	**18**
eaning – types – operation on matrices – additions – subtractions and multiplication of two matrices – transpose – determinants – minor of an element – co-factor of an element –inverse – crammers rule in two variables – problems.	
dices and Logarithms: Meaning- Basic Laws of Indices and their application for simplification. Laws of Logarithms –Common Logarithm, Application of Log Table for Simplification.	
Module No. 4:COMMERCIAL ARITHMETIC	**18**
mple Interest, Compound Interest including yearly and half yearly calculations, Annuities, Percentages, Bills Discounting, Ratios and proportions, duplicate-triplicate and sub-duplicate of a ratio. Proportions: third, fourth and inverse proportion - problems.	
Module No. 5: PROGRESSIONS	**14**
OGRESSIONS: Arithmetic Progression - Finding the 'nth' term of AP and Sum to nth term of AP. Insertion of Arithmetic Mean Geometric Progression – Finding the 'nth' term of GP and sum to 'nth' term of GP and insertion of Geometric Mean.	
Skill Developments Activities:	
1. Develop an Amortization Table for Loan Amount – EMI Calculation. 2. Secondary overhead distribution summary using Simultaneous Equations	

Method.
   3. Application of Matrix In Business Problems

Text Books:

1. Saha: Mathematics for Cost Accountants, Central Publishers
2. R.G. Saha and Others – Methods and Techniques for Business Decisions, VBH
3. Dr. SanchetiandKapoor: Business Mathematics and Statistics, Sultan Chand
4. Zamarudeen: Business Mathematics, Vikas
5. R.S Bhardwaj :Mathematics for Economics and Business
6. Madappa, mahadi Hassan, M. IqbalTaiyab – Business Mathematics, Subhash
7. G.R. Veena and Seema : Business Mathematics and Statistics I.K. Intl Publishers

Name of the Program: Bachelor Business Administration (BBA) **Course Code:**BBA.2.6 (OEC) **Name of the Course:** People Management		
Course Credits	**No. of Hours per Week**	**Total No. of Teaching Hours**
3 Credits	**3 Hrs**	**45 Hrs**

Pedagogy: Classroom's lecture, tutorials, Group discussion, Seminar, Case studies.

Course outcome: On successful completion of the course, student will demonstrate:

1. Ability to examine the difference between People Management with Human resource Management
2. Ability to explain the need for and importance of People Management.
3. Ability to explain role of manager in different stages of performance management process
4. Ability to list modern methods of performance and task assessment.
5. Ability to analyse the factors influencing the work life balance of an working individual.

Syllabus:	Hours
Module No. 1: Introduction to People Management	**06**
Diversity in organisation: age, gender, ethnicity, race, and ability. People Management: Meaning, Features, Significance of people management, Difference between People Management and Human Resource Management, impact of individual and	

organizational factors on people management.

Module No. 2: Getting Work Done and Assessment and Evaluation	12

Getting work done: Challenges of getting work done, significance of prioritization and assigning work to team members.
Performance Management: meaning, role of a manager in the different stages of the performance management process, Types of Performance assessment, Assessment and Evaluation Process of evaluation of tasks in the organisation. Modern tools of assessment and evaluation of tasks and performance.

Module No. 3: Building Peer Networks and Essentials of Communication	12

Building Peer Networks: Understanding the importance of peer networks in an organization; being able to influence those on whom you have no authority; challenges Peer networking and different types of people networking in the workplace.
Essentials of Communication: Concept of the communication process with reflection on various barriers to effective communication and ways to overcome, Types of Communication and Channels of Communication.

Module No. 4:Motivation	08

Meaning, Importance and need for motivation, team motivation- meaning, importance team motivation, types of Motivators and Modern methods of motivation

Module No. 5: Managing Self	07

Reflection on what does it mean to be a people manager; building a personal development plan for oneself, Self-Stress Management: Causes for stress, work life Balance, Importance of Work life balance, Factors influencing Work life Balance.

Skill Developments Activities:

1. Analyse two cases on any of the above content indicated above.
2. List out the modern tools to performance assessment and evaluation.
3. Conduct a survey of work life balance of working individuals
4. Draft a Career development of working individual in the middle level management.

Text Books:

1. McShane, Steven L. and Mary Ann Von Glinow, Organizational Behavior: Emerging Knowledge and Practice for the Real World. McGraw-Hill, latest edition, ISBN: 0-07-115113-3.
2. Bernardin, H. John and Joyce E. A. Russell. Human Resource Management: An Experiential Approach. McGraw-Hill, 6/e. ISBN: 0078029163
3. Argyris, C. (1974). Personality vs. Organization. Organizational Dynamics. Vol. 3. No. 2, Autumn.
4. Blume, B. Baldwin, T. and Ryan, K. (2013). Communication Apprehension. A barrier to students leadership, adaptability and multicultural appreciation. Academy of Management Learning & Education, Jun, Vol. 12 Issue 2, p158-172.
5. Colquitt, J.A., LePine, J.A., & Wesson, M.J. (2009) Organizational Behavior: Improving Performance and Commitment in the Workplace (International edition). New York: McGraw-Hill.
6. Goleman, D. (1998). Working with Emotional Intelligence. Bantam Books,

Name of the Program: Bachelor of Business Administration (BBA)		
Course Code:BBA 2.6 (OEC)		
Name of the Course:RETAIL MANAGEMENT		
Course Credits	No. of Hours per Week	Total No. of Teaching Hours
3 Credits	3 Hrs	45 Hrs

Pedagogy: Classroom's lecture, tutorials, Group discussion, Seminar, Case studies.

Course Outcomes: On successful completion Student will demonstrate ;
   a) An understanding of the types and forms of Retail business.
   b) Ability to examine Consumer Behaviour in various environment.
   c) Ability to analyse various Retail operations and evaluate them.
   d) Ability to analyse various marketing mix elements in retail operations.
   e) An understanding of Information Technology in retail business.

Syllabus:	Hours
Module No. 1: INTRODUCTION TO RETAIL BUSINESS	08
Definition – functions of retailing - types of retailing – forms of retail business ownership. Retail theories – Wheel of Retailing – Retail life cycle. Retail business in India: Influencing factors – present Indian retail scenario.	
Module No. 2: CONSUMER BEHAVIOUR IN RETAIL BUSINESS	08
Buying decision process and its implication on retailing – Influence of group and individual factors, Customer shopping behaviour, Customer service and customer satisfaction.	
Module No. 3: RETAIL OPERATIONS	08
Factors influencing location of Store - Market area analysis – Trade area analysis – Rating Plan method - Site evaluation. Retail Operations: Stores Layout and visual merchandising, Stores designing, Space planning, Inventory management, Merchandise Management, Category Management.	
Module No. 4: RETAIL MARKETING MIX	14
Introduction -Product : Decisions related to selection of goods (Merchandise Management revisited) – Decisions related to delivery of service. Pricing : Influencing factors – approaches to pricing – price sensitivity - Value pricing – Markdown pricing. Place : Supply channel – SCM principles – Retail logistics – computerized replenishment system – corporate replenishment policies. Promotion : Setting objectives – communication effects - promotional mix.	
Module No. 5: INFORMATION TECHNOLOGY IN RETAILING	07
Non store retailing (e-retailing) - The impact of Information Technology in retailing - Integrated systems and networking – EDI – Bar coding – Electronic article surveillance – Electronic shelf labels – customer database management system.	
Skill Developments Activities:	

   1. Draw a retail life cycle chart and list the stages
   2. Draw a chart showing a store operations
   3. List out the major functions of a store manager diagrammatically

4. List out the current trends in e-retailing
5. List out the Factors Influencing in the location of a New Retail outlet

Text Books:

1. Suja Nair; Retail Management, HPH

2. Karthic – Retail Management, HPH

3. S.K. Poddar& others – Retail Management, VBH.

4. R.S Tiwari ; Retail Management, HPH

Curriculum as per

National Educational Policy (NEP 2020)

BACHELOR OF BUSINESS ADMINISTRATION

(BBA)

III and IV Semester Syllabus.

Sl. No.	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week (L + T + P)	SEE	CIE	Total Marks	Credits
		Semester III						
16	Lang.1.1	Language - I	AECC	3+1+0	70	30	100	3
17	Lang.1.2	Language - II	AECC	3+1+0	70	30	100	3
18	BBA.3.1	Cost Accounting	DSC	3+0+2	70	30	100	4
19	BBA.3.2	Organizational Behavior	DSC	4+0+0	70	30	100	4
20	BBA.3.3	Statistics for Business Decisions	DSC	3+0+2	70	30	100	4
21	BBA.3.4	Artificial Intelligence	SEC	1+0+2	50	50	100	2
22	BBA.3.5	Social Media Marketing/ Rural Marketing	OEC	3+0+0	50	50	100	3
		Sub –Total (C)			450	250	700	23

Sl. No.	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week (L + T + P)	SEE	CIE	Total Marks	Credits
		Semester IV						
23	Lang.1.1	Language - I	AECC	3+1+0	70	30	100	3
24	Lang.1.2	Language - II	AECC	3+1+0	70	30	100	3
25	BBA.4.1	Management Accounting	DSC	3+0+2	70	30	100	4
26	BBA.4.2	Business Analytics / Financial Markets & Services	DSC	4+0+0	70	30	100	4
27	BBA.4.3	Financial Management	DSC	3+0+2	70	30	100	4
28	BBA.4.4	Constitution of India	AECC	2+0+0	50	50	100	2
29	BBA.4.5	Sports/NCC/NSS/others (if any)	SEC-VB	1+0+2	-	100	100	2
30	BBA.4.6	Business Leadership Skills/Personal Wealth Management	OEC	3+0+0	50	50	100	3
		Sub –Total (D)			450	350	800	25

EXIT OPTION WITH DIPLOMA – Ability to solve broadly defined problems.

	Name of the Program: BBA	
	Course Code: BBA 3.1	
	Name of the Course: COST ACCOUNTING	
Course Credits	**No. of Hours per Week**	**Total No. of Teaching Hours**
4 Credits	**4 Hrs**	**56 Hrs**

Pedagogy: Classrooms lecture, tutorials, and Problem Solving.

Course Outcomes: On successful completion of the course, the Students will demonstrate.

- Understand the elements of costing and preparation of cost sheet.
- The ability to prepare material requisitions and management of store.
- The ability to compare and contrast labour cost techniques.
- Ability to differentiate kinds of overhead costing.
- Ability to reconcile the cost.

Syllabus:	Hours
Module No. 1: INTRODUCTION TO COST ACCOUNTING	**12**

Introduction: Meaning, Objectives, Importance and Uses of Cost Accounting, Functions of Cost Accounting Department in an Organization, Difference between Cost Accounting and Financial Accounting; Various elements of Cost and Classification of Cost; Cost Object, Cost Unit; Cost Reduction and Cost Control; Limitations of Cost Accounting; Cost Sheet: Meaning and Cost Heads in a Cost Sheet, Presentation of Cost information in Cost Sheet/Statement- Problems on Cost Sheet, Tenders and Quotations.

Module No. 2: MATERIALS COST	**12**

Materials: Meaning, Importance and Types of Materials - Direct and Indirect Material.

Materials Procurement: Procedure for procurement of materials and documentation involved in procurement of materials- (Bill of materials, Material requisition note, Purchase requisition note,, Purchase order, Goods received note); Material Storage and Records: Duties of Store keeper, Store records- (Bin cards, Stores Ledger, Stock Control Cards); Material Issues and Valuation: Procedure for material issues, Documents used in material issues- (Material Requisition Note, Material Transfer Note, Materials Return

Note); Valuation of material issues- preparation of Stores Ledger/ Account - FIFO, LIFO, - problems.

Inventory Control: Inventory control techniques and determination of various stock levels- Problems on Level Setting and Computation of EOQ; ABC Analysis, FSN Inventory, VED Inventory, HML Inventory, (Concepts only).

Module No. 3: EMPLOYEE COST	10

Employee Cost: Meaning, Components, Classification and Importance of Employee (Labour) Cost in Organisations; Attendance Procedure- Time keeping and Time Booking,Idle Time- Causes and treatment of Normal and Abnormal Idle Time, Overtime- Causes and treatment (Theory only);

Methods of Remuneration (Payment of Wages and Incentives) Problems on calculation of earnings under Time Rate (Straight time rate, Halsey and Rowan Methods) and Piece rate systems (Straight piece rate and Taylor's differential piece rate); Employee Turnover- Meaning, Reasons and Effects of LTO/ETO.

Module No. 4: OVERHEADS	12

Overheads: Meaning and Classification of Overheads; Accounting and Control of Manufacturing Overheads: Estimation and Collection, Cost allocation, Apportionment, Re-apportionment and Absorption of Manufacturing Overheads; Problems on Primary and Secondary distribution and Secondary distribution using Reciprocal Service Methods only; Absorption of overheads: Meaning and Methods of Absorption of overheads; Problems on Machine hour rate

Module No. 5: RECONCILIATION OF COST AND FINANCIAL ACCOUNTS	10

Reasons for differences in Profits under Financial and Cost Accounts; Procedure for Reconciliation –Ascertainment of Profits as per Financial Accounts and Cost Accounts and Reconciliation of Profits of both sets of Accounts – Preparation of Reconciliation Statement – Problems.

- Prepare a Cost Sheet with imaginary figures.

- List the documents required in Inventory Management.

- Demonstrate the valuation of inventory using any one method of pricing material issues.

- Calculate the amount of Wages under Halsey / Rowan Plans, using imaginary data.

Text Books:

1. Jain and Narang, Cost Accounting, Kalyani Publication House.

2. N.K. Prasad, Cost Accounting, Books Syndicate Pvt. Ltd.

3. P C Tulsian, Cost Accounting, MHE India

4. Nigam & Sharma, Cost Accounting, HPH

5. Dr. B. Mariyappa, Cost Accounting, HPH

6. Khanna, Ahuja & Pandey, Practical Costing, S Chand & Co. Ltd.

7. B.S. Raman, Cost Accounting, United Publisher

Name of the Program: BBA		
Course Code: BBA 3.2		
Name of the Course: ORGANIZATIONAL BEHAVIOR		
Course Credits	**No. of Hours per Week**	**Total No. of Teaching Hours**
4 Credits	**4 Hrs**	**56 Hrs**

Pedagogy: Classrooms lecture, tutorials, and Problem Solving.

Course Outcomes: On successful completion of the course, the Students will demonstrate:

- To recall role of OB in business organization.
- Able to understand group dynamics in an organization.
- Able to understand the change management.
- Able to construct the process of organizational development.
- Ability to understand the kinds of Interventions in OB.

Syllabus:	Hours
Module No. 1: ORGANIZATIONALBEHAVIOUR AND FOUNDATIONS OF INDIVIDUAL BEHAVIOUR	**10**
Organization Behavior– Meaning, Definition of OB, Importance of OB, Foundations of OB. Individual Behavior - Personal Factors, Environmental Factors, organization systems and resources Personality-Meaning, Nature, Determinants and Traits of Personality Perception- Meaning, Factors influencing perception, Perceptual Process, Perceptual Errors, Managing Perceptions.	
Module No. 2: GROUP AND TEAM DYNAMICS	**8**
Group Dynamics-meaning, Types of Group, Development of Groups- Stages of Group Development, Determinants of Group Behavior, Team Dynamics- meaning, Types of Teams: Conflict-sources of conflict and ways of resolving conflict, managing interpersonal relationships	
Module No. 3: CHANGE MANAGEMENT	**10**
Introduction to Change Management: OD and Change, Importance and Nature of Planned Change; Theories of Planned Change - Action Research Model, Kurt Lewin's Change Model **Introducing Change Effectively**: Basic steps, Factors Influencing Change - Resistance to Change, Overcoming Resistance to Change; Empowering People to Manage Change, Activities Contributing to Effective Change Management	

Module No. 4: ORGANIZATIONAL DEVELOPMENT	12

OD: Meaning and Nature of Organizational Development (OD), Competencies of an OD Practitioner, Ethical Guidelines for OD Practitioners Process of Organizational Development: Overview of Entering and Contracting Diagnosing: Meaning of Diagnosing, Comprehensive Model for Diagnosing Organizational Systems (Organizational Level, Group Level and Individual Level)

Module No. 5: OD INTERVENTIONS	16

Designing Effective OD Interventions: How to Design Effective Interventions, Overview of OD interventions - Human Process Interventions, Techno Structural Interventions, HRM Interventions and Strategic Change Interventions, Conditions for optimal success of OD

(a) Human Process Interventions

T-Groups, Process Consultation, Third–party Intervention; Team building; Organization Confrontation Meeting, Inter-group relation Intervention: Microcosm Group; Large Group Intervention: Open –Systems Method, and Open-Space Method(in brief)

(b) Techno Structural Interventions

Restructuring Organization: Structural Design: Functional structures, Divisional structure - Product structure, Geographic and Market structure, Metrics structure, Network structure, Boundary less organization; (in brief)

(c) Human Resource Management Interventions

Overview of Performance Management Interventions: Performance Management Model,Goal Setting, Performance Appraisal Process, Reward Systems. (in brief)

Skill Developments Activities:

- Two cases on the above syllabus should be analyzed and record in the skill development

- Draw Blake and Mouton managerial grid

- List the determinants of personality

Text Books:

1. Fred Luthans, Organizational Behaviour. McGraw Hill

2. Robbins, Organizational Behaviour, International Book House.

3. K. Aswathappa, Organizational Behaviour, HPH.

4. Appanniah and, Management and Behavioural Process, HPH

5. Sharma R.K and Gupta S.K, Management and Behaviour Process, Kalyani Publishers.

Name of the Program: BBA		
Course Code: BBA 3.3		
Name of the Course: Statistics for Business Decisions		
Course Credits	No. of Hours per Week	Total No. of Teaching Hours
4 Credits	4 Hrs	56 Hrs

Pedagogy: Classrooms lecture, tutorials, and Problem Solving.

Course Outcomes: On successful completion of the course, the Students will demonstrate

- To understand the requirements of statistical framework
- To construct and visualize the data.
- To determine the data adequacy for analysis.
- To Review the data by using various tools.
- To understand and analyze the impact of probability.

Syllabus:	Hours
Module No. 1: INTRODUCTION TO STATISTICS	12

Introduction – Meaning, Functions and Uses of Statistics; Collection of Data - Techniques of Data Collection – Census Technique and Sampling Technique (Concepts). Classification: Meaning, and Methods of Classification of Data, Tabulation: Meaning, Parts of a Table – Simple problems on Tabulation; Diagrammatic Presentation: Bar Diagrams – Simple Bars, Multiple Bars, Percentage Sub-divided Bar Diagram; Two Dimensional Diagrams – Pie Diagram.

Module No. 2: MEASURES OF CENTRAL TENDENCY AND DISPERSION	14

Measures of Central Tendency: Calculation of Arithmetic Mean, Median and Mode for Individual, Discrete and Continuous Series – Problems; Empirical relation between Mean, Median and Mode.

Measures of Dispersion: Absolute and Relative measures of Range, Quartile deviation, Standard Deviation in Individual, Discrete and Continuous Series – Problems

Measures of Skewness: Calculation of Karl Pearson's (Uni-modal) and Bowley's Co-efficient of Skewness

Module No. 3: CORRELATION AND REGRESSION ANALYSIS	10

Correlation Analysis - Meaning, Types of Correlation, Calculation of Karl Pearson's Coefficient of Correlation, Computation of Probable Error, Spearman's Rank Coefficient of correlation-problems. Regression Analysis – Concept of Regression, Regression equations- Problems.

TIME SERIES ANALYSIS: Meaning, Components, fitting a straight-line trend using Least Square Method (Problems where $\Sigma X=0$ only), calculation and estimation of trend values.

Module No. 4: TIME SERIES ANALYSIS	10

Meaning, Components, fitting a straight-line trend using Least Square Method (Problems where $\Sigma X=0$ only), calculation and estimation of trend values.

Module No. 5: INDEX NUMBERS	10

Index number, Construction of Index number, Methods of Index number - simple aggregate method, Weighted method (Laspeyres, Paashes, Marshal - Edgeworth and Fishers Ideal Index number). Tests of Adequacy (Unit test, TRT, FRT, Circular test). Consumer Price Index number

Skill Developments Activities:

  a)   Data Visualization practical session Using Tableu/Power BI.

  b)   Execute Average, Variance, Standard Deviation, CV, Covariance using Excel.

  c)   Execute and Analyse Regression Model using Excel,

  d)   Practical session on Time series models using GRETL

  e)   Collect past years' Indian consumer price index data (as of the current base year) and analyse its impact on any macroeconomic indicator.

Text Books:

  1.   S P Gupta: Statistical Methods- Sultan Chand
  2.   Dr. B N Gupta: Statistics, Sahithya Bhavan
  3.   S.C Gupta: Business Statistics, HPH
  4.   Elhance: Statistical Methods, Kitab Mahal
  5.   Chikoddi & Satya Prasad: Quantitative Analysis for Business Decision, HPH
  6.   Sanchethi and Kapoor: Business Mathematics, Sultan Chand

Name of the Program: BBA		
Course Code: BBA 3.5		
Name of the Course: Social Media Marketing (OEC)		
Course Credits	**No. of Hours per Week**	**Total No. of Teaching Hours**
3 Credits	**3 Hrs**	**42 Hrs**

Pedagogy: Classrooms lecture, tutorials, and Problem Solving.

Course Outcomes: On successful completion of the course, the Students will demonstrate:

- Define social media marketing goal setting for successful online campaigns.
- Analyze the effective social media marketing strategies for various types of industries and businesses.
- Design social media content and create strategies to optimize the content's reach to the target audience.
- Appraise the reach and track progress in achieving social media objectives with a variety of measurement tools and metrics.
- Design a suitable social media campaign for the business goals.

Syllabus:	Hours
Module No. 1: Social Media Introduction	**08**
Introduction to social media, how to build a successful Social Media Strategy, Goal setting, Overview of Global E-Marketing Issues, Country and Market Opportunity Analysis, User engagement on social networks; Social advertising; Social, media analytics; Impact of online reputation; Social Technology and its marketing influence in India.	
Module No. 2: Facebook -Instagram marketing	**10**
Exploring the use of a Facebook page, Facebook Ad campaign, Facebook groups, Hashtags, Instagram, Creating automation for Instagram, Audience Insights, page Insights, exploring the various IG content types, Setting a theme and flow on Instagram, and generating Leads.	
Module No. 3: Twitter Marketing	**08**
Creating a Twitter account, optimizing a page, content types, posting contents, Integrating a personal brand on Twitter, Twitter Analytics & Ads, post assistants and automation for Twitter.	
Module No. 4: YouTube marketing	**08**

Youtube marketing, creating a youtube channel, posting content, youtube analytics, Google Pages for YouTube Channels, Video Flow, Verify Channel, Webmaster Tool – Adding Asset.	
Module No. 5: Search Engine Optimization-Recent trends and challenges	**08**
Search Engine Optimisation (SEO) Introduction, Understanding SEO, User Insights, Benefits and Challenges, Content Marketing, Traditional Media vs Social Media, recent trends and challenges in Social Media marketing.	

Skill Developments Activities:

a) Prepare Facebook Page in your name.
b) Open a YouTube channel.
c) Create a blog and write an article on Climate change.
d) Create a search engine optimization (SEO) dashboard.

Text Books:

1. Annmarie Hanlon (2022), Digital Marketing Strategic Planning & Integration,2nd Edition, SAGE Publications Ltd.

2. Matt Golden (2022), Social Media Marketing, 1st Edition, Bravex Publications.

3. Simon Kingsnorth (2022), The Digital Marketing Handbook: Deliver Powerful Digital Campaigns, 1st Edition, Kogan Page.

4. Melissa Barker, Donald I. Barker, Nicholas F. Bormann and Debra Zahay (2016), Social Media Marketing: A Strategic Approach, 2nd Edition, Cengage Learning.

5. Tracy L. Tuten and Michael R. Solomon, (2016), Social Media Marketing, 2nd Edition, Sage Publications India Private Limited.

Name of the Program: BBA
Name of the Program: BBA

<table>
<tr><td colspan="3" align="center">**Name of the Program: BBA**

Course Code: BBA 3.5

Name of the Course: Rural Marketing (OEC)</td></tr>
<tr><td>**Course Credits**</td><td>**No. of Hours per Week**</td><td>**Total No. of Teaching Hours**</td></tr>
<tr><td>**3 Credits**</td><td>**3 Hrs**</td><td>**42 Hrs**</td></tr>
<tr><td colspan="3">**Pedagogy:** Classrooms lecture, tutorials, and Problem Solving.</td></tr>
<tr><td colspan="3">**Course Outcomes: On successful completion of the course, the Students will demonstrate**

- Describe the importance and application of various concepts of rural marketing.
- demonstrate the appropriate selection of the segmentation, targeting and positioning strategies along with the environmental factors that influence rural consumers' buying behavior.
- Design a Pricing Strategy that suits the characteristics of rural products and the stage in the product life cycle.
- Formulate the appropriate marketing communication and rural distribution channel plans to promote and deliver the rural products.
- Appraise the recent trends in Rural marketing and the application of digital technology in rural marketing.</td></tr>
<tr><td colspan="2">**Syllabus:**</td><td>**Hours**</td></tr>
<tr><td colspan="2">**Module No. 1: Introduction to Rural Marketing**</td><td>08</td></tr>
<tr><td colspan="3">Nature and scope of rural marketing, rural vs urban markets, concepts and classification of rural markets, rural marketing environment: rural population, occupation pattern, income generation, location of the rural population, expenditure pattern, literacy level, land distribution, land use pattern, irrigation, development programs, infrastructure facilities.</td></tr>
<tr><td colspan="2">**Module No. 2: Rural Consumer Behavior**</td><td>08</td></tr>
<tr><td colspan="3">Consumer buying behavior in rural markets, factors affecting consumer behaviour, rural consumer buying process, the rise of rural consumerism. Market segmentation – Bases for segmenting rural consumer markets.</td></tr>
<tr><td colspan="2">**Module No. 3: Rural Product and Pricing Strategy**</td><td>08</td></tr>
<tr><td colspan="3">Rural product, Rural product classification, product life cycle, Product Life Cycle strategies in rural markets, New Product Development in rural markets, Branding for rural markets. Pricing for rural markets – Factors and strategies.</td></tr>
</table>

Module No. 4: Rural Distribution and Communication Strategy	08

Wholesaling and retailing in the rural market, rural mobile traders, rural distribution models- FMCG companies, durable companies, Service organizations, emerging distribution models.

Rural communication strategy, challenges in   rural   Communication,   creating promotion mix for rural audiences: advertisement, sales promotion, publicity.

Module No. 5: Regulations and Recent Trends in Rural Marketing	10

Regulated market, Regulated Market in India, Future of Regulated Markets in India, Role of Govt in Developing rural marketing, Public Distribution Systems (PDS), FoodCorporation of India, Self Help Groups (SHG's). Agricultural Credit Policy, Digitalizing rural India, online marketing reach in the rural market, recent trends in packing, labelling,grading, transporting, order processing, payment methods, storage and warehousing andCorporate farming.

Skill Developments Activities:

   a) **Prepare a Product life cycle for a Rural product**
   b) **Select a Rural Product and conduct a Consumer Satisfaction Survey**
   c) **Prepare an advertisement copy for a rural product**
   d) **Visit an APMC Yard/Mandi's and prepare a report on any one Agri product pricing.**

Text Books:

   1. Debarun Chakrabaorty and Soumya Kanti Dhara, et al. (2021), Rural Marketing inIndia: Texts and Cases, 1st Edition Atlantic Publishers and Distributors Pvt Ltd

   2. Acharya SS and Agarwal NL (2019), Agricultural Marketing in India, 6th Edition,Oxford & IBH Publishing Co Pvt Ltd.

   3. Dinesh Kumar and Punam Gupta (2019), Rural Marketing), 1st Edition, SAGEPublications India Pvt Ltd.

   4. C. G. Krishnamacharyulu (2010), Rural Marketing: Text and Cases, 2nd Edition,Pearson India Education Services Pvt Ltd.

   5. T.P.Gopalaswamy (2009) Rural Marketing-Environment, Problems and Strategies, 3rd Edition, Vikas Publishing House.

Name of the Program: BBA

Course Code: BBA 4.1

Name of the Course: MANAGEMENT ACCOUNTING

Course Credits	No. of Hours per Week	Total No. of Teaching Hours
4 Credits	**4 Hrs**	**56 Hrs**

Pedagogy: Classrooms lecture, tutorials, and Problem Solving.

Course Outcomes: On successful completion of the course, the Students will demonstrate:

- Able to understand the concept of Management Accounting.
- To Understand and recall ratios and apply the same on given case.
- To construct cash flow statement.
- Should be able to apply Marginal cost rations to make business decisions.
- Student should be able to analyze business problems through applicatio ns.

Syllabus:	Hours
Module No. 1: INTRODUCTION TO MANAGEMENT ACCOUNTING	**8**
Introduction- Meaning and Definition – Objectives – Nature and Scope–Functions- Role of Management Accountant, Relationship between Financial Accounting and Management Accounting, Relationship between Cost Accounting and Management Accounting, advantages and limitations of Management Accounting.	
Module No. 2: RATIO ANALYSIS	**14**
Introduction-Meaning and Definition of ratio, Meaning of Accounting ratio, and Ratio Analysis – Uses and Limitations –Classification of ratios- Liquidity ratios, Profitability ratios and Solvency ratios. Problems on conversion of financial statements into ratios and ratios into financial statements.	
Module No. 3: CASH FLOW ANALYSIS	**12**
Meaning and Definition of Cash Flow Statement – Concept of Cash and Cash Equivalents - Uses of Cash Flow Statement – Limitations of Cash Flow Statement– Differences between Cash Flow Statement and Fund Flow Statement – Provisions of Ind. AS-7. Procedure for preparation of Cash Flow Statement – Cash Flow from Operating Activities – Cash Flow from Investing Activities and Cash Flow from Financing Activities – Preparation of Cash Flow Statement according to Ind. AS- 7	
Module No. 4: MARGINAL COSTING	**12**

Introduction-Meaning and definition of marginal cost, marginal costing, features of marginal costing- terms used in marginal costing – P/V ratio, BEP, Margin of Safety, Angle of Incidence and Break-Even Chart. Break Even Analysis- assumption and uses-problems.

Decision Making-Make or Buy, -problems on decision making.

Module No. 5: STANDARD COSTING	**10**

Historical costing - Introduction – Meaning & Definition of Standard Cost and Standard Costing - Advantages & Disadvantages of Standard Costing –preliminaries in establishing system of standard costing – Variance Analysis – Material Variance, Labour Variance and Overheads Variance – Problems on Material Variances and Labor Variances only.

Skill Developments Activities:

- Collect the financial statement of a company and calculate important ratios.

- Collect the annual report of a company and prepare a cash flow statement.

- Prepare a Break-even-chart with imaginary figures.

- Prepare a flexible budget using imaginary figures of at least three levels.

- Draft the chart of various total cost variances.

Text Books:

1. Dr. S.N. Maheswari, Management Accounting, Mahavir Publications

2. T.S.Sexana, Advanced Cost and Management Accounting, Sultan Chand

3. Sudhindra Bhat, Management Accounting, Excel Books.

4. Dr. S.N. Goyal and Manmohan, Management Accounting, S.N. Publications.

5. B.S. Raman, Management Accounting, United Publishers.

6. Sharma and Gupta, Management Accounting, Kalyani Publishers.

7. M Muniraju & K Ramachandra, Management Accounting, HPH

8. PN Reddy & Appanaiah, Essentials of Management Accounting, HPH**.**

Name of the Program: BBA		
Course Code: BBA 4.2		
Name of the Course: Business Analytics		
Course Credits	**No. of Hours per Week**	**Total No. of Teaching Hours**
4 Credits	**4 Hrs**	**56 Hrs**

Pedagogy: Classrooms lecture, tutorials, and Problem Solving.

Course Outcomes: On successful completion of the course, the Students will demonstrate

- Able to understand Data Types and storage of Data.
- To understand types of analytics and data models.
- To demonstrate visualization of data.
- To recall the data mining and processing of data.
- Able to understand concepts of different analytics model.

Syllabus:	Hours
Module No. 1: INTRODUCTION TO BUSINESS ANALYTICS	12

Business Analytics, Terminologies used in Analytics: Business Analytics, Business Intelligence, Meaning, Importance, Scope, Uses of Business Analytics, Architecture of Business Analytics, Types of Analytics: Descriptive, Diagnostics, Predictive, Prescriptive, Application of Business analytics, Introduction to Data Science and Big Data.

Module No. 2: ROLE OF DATA IN THE ORGANIZATION	10

Sources of data, Use of Data in Decision making, Importance of data quality, dealing with missing or incomplete data, Types of Digital Data- Structured, Semi Structured, Unstructured Data. Data warehouse, Data mining, Data Integration – What, need, advantages, approaches of Data integration, Data profiling.

Module No. 3: TOOLS USED FOR DATA ANALYTICS	12

Introduction to data analytics software – Types of data analytics software – open source and proprietary software.

Lab sessions:

R, JAMOVI, GRETL, Python: Installation of software –Installation of packages / library - Importing of data – Saving of data – Run descriptive Statistics – Interpret result – plotting of charts – inferences of chart. (Using all the four specified softwares).

Module No. 4: DATABASE ORIENTATION	12

Database definition, types of structures, DBMs, RDBMS, Relational Database Language , Introduction to SQL, Features of SQL, SQL Languages, DDL commands - Create, Add, Drop, Constraints in SQL, DML Commands – Insert, Delete, Update, Data Query Language – Where clause, Order by, Group by, DCL commands – Grant, Revoke, TCL Commands – Commit, Roll Back, Save point. Aggregate Functions, Relational Algebra.	
Module No. 5: DATA VISUALIZATION USING TABLEAU (PUBLIC VERSION)	**10**
Introduction to Dimensions and measures, Types of Charts, (Pie Chart, Column Chart, Line Chart, Bar Chart, Area Chart, Scatter Chart, Bubble Chart, Stock Chart), Basic understanding in dashboard and storyboard. (Explain using practical examples and students executes the examples using tableau.)	

Skill Developments Activities:

1. Prepare tree map chart using Tableau.
2. Run a descriptive statistic using R and Python software.
3. Execute a summary chart in JAMOVI.
4. Execute DCL and TCL Command in SQL.

Text Books:

1. Business Analytics: Text and Cases, Tanushri Banerjee, Arvindram Banerjee,

   Publisher: Sage Publication

2. Business Analytics, U Dinesh Kumar, Publication: Wiley

3. Business Analytics, R. Evans James, Publisher: Pearson

4. Fundamental of Business Analytics, Seema Acharya R N Prasad, Publisher: Wiley

5. Business Analytics: Data Analysis and Decision Making, Albright and Winston

   published by Cengage Learning**.**

6. Swain Scheps, Business Intelligence for Dummies.

7. Rick Sherman, Business Intelligence Guidebook: From Data Integration to Analytics

8. Cindi Howson. Successful Business Intelligence, Second Edition: Unlock the Value of BI & Big Data

9. Seema Acharya R N Prasad, Fundamentals of Business Analytics, 2ed, Wile

Name of the Program: BBA		
Course Code: BBA 4.2		
Name of the Course: Financial Markets & Services		
Course Credits	**No. of Hours per Week**	**Total No. of Teaching Hours**
4 Credits	**4 Hrs**	**56 Hrs**

Pedagogy: Classrooms lecture, tutorials, and Problem Solving.

Course Outcomes: On successful completion of the course, the Students will demonstrate

- To able to recall concepts of financial system.
- Able to differentiate the roles of financial institutions.
- Able understand concept of financial services.
- To understand the trading process of Instruments.
- Able to Summarize the concept of stock market.

Syllabus:	Hours
Module No. 1: OVERVIEW OF FINANCIAL SYSTEM	10
Financial System – Features, Constituents of Financial System; Financial Institutions; Financial Services; Financial Markets and Financial Instruments.	
Module No. 2: FINANCIAL INSTITUTIONS	14
Characteristics of Financial Institutions, Broad Categories – Money Market Institutions and Capital Market Institutions. Objectives and Functions of Industrial Finance Corporation of India, Industrial Development Bank of India, State Financial Corporations, Industrial Credit and Investment Corporation of India, EXIM Bank of India, National Small Industrial Development Corporation, National Industrial Development Corporation, RBI Measures for NBFCs.	
Module No. 3: FINANCIAL SERVICES	12
Financial Services – Meaning, Objectives, Functions, Characteristics; Types of Financial Services - Merchant Banking – Functions and Operations, Leasing, Mutual Funds, Venture Capital & Credit Rating.	
Module No. 4: FINANCIAL MARKETS AND INSTRUMENTS	10
Meaning and Definition, Role and Functions of Financial Markets, Constituents of Financial Markets; Money Market Instruments, Capital Market and Instruments; SEBI guidelines for Listing of Shares and Issue of Commercial Papers.	

Module No. 5: STOCK MARKETS	10

Introduction - Functions of Stock Exchange; Stock Market Operations - Trading, Settlement and Custody (Brief discussion on NSDL & CSDL); Brief discussion of BSE, NSE and OTCEI.

Skill Developments Activities:

- Visit any financial institution and prepare a report regarding its structure, functions and
- performance.
- Analyze the ratings given by any credit rating agency, for at least 5 companies.
- Conduct a mock stock-trading session and record the outcome.
- Identify a company of your choice and record its share prices for one month.

Text Books:

1. L.M. Bhole, Financial Institutions & Markets, McGraw Hill

2. Khan, M.Y, Indian Financial System, McGraw Hill

3. Sharma, Meera, Management of Financial Institutions, Eastern Economy Edition

4. Bhole and Mahakud, Financial Institutions and Markets – Structure, Growth and Innovations, McGraw Hill

5. Guruswamy, S., Financial Services and System, McGraw Hill

6. Edminister. R.O, Financial Institutions, Markets & Management, McGraw Hill

7. Khan. M.Y, Indian Financial System, Vikas Pub. House

8. H.R Machiraju, Indian Financial System, Vikas Pub. House

9. E.Gorden & K. Nataraj, Financial Markets and Services, HPH

<table>
<tr><td colspan="3" align="center">Name of the Program: BBA</td></tr>
<tr><td colspan="3" align="center">Course Code: BBA 4.3</td></tr>
<tr><td colspan="3" align="center">Name of the Course: FINANCIAL MANAGEMENT</td></tr>
<tr><td>Course Credits</td><td>No. of Hours per Week</td><td>Total No. of Teaching Hours</td></tr>
<tr><td>4 Credits</td><td>4 Hrs</td><td>56 Hrs</td></tr>
</table>

Course Outcomes: On successful completion of the course, the Students will demonstrate.

- To identify the goals of financial management.
- To appraise the concepts of time value of money.
- To understand the different models of dividend policy.
- Able to analyze the business problem related to investments.
- Able to appraise the working capital requirements in an organization.

Syllabus:

Module No. 1: INTRODUCTION TO FINANCIAL MANAGEMENT	Hours
Introduction – Meaning of Finance, Business Finance, Finance Functions, Organization structure of Finance Department; Financial Management – Goals of Financial Management, Financial Decisions, Role of a Financial Manager; Financial Planning – Steps in Financial Planning, Principles of Sound Financial Planning, Factors influencing a Sound Financial Plan	**12**
Module No. 2: TIME VALUE OF MONEY	
Meaning, Need, Future Value (Single Flow, Uneven Flow & Annuity); Present Value (Single Flow – Uneven Flow & Annuity); Doubling Period; Concept of Valuation -- Valuation of Bonds, Debentures and Shares (Simple Problems)	**12**
Module No. 3: FINANCING & DIVIDEND DECISIONS	
Financing Decision: Sources of Long-Term Finance -- Meaning of Capital Structure, Factors influencing Capital Structure, Optimum Capital Structure – EBIT, EPS Analysis, Leverages – Problems Dividend Decision: Meaning & Determinants of Dividend Policy, Types of Dividends, Bonus Shares (Meaning only)	**12**

Module No. 4: INVESTMENT DECISION	
Meaning and Scope of Capital Budgeting, Features & Significance, Techniques --Payback Period, Accounting Rate of Return, Net Present Value, Internal Rate of Return and Profitability Index (Problems)	**10**

Module No. 5: WORKING CAPITAL MANAGEMENT	
Working Capital -- Concept of Working Capital, Significance of Adequate Working Capital, Types of Working Capital, Problems of Excess or Inadequate Working Capital, Determinants of Working Capital, Sources of Working Capital, Estimation of Working Capital (Simple Problems)	**10**

Skill Developments Activities:

- Calculate Equated Installment and prepare Loan Repayment schedule for the loan borrowed by your family / friend.

- Identify the capital budgeting and capital structure practices followed in any firm/company of your choice (using primary/secondary data)

- Visit a business entity and estimate working capital requirement for the entity.

- Develop spreadsheet models for different components of time value of money and capital budgeting.

Text Books:

1. I M Pandey, Financial Management. Vikas Publication.

2. Prasanna Chandra, Financial Management, TMH

3. S N Maheshwari, Financial Management, Sultan Chand

4. Khan and Jain, Financial Management, TMH

5. Dr. V Rajeshkumar and Nagaraju V, Financial management, MH India

6. Dr. Aswathanarayana.T ,Financial Management, VBH

7.	K. Venkataramana, Financial Management, SHBP
8.	G. Sudarshan Reddy, Financial Management, HPH
9.	Sharma and Shashi Gupta, Financial Management, Kalyani Publication

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Name of the Program: BBA
Course Code: BBA 4.6
Name of the Course: Business Leadership Skills (OEC)

Course Credits	No. of Hours per Week	Total No. of Teaching Hours
3 Credits	3 Hrs	42 Hrs

Pedagogy: Classrooms lecture, tutorials, and Problem Solving.

Course Outcomes: On successful completion of the course, the Students will Demonstrate

- To make students understand the significance of leadership skills for effective peoplemanagement

- To increase the comprehension of leadership through various leadership theories

- To make students understand different leadership styles, types, patterns and functions

- To introduce various leadership approaches for effective management of people

- To make students aware of recent trends in the area of business leadership

Syllabus:	Hours
Module No. 1: INTRODUCTION TO BUSINESS LEADERSHIP	10
Introduction to business leadership, meaning/definition of leadership, evolution and growth of leadership; functions and characteristics of leadership; latest trends/current scenario of business leadership.	

Module No. 2: LEADERSHIP FROM MANAGERIAL PERSPECTIVE	12
Nature of leadership, Significance or importance of leadership, Qualities of an effective leader, leader v/s manager; authority v/s leadership; formal v/s informal leadership; different roles of leadership; different levels of leadership;	
Module No. 3: LEADERSHIP FROM THEORETICAL PERSPECTIVE	8
Great man theory, Trait theory, Situational leadership theory, transactional leadership, transformational leadership theory, Likert's Management System; Fielder's contingency model, Blake and Mouton's Managerial Grid.	
Module No. 4: LEADERSHIP FROM AN OPERATIONAL PERSPECTIVE	6
Leadership styles: a) Autocratic leadership, b) Bureaucratic leadership, c) Democratic leadership, and d) Laissez faire leadership;	
Module No. 5: LEADERSHIP STRATEGIES	6
Leadership Strategies a) leading from the front, b) supporting leadership, c) interactive leadership. Group conflict, leader's role in managing group conflict; challenges in leadership; change management.	

Skill Developments Activities:

- Collect information about the real time corporate leaders with different leadership styles & discuss their leadership styles and traits in the class room.

- Present the students with a workplace problem, and have each student participant write down what they would do to solve it. Then, have each participant read their response aloud. This can help the teacher to identify the types of leadership styles that are present among the student participants and thereby highlight and discuss them in the class.

- Student can make a presentation on any famous corporate/political personality covering their leadership style, their approach to people management, their

effectiveness in managing conflicts and how did they manage the crisis situations and so on.

Text Books:

1. Northouse, P. (2007). Leadership: Theory and Practice. Sage Publications.

2. Stephen, R. P. (1988). Orgaizational Behaviour - Concepts, controversies and Appications. New Delhi: Printice Hall of India Ltd.

3. Subba Rao. (2018). Organizational Behaviour (18th ed.). Himalaya Publishing House.

4. Subba Rao. (2022). Personnel and Human Resource Management (5th ed.). Bangalore: Himalay Publishing House.

<table>
<tr><td colspan="3" align="center">Name of the Program: BBA

Course Code: BBA 4.6

Name of the Course: Personal Wealth Management</td></tr>
<tr><td>Course Credits</td><td>No. of Hours per Week</td><td>Total No. of Teaching Hours</td></tr>
<tr><td align="center">3 Credits</td><td align="center">3 Hrs</td><td align="center">42 Hrs</td></tr>
</table>

Pedagogy: Classrooms lecture, tutorials, and Problem Solving.

Course Outcomes: On successful completion of the course, the Students will demonstrate

- Demonstrate an understanding of the importance of Wealth Management and Financial Planning in personal life
- Identify the Real Estate Investment Routes and understand the tax planning that minimises tax burden
- Select and Apply the Asset Allocation strategies to balance between Risk and Return
- Anlayse the Retirement Planning Benefits and retirement strategies to provide regular income for life.
- Understand the basic principles and importance various insurance polices

Syllabus:	Hours
Module No. 1: Wealth Management and Financial Planning	08

Meaning of Wealth Management, Need, Scope and Components of Wealth Management, Process of Wealth Management, Expectations of Clients, Code of Ethics for Wealth Manager. Challenges to WM in India – Financial Planning - Systematic Approach to Investing (SIP, STP & SWP)- Life Cycle and Wealth Cycle - Financial Planning in India, Legal aspects of Financial Planning.

Module No. 2: Estate Planning and Tax Planning	08

Real Estate, Role of Real Estate, Real Estate Investment Routes, Real Estate Indices -Assets & Liabilities, Nomination, Inheritance Law, Will, Understanding Trust and Trust Documents – Tax Planning Concepts, Assessment Year, Financial Year, Income Tax Slabs, TDS, Advance Tax, LTCG, STCG, Carry Forward and Set-off.

Module No. 3: Asset Allocation Strategies	08

Asset allocation Strategies -Asset allocation Decision, Equity portfolio strategies - Active Vs Passive, Management strategies, Value Vs growth investing, -Tactical, Fixed & Flexible. **Portfolio Management Strategies** - Indexing - Active - interest rate anticipation, Valuation analysis, Credit

analysis, Yield spread analysis and Bond swaps - Allocation to Speculation, Diversification in Perspective.	
Module No. 4: Retirement Planning and Employee Benefits	**10**
Introduction to Retirement Planning - Types of Retirement Plans - Defined Benefit and Defined Contribution plan, Superannuation Fund and other retirement plans, Pre andPost Retirement Planning Strategies – ESOP and ESPP.	
Module No. 5: Insurance Products in Wealth Management	**08**
Meaning, Basic Principles of Insurance, Functions and Characteristics of Insurance - Group Life and Health Insurance; Types of Life Insurance Policies, Types of General Insurance Policies, Health Insurance and Group Insurance Policy – Risk Management through Insurance.	
Skill Developments Activities: • **List out different Insurance schemes** • **Create your own personal portfolio using imaginary numbers and justify.** • **Conduct a survey of 20 salaried employees on their investment avenues through questionnaire.** • **Prepare technical charts report of any 5 listed stocks in BSE S&P SENSEX.**	
Text Books: • Pawan V. Jhabak – Wealth Management, Himalaya Publishing Hou Himalaya Publishing House Pvt. Ltd., Mumbai - 400 004. • S.K Bagchi – Wealth Management Jaico Publishing House, Firs Edition. • NSE Academy – Financial Planning and Wealth Management. • NCFM Work Book – Financial Markets (Advanced).	

JSS COLLEGE OF ARTS COMMERCE & SCIENCE

(Autonomous)

Ooty Road, Mysuru – 25

DEPARTMENT OF COMMERCE AND MANAGEMENT

BBA Programme
(III Year)

Syllabus
CHOICE BASED CREDIT SYSTEM

2019-20

Programme Outcomes

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

I SEMESTER BBA

FINANCIAL ACCOUNTING – I – DSC -1

L: T: P- 4:0:1

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

CDA22001

I SEMESTER

PRINCIPLES OF MANAGEMENT– DSC -2

L: T: P- 3:1:0

Course Outcome:

On successful completion of this course the students are able to:

CO1: Identify the details of Management functions and become manager

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

CDA23001

I SEMESTER

BUSINESS ENVIRONMENT – DSC - 3

L: T: P - 3:1:0

Course Outcome:

On successful completion of this course the students are able to:

CO1: Understand the characteristics and types of environment

CO2: Understand the management structure and nature

CO3: Learn in depth the digital Economic Environment

CO4: Understand the different forms of business organization.

CO5: Understand the Global business environment

CO6: Learn in depth the Concepts of Network Marketing, Franchising, Business Process Management, Knowledge Process Management-Business-Commerce and acquire Business foundation skills

CDB21001

II SEMESTER

BUSINESS DECISION THEORIES – DSC -4

L:T:P - 4:1:0

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

CDB22001

II SEMESTER

MANAGEMENT OF SERVICES – DSC -5

L:T:P - 3:1:0

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

CDB23001

II SEMESTER

FINANCIAL ACCOUNTING – II – DSC -6

L: T: P - 4:1:0

Course Outcomes:

On successful completion of this course the students are able to:

CO1: Understand in depth the details of consignment transaction

CO2: Learn in depth the accounting procedure of joint venture and able to maintain the books of accounts

CO3: Identify the causes for differences between the cash balance in cash book and pass book statement

CO4: Understand in depth the details of hire purchase and installment agreement

CDC21001

III SEMESTER

MANAGEMENT INFORMATION SYSTEM – DSC -7

L: T: P - 2:0:2

Course Outcome:

On successful completion of this course the students are able to:

CO1: Understand in depth the evolution, significance and need of Management Information System

CO2: Learn in depth the structure of MIS based on management activity

CO3: Types of information systems - Operations support system - Transaction Processing Systems - Decision support System - Process Control Systems

CO4: Identify the Information required for various levels of management and Value of information in decision making

CO5: Understand in depth the details of Managing and Controlling information

CO6: Understand in depth the ERP Concepts, Evolution of ERP, and ERP packages,

CDC22001

III SEMESTER

FINANCIAL ACCOUNTING –III – DSC – 8

L: T: P - 4:1:0

Course Outcome:

On successful completion of this course the students can:
CO1: Learn in depth different sources of finance and become a corporate accountant
CO2: Understand the provision of Companies Act 2013
CO3: Identify the provisions for issue of debenture and bonds
CO4: Prepare the financial statement of companies as per the schedule of Companies Act 2013
CO5: Understand the details of liquidation of company and can become a liquidator

CDC23001

III SEMESTER

COST ACCOUNTING – II – DSC -9

L:T:P - 4:1:0

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

CDD21001

IV SEMESTER

QUANTATIVE TECHNIQUES– DSC -10

L:T:P - 4:1:0

Course Outcome:

On successful completion of this course the students can:

CO1: Understand in depth the classification and operation of matrices and determinants

CO2: Learn the details of progression and their application to business

CO3: Understand in detail the concept of Ratio, proportion and variation

CO4: Learn in depth the Laws of indices and logarithms and its application

CO5: Understand the details of simple interest and compound interest

CDD22001

IV SEMESTER

COMMERCIAL LAW– DSC -11

L:T:P - 4:1:0

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 the provisions of competition Protection Act 2002

CO6: Identify the provisions of special contracts

CDD23001

IV SEMESTER

ORGANISATIONAL BEHAVIOUR– DSC -12

L:T:P - 3:1:0

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

CDD24001

IV SEMESTER

MANAGEMENT ACCOUNTING – DSC -13

L:T:P - 4:1:0

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 techniques and able to analyse and interpret the financial statements

CO5: Learn in depth the details of different types of budget and able to prepare them

CO6: Understand in depth standard costing and variance analysis

CDE21001

V SEMESTER

COMPANY LAW– DSC -14

L:T:P - 3:1:0

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 Formation 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 Membership of a company

CO5: Learn in details Company frauds and their prevention

CO6: Understand in depth characteristics of different types of company and corporate veil

CDE22001

V SEMESTER

BUSINESS STATISTICS - I – DSC -15

L:T:P - 4:1:0

Course Outcome:

On successful completion of this course the students can:

CO1: Understand in depth the characteristics of statistics and data collection

CO2: Learn in details with examples Measures of Central tendency

CO3: Understand the classification and characteristics of Measures of dispersion

CO4: Learn in detail the correlation and determine the relation between two variables

CO5: Understand in depth regression and able to find unknown variable value based on known variable value

CDE23001

V SEMESTER

TAX MANAGEMENT– I – DSC -16

L:T:P - 4:1:0

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: Identify the different heads of income and able to compute assessable income

CO3: Identify in detail different sections of IT Act to reduce tax liability

CO4: Deliberate in details with examples and appear before IT tribunal on behalf of his clients

CO5: Understand in details with examples IT Authorities and able to work in different position of CBDT

CDE24001

V SEMESTER

BUSINESS RESEARCH METHODS – SEC -1

L:T:P - 3:1:0

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: Understand the details of types of Business Research and Research design

CO4: Identify and contribute to the discipline of commerce and management through the research

CO5: Deliberate the details of Data analysis and methods of analysis

CO6: Specify in detail the sampling with examples

CDE25001

V SEMESTER

PROJECT MANAGEMENT –SEC -1

L:T:P - 3:1:0

On successful completion of this course the students can:

CO1: Learn in depth the classification of projects, stages in project cycle, identification, formulation and implementation.

CO2: Understand and able to report about the role and responsibilities of project manager.

CO3: Understand the details of Project formulation, formulation stages and feasibility report

CO4: Identify the Administrative agencies for project approval, Ministry of Finance, Bureau of public enterprises planning commission Public Investment Board.

CO5: Understand and able to Estimate the Project Cost

CO6: Understand and able to prepare the project report.

CDE26001

V SEMESTER

Marketing Management – DSE -1

Elective I - Principles of Marketing

L:T:P - 4:1:0

Course Outcome:

On successful completion of the course students can:

CO1: Learn in depth characteristics of marketing

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 pricing the product

CO4: Deliberate the factors influencing the consumer behavior

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

CDE27001

V SEMESTER

HUMAN RESOURCE MANAGEMENT – DSE -1

Elective I - Human Resource Management

L:T:P - 4:1:0

Course Outcome:

On successful completion of this course the students can:

CO1: Learn in depth the Evolution and Development of HRM.

CO2: Understand the trade union movement era; social responsibility era; Human relations Era; behaviourial Science Era; systems approach era and contingency approach era.

CO3: Understand the details of need for and Importance of HRP- Human Resource Planning process; Human Resource information system and Barriers to HRP.

CO4: Identify the Recruitment practices in India

CO5: Understand the Selection process

CO6: Understand the ability tests, Aptitude tests, Achievement tests, Intelligence tests, Personality tests- interviews objectives.

CDE28001

V SEMESTER

FINANCIAL MANAGEMENT– DSE -1

Elective I - Financial Management

L:T:P - 4:1:0

Course Outcome:

On successful completion of this course the students can:

CO1: Learn in depth the concepts of Profit Maximization and Wealth Maximization.

CO2: Understand and able to identify the Sources of finance.

CO3: Understand the concepts of Cost of Debt, Cost of Preference Capital, Cost of Equity, Cost of Equity under CAPM, Cost of Retained Earnings, -Weighted Cost of Capital.

CO4: Understand the theories of Capital Structure-Net Income approach, Net operating Income theory, Traditional Approach, MM Hypothesis.

CO5: Understand and identify the Factors influencing Dividend decision

CO6: Understand the relevance of Dividend Policy.

CDE29001

V SEMESTER

BANKING AND INSURANCE– DSE -1

Elective I - Indian Banking System

L:T:P - 4:1:0

Course Outcome:

On successful completion of this course the students can:
CO1: Learn in depth the structure of commercial banks in India.

CO2: Understand and identify the changing face of commercial banks,

CO3: Understand the cclassification of financial markets.

CO4: Understand and identify the obligations of a banker
CO5: Understand of types of accounts
CO6: Understand and identify theSpecial types of customers

CDE30001

V SEMESTER

TOURISM MANAGEMENT– DSE -1

Elective I - Fundamentals of Tourism

L:T:P - 4:1:0

Course Outcome:

On successful completion of this course the students can:
CO1: Understand and identify the types of Tourism

CO2: Understand in depth the History of Tourism and Tourism in India

CO3: Able to identify the Infrastructure in Tourism

CO4: Learn in depth and identify the factors affecting tourism
CO5: Able to identify the trends in tourist statistics with respect to Karnataka and India
CO6: Understand the impact of tourism in India

CDE26201

V SEMESTER

MARKETING MANAGEMENT – DSE -2

Elective II - Rural Marketing and Consumer Behaviour

L: T: P - 4:1:0

Course Outcome:

On successful completion of this course the students can:

CO1: Understand and identify thefactors affecting rural consumer behaviour

CO2: Understand in depth the Product branding and promotion in rural market

CO3: Able to identify the importance of consumer behaviour in marketing decisions

CO4: Learn in depth and identify the influence of culture on consumer behaviour

CO5: Understand the concepts of Consumer reference groups and group dynamics

CO6: Able to identify the Consumer decision making process

CDE27201

V SEMESTER

HUMAN RESOURCE MANAGEMENT - DSE -2

Elective II - Human Resource Development

L:T:P - 4:1:0

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

CDE28201

V SEMESTER

FINANCIAL MANAGEMENT – DSE -2

Elective II – Working Capital Management

L: T: P - 4:1:0

Course Outcome:

On successful completion of this course the students can:
CO1: Understand and identify the nature and types of Working Capital

CO2: Understand in depth the approaches to Financing of Current assets and Working Capital Estimation

CO3: Able to identify the objectives of Cash Management

CO4: Learn in depth and identify Cost and Benefits of receivables
CO5: Able to identify the types of inventories
CO6: Understand the concept of Financing of Working Capital

CDE29201

V SEMESTER

BANKING INSURANCE - DSE -2

ELECTIVE II - Banking Information Technology

L:T:P - 4:1:0

Course Outcome:

On successful completion of this course the students can:
CO1: Understand in depth the concept of bank mechanization

CO2: Understand in depth the concept of Electronic fund transfer system

CO3: Able to identify the objectives of Electronic Clearing System, procedure, cyber trading and mechanism

CO4: Learn in depth and identify Cyber crime and cyber laws, penalty for damage to computer and computer system, hacking with computer system

CO5: Able to identify the MICR based national clearing system and Code allotment under MICR,

CO6: Understand the concept of Security considerations

CDE30201

V SEMESTER

TOURISM MANAGEMENT– DSE -2

ELECTIVE II – Tourism Planning and Organization

L:T:P - 4:1:0

Course Outcome:

On successful completion of this course the students can:

CO1: Understand in depth the concept of Planning approaches for different forms of Tourism

CO2: Understand the concept of Travel organization

CO3: Able to identify the Functions of a Travel Agency

CO4: Learn in depth and identify Evolution of Tour operation business – Functions of Tour Operators, Sources of Income of Travel Agency and Tour Operator

CO5: Able to identify the Duties and Responsibilities - Tour guiding - Tour escort - Tour managers –Tour guides

CO6: Understand the Procedure for setting up of Travel Agency and Tour Operating Enterprises

CDF21001

VI SEMESTER

ENTREPRENEURSHIP DEVELOPMENT – DSC -17

L: T: P - 3:1:0

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 mobilization of resources

CO4: Learn in depth the characteristics of customer and able to identify the customer

CDF22001

VI SEMESTER
BUSINESS STATISTICS - II – DSC -18

L:T:P - 3:1:0

Course Outcome:

On successful completion of this course the students can:

CO1: Understand in depth the components of time series analysis and measurement of trend

CO2: Learn in detail the features of linear programming and apply to solve business problem

CO3: Understand the statistical decision making process under certainty and uncertainty

CO4: Learn in detail the theories of probability

CO5: Understand in depth the properties of theoretical distributions and their application to business problem

CDF23001

VI SEMESTER

TAX MANAGEMENT – II – DSC -19

L:T:P - 3:1:0

Course Outcome:

On successful completion of this course the students are able to:
CO1:Understand the concept of Depreciation and rates of depreciation

CO2: Understand and identify the types of Capital Assets.

CO3: Understand in detail the concept of Income from other Sources

CO4: Learn in depth the computation of Total Income and Tax Liability

CO5: Learn in depth the concept of Tax deducted at Source
CO6: Understand in detail the concept of Goods and Service Tax

CDF24001

VI SEMESTER

BUSINESS POLICY –SEC – 2

L:T:P - 3:1:0

Course Outcome:

On successful completion of this course the students are able to:
CO1:Understand the concept of Business policy and Strategic Management

CO2: Understand and identify the Strategic planning in Organisation

CO3: Understand in detail the concept of Strategy Formulation. Strategic & Situational Analysis

CO4 :Learn in depth the concept of SWOT Analysis

CO5: Learn in depth the concept of Financial Strategy and Production Strategy
CO6: Understand in detail the Human Resource Strategy

CDF25001

VI SEMESTER

Project Report– SEC - 2

L: T: P–1:0:3

    C1   –   Proposal of Project Work - 15 Marks
    C2   –   Progress of Project Work - 15 Marks
    Viva   -   20 Marks
Valuation of Report – 50 Marks

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

CDF26401

VI SEMESTER

MARKETING MANAGEMENT– DSE -3

Elective III – Advertising

L:T:P - 4:1:0

Course Outcome:

On successful completion of this course the students are able to:

CO1: Understand the objectives, Scope and Growth of Modern Advertising

CO2: Understand and identify types of Advertising

CO3: Understand in detail the concept of Elements of Advertisement

CO4:Learn in depth the eessentials of good advertisement copy

CO5: Understand and identify the Factors influencing the choice of an Advertising agency –
Types of agencies

CO6: Understand in detail the Advertising ethics

CDF27401

VI SEMESTER

HUMAN RESOURCE MANAGEMENT– DSE -3

Elective III –Performance Appraisal and Compensation Management

L:T:P - 4:1:0

Course Outcome:

On successful completion of this course the students are able to:

CO1: Understand and identify the objectives, principles, factors influencing wage and salary
Administration

CO2: Understand the concept of wage policy in India

CO3: Learn in depth the objectives of fringe benefits.

CO4:Learn in depth the Methods of performance appraisal

CO5: Understand and identify the essentials of an effective appraisal system

CO6: Understand in detail the concept of m**otivation**

CDF28401

VI SEMESTER

FINANCIAL MANAGEMENT– DSE -3

Elective III – Financial Services

L:T:P - 4:1:0

Course Outcome:

On successful completion of this course the students are able to:

CO1: Understand and identify the features, importance, contribution of financial service in promoting industry and service

CO2: Understand the concept of money market and capital market.

CO3: Learn in depth the growth of merchant banking in India

CO4: Learn in depth the Scope of merchant banking services

CO5: Understand the concept of Mutual Funds

CO6: Understand in detail the concept of Factoring

CDF29401

VI SEMESTER

BANKING AND INSURANCE– DSE -3

Elective III –Principles of Insurance

L:T:P - 4:1:0

Course Outcome:

On successful completion of this course the students are able to:

CO1: Understand and identify the nature of business risk, causes of business risk, types of business risk and methods of handling risk,

CO2: Understand and identify the characteristics, purpose, need and benefits of insurance

CO3: Learn in depth the principles of insurance

CO4: Understand the concept of Life insurance

CO5: Understand the concept ofStructure and operation of insurance business

CO6: Understand in detail the concept of Life Insurance Agency

CDF30401

VI SEMESTER

TOURISM MANAGEMENT– DSE -3

Elective III –Tourism Management

L:T:P - 4:1:0

Course Outcome:

On successful completion of this course the students are able to:

CO1: Understand the concept of Managing of Services in tourism

CO2: Understand the concept of Front Office organization structure

CO3: Learn in depth the Role of State Tourism Development Corporation in the development of tourism in Karnataka.

CO4: Understand the concept of increasing competitiveness for globalization

CO5: Understand and identify the National Parks and Wildlife sanctuaries,

CO6: Understand and identify the types of Accommodation

CDF26601

VI SEMESTER

MARKETING MANAGEMENT– DSE -4

Elective VI –Retail and Supply Chain Management

L:T:P - 4:1:0

Course Outcome:

On successful completion of this course the students are able to:

CO1: Understand the concept of evolution of Retailing in India

CO2: Understand the concept of Emerging Trends in Retailing,

CO3: Learn in depth the Role of Design & Layout, Location Planning and its importance,
CO4: Understand the concept of Floor Space Management

CO5: Understand and identify the Elements/Components of Retail Store Operation
CO6: Understand the Concepts and importance of a Supply Chain

CDF27601

VI SEMESTER

Human Resource Management– DSE -4

Elective VI – Employee Empowerment and Industrial Relations

L:T:P - 4:1:0

Course Outcome:

On successful completion of this course the students are able to:

CO1: Understand and identify conditions necessary for employee empowerment

CO2: Understand the concept of Quality circles

CO3:Learn in depth the types of social Security

CO4: Understand the concept of trade unions and problems of Trade Union.

CO5: Understand and identify the measures to strengthen trade Union movement in India
CO6: Understand the concept of Strategic HRM

CDF28601

VI SEMESTER

FINANCIAL MANAGEMENT– DSE -4

Elective IV – Investment Analysis and Portfolio Management

Course Outcome:

On successful completion of this course the students are able to:

CO1: Understand the concept of Investment

CO2: Understand the concept of Portfolio Management Process- Approaches to Investment Decision making Portfolio Management Process- Approaches to Investment Decision making

CO3:Learn in depth theCapital Market instruments

CO4: Understand the concept of Risk and Return

CO5: Understand the concept of Portfolio Return and Risk-Measurement

CO6: Understand the concept of Markowitz model.

CDF29601

VI SEMESTER

BANKING AND INSURANCE– DSE -4

Elective IV – General Insurance

L:T:P - 4:1:0

Course Outcome:

On successful completion of this course the students are able to:

CO1: Understand the concept of General Insurance business in India

CO2: Understand the concept of GIC of India and its subsidiaries

CO3:Learn in depth the Classification of General Insurance

CO4: Understand the concept of Marine Insurance

CO5: Understand and identify the Types of marine insurance policies

CO6: Understand the concept of Health insurance

CDF30601

VI SEMESTER

TOURISM MANAGEMENT– DSE -4

Elective IV – TOURISM MARKETING

L:T:P - 4:1:0

Course Outcome:

On successful completion of this course the students are able to:

CO1: Understand the concept of Tourism Marketing

CO2: Understand the concept of State tourism offices and Local Bodies, Private Organizations, Non-Governmental Organizations in Tourism

CO3:Learn in depth the Tourism Marketing Environment

CO4: Understand the concept of Tourism Pricing and Promotion

CO5: Understand and identify the factors influencing Tourism Pricing, Methods of Price fixation, Pricing Strategies

CO6: Understand and identify the Promotional Tools in Tourism

JSS COLLEGE OF ARTS COMMERCE & SCIENCE
(Autonomous)
Ooty Road, Mysuru – 25

DEPARTMENT OF COMMERCE AND MANAGEMENT

B.COM Programme
(II & II Year)
Syllabus as per NEP
(Modified)

w.e.f
2023-24

B.Com. First & Second Semester Programme Structure

First Semester

Sl. No.	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week (L + T + P)	SEE	CIE	Total Marks	Credits
1	Lang.1.1	Language - I	AECC	3+1+0	60	40	100	3
2	Lang.1.2	Language – II	AECC	3+1+0	60	40	100	3
3	B.Com.1.1	Financial Accounting	DSC-1	3+2+0	60	40	100	4
4	B.Com.1.2	Management Principles and Applications	DSC-2	4+0+0	60	40	100	4
5	B.Com.1.3	Principles of Marketing	DSC-3	4+0+0	60	40	100	4
6	B.Com.1.4	Digital Fluency	SEC-SB	1+0+2	60	40	100	2
7	B.Com.1.5	1.5 a. Accounting for Everyone or 1.5b. Financial Literacy	OEC	3+0+0	60	40	100	3
8	B.Com. 1.6	Yoga	SEC- VB	0+0+2	-	100	100	1
9	B.Com. 1.7	Health & Wellness	SEC - VB	0+0+2	-	100	100	1
		Total			420	480	900	25

Second Semester

Sl. No.	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week (L + T + P)	SEE	CIE	Total Marks	Credits
10	Lang.2.1	Language - I	AECC	3+1+0	60	40	100	3
11	Lang.2.2	Language – II	AECC	3+1+0	60	40	100	3
12	B.Com.2.1	Advanced Financial Accounting	DSC	3+2+0	60	40	100	4
14	B.Com.2.2	2.2a Business Mathematics or 2.2b Corporate Administration	DSC	3+2+0	60	40	100	4
15	B.Com.2.3	Law & Practice of Banking	DSC	4+0+0	60	40	100	4
16	B.Com.2.4	2.4a Health Wellness or 2.4b Social & EmotionalLearning	SEC-VB	1+0+2	-	100	100	2
17	B.Com.2.5	Environmental Studies	AECC	2+0+0	60	40	100	2
18	B.Com.2.6	2.6a. Financial Environment or 2.6b. Investing inStock Markets	OEC	3+0+0	60	40	100	3
		Total			420	380	800	25

B.Com.

First Semester

2023-24

Name of the Program: Bachelor of Commerce (B.Com.)		
Course Code: B.Com. 1.1		
Name of the Course: Financial Accounting		
Course Credits	**No. of Hours per Week**	**Total No. of Teaching Hours**
4 Credits	**4 Hrs**	**56 Hrs**

Pedagogy: Classrooms lecture, tutorials, Group discussion, Seminar, Case studies & field work etc.,

Course Outcomes: On successful completion of the course, the Students will be able to

a) Understand the theoretical framework of accounting as well accounting standards.
b) Demonstrate the preparation of financial statement of manufacturing and non-manufacturing entities of sole proprietors.
c) Exercise the accounting treatments for consignment transactions & events in the books of consignor and consignee.
d) Understand the accounting treatment for royalty transactions & articulate the Royalty agreements.
e) Outline the emerging trends in the field of accounting.

Syllabus:	Hours
Module No. 1: Theoretical Framework of Accounting	**10**
Introduction-Meaning and Scope of Accounting- Accounting Terminologies- Uses and Users of Accounting information-Accounting Process-Basis of Accounting: Cash and Accrual basis-Branches of Accounting-Accounting Principles-Concepts and Conventions-Accounting Standards-Indian Accounting Standards (IND AS).	
Module No. 2: Financial Statements of Sole Proprietors	**12**
Introduction-Meaning of Sole Proprietor-Financial Statements of Non-Manufacturing Entities: Trading Account-Income Statement/Profit & Loss Account-Balance Sheet; Financial Statements of Manufacturing Entities: Manufacturing Account-Trading Account-Profit & Loss accountant- Balance Sheet.	
Module No. 3: Consignment Accounts	**12**
Introduction-Meaning of Consignment-Consignment vs Sales-Pro-forma Invoice-Accounts Sales-Types Commission-Accounting for Consignment Transactions & Events in the books of Consignor and Consignee - Treatment of Normal & Abnormal Loss. -Valuation of Closing Stock-Goods sent at Cost Price and Invoice Price.	
Module No. 4: Royalty Accounts	**14**
Introduction-Meaning-Types of Royalty-Technical Terms: Lessee, Lessor, Minimum Rent – Short Workings –Recoupment of Short Working–Accounting Treatment in the books of Lessee and lessor – Journal Entries and Ledger Accounts including minimum rent account.	
Module No. 5: Emerging Trends in Accounting	**08**
Digital Transformation of Accounting-Big Data Analytics in Accounting-Cloud Computing in accounting- Accounting with drones- Forensic Accounting- Accounting for Planet--Creative Accounting-Outsourced Accounting- Predictive Accounting (Theory Only).	

Skill Developments Activities:

1. Collect Annual Reports of sole proprietors and identify accounting concepts and conventions followed in the preparation of the annual reports.
2. Collect Annual Reports of sole proprietors and identify the different components.
3. Preparation of Proform invoice and accounts sales with imaginary figures.
4. Collect Royalty Agreements and draft dummy royalty agreements with imaginary figures.

5. Identify latest innovations and developments in the field of accounting.
6. Any other activities, which are relevant to the course.

Text Books:

1. ICAI Study Materials on Principles & Practice of Accounting, Accounting and Advanced Accounting.
2. SP Iyengar (2005), Advanced Accounting, Sultan Chand & Sons, Vol. 1.
3. Robert N Anthony, David Hawkins, Kenneth A. Merchant, (2017) Accounting: Text and Cases, McGraw-Hill Education, 13th Edition.
4. Charles T. Horngren and Donna Philbrick, (2013) Introduction to Financial Accounting, Pearson Education, 11th Edition.
5. J.R. Monga, Financial Accounting: Concepts and Applications. Mayur Paper Backs, New Delhi, 32nd Edition.
6. S.N. Maheshwari, and. S. K. Maheshwari. Financial Accounting. Vikas Publishing House, New Delhi, 6th Edition.
7. B.S. Raman (2008), Financial Accounting Vol. I & II, United Publishers & Distributors
8. 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.

Name of the Program: Bachelor of Commerce (B.Com.)		
Course Code: B.Com. 1.2		
Name of the Course: Management Principles and Applications		
Course Credits	**No. of Hours per Week**	**Total No. of Teaching Hours**
4 Credits	**4 Hrs**	**56 Hrs**

Pedagogy: Classrooms lecture, Case studies, Group discussion, Seminar & field work etc.,

Course Outcomes: On successful completion of the course, the Students will be able to
  a) Understand and identify the different theories of organisations, which are relevant in the present context.
  b) Design and demonstrate the strategic plan for the attainment of organisational goals.
  c) Differentiate the different types of authority and chose the best one in the present context.
  d) Compare and chose the different types of motivation factors and leadership styles.
  e) Choose the best controlling techniques for better productivity of an organisation.

Syllabus:	Hours
Module No. 1: Introduction to Management	**12**
Introduction-Meaning and importance of Management-Managerial Functions- Essence of Mangership-Evolution of the Management thoughts: Classical organizational theories- Neo-Classical theories-Modern organizational theories.	
Module No. 2: Planning	**10**
Introduction-Meaning-Nature-Purpose-Types of plans-Planning process; Strategic planning: Concept-Process-Importance and Limitations; Environmental Analysis and diagnosis: Meaning-importance and Techniques (SWOT/TOWS/WOTS-UP-BCG Matrix-Competitor Analysis); Decision-making-Concept-Importance-Committee and Group decision making Process.	
Module No. 3: Organizing	**12**
Introduction-Meaning-Concept and Process of Organizing – An overview-Span of management-Different types of authority (line, staff and functional)-Decentralization-Delegation of authority; Formal and Informal Structure-Principles of Organizing; Network Organisation Structure.	
Module No. 4: Staffing and Leading	12
Introduction-**Staffing:** Concept of Staffing-Staffing Process; **Motivation:** Concept-Importance-extrinsic and intrinsic motivation-Major Motivation theories: Maslow's Need-Hierarchy Theory-Hertzberg's Two-factor Theory-Vroom's Expectation Theory; **Leadership:** Concept- Importance-Major theories of Leadership (Likert's scale theory, Blake and Mouten's Managerial Grid theory, House's Path Goal theory, Fred Fielder's situational Leadership), Transactional leadership, Transformational Leadership, Transforming Leadership; **Communication:** Concept-purpose-process-Oral and written communication-Formal and informal communication networks-Barriers to communication-Overcoming barriers to communication.	
Module No. 5: Controlling and Coordination	**12**
Control: Concept-Process-Limitations-Principles of Effective Control-Major Techniques of control – Ratio Analysis, ROI, Budgetary Control, EVA, PERT/CPM, Emerging issues in Management; **Coordination:** Meaning-Nature-Importance-Principles of Coordination.	

Skill Development Activities:

1. Collect the photographs and bio-data of any three leading contributors of management thoughts.
2. Visit any business organisation and collect the information on types of planning adopted by them.
3. Visit any business organisation and collect different types of authority followed and also the draw the organizational structure.
4. Analyse the leadership styles of any select five companies of different sectors.
5. Visit any manufacturing firm and identify the controlling system followed.
6. Any other activities, which are relevant to the course.

Text Books:

1. Harold Koontz and Heinz Weihrich (2017), Essentials of Management: An International and Leadership Perspective, McGraw Hill Education, 10th Edition.
2. Stephen P Robbins and Madhushree Nanda Agrawal (2009), Fundamentals of Management: Essential Concepts and Applications, Pearson Education, 6th Edition.
3. James H. Donnelly, (1990) Fundamentals of Management, Pearson Education, 7th Edition.
4. B.P. Singh and A.K.Singh (2002), Essentials of Management, Excel Books
5. P C Tripathi & P N Reddy (2005), Principles of Management, TMH Publications, 3rd Edition.
6. Koontz Harold (2004), Essentials of Management, Tata McGraw Hill.

Note: Latest edition of text books may be used.

Name of the Program: Bachelor of Commerce (B.Com.)

Name of the Program: Bachelor of Commerce (B.Com.)
Course Code: B.Com. 1.3
Name of the Course: Principles of Marketing

Course Credits	No. of Hours per Week	Total No. of Teaching Hours
4 Credits	4 Hrs	56 Hrs

Pedagogy: Classrooms lecture, Case studies, Group discussion, Seminar & field work etc.,

Course Outcomes: On successful completion of the course, the Students will be able to
   f)   Understand the basic concepts of marketing and asses the marketing environment.
   g) Analyse the consumer behaviour in the present scenario and marketing segmentation.
   h) Discover the new product development & identify the factors affecting the price of a product in the present context.
   i)   Judge the impact of promotional techniques on the customers & importance of channels of distribution.
   j)   Outline the recent developments in the field of marketing.

Syllabus:	Hours
Module No. 1: Introduction to Marketing	**12**

Introduction-Nature-Scope-Importance of Marketing; Concepts & Approaches of Marketing: Need-Want-Demand-Customer Value-Customer Creation; Evolution of marketing; Selling vs Marketing; Marketing Environment: Concept-importance-Micro and Macro Environment. Marketing Management-Meaning-importance.

Module No. 2: Consumer Behaviour & Market segmentation	**12**

Consumer Behaviour: Nature and Importance-Consumer buying decision process; Factors influencing consumer buying behaviour; **Market segmentation:** Concept, importance and bases; Target market selection-Positioning concept-Importance and bases; Product differentiation vs. market segmentation. **Marketing Mix:** Product-Price-Place & Promotion.

Module No. 3: Product and Pricing	**12**

Product: Concept and importance-Product classifications-Concept of product mix; Branding-packaging and labelling; Product-Support Services; Product life-cycle; New Product Development Process; Consumer adoption process. **Pricing:** Significance. Factors affecting price of a product. Pricing policies and strategies.

Module No. 4: Promotion and Distribution	**12**

Promotion: Nature and importance of promotion; Communication process; Types of promotion: advertising, personal selling, public relations & sales promotion, and their distinctive characteristics; Promotion mix and factors affecting promotion mix decisions. **Distribution Channels and 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; e-retailing, Physical Distribution.

Module No. 5: Recent Developments in Marketing	**08**

Social Marketing, online marketing, direct marketing, services marketing, green marketing, Rural marketing; Consumerism, Search Engine Marketing-Mobile Marketing- Marketing Analytics-Social Media Marketing-Email Marketing-Live Video Streaming Marketing-Network Marketing, any other recent developments in Marketing.

Skill Development Activities:
   1. Analyse the marketing environment of your locality and identify need, wants & purchasing power of customers.

2. Collect consumer behaviour towards home appliances in your locality.
3. Visit any organisation and collect the information towards pricing of the products.
4. Visit any wholesalers/Retailers, collect the role of them in marketing.
5. Identify the recent developments in the field of marketing.
6. Any other activities, which are relevant to the course.

Reference Materials:
1. Philip Kotler (2015), Principles of Marketing. 13th edition. Pearson Education.
2. Saxena Rajan, (2017) Marketing Management, Tata McGraw-Hill Publishing Company Ltd., New Delhi. Fifth Edition.
3. Kumar Arun & MeenakshiN (2016), Marketing Management, Vikas Publishing House Pvt. Ltd., New Delhi. Third Edition
4. Panda Tapan (2008), Marketing Management, Excel books, New Delhi, Second Edition.
5. Michael, J. Etzel, Bruce J. Walker, William J Stanton and Ajay Pandit. Marketing: Concepts and Cases. (Special Indian Edition)., McGraw Hill Education
6. William D. Perreault, and McCarthy, E. Jerome., Basic Marketing. Pearson Education.
7. Majaro, Simon. The Essence of Marketing. Pearson Education, New Delhi.
8. Iacobucci and Kapoor, Marketing Management: A South Asian Perspective. Cengage Learning.
9. Chhabra, T.N., and S. K. Grover. Marketing Management. Fourth Edition.
Note: Latest edition of text books may be used.

Name of the Program: Bachelor of Commerce (B.Com)		
Course Code: B.Com. 1.5 (Open Elective Course)		
Name of the Course: Accounting for Everyone		
Course Credits	**No. of Hours per Week**	**Total No. of Teaching Hours**
3 Credits	**3 Hrs**	**42 Hrs**

Pedagogy: Classrooms lecture, Case studies, Group discussion, Seminar & field work etc.,

Course Outcomes: On successful completion of the course, the Students will be able to
  k) Analyse various terms used in accounting;
  l) Make accounting entries and prepare cash book and other accounts necessary while running a business;
  m) Prepare accounting equation of various business transactions;
  n) Analyse information from company's annual report;
  o) Comprehend the management reports of the company.

Syllabus:	Hours
Module No. 1: Introduction to Accounting	**08**

Meaning, Importance and Need, Its objectives and relevance to business establishments and other organizations, and individuals. Accounting information: meaning, users and utilities, sources of accounting information. Some Basic Terms –Transaction, Account, Asset, Liability, Capital, Expenditure & Expense, Income, Revenue, Gain, Profit, Surplus, Loss, Deficit. Debit, Credit, Accounting Year, Financial Year.

Module No. 2: Transactions and Recording of Transactions	**08**

Features of recordable transactions and events, Basis of recording – vouchers and another basis. Recording of transactions: Personal account, Real Account and Nominal Account; Rules for Debit and Credit; Double Entry System, journalizing transactions; Preparation of Ledger, Cash Book including bank transactions. (Simple Problems)

Module No. 3: Preparation of Financial Statements	**10**

Fundamental Accounting Equation; Concept of revenue and Capital; Preparation of financial statements. (Simple problems)

Module No. 4: Company Accounts	**08**

Explanation of certain terms – Public Limited Company, Private Limited Company, Share, Share Capital, Shareholder, Board of Directors, Stock Exchange, Listed Company, Share Price, Sensex - BSE, NSE; Annual report, etc. Contents and disclosures in Annual Report, Company Balance Sheet and Statement of Profit and Loss. Content Analysis based on annual report including textual analysis.

Module 5: Management Reports	**08**

Reports on Management Review and Governance; Report of Board of Directors - Management discussion analysis- Annual Report on CSR – Business responsibility report – Corporate governance report – Secretarial audit report.

Skill Development Activities:
  1. Download annual reports of business Organisations from the websites and go through the contents of the annual report and present the salient features of the annual report using some ratios and content analysis including textual analysis.
  2. Prepare accounting equation by collecting necessary data from medium sized firm.
  3. Prepare financial statements collecting necessary data from small business firms.
  4. Collect the management reports of any large scale organisation and analyse the same.
  5. Any other activities, which are relevant to the course.

Text Books:

1. Hatfield, L. (2019). Accounting Basics. Amazon Digital Services LLC.
2. Horngren, C. T., Sundem, G. L., Elliott, J. A., & Philbrick, D. (2013). Introduction to Financial Accounting. London: Pearson Education.
3. Siddiqui, S. A. (2008). Book Keeping & Accountancy. New Delhi: Laxmi Publications Pvt. Ltd.
4. Sehgal, D. (2014). Financial Accounting. New Delhi: Vikas Publishing House Pvt. Ltd.
5. Tulsian, P. C. (2007). Financial Accounting. New Delhi: Tata McGraw Hill Publishing Co. Ltd.
6. Mukharji, A., & Hanif, M. (2015). Financial Accounting. New Delhi: Tata McGraw Hill Publishing Co. Ltd.
7. Maheshwari, S. N., Maheshwari, S. K., & Maheshwari, S. K. (2018). Financial Accounting. New Delhi: Vikas Publishing House Pvt. Ltd.
8. Khan, M.Y. and Jain, P.K. Management Accounting. McGraw Hill Education.
9. Arora, M.N. Management Accounting, Vikas Publishing House, New Delhi
Note: Latest edition of text books may be used.

<table>
<tr><td colspan="3" align="center">**Name of the Program:** Bachelor of Commerce (B.Com)
Course Code: B.Com. 1.5 (Open Elective Course)
Name of the Course: Financial Literacy</td></tr>
</table>

Course Credits	No. of Hours per Week	Total No. of Teaching Hours
3 Credits	**3 Hrs**	**42 Hrs**

Pedagogy: Classrooms lecture, Case studies, Group discussion, Seminar & field work etc.,

Course Outcomes: On successful completion of the course, the Students will be able to
1. Describe the importance of financial literacy and list out the institutions providing financial services;
2. Prepare financial plan and budget and manage personal finances;
3. Open, avail, and manage/operate services offered by banks;
4. Open, avail, and manage/operate services offered by post offices;
5. Plan for life insurance and property insurance & select instrument for investment in shares

Syllabus:	Hours
Module No. 1: Introduction	**07**
Meaning, importance and scope of financial literacy; Prerequisites of Financial Literacy – level of education, numerical and communication ability; Various financial institutions – Banks, Insurance companies, Post Offices; Mobile App based services. Need of availing of financial services from banks, insurance companies and postal services.	
Module No. 2: Financial Planning and Budgeting	**07**
Concept of economic wants and means for satisfying these needs; Balancing between economic wants and resources; Meaning, importance and need for financial planning; Personal Budget, Family Budget, Business Budget and National Budget; Procedure for financial planning and preparing budget; Budget surplus and Budget deficit, avenues for savings from surplus, sources for meeting deficit.	
Module No. 3: Banking Services	**10**
Types of banks; Banking products and services – Various services offered by banks; Types of bank deposit accounts – Savings Bank Account, Term Deposit, Current Account, Recurring Deposit, PPF, NSC etc.; Formalities to open various types of bank accounts, PAN Card, Address proof, KYC norm; Various types of loans – short term, medium term, long term, micro finance, agricultural etc. and related interest rates offered by various nationalized banks and post office; Cashless banking, e-banking, Check Counterfeit Currency; CIBIL, ATM, Debit and Credit Card, and APP based Payment system; Banking complaints and Ombudsman.	
Module No. 4: Financial Services from Post Office	**08**
Post office Savings Schemes: Savings Bank, Recurring Deposit, Term Deposit, Monthly Income Scheme, Kishan Vikas Patra, NSC, PPF, Senior Citizen Savings Scheme (SCSS), Sukanya Samriddhi Yojana/ Account (SSY/SSA); India Post Payments Bank (IPPB). Money Transfer: Money Order, E-Money order. Instant Money Order, collaboration with the Western Union Financial Services; MO Videsh, International Money Transfer Service, Electronic Clearance Services (ECS), Money gram International Money Transfer, Indian Postal Order (IPO).	
Module 5: Protection and Investment Related Financial Services	**10**
Insurance Services: Life Insurance Policies: Life Insurance, Term Life Insurance, Endowment Policies, Pension Policies, ULIP, Health Insurance and its Plans, Comparison of	

policies offered by various life insurance companies. Property Insurance: Policies offered by various general insurance companies. Post office life Insurance Schemes: Postal Life Insurance and Rural Postal Life Insurance (PLI/RPLI). Housing Loans: Institutions providing housing loans, Loans under Pradhanmantri Awas Yojana – Rural and Urban.

Investment avenues in Equity and Debt Instruments: Portfolio Management: Meaning and importance; Share Market and Debt Market, Sensex and its significance; Investment in Shares – selection procedure for investment in shares; Risk element; Investment
Management - Services from brokers and Institutions, and self-management; Mutual Fund.

Skill Development Activities:
1. Visit banks, post offices, and insurance companies to collect information and required documents related to the services offered by these institutions and to know the procedure of availing of these services.
2. Fill up the forms to open accounts and to avail loans and shall attach photocopies of necessary documents.
3. Prepare personal and family budget for one/six/ twelve month on imaginary figures.
4. Try to open Demat account and trade for small amount and submit the report on procedure on opening of Demat account and factors considered for trading.
5. Any other activities, which are relevant to the course.

Text Books:
1. Avadhani, V. A. (2019). Investment Management. Mumbai: Himalaya Publishing House Pvt. Ltd.
2. Chandra, P. (2012). Investment Game: How to Win. New Delhi: Tata McGraw Hill Education.
3. Kothari, R. (2010). Financial Services in India-Concept and Application. New Delhi: Sage Publications India Pvt. Ltd.
4. Milling, B. E. (2003). The Basics of Finance: Financial Tools for Non-Financial Managers. Indiana: universe Company.
5. Mittra, S., Rai, S. K., Sahu, A. P., & Starn, H. J. (2015). Financial Planning. New Delhi: Sage Publications India Pvt. Ltd.
6. Zokaityte, A. (2017). Financial Literacy Education. London: Palgrave Macmillan.

Note: Latest edition of text books may be used.

B.Com.

Second Semester

2023-24

Name of the Program: Bachelor of Commerce (B.Com.)		
Course Code: B.Com. 2.1		
Name of the Course: Advanced Financial Accounting		
Course Credits	**No. of Hours per Week**	**Total No. of Teaching Hours**
4 Credits	**4 Hrs**	**56 Hrs**

Pedagogy: Classrooms lecture, Case studies, Tutorial classes, Group discussion, Seminar & field work etc.,

Course Outcomes: On successful completion of the course, the Students will be able to
   p) Understand & compute the amount of claims for loss of stock & loss of Profit.
   q) Learn various methods of accounting for hire purchase transactions.
   r) Deal with the inter-departmental transfers and their accounting treatment.
   s) Demonstrate various accounting treatments for dependent & independent branches.
   t) Prepare financial statements from incomplete records.

Syllabus:	Hours
Module No. 1: Insurance Claims for Loss of Stock & Loss of Profit	**10**
Introduction-Meaning of fire-computation of Claim for loss of stock- Computations of Claim for loss of Profit-Average Clause.	
Module No. 2: Hire Purchase Accounting	**10**
Introduction-Meaning of hire purchase-difference between hire purchase and instalment-Nature-features-terms used-Ascertainment of Interest-Accounting for hire purchase transactions-Repossession.	
Module No. 3: Departmental Accounts	**12**
Introduction-meaning-advantages and disadvantages-methods of departmental accounting-basis of allocation of common expenditure among different departments-types of departments-inter department transfer and its treatment	
Module No. 4: Accounting for Branches	**12**
Introduction-difference between branch accounts and departmental accounts-types of branches-Accounting for dependent & independent branches; Foreign branches: Accounts for foreign branches-Techniques for foreign currency translation. (Theory only).	
Module No. 5: Conversion of Single Entry into Double Entry	**12**
Introduction - Meaning-Limitations of Single Entry System-Difference between Single entry and Double entry system - Problems on Conversion of Single Entry into Double Entry.	

Skill Developments Activities:
   7. Identify the procedure & documentations involved in the insurance claims.
   8. Collect hire purchase agreements and draft dummy hire purchase agreements with imaginary figures.
   9. Identify the common expenditures of an organisation among various departments.
   10. Collect the procedure and documentations involved in the establishment of various branches.
   11. Visit any sole proprietor firm and identify the steps involved in the conversion of single entry into double entry system.
   12. Any other activities, which are relevant to the course.

Text Books:

   1. ICAI Study Materials on Principles & Practice of Accounting, Accounting and Advanced Accounting.

2. SP Iyengar (2005), Advanced Accounting, Sultan Chand & Sons, Vol. 1.
3. Robert N Anthony, David Hawkins, Kenneth A. Merchant, (2017) Accounting: Text and Cases, McGraw-Hill Education, 13th Edition.
4. Charles T. Horngren and Donna Philbrick, (2013) Introduction to Financial Accounting, Pearson Education, 11th Edition.
5. J.R. Monga, Financial Accounting: Concepts and Applications. Mayur Paper Backs, New Delhi, 32nd Edition.
6. S.N. Maheshwari, and. S. K. Maheshwari. Financial Accounting. Vikas Publishing House, New Delhi, 6th Edition.
7. B.S. Raman (2008), Financial Accounting Vol. I & II, United Publishers & Distributors
8. 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.

Name of the Program: Bachelor of Commerce (B.Com.)		
Course Code: B.Com. 2.2a		
Name of the Course: Business Mathematics		
Course Credits	**No. of Hours per Week**	**Total No. of Teaching Hours**
4 Credits	**4 Hrs**	**56 Hrs**

Pedagogy: Classrooms lecture, Case studies, Tutorial classes, Group discussion, Seminar & field work etc.,

Course Outcomes: On successful completion of the course, the Students will be able to
- **a)** Understand the number system and indices applications in solving basic business problems.
- **b)** Apply concept of commercial arithmetic concepts to solve business problems.
- **c)** Make use of theory of equation in solving the business problems in the present context.
- **d)** Understand and apply the concepts of Set Theory, Permutations & Combinations and Matrices solving business problems.
- **e)** Apply measurement of solids in solving simple business problems.

Syllabus:	Hours
Module No. 1: Number System and Indices	12
Introduction - Meaning - Natural Numbers - Even & Odd Numbers - Prime, Rational Number and its features & Irrational Numbers - simple problems on finding sum of natural, Odd and Even numbers- HCF and LCM, problems thereon; Indices-Introduction, Laws of indices, application of laws for simplification, simple problems.	
Module No. 2: Commercial Mathematics	10
Introduction - Meaning of Simple and Compound interest and problems thereon,- Annuities, types & problems on present and future value of annuity; Ratios and Proportions-meaning and problems thereon-problems on speed, time and work.	
Module No. 3: Theory of Equation	12
Introduction - Meaning-Problems on Linear equations and solving pure and adfected quadratic equations (factor and Sridharacharya methods only), problems on Simultaneous equations (Elimination method only).	
Module No. 4: Set Theory, Permutations & Combinations and Matrices	12
Introduction - Meaning & types of sets-Laws of Sets-Venn diagram-problems thereon; Meaning and problems on permutations and combinations; Matrices-Meaning & types of Matrices, simple problems on addition, subtraction and multiplication.	
Module No. 5: Measurement of Solids	10
Introduction - Meaning and problems on Area and perimeter/circumference of Triangle, Square, Rectangle, Circle, Cone and Cylinder.	

Skill Developments Activities:
1. Show the number of ways in which your telephone number can be arranged to get odd numbers.
2. Visit any Commercial Bank in your area and collect the information about types of loans and the rates of interest on loans.
3. Use Matrix principles to implement food requirement and protein for two families.
4. Measure your classroom with the help of a tape and find the cost of the carpet for the floor area of the classroom.
5. Any other activities, which are relevant to the course.

Text Books:

1. Saha and Rama Rao, Business Mathematics, HPH.
2. S.N.Dorairaj, Business Mathematics, United Publication.
3. R. Gupta, Mathematics for Cost Accountants.
4. S. P. Gupta, Business Mathematics.
5. Madappa and Sridhara Rao, Business Mathematics.
6. Padmalochana Hazarika, Business Mathematics.
7. Dr.B.H.Suresh, Quantitative Techniques, Chetana Book House.
8. Dr. Padmalochan Hazarika, A Textbook of Business Mathematics, S. Chand, NewDelhi, No. 4, 2016.
9. A. P. Verma, Business Mathematics, Asian Books Private Limited, New Delhi, No. 3,January 2007.
10. D. C. Sancheti & V. K. Kapoor, Business

Name of the Program: Bachelor of Commerce (B.Com.)		
Course Code: B.Com. 2.2b		
Name of the Course: Corporate Administration		
Course Credits	**No. of Hours per Week**	**Total No. of Teaching Hours**
4 Credits	**4 Hrs**	**56 Hrs**

Pedagogy: Classrooms lecture, Case studies, Group discussion, Seminar & field work etc.,

Course Outcomes: On successful completion of the course, the Students will be able to
- u) Understand the framework of Companies Act of 2013 and different kind of companies.
- v) Identify the stages and documents involved in the formation of companies in India.
- w) Analyse the role, responsibilities and functions of Key management Personnel in Corporate Administration.
- x) Examine the procedure involved in the corporate meeting and the role of company secretary in the meeting.
- y) Evaluate the role of liquidator in the process of winding up of the company.

Syllabus:	Hours
Module No. 1: Introduction to Company	**12**
Introduction - Meaning and Definition – Features – Highlights of Companies Act 2013 - - Kinds of Companies – One Person Company-Private Company-Public Company- Company limited by Guarantee-Company limited by Shares- Holding Company- Subsidiary Company-Government Company-Associate Company- Small Company-Foreign Company-Global Company-Body Corporate-Listed Company.	
Module No. 2: Formation of Companies	**12**
Introduction - **Promotion Stage:** Meaning of Promoter, Position of Promoter & Functions of Promoter, **Incorporation Stage:** Meaning & contents of Memorandum of Association & Articles of Association, Distinction between Memorandum of Association and Articles of Association, Certificate of Incorporation, **Subscription Stage** – Meaning & contents of Prospectus, Statement in lieu of Prospects and Book Building, **Commencement Stage** – Document to be filed, e-filing, Register of Companies, Certificate of Commencement of Business; Formation of Global Companies: Meaning – Types –Features – Legal Formalities–Administration.	
Module No. 3: Company Administration	**12**
Introduction - Key Managerial Personnel – Managing Director, Whole time Directors, the Companies Secretary, Chief Financial Officer, Resident Director, Independent Director, Auditors – Appointment – Powers - Duties & Responsibilities. Managing Director – Appointment – Powers – Duties & Responsibilities. Audit Committee, CSR Committee. Company Secretary - Meaning, Types, Qualification, Appointment, Position, Rights, Duties, Liabilities & Removal or dismissal.	
Module No. 4: Corporate Meetings	**10**
Introduction - Corporate meetings: types – Importance - Distinction; Resolutions: Types – Distinction; Requisites of a valid meeting – Notice – Quorum –Proxies - Voting - Registration of resolutions; Role of a company secretary in convening the meetings.	
Module No. 5: Winding Up	**10**
Introduction – Meaning- Modes of Winding up –Consequence of Winding up – Official Liquidator – Role & Responsibilities of Liquidator – Defunct Company – Insolvency Code.	
Skill Development Activities:	
1. Collect the Companies Act 2013 from the Ministry of Corporate Affairs website and	

prepare the highlights of the same.

2. Visit any Registrar of the Companies, find out the procedure involved in the formation of the companies.
3. Visit any Company and discuss with Directors of the same on role and responsibilities and prepare report on the same.
4. Collect the copy of notice of the Meeting and Resolutions, Prepare the dummy copy of Notice and resolutions.
5. Contact any official liquidator of an organisation and discuss the procedure involved on the same and prepare report.
6. Any other activities, which are relevant to the course.

Text Books:
9. S.N Maheshwari, Elements of Corporate Law, HPH.
10. Balchandran, Business Law for Management, HPH
11. Dr. P.N. Reddy and H.R. Appanaiah, Essentials of Company Law and Secretarial Practice, HPH.
12. K. Venkataramana, Corporate Administration, SHBP.
13. N.D. Kapoor: Company Law and Secretarial Practice, Sultan Chand.
14. M.C. Bhandari, Guide to Company Law Procedures, Wadhwa Publication.
15. S.C. Kuchal, Company Law and Secretarial Practice.
16. S.C. Sharm, Business Law, I.K. International Publishers
Note: Latest edition of text books may be used.

Name of the Program: Bachelor of Commerce (B.Com.)		
Course Code: B.Com. 2.3		
Name of the Course: Law and Practice of Banking		
Course Credits	**No. of Hours per Week**	**Total No. of Teaching Hours**
4 Credits	**4 Hrs**	**56 Hrs**

Pedagogy: Classrooms lecture, Case studies, Group discussion, Seminar & field work etc.,

Course Outcomes: On successful completion of the course, the Students will be able to
   z) Summarize the relationship between Banker & customer and different types of functions of banker.
   aa) Analyse the role, functions and duties of paying and collecting banker.
   bb) Make use of the procedure involved in opening and operating different accounts.
   cc) Examine the different types of negotiable instrument & their relevance in the present context.
   dd)   Estimate possible developments in the banking sector in the upcoming days.

Syllabus:	Hours
Module No. 1: Introduction to Banking	**12**
Introduction- Meaning – Need – Importance – Primary, Secondary & Modern functions of banks - Origin of banking- Banker and Customer Relationship (General and special relationship) - Origin and growth of commercial banks in India – Types of Banks in India– Banks' Lending - changing role of commercial banks. RBI: History-Role & Functions.	
Module No. 2: Paying and Collecting Banker	**12**
Paying banker: Introduction - Meaning – Role – Functions - Duties - Precautions and Statutory Protection and rights - Dishonor of Cheques – Grounds of Dishonor – Consequences of wrongful dishonor of Cheques; **Collecting Banker**: Introduction - Meaning – Legal status of collecting banker - Holder for value -Holder in due course – Duties & Responsibilities - Precautions and Statutory Protection to Collecting Banker.	
Module No. 3: Customers and Account Holders	**10**
Introduction - Types of Customers and Account Holders - Procedure and Practice in opening and operating accounts of different customers: Minors - Joint Account Holders- Partnership Firms - Joint Stock companies - Executors and Trustees - Clubs and Associations and Joint Hindu Undivided Family.	
Module No. 4: Negotiable Instruments	**12**
Introduction – Meaning & Definition – Features – Kinds of Negotiable Instruments: Promissory Notes - Bills of Exchange - Cheques - Crossing of Cheques – Types of Crossing; Endorsements: Introduction - Meaning - Essentials & Kinds of Endorsement – Rules of endorsement.	
Module No. 5: Recent Developments in Banking	**10**
Introduction - New technology in Banking – E-services – Debit and Credit cards - Internet Banking-Electronic Fund Transfer- MICR – RTGS - NEFT –ECS- Small banks-Payment banks-Digital Wallet-Crypto currency- KYC norms – Basel Norms - Mobile banking-E- payments - E-money. Any other recent development in the banking sector.	
Skill Development Activities:	
1. Refer RBI website and identify the different types of banks operating in India. 2. Visit any Public sector bank & discuss with the branch manager about the role and functions as a paying and collecting banker. 3. Collect and fill dummy account opening forms as different types of customer. 4. Draft specimen of Negotiable instruments: bill of exchange, Promissory Notes and Cheques.	

5. Identify and prepare report on pros and cons of recent development in the field of banking sector.
6. Any other activities, which are relevant to the course.

Text Books:
17. Gordon & Natarajan, Banking Theory Law and Practice, HPH, 24th Edition
18. S. P Srivastava (2016), Banking Theory & Practice, Anmol Publications
19. Maheshwari. S.N. (2014), Banking Law and Practice, Kalyani Publishers, 11 edition
20. Shekar. K.C (2013), Banking Theory Law and Practice, Vikas Publication, 21st Edition.
21. Dr. Alice Mani (2015), Banking Law and Operation, SBH.
Note: Latest edition of text books may be used.

Name of the Program: Bachelor of Commerce (B.Com)		
Course Code: B.Com. 2.6a (Open Elective Course)		
Name of the Course: Financial Environment		
Course Credits	**No. of Hours per Week**	**Total No. of Teaching Hours**
3 Credits	**3 Hrs**	**42 Hrs**

Pedagogy: Classrooms lecture, Case studies, Group discussion, Seminar & field work etc.,

Course Outcomes: On successful completion of the course, the Students will be able to
    ee) Understand the fundamentals of Indian Economy and its significance.
    ff) Evaluate the impact of monetary policy on the stakeholders of the Economy.
    gg)Assess the impact of fiscal policy on the stakeholders of the Economy.
    hh)Examine the status of inflation, unemployment and labour market in India
    ii) Inference the financial sector reforms in India.

Syllabus:	Hours
Module No. 1: Fundamentals of India Economy	**10**
Introduction - Production & Cost-Demand & Supply-Perfect & Imperfect Competition-Monopoly-National Income Accounting-Business Cycle-Open Economy-Utility theory-GDP-GNP-impact- other Marco financial indicators.	
Module No. 2: Monetary Policy	**08**
Introduction - Meaning-objectives-qualitative & quantitative measures for credit control. Influence of policy rates of RBI: Repo-Reverse repo- Marginal standing facility and Bank rate. Influence of reserve ratios of RBI: CRR-SLR-Exchange rates-lending/deposit rates-design & issues of monetary policy-LAF - RBI Role, functions and its Governance	
Module No. 3: Fiscal Policy	**08**
Introduction - Meanings-objectives- public expenditure-public debt-fiscal & budget deficit-Keynesian approach-fiscal policy tools-fiscal policy effects on employment-supply side approach-design & issues of fiscal policy-fiscal budget- Role of Ministry of Finance in Fiscal Policy.	
Module No. 4: Inflation, Unemployment and Labour market	**08**
Introduction - **Inflation:** Causes of rising & falling inflation-inflation and interest rates-social costs of inflation; **Unemployment** – natural rate of unemployment-frictional & wait unemployment. **Labour market** and its interaction with production system; Phillips curve-the trade-off between inflation and unemployment-sacrifice ratio-role of expectations adaptive and rational	
Module 5: Financial Sector Reforms:	08
Introduction - Financial sector reforms - Recommendation & action taken -SARFESI Act-Narasimham Committee I & II- Kelkar Committee- FRBM Act - Basel-BIS-history-need- mission-objectives-Basel norms I, II & III- criticism of Basel norms-Implementations of Basel norms in India- impact of Basel norms on Indian banks.	

Skill Development Activities:
1. Collect last ten year GDP rate and examine the same.
2. Collect last two years monetary policy rates of RBI and analyse the impact of the

same.
3. Collect last five years fiscal policy of Indian Government and analyse the impact of the same on rural poor.
4. Collect last five year data on inflation, unemployment rate and labour market conditions and critically prepare the report.
5. Identify the recent financial sector reforms in India.
6. Any other activities, which are relevant to the course.

Text Books:
1. V K Puri and S K Mishra, Indian Economy, HPH.
2. Datt and Sundharam's, Indian Economy, S Chand
3. Ramesh Singh, Indian Economy, McGraw Hill education.
4. Khan and Jain, Financial Services, Mcgraw Hill Education, 8th edition
5. RBI working papers
6. Mistry of Finance, GOI of working papers
7. SEBI Guidelines Issued from time to time.

Note: Latest edition of text books may be used.

Name of the Program: Bachelor of Commerce (B.Com)		
Course Code: B.Com. 2.6b (Open Elective Course)		
Name of the Course: Investing in Stock Markets		
Course Credits	**No. of Hours per Week**	**Total No. of Teaching Hours**
3 Credits	**3 Hrs**	**42 Hrs**

Pedagogy: Classrooms lecture, Case studies, Group discussion, Seminar & field work etc.,

Course Outcomes: On successful completion of the course, the Students will be able to
- jj) Explain the basics of investing in the stock market, the investment environment as well as risk & return;
- kk) Analyse Indian securities market;
- ll) Examine EIC framework and conduct fundamental analysis;
- mm)   Perform technical analysis;
- nn) Invest in mutual funds market.

Syllabus:	Hours
Module No. 1: Basics of Investing	**10**

Basics of Investment & Investment Environment. Risk and Return, Avenues of Investment - Equity shares, Preference shares, Bonds & Debentures, Insurance Schemes, Mutual Funds, Index Funds. Indian Security Markets - Primary Market, Secondary Market and Derivative Market. Responsible Investment.

Module No. 2: Fundamental Analysis	**08**

Top down and bottom up approaches, Analysis of international & domestic economic scenario, Industry analysis, Company analysis (Quality of management, financial analysis: Both Annual and Quarterly, Income statement analysis, position statement analysis including key financial ratios, Cash flow statement analysis, Industry market ratios: PE, PEG, Price over sales, Price over book value, EVA), Understanding Shareholding pattern of the company.

Module No. 3: Technical Analysis	**08**

Trading rules (credit balance theory, confidence index, filter rules, market breath, advances vs declines and charting (use of historic prices, simple moving average and MACD) basic and advanced interactive charts. Do's & Don'ts of investing in markets.

Module No. 4: Indian Stock Market	**08**

Market Participants: Stock Broker, Investor, Depositories, Clearing House, Stock Exchanges. Role of stock exchange, Stock exchanges in India- BSE, NSE and MCX. Security Market Indices: Nifty, Sensex and Sectoral indices, Sources of financial information. Trading in securities: Demat trading, types of orders, using brokerage and analyst recommendations

Module 5: Investing in Mutual Funds	**08**

Concept and background on Mutual Funds: Advantages, Disadvantages of investing in Mutual Funds, Types of Mutual funds- Open ended, close ended, equity, debt, hybrid, index funds and money market funds. Factors affecting choice of mutual funds. CRISIL mutual fund ranking and its usage, calculation and use of Net Asset Value.

Skill Development Activities:
1. Work on the spreadsheet for doing basic calculations in finance.
2. Learners will also practice technical analysis with the help of relevant software.
3. Practice use of Technical charts in predicting price movements through line chart, bar chart, candle and stick chart, etc., moving averages, exponential moving average.
4. Calculate of risk and return of stocks using price history available on NSE website.
5. Prepare equity research report-use of spreadsheets in valuation of securities,

fundamental analysis of securities with the help of qualitative and quantitative data available in respect of companies on various financial websites, etc.

6. Any other activities, which are relevant to the course.

Text Books:

1. Chandra, P. (2017). Investment Analysis and Portfolio Management. New Delhi: Tata McGraw Hill Education.
2. Kevin, S. (2015). Security Analysis and Portfolio Management. Delhi: PHI Learning. Ranganatham,
3. M., & Madhumathi, R. (2012). Security Analysis and Portfolio Management. Uttar Pradesh: Pearson (India) Education.
4. Pandian, P. (2012). Security Analysis and Portfolio Management. New Delhi: Vikas Publishing House.

Note: Latest edition of text books may be used.

JSS COLLEGE OF ARTS COMMERCE & SCIENCE

(Autonomous)

Ooty Road, Mysuru – 25

DEPARTMENT OF COMMERCE AND MANAGEMENT

B.COM Programme
(II Year)
Syllabus as per NEP
(Modified)

w.e.f
2023-24

III SemesterB.Com								
Sl. No.	Course Code	TitleoftheCourse	CategoryofCourses	TeachingHoursperWeek (L+T+P)	SEE	CIE	TotalMarks	Credits
16	Lang.1.1	Language-I	AECC	3+1+0	60	40	100	3
17	Lang.1.2	Language–II	AECC	3+1+0	60	40	100	3
18	B.Com.3.1	CorporateAccounting	DSC	3+0+2	60	40	100	4
19	B.Com.3.2	BusinessStatistics	DSC	3+0+2	60	40	100	4
20	B.Com.3.3	CostAccounting	DSC	3+0+2	60	40	100	4
21	B.Com.3.4	Artificial Intelligence OR Financial Education. & Investment Awareness	SEC	1+0+2	60	40	100	2
23	B.Com.3.5	India and Indian Constitution OR 1. Advertising Skills/ 2. Entrepreneurialskills	AECC OR OEC	3+0+0	60	40	100	3
24	B.Com.3.6	Sports/NCC/NSS/R & R /S & /Cultural	SEC-VB	1+0+2	-	100	100	2
		Sub–Total(C)			420	280	700	25

IVSemester B.Com.								
Sl. No.	Course Code	TitleoftheCourse	CategoryofCourses	TeachingHoursperWeek (L+T+P)	SEE	CIE	TotalMarks	Credits
25	Lang.1.1	Language-I	AECC	3+1+0	60	40	100	3
26	Lang.1.2	Language–II	AECC	3+1+0	60	40	100	3
27	B.Com.4.1	AdvancedCorporate Accounting	DSC	3+0+2	60	40	100	4
28	B.Com.4.2	CostingMethods&Techniques	DSC	3+0+2	60	40	100	4
29	B.Com.4.3	Business Regulatory Framework	DSC	4+0+0	60	40	100	4
30	B.Com.4.4	Artificial Intelligence OR Financial Education. & Investment Awareness	SEC	1+0+2	60	40	100	2
31	B.Com.4.5	Sports/NCC/NSS/R & R /S & /Cultural	SEC-VB	1+0+2	-	100	100	2
32	B.Com.4.6	1. BusinessEthicsor/ 2. CorporateGovernance OR India and Indian Constitution	OEC OR AECC	3+0+0	60	40	100	3
		Sub–Total(D)			420	380	800	25

Third Semester B.Com.
Academic Year 2023-24

NameoftheProgram:BachelorofCommerce(B.Com.)		
NameoftheProgram: BachelorofCommerce(B.Com.) **CourseCode:**B.Com.3.1 **NameoftheCourse:**CorporateAccounting		
CourseCredits	**No.ofHoursperWeek**	**TotalNo.ofTeachingHours**
4Credits	**3+2Hrs**	**56Hrs**

Pedagogy: Classroomslecture,Casestudies,TutorialClasses,Groupdiscussion, Seminar & field work etc.,

CourseOutcomes:Onsuccessfulcompletionofthe course,theStudentswillbe able to
  a) Understandthetreatmentofunderwritingofshares.
  b) Comprehendthecomputationofprofitpriortoincorporation.
  c) Knowthevaluationofintangibleassets.
  d) Know thevaluationofshares.
  e) Prepare thefinancialstatements ofcompaniesaspercompaniesact,2013.

Syllabus:	Hours
ModuleNo.1:UnderwritingofShares	**12**
Introduction -MeaningofUnderwriting–SEBIregulationsregardingunderwriting; Underwritingcommission.Underwriter–functions-AdvantagesofUnderwriting, Typesofunderwriting-MarkedandUnmarkedApplications–DeterminationofLiabilityin respectofunderwritingcontract–whenfullyunderwrittenandpartiallyunderwritten–with and without firm underwritingproblem.	
ModuleNo.2:ProfitPriortoIncorporation	**10**
Introduction - Meaning – calculation of sales ratio – time ratio – weighted ratio – treatment of capital and revenue expenditure – Ascertainment of pre-incorporation and post-incorporationprofitsbypreparingstatementofProfitandLossandBalanceSheetasper scheduleIIIofcompaniesAct,2013.	
ModuleNo.3 ValuationofIntangibleAssets	**10**
Introduction - Valuation of Goodwill –factors influencing goodwill, circumstances of valuation of goodwill- Methods of Valuation of Goodwill: Average Profit Method, Capitalization of average Profit Method, Super Profit Method, Capitalization of Super ProfitMethod,andAnnuityMethod-Problems.BrandvaluationandIntellectualProperty Rights(IPR).	
ModuleNo.4:ValuationofShares	**10**
Introduction **-** Meaning – Need for Valuation – Factors Affecting Valuation – Methods of Valuation:IntrinsicValueMethod,YieldMethod,EarningCapacityMethod,FairValue of shares. Rights Issue and Valuation of Rights Issue, Valuation of Warrants.	
Module5:FinancialStatementsof Companies	**14**
StatutoryProvisionsregarding preparation of financial statements of companies asper schedule III of companies act,2013 and IND AS-1– Treatment of Special Items – Tax deducted at source – Advance payment of Tax – Provision for Tax – Depreciation – Interestondebentures –Dividends –Rulesregardingpaymentofdividends–Transferto Reserves – Preparation of Statement of profit and loss and Balance Sheet.	

SkillDevelopmentActivities:

1. CompilethelistofIndiancompanieswhichhaveissuedsharesthroughIPO/FPOinthe current financial year.
2. Determine Underwriters' Liability in case of an IPO, with imaginary figures. •Present the formatof'StatementofProfitandLoss','BalanceSheet'and'StatementofChangesinEquity', with imaginary figures
3. Collectfinancialstatementofacompanyandcalculateintrinsicvalueofanequityshare..
4. CollectannualreportofaCompanyandListoutitsassetsandLiabilities.
5. Collectionoflatestfinancialstatementsofacompanyandfindouttheintrinsicvalue ofshares
6. Collecttheannualreportsofcompanyandcalculatethevalueofgoodwillunder differentmethods
7. Anyotheractivities,whicharerelevanttothecourse.

TextBooks:

1. J.R.Monga,FundamentalsofCorporateAccounting.MayurPaperBacks,New Delhi.
2. M.C.Shukla,T.S.Grewal,andS.C.Gupta.AdvancedAccounts.Vol.-II.S.Chand &Co.,NewDelhi.
3. S.N. Maheshwari, andS. K. Maheshwari. CorporateAccounting. Vikas Publishing House, New Delhi.
4. AshokSehgal,FundamentalsofCorporateAccounting.TaxmanPublication,New Delhi.
5. V.K.GoyalandRuchiGoyal,CorporateAccounting.PHILearning.
6. Jain,S.P.andK.L.Narang.CorporateAccounting.KalyaniPublishers,NewDelhi.
7. BhushanKumarGoyal, FundamentalsofCorporateAccounting,International Book House
8. P.C.TulsianandBharatTulsian,CorporateAccounting,S.Chand
9. AmitabhaMukherjee,MohammedHanif,CorporateAccounting,McGrawHill Education
10. Arulanandam&Raman;CorporateAccounting–II
11. MadegowdaJ–Advancedcorporateaccounting,HPH
12. Soundarajan.A&K.Venkataramana,CorporateAccounting,VBH.
13. S.P.JainandK.L.Narang–CorporateAccounting
14. S.Bhat-CorporateAccounting.
15. SPIyengar,AdvancedAccountancy,SultanChand
16. RLGupta,AdvancedAccountancy.
17. AnilKumar.S, Rajesh Kumar.Vand Mariyappa.B, Corporate Accounting, HPH.

Note:Latesteditionoftextbooksmaybeused.

NameoftheProgram:BachelorofCommerce(B.Com.)
Course Code:B.Com.3.2
NameoftheCourse:BusinessStatistics

CourseCredits	No.ofHoursperWeek	TotalNo.ofTeachingHours
4Credits	3+2Hrs	56Hrs

Pedagogy: Classroomslecture,Case studies,Tutorial Classes,Groupdiscussion, Seminar & field work etc.,

CourseOutcomes:Onsuccessfulcompletionofthe course,theStudentswillbeable to
a. Familiarizesstatisticaldataanddescriptivestatisticsforbusinessdecision-making.
b. Comprehendthemeasuresofvariationandmeasuresofskewness.
c. Demonstratetheuseofprobabilityandprobabilitydistributionsinbusiness.
d. Validatetheapplicationofcorrelationandregressioninbusinessdecisions.
e. Showtheuseofindexnumbersinbusiness.

Syllabus:	Hours
ModuleNo.1:StatisticalDataandDescriptive statistics.	14

 Nature and Classification of data: Univariate, bivariate and multivariate data; Measures of Central Tendency:Mathematical averages including arithmetic mean, Properties and applications.Positional Averages - ModeandMedian (includinggraphicdetermination).

ModuleNo.2:MeasuresofVariation:andSkewness	12

Measures ofVariation:absolute andrelative. Range,quartiledeviation, mean deviation, standard deviation, and their coefficients, Properties of standard deviation/variance. Skewness: Meaning,MeasurementusingKarlPearsonandBowley's measures; concept of Kurtosis.

ModuleNo.3:Probability Distributions	10

TheoryofProbability.Approachestothecalculationofprobability;Calculationofevent Probabilities. Addition and multiplication laws of probability (Proof not required); Conditional probability and Bayes' Theorem (Proof not required)- Expectation and variance of a random variable - Probability distributions - Binomial distribution: Probability distribution function, Constants, Shape, Fitting of binomial distribution - Poissondistribution:Probabilityfunction,(includingPoissonapproximationtobinomial distribution),Constants,Fitting of Poissondistribution- Normal distribution:Probability distributionfunction,Propertiesofnormalcurve,Simpleproblems.

ModuleNo.4:CorrelationandRegressionAnalysis	12

Correlation Analysis: Meaning of Correlation: - types of correlation- Positive and negative correlation-simple, partial, and multiple correlation. linear and Non-linear correlationandScatterdiagram,Pearson'sco-efficientofCorrelation;Correlation and Probableerror;Spearman'sRankCorrelationco-efficient.-problems.

Regression Analysis: meaning and definition- regression lines, Regression equations andestimation;Propertiesofregressioncoefficients;Relationshipbetween Correlation andRegressioncoefficients- problems.

Module5:IndexNumbers	08

Meaningandusesofindexnumbers;Constructionofindexnumbers:Fisher'sidealindex number with Time Reversal and Factor Reversal Tests.Constructionofconsumer price indices Using Aggregative Expenditure method and Family Budget method.

SkillDevelopmentActivities:
1. ApplicationofMSExcelFunctionsinstatisticaldecisionmakingandstudents should submitoutput of the same.
2. Collecttheagestatisticsof10newmarriedcouplescalculateCorrelationcoefficient.
3. Recalltheuseofprobabilitytheoryinbusiness.
4. Identifytheapplicabilityofcorrelationandregressioninbusinessdecision making.
5. Constructconsumerpriceindiceswithimaginaryfigures.
6. Anyotheractivities, whicharerelevanttothecourse.

TextBooks:
1. Levin,Richard,David S.Rubin,Sanjay Rastogi,andHMSiddiqui.Statisticsfor Management. 7th ed., Pearson Education.
2. David M. Levine, Mark L. Berenson, Timothy C. Krehbiel, P. K. Viswanathan, Business Statistics: A First Course, Pearson Education.
3. SiegelAndrewF.PracticalBusinessStatistics.McGraw HillEducation.
4. Gupta,S.P., andArchana Agarwal. BusinessStatistics,SultanChand andSons, New Delhi.
5. VohraN.D.,BusinessStatistics,McGrawHill Education.
6. MurrayRSpiegel,LarryJ.Stephens,NarinderKumar.Statistics(Schaum'sOutline Series), McGraw Hill Education.
7. Gupta,S.C.FundamentalsofStatistics.HimalayaPublishingHouse.
8. Anderson,Sweeney, andWilliams,Statisticsfor Studentsof Economics and Business, Cengage Learning.

Note:Latesteditionoftextbooksmaybeused.

NameoftheProgram:BachelorofCommerce(B.Com.)
NameoftheProgram: BachelorofCommerce(B.Com.) **Course Code:**B.Com.3.3 **NameoftheCourse:**CostAccounting

CourseCredits	No.ofHoursperWeek	TotalNo.ofTeachingHours
4Credits	**3+2Hrs**	**56Hrs**

Pedagogy: Classroomslecture,Casestudies, Tutorial classes, Group discussion, Seminar & field work etc.,

CourseOutcomes:Onsuccessfulcompletionofthe course,thestudents willbeableto
 a) Understandconceptsofcostaccounting&MethodsofCosting.
 b) OutlinetheProcedureanddocumentationsinvolvedinprocurementofmaterials & compute the valuation of Inventory.
 c) Makeuseofpayroll procedures&computeidleandovertime.
 d) Discussthemethodsof allocation,apportionment&absorptionofoverheads.
 e) Preparecostsheet&discusscostallocationunderABC.

Syllabus:	Hours
ModuleNo.1:IntroductiontoCostAccounting	**12**

Introduction- Meaning and definition- Objectives, Importance and Uses of Cost Accounting, DifferencebetweenCostAccountingandFinancialAccounting;VariousElementsofCostand ClassificationofCost;Costobject, Costunit, Costdriver, costcentre;Costreductionand Cost control; Methods and Techniques of Costing (Meanings Only); Use of IT in Cost Accounting; Limitations of Cost Accounting; Cost Sheet: Meaning and Cost heads in a Cost Sheet, PresentationofCostInformationinCostSheet.ProblemsonCostSheet,Tendersand Quotations.

ModuleNo.2:MaterialCost	**12**

Materials: Meaning, Importance and Types of Materials – Direct and Indirect Material Materialsmaterialcontrol.-InventorycontrolTechniqueofinventorycontrol,problems on level setting and EOQ.Procurement- Procedure for procurement of materials and documentation involved in materials accounting – Material Storage: Duties of Store keeper, pricing of material issues, preparation of Stores Ledger Account – FIFO, LIFO, SimpleAveragePriceandWeightedAveragePriceMethods–Problems.

ModuleNo.3:EmployeeCost	**10**

Introduction–EmployeeCost–typesoflabourcost-LabourCostControl–timekeeping and time booking and Payroll Procedure -Preparation of Payroll: Idle Time Causes and TreatmentofNormalandAbnormalIdletime,OverTimeCausesandTreatment-Labour Turnover-Meaning,ReasonsandEffectsofLabourturnover. Methods ofWagePayment: Timeratesystemandpieceratesystem,andtheIncentiveschemes-Halseyplan, RowanplanandTaylordifferentialpieceratesystem-problems.

ModuleNo.4:OverheadsCost	**12**

Introduction- Meaning and Classification of Overheads; Accounting and Control of Manufacturing Overheads: Estimation and Collection, Cost Allocation, Apportionment, Re-apportionment and AbsorptionofManufacturingOverheads;ProblemsonPrimaryandSecondaryoverheadsdistribution using Reciprocal Service Methods (Repeated Distribution Method and Simultaneous Equation Method);Absorption ofOverheads: Meaningand MethodsofAbsorption ofOverheads;Problemson MachineHour Rate.

ModuleNo.5:ReconciliationofCostandFinancialAccounts	10

Introduction–meaningofreconciliation,ReasonsfordifferencesinProfitsunder Financial and Cost Accounts; Procedure for Reconciliation – Ascertainment of Profits as per FinancialAccountsandCostAccountsandReconciliationofProfitsofbothsetsofAccounts – PreparationofReconciliationStatement–Problems.

SkillDevelopmentsActivities:

1. VisitanyManufacturingentity,collectthemethodofinventoryvaluationadopted& procedureinvolvedinprocuring inventory.
2. Drawtheformatoffivedocumentsusedformaterialaccounting
3. PreparedummyPayrollwithimaginaryfigures.
4. Visitanylarge-scaleorganisation,identifythetechniquesusedforcontrolling administrative, Selling & distribution overheads.
5. Visit anymanufacturingentityandcollect thecostdateandpreparethecost sheet.
6. Anyotheractivities,whicharerelevanttothecourse.

TextBooks:

1. CharlesT.Horngren,SrikantM.Datar,MadhavV.Rajan,CostAccounting: AManagerial Emphasis,PearsonEducation.
2. JawaharLal,CostAccounting.,McGrawHillEducation
3. MadegowdaJ,CostAccounting,HPH.
4. RajivGoel,CostAccounting,InternationalBookHouse
5. Jain,S.P.andK.L.Narang.CostAccounting:PrinciplesandMethods.Kalyani Publishers
6. Arora,M.N. Cost Accounting–Principlesand Practice, Vikas Publishing House, NewDelhi.
7. Maheshwari, S.N. andS.N. Mittal. Cost Accounting: Theoryand Problems.ShriMahavirBookDepot,NewDelhi.
8. Iyengar,S.P.CostAccounting,SultanChand&Sons
9. MariyappaBCostAccounting,HPH

Note:Latesteditionoftextbooksmaybeused.

3.4CurriculumofArtificialIntelligencewillbegivenbyKSHEC

NameoftheProgram:BachelorofCommerce(B.Com.)		
CourseCode:B.Com.3.5(OEC)		
NameoftheCourse:AdvertisingSkills		
CourseCredits	**No.ofHoursperWeek**	**TotalNo.ofTeachingHours**
3Credits	**3Hrs**	**42Hrs**

Pedagogy: Classroomslecture,Casestudies,Groupdiscussion&Seminaretc.,

Course Outcomes:Onsuccessfulcompletionofthe course,the studentswillbe ableto
  a. familiarisewithadvertisingconcepts.
  b. Ableidentifyeffectivemediachoiceforadvertising.
  c. Developadsfordifferentmedia.
  d. Measuretheadvertisingeffectiveness.
  e. Analysetheroleofadvertisingagency.

Syllabus:	Hours
ModuleNo.1:Introduction	**10**
CommunicationProcess;Advertisingasa toolofcommunication;Meaning,natureand importance of advertising;Typesof advertising;Advertisingobjectives.Audience analysis; Setting of advertising budget: Determinants and major methods.	
ModuleNo.2:MediaDecisions	**07**
Major media types - their characteristics, internet as an advertising media, merits and demerits;Factorsinfluencingmediachoice;mediaselection,mediascheduling,Advertising through the Internet-media devices.	
ModuleNo.3:**MessageDevelopment**	**08**
Advertisingappeals,Advertisingcopyandelements,Preparingadsfordifferentmedia	
ModuleNo.4:Measuring Advertising Effectiveness	**10**
Evaluatingcommunicationandsaleseffects;Pre-andPost-testingtechniques	
ModuleNo.5:AdvertisingAgency	**07**
a) AdvertisingAgency:Role,typesandselectionofadvertisingagency. b) Social,ethicalandlegalaspectsofadvertisinginIndia.	

SkillDevelopmentActivities:

  1. AnalyzetheaudiencefeedbackonadvertisementofFMCG.
  2. Listoutanytenproducts/servicesadvertisedthroughinternet.
  3. Designanytwoadsforprintmedia.
  4. ExaminethelegalaspectsofadvertisinginIndiaandsubmitthereport.
  5. Anyotheractivities,whicharerelevanttothecourse.

TextBooks:

1. GeorgeEBelch,MichaelABelch,KeyoorPurani,AdvertisingandPromotion .AnIntegratedMarketingCommunicationsPerspective(SIE),McGrawHill   Education
2. S.Wats Dunn,andArnoldM. Barban.Advertising:It's Role in Marketing. Dryden Press
3. Burnett,Wells,andMoriatty.Advertising:Principles andPractice.5thed. Prentice Hall of India, New Delhi.
4. Batra,MyersandAakers.AdvertisingManagement.PHILearning.
5. Terence A. Shimp. AdvertisingandPromotion: An IMC Approach. Cengage Learning.
6. Sharma,Kavita.Advertising:PlanningandDecisionMaking,Taxmann Publications
7. Jaishree   JethwaneyandShrutiJain,AdvertisingManagement,OxfordUniversity Press, 2012
8. ChunawalaandSethia,Advertising,HimalayaPublishingHouse
9. RuchiGupta,Advertising,S.Chand&Co.
10. O'Guinn, AdvertisingandPromotion: AnIntegratedBrandApproach, Cengage Learning

Note:Latesteditionoftextbooksmaybeused.

NameoftheProgram: BachelorofCommerce(B.Com.)
CourseCode:OEC
NameoftheCourse: EntrepreneurshipSkills

CourseCredits	**No.ofHoursperWeek**	**TotalNo.ofTeachingHours**
3Credits	**3Hrs**	**42Hrs**

Pedagogy: Classroomslecture,Casestudies,Groupdiscussion&Seminaretc.,

CourseOutcomes:Onsuccessfulcompletionof thecourse,theStudents willbeableto
   a. Discovertheirstrengthsandweaknesses in developing theentrepreneurialmind-set.
   b. Identify the different GovernmentInstitutions/Schemes available for promoting Entrepreneurs.
   c. Understandthevariousaspectstoset-upanEnterprises.
   d. FamiliariseMechanismofMonitoringandmaintaininganEnterprises.
   e. Knowthevariousfeaturesforsuccessful/unsuccessfulentrepreneurs.

Syllabus:	Hours
ModuleNo.1: Introduction	**10**
Need of becoming entrepreneur- ways to become a good entrepreneur-Enabling environmentavailabletobecomeanentrepreneur. Self-discovery,IdeaGeneration-Idea Evaluation-Feasibilityanalysis- Finding team-Preparation of business model.	
ModuleNo.2:Promoting Entrepreneur	**08**
Introduction-DifferentGovernment institutions/schemespromotingentrepreneurs: Graminbanks,PMMY-MUDRALoan,DIC,SIDA,SISI,NSIC,andSIDO,etc.,	
ModuleNo.3:**EnterpriseSet-up**	**08**
Introduction–Waystosetupanenterpriseanddifferentaspectsinvolved:legal compliances,marketingaspect,budgetingetc.,	
ModuleNo.4:MonitoringandMaintaininganEnterprise	**10**
Introduction–Daytodaymonitoringmechanismformarinatinganenterprise-Different GovernmentSchemessupportingentrepreneurship.	
ModuleNo.5:CaseletsDiscussion	**0**
Examplesofsuccessful andunsuccessfulentrepreneurshipofMUDRA Loan,Gramin banks, SISI and NSIC etc.,	

SkillDevelopmentActivities:

   1.Listoutthe discoveryand evaluationof viablebusinessideas fornew venture creation.

2. Practice critical talents and traits required for entrepreneurs such as problem solving, creativity, communication, business math, sales, and negotiation
3. List out practical issues in setting-up of different enterprises.
4. Analyze the impact of various Government schemes in promotion of entrepreneurs.
5. Any other activities, which are relevant to the course.

TextBooks:
1. Entrepreneurship-Starting, Developing, and Management a new Enterprise – Hisrich and – Peters-Irwin
2. Fayolle A (2007) Entrepreneurship and new value creation. Cambridge, Cambridge University Press
3. Hougaard S. (2005) The business idea. Berlin, Springer
4. Lowe R & S Mariott (2006) Enterprise: Entrepreneurship & Innovation. Burlington, Butterworth Heinemann

Note: Latest edition of textbooks may be used.

Fourth Semester B.Com.
Academic Year 2023-24

NameoftheProgram:BachelorofCommerce(B.Com.)
Course Code:B.Com.4.1
NameoftheCourse:AdvancedCorporateAccounting

CourseCredits	No.ofHoursperWeek	TotalNo.ofTeachingHours
4Credits	3+2Hrs	56Hrs

Pedagogy: Classroomlectures, Casestudies,Groupdiscussion&Seminaretc.,

CourseOutcomes:Onsuccessfulcompletionofthe course,theStudentswillbeable to
  a) Knowtheprocedureofredemptionofpreferenceshares.
  b) ComprehendthedifferentmethodsofMergersandAcquisitionofCompanies
  c) Understandtheprocessofinternalreconstruction.
  d) Preparetheliquidatorsfinalstatementofaccounts.
  e) Understandtherecentdevelopmentsinaccountingandaccountingstandards.

Syllabus:	Hours
ModuleNo.1:RedemptionofPreferenceShares	**10**
Meaning–legalprovisions–treatmentregardingpremiumonredemption–creationof Capital Redemption Reserve Account– Fresh issue of shares –Arranging for cash balance forthepurposeofredemption– minimumnumberofshares tobeissuedfor redemption – issue of bonus shares – preparation of Balance sheet (Schedule III toCompaniesAct 2013) after redemption.	
ModuleNo.2:MergersandAcquisitionofCompanies	**16**
MeaningofAmalgamationandAcquisition –TypesofAmalgamation –Amalgamation in the nature of Merger – Amalgamation in the nature of Purchase - Methods of Calculation of Purchase Consideration (Ind AS 103), Net asset Method - Net Payment Method, Accounting for Amalgamation (Problems on pooling of interest method and purchase method) – Journal Entries and Ledger Accounts in the Books of Transferor Company and Journal EntriesinthebooksofTransfereeCompany–PreparationofBalanceSheetafterMerger. (Schedule III to Companies Act 2013).	
ModuleNo.3:**InternalReconstructionof Companies**	**10**
Meaning of Capital Reduction; Objectives of Capital Reduction; Provisions for Reduction of Share Capital under Companies Act, 2013. Forms of Reduction. Accounting for Capital Reduction. Problems on passing Journal Entries, preparation of Capital Reduction Account andBalancesheetafterreduction(ScheduleIIItoCompaniesAct2013).	
ModuleNo.4:LiquidationofCompanies	**12**
Meaning of Liquidation, Modes of Winding up – Compulsory Winding up, Voluntary WindingupandwindingupsubjecttoSupervisionbyCourt.Orderofpaymentsinthe event of Liquidation. Liquidator's Statement of Account. Liquidator's remuneration. ProblemsonpreparationofLiquidator'sStatementof Account.	
ModuleNo.5:RecentDevelopmentsinAccounting andAccounting standards.	**08**

Human Resource Accounting – Environmental Accounting Discloser as per Global Reporting Initiative (GRI) Reporting of variables – Social Responsibility Accounting, IndianAccountingStandards-Meaning-objectives-SignificanceofAccountingstandards in India- Process of setting Accounting Standards in India- List of Indian accounting standards. (IND AS).

SkillDevelopmentActivities:

1. ListoutlegalprovisionsinrespectofRedemptionofPreferenceshares.
2. CalculationofPurchaseconsiderationwithimaginaryfigures.
3. ListanyfivecasesofamalgamationinthenatureofmergeroracquisitionofJoint Stock Companies.
4. List outlegalprovisionsinrespectofinternalreconstruction.
5. ListoutanyfiveIndianAccountingStandards.
6. Anyotheractivities,whichcharerelevanttothecourse.

TextBooks:

1. Arulanandam&Raman;CorporateAccounting-II,HPH
2. Anil Kumar.SRajesh Kumar.Vand Mariyappa.BAdvancedCorporate Accounting, HPH
3. RoadmaptoIFRSandIndianAccountingStandardsbyCAShibaramaTripathy
4. Dr. Venkataraman.R–AdvancedCorporateAccounting
5. S.N.Maheswari,FinancialAccounting,Vikaspublishing
6. SoundarajanA&K.Venkataramana,AdvancedCorporateAccounting,SHBP.
7. RLGupta,AdvancedAccountancy,SultanChand
8. K.KVerma–CorporateAccounting.
9. JainandNarang,CorporateAccounting.
10. Tulsian,Advanced Accounting,
11. ShuklaandGrewal–AdvancedAccountancy,SultanChand
12. SrinivasPutty,AdvancedCorporateAccounting,HPH.

Note:Latesteditionoftextbooksmaybeused.

NameoftheProgram:BachelorofCommerce(B.Com.)
Course Code:B.Com.4.2
NameoftheCourse:CostingMethodsandTechniques

CourseCredits	No.ofHoursperWeek	TotalNo.ofTeaching Hours
4Credits	3+2Hrs	56Hrs

Pedagogy: Classroomlectures,Casestudies,Groupdiscussion&Seminaretc.,

CourseOutcomes:Onsuccessfulcompletionofthecourse,theStudentswillbe able to
  a) Themethodofcostingapplicableindifferentindustries.
  b) Determinationofcostbyapplyingdifferentmethodsofcosting.
  c) Prepareflexibleandcashbudgetwithimaginaryfigures
  d) Analysetheprocessesinvolved instandardcosting.
  e) FamiliarizewiththeActivityBasedCostinganditsapplications.

Syllabus:	Hours
ModuleNo.1: JobandContractCosting	**12**

Job Costing: Meaning, prerequisites, job costing procedure, Features, objectives applications, advantages and disadvantages of Job costing, Job cost sheet- simple problems.
Contract Costing: Meaning, features of contract costing, applications of contract costing, similarities and dissimilarities between job costing and contract costing recording of contract costs, meaning of terms used in contract costing; treatment of profit on incomplete contracts-Problems.

Module No.2: ProcessandServiceCosting	**12**

Process costing: Meaning, features and applications of Process Costing; comparison between Job Costing and Process Costing, advantages and disadvantages of process costing; treatment of process losses and gains in cost accounts; preparation of process accounts.
Service costing: Introduction to service costing;Application ofService costing;Service costing v/s product costing; Cost units for different service sectors; Service cost statement; Determination of costs for different service sectors - Transport services, hospitalsandeducationalinstitutions-problemsonpreparationofservicecost statementsfortheseservice sectors.

ModuleNo.3: ActivityBasedCosting	**10**

Introduction - Weakness of conventional costing system – concept of ABC – Characteristics of ABC - Kaplan and Cooper's Approach – cost drivers and cost pools – allocation of overheads under ABC –– Steps in the implementation of ABC – Benefits fromadaptationofABCsystem–difficultiesfacedbytheindustriesinthesuccessful implementationofABC–Problems.

Module4:Marginal Costing	**12**

Meaning and Definition of marginal cost, marginal costing, features of marginal costing-termsusedinmarginalcosting–P/Vratio,BEP,MarginofSafety,Angleof Incidence.BreakEvenAnalysisassumptionsanduses.BreakEvenChart.(theory). ProblemsonCVP analysis.

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Module5:BudgetaryControlandStandardCosting	10

Budgetary Control Introduction – Meaning & Definition of Budget and Budgetary Control–ObjectivesofBudgetaryControl–essentialrequirementsofbudgetarycontrol – advantages and disadvantages of budgetary control – Types of budgets- Functional Budgets-Cashbudget,salesbudget,purchasebudgetandproductionbudget.Fixedand Flexible budgets - Problems on Flexible budget and Cash budget only.
Standard Costing Introduction – Uses and limitations, variance analysis- Material variances,LabourvariancesandOverheadvariances-problemsonMaterialandLabour variancesonly.

SkillDevelopmentActivities:

1. Namingtheappropriatemethod ofcostingwithjustificationforeachofthe following Industries-PaperMill, Printing, SugarMill, Rice Mill, Hospital, Oil Refinery, Pickle Manufacturing, KSRTC and Hotel.
2. Listoutthemoderncostingtoolsinaccountingfield.
3. PrepareflexibleBudgetandcashbudgetwithimaginaryfigures
4. Narratethestepsinvolvedinstandardcosting.System.
5. Prepare a report, which explains the conditions that are necessary for the successful implementation of a JIT manufacturing system.
6. ExplainABC.IllustratehowABCcanbeapplied.

Note: Anyotheractivitiesinadditiontotheabove,whicharerelevanttothecourse.

ReferenceBooks:

1. John K Shankand Vijaya Govindarajan;Strategic Cost Management;Free Press Publication; New York
2. SPJainandKLNarang,AdvancedCostAccounting,KalyaniPublications,
3. Robert S Kaplan andAnthonyA Atkinson, AdvancedManagement Accounting, PHI, New Delhi.
4. ShankandGovindrajan,StrategicCost Management, Simon andSchuster, 36 New York.
5. LinThomas, Cases and Readings in Strategic Cost Management, McGraw Hill Publications, New York.
6. MariyappaBMethodsandTechniquesofCosting.,HPH.

Note:LatesteditionofReferencebooksmaybeused.

NameoftheProgram:BachelorofCommerce(B.Com.)
Course Code:B.Com.4.3
NameoftheCourse:BusinessRegulatoryFramework

CourseCredits	No.ofHoursperWeek	TotalNo.ofTeachingHours
4Credits	4Hrs	56Hrs

Pedagogy: Classroomslecture,Casestudies, Groupdiscussion, Seminar&field work etc.,

CourseOutcomes:Onsuccessfulcompletionofthe course,theStudentswillbe able to
a) RecognisethelawsrelatingtoContractsanditsapplicationinbusinessactivities.
b) Acquire knowledgeonbailmentand indemnificationofgoodsina contractual relationship and role of agents.
c) Comprehend the rulesfor Sale of Goodsandrightsand dutiesof abuyerand a seller.
d) Distinguishthe partnershiplaws,itsapplicabilityand relevance.
e) Rephrasethecyberlawinthepresentcontext.

Syllabus:	Hours
ModuleNo.1: IndianContractAct,1872	**12**
Introduction – Definition of Contract, Essentials of Valid Contract, Offer and acceptance, consideration, contractual capacity, freeconsent. Classification of Contract, Discharge of a contract, Breach of Contract and Remedies to Breach of Contract	
ModuleNo.2:TheSaleofGoodsAct,1930	**10**
Introduction - Definition of Contract of Sale, Essentials of Contract of Sale, Conditions and Warranties, Transfer of ownership in goods including sale by a non- owner and exceptions-Performanceofcontractofsale-Unpaidseller,rightsofanunpaidselleragainstthe goodsandagainstthebuyer	
ModuleNo.3:CompetitionandConsumerLaws	**12**
The Competition Act 2002 – Objectives of Competition Act, Features of Competition Act CAT, Offences and Penalties under the Act, Competition Commission of India. **Consumer Protection Act 1986** – Definitions of the terms – Consumer, Consumer Dispute Defect, Deficiency, Unfair Trade Practices, and Services, Rights of Consumer under the Act, ConsumerRedressalAgencies –DistrictForum,StateCommissionandNationalCommission.	
ModuleNo.4:EconomicLaws	**12**
WTO patent rules – Indian Patent Act, 1970 – Meaning and Scope of Intellectual Property Rights (IPR), Procedure to get Patent for Inventions and Non-Inventions. **FEMA1999**–ObjectivesofFEMA,SalientFeaturesofFEMA,DefinitionofImportantTerms –AuthorizedDealer,Currency-ForeignCurrency,ForeignExchange,ForeignSecurity.	
Module5:EnvironmentandCyberLaws	**10**

Environment Protection Act 1986 – Objectives of the Act, Definitions of Important Terms – Environment, Environment Pollutant, Environment Pollution, Hazardous Substance and Occupier,TypesofPollution,PowersofCentralGovernmenttoprotectEnvironmentinIndia.

CyberLaw: Definition,IntroductiontoIndianCyberLaw,CyberspaceandCybersecurity.

SkillDevelopmentActivities:

1. Discussthecaseof"CarlillvsCarbolicSmokeBallCompany" case
2. Discussthecaseof"MohoriBibeev/sDharmodasGhose".
3. Discussanyonecaselawrelatingto minor.
4. Statetheprocedureforgettingpatentfor'inventions'and/or'non-inventions'.
5. Listatleast5itemswhichcanbecategorizedas'hazardoussubstance'accordingto EnvironmentProtectionAct.
6. Listout any top upcoming jobs incybersecurityandexaminethe skills required for the same.
7. Anyotheractivities,whicharerelevanttothecourse.

TextBooks:

1. M.C. Kuchhal, andVivekKuchhal,BusinessLaw,VikasPublishingHouse,New Delhi.
2. AvtarSingh,BusinessLaw,EasternBookCompany,Lucknow.
3. RavinderKumar,LegalAspectsofBusiness,CengageLearning
4. SN Maheshwariand SK Maheshwari,Business Law,National Publishing House, New Delhi.
5. AggarwalSK,BusinessLaw,GalgotiaPublishersCompany,NewDelhi
6. BhushanKumarGoyalandJainKinneri,BusinessLaws,InternationalBookHouse
7. SushmaArora,BusinessLaws,TaxmannPulications.
8. AkhileshwarPathak,LegalAspectsof Business,McGrawHillEducation,6thEd.
9. PCTulsianandBharatTulsian,BusinessLaw,McGrawHillEducation
10. Sharma,J.P.andSunainaKanojia,BusinessLaws,AneBooksPvt.Ltd.,New Delhi
11. K.RamaRaoandRavi S.P.,BusinessRegulatoryFramework.,HPH
12. N.D.Kapoor,BusinessLaws,SultanChandPublications
13. .K.Aswathappa,BusinessLaws, HPH,
14. .InformationTechnologyAct/Rules2000,TaxmannPublicationsPvt.Ltd.
15. Chanda.P.R,BusinessLaws,GalgotiaPublishingCompany
    Note:Latesteditionoftextbooksmaybeused.

4.4 Constitution of India curriculum will be given by KSHIC

4.5 Sports/NCC/NSS/Others (If any) – as per concerned University

NameoftheProgram:BachelorofCommerce(B.Com.)
CourseCode:B.Com.4.6(OEC)
NameoftheCourse:BusinessEthics

CourseCredits	No.ofHoursperWeek	TotalNo.ofTeachingHours
3Credits	3Hrs	42Hrs

Pedagogy:Classroomlectures,Casestudies,Groupdiscussion&Seminaretc.,

CourseOutcomes:Onsuccessfulcompletionofthecourse,thestudentswillbeableto
   a. Explaintheconceptsofbusinessethicsanditsapproaches.
   b. Examinethebusinessandorganisationalethicsinthepresentcontext.
   c. AnalysetheethicalaspectsinmarketingandHRareas.
   d. Analysetheethicalaspectsin financeandITareas.
   e. Examinetheimpactofglobalisationonbusinessethics.

Syllabus:	Hours
ModuleNo.1:BusinessEthics	**08**
Introduction, Concepts and theories: Introduction, definitions, importance and need for Business ethics, Values and morals. Management and ethics, Normative Theories, – Gandhian Approach, Friedman's Economic theory, Kant's Deontological theory, Mill & Bentham's Utilitarianism theory.	
ModuleNo.2:Business&OrganisationalEthics	**10**
TheIndianBusinessscene,EthicalConcerns,LPG&Globaltrendsinbusinessethics, Business ethics rating in India. Organizations &Organisation culture, Types of Organization, Corporate code of ethics –Formulating, Advantages, implementation Professionalismand professional ethics code.	
ModuleNo.3:**EthicalAspectsinOrganization-I**	**08**
MarketingethicsandConsumerethics–Ethicalissuesinadvertising,Criticismsin Marketing ethics, Ethics in HRM: Selection, TrainingandDevelopment– Ethics atwork place – Ethics in Performance Appraisal.	
ModuleNo.4:EthicalAspectsinOrganization-II	**08**
EthicsinFinance:Insidertrading-Ethicalinvestment-CombatingFrauds.Ethicalissues in Information Technology: Information Security and Threats – Intellectual Property Rights – Cybercrime.	
ModuleNo.5:GlobalizationandBusinessEthics	**08**
GrowthofGlobalCorporations,FactorsfacilitatingGlobalisation,Impactofglobalization on Indian corporate and social culture, Advantages and disadvantages of MNC's to the Host Country, International codes of Business Conduct, Whistle blowing and its codes.	

SkillDevelopmentActivities:
1. The students may be askedto conductthe surveyofanytwoorganizations to study the ethical practices.
2. ListoutanyfivemostethicalratingofIndiancompanies.
3. CollecttheinformationonunethicalpracticesinmarketingandHRarea.
4. CollecttheinformationonunethicalpracticesinfinanceandITarea.
5. Analyse and submitthe report onthe impact of globalizationonIndian business housesin the context of ethical aspects.
6. Anyotheractivities, whicharerelevanttothecourse.

TextBooks:

1. LauraPHartman,T,PerspectivesinBusinessEthics,TataMcGrawHill.
2. B. H. Agalgatti& R.P. Banerjee,Business Ethics –Concept& Practice,Nirali Publication.
3. R.P.Banerjee,EthicsinBusiness&Management,HimalayaPublication
4. Crane,BusinessEthics,Pub.ByOxfordPress
5. CSVMurthy,BusinessEthics,HimalayaPublishingHouse

Note:Lattesteditionoftextbooksmaybeused.

NameoftheProgram:BachelorofCommerce(B.Com.)		
CourseCode:B.Com.4.6(OEC)		
NameoftheCourse:CorporateGovernance		
CourseCredits	**No.ofHoursperWeek**	**TotalNo.ofTeachingHours**
3Credits	**3Hrs**	**42Hrs**

Pedagogy: Classroomlectures,Casestudies,Groupdiscussion&Seminaretc.,

CourseOutcomes:Onsuccessfulcompletionofthe course,theStudentswillbeable to
   a) Identifytheimportanceofcorporategovernance.
   b) Knowtherights,dutiesandresponsibilitiesofDirectors.
   c) Analysethelegal&regulatoryframeworkofcorporategovernance.
   d) Outlinetheimportanceandroleofboardcommittee.
   e) Understandthemajorexpertcommittees'Reportsoncorporategovernance.

Syllabus:	Hours
ModuleNo.1:CorporateGovernance	**10**
Introduction,Itsimportance,Principlesofcorporategovernance,OECDPrinciplesof corporate governance, Theories of corporate governance-Agency theory and stewardship theory, Models of corporate governance around the world, Need for good corporate governance - Evolution of Corporate Governance – Ancient and Modern Concept - ConceptofCorporateGovernance,GenerationofValuefromPerformance -Principlesof Corporate Governance.	
ModuleNo.2:CorporateandBoardManagement	**10**
CorporateBusinessOwnershipStructure-BoardofDirectors–Role,Composition, Systems and Procedures - Fiduciary relationship - Types of Directors-Promoter/Nominee/Shareholder/Independent - Rights, Duties and Responsibilities of Directors; Role of Directors and Executives – Responsibility for Leadership, Harmony betweenDirectorsandExecutives-TrainingofDirectors-need,objective,methodology-Scope and Responsibilities and competencies for directors - Executive Management Process, Executive Remuneration - Functional Committees of Board - Rights and Relationship of Shareholders and Other Stakeholders.	
ModuleNo.3:**LegalandRegulatoryFrameworkofCorporateGovernance**	**08**
Need for Legislation of Corporate Governance - Legislative Provisions of Corporate Governance in Companies Act 1956, Securities (Contracts and Regulations) Act, 1956 (SCRA),DepositoriesAct1996,SecuritiesandExchangeBoardofIndia Act1992,Listing Agreement, Banking RegulationAct,1949andOther CorporateLaws- Legal Provisions relatingtoInvestorProtection.	
ModuleNo.4:BoardCommitteesandRoleofProfessionals	**08**

Board Committees - Audit Committee, Remuneration Committee, Shareholders' GrievanceCommittee,othercommittees-Need,FunctionsandAdvantagesofCommittee Management-ConstitutionandScopeofBoardCommittees-BoardCommittees'Charter - Terms of Reference and Accountability and Performance Appraisals - Attendance and participationincommitteemeetings- IndependenceofMembersofBoard Committees- Disclosures in Annual Report; Integrity of Financial Reporting Systems - Role of Professionals in Board Committees - Role of Company Secretaries in compliance of Corporate Governance.

ModuleNo.5:CorporateGovernance-CodesandPractices	06

Introduction - Major Expert Committees' Reports of India - Study of Codes of Corporate Governance - Best Practices of Corporate Governance - Value Creation through Corporate Governance-CorporateGovernanceRatings.

SkillDevelopmentActivities:
1. Collecttheannual reports ofany two companies,findoutthe corporate governance aspects in the reports.
2. Collectany two companies Board ofDirectors names and findouttheirnature of directorship.
3. PreparereportontheapplicabilityofdifferentmodelsofCorporateGovernance.
4. Criticallycomparetherecommendationsofvariouscorporategovernance committee.
5. Anyotheractivities, whicharerelevanttothecourse.

TextBooks:

1. Bairs N. andD Band,Winning Ways throughCorporateGovernance, Macmillan London.
2. CharkhamJ,KeepingGood Company:AStudyofCorporateGovernanceinFive Countries, Oxford University Press,London.
3. SubhashChandraDas,CorporateGovernanceinIndia–AnEvaluation(Third edition),PHILearningPrivateLimited.
4. ClarkT.andEMonkHouse,RethinkingtheCompany,Pitman,London.
5. FernandoA.C,CorporateGovernance,PearsonEducation.
6. Prentice D.D.andPRJHolland, Contemporary Issues in Governance,Clarendon Press.
7. ReportoftheCadburyCommitteeonFinancialAspectsofCorporate Governance, London Stock Exchange, London.
8. ReportonCorporateGovernance,ConfederationofIndiaIndustriesandBombay.

Note:Lattesteditionoftextbooksmaybeused.

JSS COLLEGE OF ARTS COMMERCE & SCIENCE
(Autonomous)
Ooty Road, Mysuru – 25

DEPARTMENT OF COMMERCE AND MANAGEMENT

B.COM Programme
(III Year)

Syllabus
CHOICE BASED CREDIT SYSTEM

2019-20

Programme Outcomes

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, Counselor

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

After completing the graduation in the Bachelor of Commerce the students can become a:

PSO1: Business Entrepreneur

PSO2: Business Administrator

PSO3: Financial Cost and Management Accounting

PSO4: Business Researcher

PSO5: Bank Manager

PSO6: Personal secretary

PSO7: Project Manager

PSO8: Legal Adviser

PSO9: Stock Broker

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SEMESTER I

DISCIPLINE SPECIFIC COURSE -1

1.4 FINANCIAL ACCOUNTING – I

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L:T:P - 4:1:1

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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: Introduction
Accounting - Meaning and Definitions, objectives, functions, advantages and limitations of accounting, users of financial accounting information and their needs. Systems of Book-Keeping – Rules of double entry - preparation of Journal, Ledger and Trial Balance. Accounting Principles - Accounting Concepts and Conventions. Accounting Standards: Concept, benefits, procedure for issuing accounting standards in India. IFRS – need and procedure

Unit 2: Final accounts
Final accounts of sole trading concern- Preparation of Manufacturing, Trading and Profit and Loss Account and Balance sheet with adjustments.

Unit 3: Bills of Exchange
Meaning – Characteristics – kinds – noting, protest-Discounting, endorsement, Dishonour – Rebate & renewals of bills. Problems on trade bills only

Unit 4: Branch Account
Meaning and objectives. Dependent branches – concept, accounting aspects; debtors system, stock and debtors system, branch final accounts system. Independent branches: concept accounting treatment. Goods invoiced by HO at cost and invoice price.

Unit5: **Departmental accounts**
Meaning, objectives, advantages of keeping departmental accounts, basis for allocation of joint expenses, internal transfer of goods, preparation of profit and loss account and balance sheet.

Unit 6: **Computerized Accounting Systems**   **26 Practical Lab**
Computerized 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.

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.

References:

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.

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SEMESTER – I

DISCIPLINE SPECIFIC COURSE - 2

1.5 BUSINESS ORGANISATION AND MANAGEMENT

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L:T:P – 3 :1:0

Course Outcome:

On successful completion of this course the students are able to:

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. Technological innovations and skill development. 'Make in India' Movement. 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; Forms of Public Enterprises. Multinational Corporations.

Unit 3: Management
The Process of Management: Planning; Decision-making; Strategy Formulation.
Organizing: - Types of Organisational Structure - Departmentation – 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. 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.

References:

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.

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SEMESTER – I

DISCIPLINE SPECIFIC COURSE - 3

1.6 BANKING AND INSURANCE

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L:T:P-3:1:0

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

CO5: Identify the loans and advances offered by the banks to various sectors

CO6: understand in depth the relationship between customer and banker

Unit 1: Introduction to Banking
Definition, Origin and growth of banks in India, Types of banks - Scheduled banks, nationalized banks, private sector banks, Regional Rural Banks, cooperative banks, foreign banks. Role and importance of banks in national economy. Central bank- Introduction, role and functions.

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, types of crossing, dishonor of cheques. Difference between cheque and bill of exchange. Paying banker and collecting banker.

Unit 3: Loans And Advances
Principles of bank lending - liquidity, profitability, safety and security. 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). Cheque transaction system- definition of electronic cheque, process, advantages. Cyber crimes.

Unit 5: Risk and Insurance
Risk – basic concept of risk, types of risks, Risk management process and objectives.
Insurance- Meaning and definition, importance, types and principles of insurance – utmost good faith, insurable interest, indemnity, subrogation, contribution and proximity cause. Introduction to general insurance. Life insurance - Meaning and Definition- Benefits, life insurance players in India.
IRDA - Functions and role.

References:

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.

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SEMESTER II
DISCIPLINE SPECIFIC COURSE - 4
2.4 COST ACCOUNTING

L:T:P-3:1:0

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

CO6: Understand in depth characteristics of process costing and able to identify process losses

Unit 1: Introduction
Meaning and definition of cost, costing, cost accounting and cost accountancy; objectives, advantages and limitations of cost accounting, differences between cost accounting and financial accounting. Elements of cost, classification of cost, cost centre, cost unit, problems on preparation of cost sheet, tenders and quotations.

Unit 2: Materials
Classification and codification of materials, functions of purchase department, stores department-stores records, techniques of inventory control-stock levels, EOQ, ABC analysis, Material losses-types and treatment, Pricing of Materials- problems on LIFO, FIFO and weighted average price

Unit 3: **Labour**
Methods of time keeping and time booking; methods of remuneration-time rate, piece rate, Halsey and Rowan Plan, Idle time-causes and treatment, overtime, labour turnover-causes, measurement and treatment; problems on Halsey method, Rowan plan, Merick differential piece rate system, FW Taylors differential piece system

Unit 4: Overheads
Meaning, Nature, methods of classification of overheads, allocation and apportionment-problems on primary distribution, secondary distribution, repeated distribution methods. Methods of absorption of overheads- problems on Machine Hour Rate only. Activity based costing –Meaning, purpose, benefits, stages, relevance in decision- making.

Unit 5: Process Costing

Meaning, Features of process Costing-Application of Process Costing – Difference between job costing and process costing – Advantages of process costing - Limitations – Elements of Production cost. Process Losses – Normal Loss – Abnormal Loss. Abnormal Gain

References:

1.Cost Accounting: N.K. Prasad
2.Cost Accounting: Nigam & Sharma :
3.Practical Costing: Khanna Pandey & Ahuja
4: Cost Accounting: M.L. Agarwal
5.Cost Accounting: Jain & Narang
6.Cost Accounting: S.P. Iyengar
7.Cost Accounting: S.N. Maheshwari

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SEMESTER II

DISCIPLINE SPECIFIC COURSE - 5

2.5 FINANCIAL ACCOUNTING II

L:T:P-5:1:0

Course Outcome:

On successful completion of this course the students are able to:

CO1: Understand in depth the details of consignment transaction
CO2: Learn in depth the accounting procedure of joint venture and able to maintain the
books of accounts
CO3: Identify the causes for differences between the cash balance in cash book and pass
book statement
CO4: Learn the details of hire purchase and installment system
CO5: Identify and recognize the capital and revenue items and able to prepare the financial
statement of nonprofit organisation
 CO6: Understand the details of royalties and able to Write down the various ledger
accounts

Unit 1: Accounting for consignment transaction
Meaning, difference between consignment and sale, proforma invoice and account sales, types of commission valuation of goods lost in transit-valuation of stock on consignment, goods sent to branch at cost price and at invoice price, problems on cost price and invoice price.

Unit 2: Joint Venture
Meaning – features - differences between joint venture and partnership, joint venture and consignment. Accounting procedures: Joint Bank Account, Records Maintained by Co-venturer of (a) all transactions (b) only his own transactions   (Memorandum   joint venture account). Problems on joint bank account method only.

Unit 3: Accounting for Hire purchase and Instalment system
Meaning, features, preparation of statement of analysis, ascertainment of cash price of an asset, problems on hire purchase system. Accounting for instalment system- meaning, features and differences between hire- purchase and instalment system, problems on instalment system

Unit 4: Accounting for royalties
Meaning and types, minimum rent, short working, and recoupment of short working-analytical table-preparation of ledger accounts in the books of both parties excluding sublease

Unit 5: - **Bank Reconciliation Statement**
Meaning and need, reasons for the differences between the cash balance shown in cash book and pass book. Problems on - Bank Reconciliation Statement

Unit 6: - Financial statement of non-profit organization
Meaning, recognition of capital and revenue items, receipts and payment account, income and expenditure account, preparation of income and expenditure account and balance sheet

References:

1. Accounting Principles; Anthony, R.N. and Reece, J.S.: Richard Irwin Inc.
2. Advanced Accounting; Gupta, R.L and Radhaswamy, M: Sultan Chand and Sons, New Delhi.
3. Advanced Accounts; Shukla. M.C., Grewal T.S., and Gupta,S.C.: S. Chand & Co. New Delhi
4. Higher Sciences of Accountancy : . Agarwala A.N., Agarwala K.N.:Kitab Mahal, Allahabad.
5. Financial Accounts, Mishra A.K.: Sahitya Bhawan Publishers and Distributers

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SEMESTER II

DISCIPLINE SPECIFIC COURSE - 6

2.6 PRINCIPLES OF MARKETING

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L:T:P-3:1:0

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

CO7: Understand the details of promotion mix and decide effective promotion mix

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.

References:

1. Kotler, Philip, Gary Armstrong, Prafulla Agnihotri and Ehsanul Haque. *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.

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SEMESTER III

DISCIPLINE SPECIFIC COURSE - 7

3.3 CORPORATE ACCOUNTING - I

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L:T:P-3:1:0

Course Outcome:

On successful completion of this course the students can:

CO1: Learn in depth different sources of finance and become a corporate accountant

CO2: Understand the provision of Companies Act 2013 on dividend declaration

CO3: Identify the characteristics of intermediate in stock exchange and start career as stock Broker

CO4: Prepare the financial statement of companies as per the schedule of Companies Act 2013

CO5: Understand the details of underwriting of shares and debentures

CO6: Identify the circumstances of liquidation of companies and able to prepare liquidator's final statement of account

Unit 1: Accounting for Share Capital
Meaning and types of shares-issue of shares over- subscription and prorate allotment-forfeiture of shares-reissue of forfeited shares-passing journal entries and preparing balance sheet.

Unit 2: Financial Statements of Limited Companies
Preparation of financial statements as per schedule III of Companies' Act-2013. Provisions of companies Act-2013 on Declaration of Dividends.

Unit 3: Accounting for Redemption of Preference Shares and Issue of Bonus Shares
Conditions for redemption of preference shares, and Accounting procedure for redemption; meaning of bonus shares and bonus issue-SEBI guidelines for bonus issue-accounting entries for issue of bonus shares.

Unit 4: Issue and Redemption of Debentures
Meaning and types of debentures-methods of redemption of debentures-journal entries for issue of debentures and conditions for redemption- financing for redemption of debentures.

Unit 5: Liquidation of Companies
Meaning and circumstances of liquidation- preparation of liquidator's final statement of account.

Unit 6: Accounting for employees stock option plan, buy-back of securities, equity shares with differential rights, under writing of shares and debentures.

References:

1. Accounting Principles; Anthony, R.N. and Reece, J.S.: Richard Irwin Inc.
2. Advanced Accounting ; Gupta, R.L and Radhaswamy, M: Sultan Chand and Sons, New Delhi.
3. Advanced Accounts; Shukla. M.C., Grewal T.S., and Gupta,S.C.: S. Chand & Co. New Delhi.
4. Higher Sciences of Accountancy : . Agarwala A.N., Agarwala K.N.:Kitab Mahal, Allahabad.
5. Financial Accounts, Mishra A.K.: Sahitya Bhawan Publishers and Distributers

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SEMESTER III

DISCIPLINE SPECIFIC COURSE - 8

3.4 INCOME TAX-I

L:T:P-3:1:0

Course Outcome:

On successful completion of this course the students able:

CO1: Learn in depth Income Tax Act of 1961 and able to practice as Tax Consultant and Tax Practitioner

CO2: Understand in detail the provisions for computation of taxable salary

CO3: Learn the provisions of IT Act relation to income from house property and able compute income from house property

CO4: Learn in detail the provisions of depreciation under IT ACT

CO5: Identify in detail the different expenses allowable and inadmissible for computation of Business income

CO6: Compute Taxable income from business

Unit 1: Introduction

Brief History of Income Tax Act, Finance Act, Scheme of Income Tax, Basic Concepts-Income, Assessee, person, Assessment year, Previous Year, Gross Total Income, Total Income, Marginal rate of Tax—Agricultural Income-Residential Status of individual, Incidence of Tax (including problems)- Incomes which do not form part of Total Income U/S 10.

Unit 2: Heads of Income

Income from Salary -features of salary income-allowances, perquisites, provident fund, computation of Taxable salary income

Unit 3: Income from Salary: Retirement benefits

Gratuity, Commutation of Pension, Leave encashment - problems

Unit 4: Income from House Property

Basis of charge - deemed ownership - exemptions determination of annual value-Deductions u/s 24-computation of income from house property.

Unit 5: - **a) Depreciation**- Meaning, computation of Deprecation

       b) Profits and gains of Business and profession (Individual Assessees)- Expenses expressly allowable and inadmissible, General Deductions/ expenditures u/s 37, losses, deemed profits, Method of accounting-computation of taxable income from business. Computation of Income from profession in Case of Advocates, Doctors, Chartered Accountant.

References:

1.Direct Taxation-T.N.Manoharan
2.Direct Taxation- Girish Ahuja, & Ravi Gupta
3.Direct Taxation- Dr. Vinod.k.singania
4.Income Tax law and practice-Gaur & Narang
5.Income Tax Law- Dinakar Pagare
6.Income Tax Law & Accounts-Bhagavati Prasad
7.Income Tax Law and Accounts – H.C. Mehrothra

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SEMESTER III

DISCIPLINE SPECIFIC COURSE - 9

3.5 CORPORATE GOVERNANCE

L:T:P-3:1:0

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 theories of corporate governance

CO4: Understand the details of Corporate Governance in India

CO5: Learn in depth the 4ps of corporate governance

Unit 1: Introduction to corporate governance
Meaning, Definition, need and importance. Benefits of corporate governance. Cadbury Committee Report in UK.

Unit 2: Business Ethics
Concept, importance & benefits – corporate philosophy & ethics – Managing ethics & legal compliance.

Unit 3: Theories of Corporate Governance
Agency theory, Stewardship theory & Stakeholders theory.

Unit 4: Mechanism & Control
4 ps of corporate governance (people, purpose, process & performance) – wealth creation, management & distribution – disclosure in office documents – A brief note on clause 49 of listing agreements of company with stock exchanges. Compliance aspect of corporate governance.

Unit 5: Corporate Governance in India
Reforming constitution of Board of Directors – A brief study of Kumara Birla Mangalam Committee – Naresh Chandra Committee – Narayanmurthy Committee – Corporate Governance code- Board subcommittee for compliance with Corporate Governance regulation.

References:

1. Corporate Governance – Subhash Chandra Das
2. Corporate Governance – Kesho Prasad
3. Corporate Governance – Ashwathappa

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SEMESTER IV
DISCIPLINE SPECIFIC COURSE - 10
4.3 CORPORATE ACCOUNTING- II

Course Outcome:

On successful completion of this course the students can:

CO1: Learn in depth the latest regulation of Insurance for the preparation of final accounts

CO2: Understand the characteristics of Human Resource Accounting

CO3: Identify the characteristics of intermediate in stock exchange and start career as stock Broker

CO4: Prepare final accounts of life insurance as per latest regulations

CO5: Understand the details of Inflation accounting

CO6: Learn in depth about Holding and Subsidiary company and play a vital role in preparation of consolidated Balance Sheet

CO7: Learn the details of Electricity Supply Act 2003 and able to prepare final accounts of electricity companies

Unit 1: Accounting for General Insurance Companies

Fire and marine insurance, preparation of final accounts as per latest regulations

Unit 2: Accounting for Life Insurance

Preparation of valuation balance sheet, preparation of final accounts as per latest regulations.

Unit 3: Final accounts of Electricity Companies

Forms of financial statements, differences between depreciation as per companies act and as per tariff policy under Electricity supply act 2003

Unit 4: Holding Company Accounts

Accounting for Holding Company: Preparation of Consolidated Balance Sheet, Minority interest, Computation of Goodwill/ Capital Reserve, Revaluation of assets of subsidiary Company.

Unit 5: Human Resource Accounting

Accounting Aspects of Human Capital –Meaning, Basic Premises, Need and Significance of HRA, Advantages and Limitation of HRA; Monetary and Non-Monetary Models; Cost Based Models- Acquisition Cost Method, Replacement Cost Model, Opportunity Cost Method, standard cost method, Current Purchasing Power Method (C.P.P.M.).

Unit 6: Inflation accounting and income measurement

Inflation Accounting: Concept – Limitations of historical based-cost financial statements – Methods of Inflation Accounting: Current Purchasing Power Method – Current Cost Accounting Method (Including problems). Income Concepts for financial reporting – Measurement and Reporting of Revenues, Expenses, Gains and Losses (Theory only) – Analysis of Changes in Gross Profit (Including problems).

References:

1. Accounting Principles; Anthony, R.N. and Reece, J.S.: Richard Irwin Inc.

2. Advanced Accounting ; Gupta, R.L and Radhaswamy, M: Sultan Chand and Sons, New Delhi.

3. Advanced Accounts; Shukla. M.C., Grewal T.S., and Gupta,S.C.: S. Chand & Co. New Delhi.

4. Higher Sciences of Accountancy : Agarwala A.N. Agarwala, K.N.:Kitab Mahal, Allahabad.

5. Financial Accounts, MishraA.K :Sahitya Bhawan Publishers and Distributers

6. Chakraborty, S.K., Human Asset Accounting: The Indian Context in Topics in Accounting and Finance, Oxford University Press.

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SEMESTER IV

DISCIPLINE SPECIFIC COURSE - 11

4.4 INCOME TAX-II

Course Outcome:

On successful completion of this course the students can:

CO1: Understand in detail the provisions for computation of capital gain and income from other sources

CO2: Learn in depth the provisions of IT Act for the Assessment of firm and company

CO3: Learn the details of set off and carry forward of losses

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

CO7: Learn to compute the taxable capital gain and income from other sources

Unit 1: Capital Gain

Capital Asset, Transfer, cost of acquisition, cost of improvement, indexation, types of Capital gain- exemptions for individual assessee u/s 54-54GB-problmes

Unit 2: Income from other sources

Income from other sources. Set off and carry forward of losses (theory only)

Unit 3: Assessment of Individual

Application of Deductions u/s 80C-80U, Section 87A computation of Tax liability. (Available software package for computation of tax liability, computation using Excel-Work sheet)

Unit 4: Assessment of Partnership Firm

Definition of Firm, Partner U/S 2(23) Residential Status -conditions u/s 184, Provisions u/s 40(b)-Deductions from 80G80JJA- Alternate Minimum Tax(AMT)-Computation of tax liability of Firms (Use of available software package for computation of tax liability, Related Forms and Challans-Computation using excel work- sheet)

Unit 5: Assessment of Company

Definition of Company, Closely-held company, Widely-held Company, Indian Company, Foreign Company-Residential Status of company-Applicable Deductions u/s 80G -80JJA-

Computation of Tax Liability (Including Minimum Alternate Tax) (Use of Software package-Quick Books/ Electrocom)

References:

1.Direct Taxation-T.N.Manoharan

2.Direct Taxation- Girish Ahuja, & Ravi Gupta
3.Direct Taxation- Dr. Vinod.k.singania
4.Income Tax law and practice-Gaur & Narang
5.Income Tax Law- Dinakar Pagare
6.Income Tax Law & Accounts-Bhagavati Prasad
7.Income Tax Law and Accounts – H.C. Mehrothra

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SEMESTER IV

DISCIPLINE SPECIFIC COURSE - 12

4.5 QUANTITATIVE TECHNIQUES

L:T:P-3:1:0

Course Outcome:

On successful completion of this course the students can:
CO1: Understand in depth the classification and operation of matrices and determinants
CO2: Learn the details of progression and their application to business
CO3: Understand in detail the concept of Ratio, proportion and variation
CO4: Learn in depth the Laws of indices and logarithms and its application to solve
      business problem
CO5: Understand the details of simple interest and compound interest
CO6: Find the value of present worth, bankers gain, banker's and true discount

Unit 1: Indices and logarithms
Meaning-Basic laws of Indices and their application for simplification, laws of logarithms-common logarithms, application of log table for simplification.

Unit 2: Progression
Meaning of sequence, progression; types of progressions; arithmetic progression and geometric progression-general terms and sum of 'n' term of Arithmetic progression and Geometric progression-Application problems on Arithmetic progression and geometric progression.

Unit 3: Ratio, proportion, variation, and percentages
Meaning and their application to business

Unit 4: Simple interest and compound interest-Bills discounting-
Meaning-concepts; Bankers discount, true discount, bankers' gain and present worth of bill.

Unit 5: Matrices and determinants
Meaning and types of matrices, matrix operation - addition, subtraction and multiplication Determinants of a matrix and its evaluation; solutions of linear equations by using cramer's rule.

References:

1. Dr. B H Suresh and Mahadevaswamy G H, Quantitative Techniques,Nithya Publications,
    Mysore.
2. P.R. Vittal, Business Mathematics, Revised Edition,Margham Publications, New Delhi,
2001.

3. V.K.Kapoor, Introductory to Business Mathematics, S.CHAND, New Delhi, 2009.

4. Sancheti and Kapoor, Business Mathematics, Sultan chand and Sons, New Delhi-42.

5. G.K.Ranganath and T.V. Narsimha Rao Basic Mathematics- Volume II.

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SEMESTER V

DISCIPLINE SPECIFIC COURSE - 13

5.1 ENTREPRENEURSHIP DEVELOPMENT

L: T: P-3:1:0

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 access different financial scheme to small business

CO3: Identify in detail with examples to easily different financial schemes offered by Banks and Government Agencies

CO4: Understand in depth and identify the social responsibility of an entrepreneur towards different sectors

CO5: Learn in depth the Self employment opportunities
CO6: Learn in detail the ethics in business
CO7: Identify the content of project report
CO8: Understand in depth the procedure of setting up of new business

Unit 1: Introduction
Meaning, definition of Entrepreneur, Enterprise, Entrepreneurship, Characteristics of successful entrepreneur, Functions, Role of entrepreneur in economic development, women entrepreneur, Rural entrepreneur, Agricultural entrepreneur-meaning and challenges.

Unit 2: Entrepreneurship Development Program (EDP)
Meaning, objective, importance, institutions doing EDP in India, DIC, CEDOCK, SSI, NSIC, EDII, AWAKE, KVIC,RUDSET, Industrial estate-Meaning and importance.

Unit 3: Financing of Small Business in India
Institutional and non institutional assistance SFCs, banks, SIDBI, NBFC-meaning and schemes; venture capital, bills discounting, factoring, state and central government subsidies and incentives for SSI (existing) - recent industrial policy(2011), PM MUDRA YOJANA- meaning, objectives, procedures for obtaining loan under MUDRA.

Unit 4: Setting up of new business, forms for small business
Small proprietorship, partnership, private company, cooperative society-meaning and nature, project formulation, project report-meaning, importance, general format of project report, project appraisal, financial, technical, marketing, social feasibility study, obtaining license, clearance certificate, registration procedure.

Unit 5: Business Ethics
Meaning, ethics in business, importance, various social responsibility of an entrepreneur towards customers, suppliers, government and society, self- employment-recent trends in

the areas of self employment-event management-meaning and areas of business in event management (party organizing , catering, wedding plan and corporate event plan) tourism-meaning, tourism products, E-marketing as self employment opportunity.

Reference:

1.Entrepreneurship And Small Business Management- C B Guptha And S S Khanka
2.Entrepreneruship Development – C B Guptha And Srinivasan 3.Entreprenership development development –Shankaraiah
4.Entrepreneurship development-S S Khanka

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SEMESTER V

DISCIPLINE SPECIFIC COURSE -14

5.2 IFRS (IND - AS)

L:T:P-3:1:0

Course Outcome:

On successful completion of this course the students can:

CO1: Deliberate the characteristics of IFRS
CO2: Understand in depth frame work for the preparation and presentation of financial
      statement
CO3: Learn in details with examples Accounting for assets and liabilities
CO4: Learn in details with examples IND AS on business combination
CO5: Understand the details of IND AS in relation to accounting for Revenue and Expenses

Unit 1: IFRS
Meaning, Need for IFRS, IASB, IASB Current Structure, IFRS Due Process, Benefits and limitations of IFRS; Introduction to Indian Accounting Standards (IND-ASs - Converged IFRSs), Accounting Regulations in New Companies Act – 2013, IFRSs issued by IASB (1-17),List of IND-ASs.

Unit 2: Framework for the Preparation and Presentation of Financial Statements
Meaning of Framework, Purpose and status - Scope - Application - Uses and their information and needs – objectives - Underlying assumptions – Qualitative characteristics – Elements of Financial statements – Recognition and Measurement of the elements of financial statement Balance sheet, Statement of changes in Equity, Statement of Profit and Loss consolidated financial statements, other comprehensive income as per schedule III of the Companies Act, 2013 – **Simple problems on each statement**.

Unit 3: Accounting for Assets and Liabilities
Recognition and Measurement criteria for Investment Property (IND-AS 40) – Borrowing Cost (IND-AS 23) –– Provisions, Contingent Assets and Contingent Liabilities (IND-AS 37) - Share-based Payment (IND-AS 102) - . Recognition and Measurement for Property, Plant and Equipment (IND-AS 16) – Intangible Assets (IND-AS 38) - Inventories (IND-AS 2) - Leases (IND-AS 17) – Impairment of Assets (IND-AS 36) - **Theory and Simple Problems only**

Unit 4: Accounting for Revenue and Expenses
Income Taxes (IND-AS 12) – Employee Benefits (IND-AS 19) -Construction contracts (IND-AS 11) - Revenue (IND-AS 18) - Revenue from Contracts with Customers (IND-AS 115).

Unit 5: IND-AS on Business Combination
IND-AS on Business Combination, Consolidation and Disclosure-Consolidated Financial Statements (IND-AS 110) – Joint Arrangements (IND-AS 111) – Business Combinations (IND-AS 103) - Related Party Disclosures (IND-AS 24) – Operating

Segments (IND-AS 108)   – First-time adoption of International Financial Reporting Standards (IND-AS101)– Financial Instruments: Disclosures (IND-AS 107) – Disclosure of interests   in   Other   Entities (IND-AS 112) –Earning Per   Share (IND-AS 33)   –   Interim Financial Reporting (IND-AS34)– Insurance Contracts (IND-AS 104)– **Theory and Simple Problems only**.

References:

1. A Quick Guide to Indian Accounting Standards (Ind-AS) by Chethan N. Patel and BhupendraMantri, Taxmann Publication (P.) Ltd.

2. Students' Guide to Ind ASs – Converged IFRSs by Dr. D.S. Rawat, Taxmann Publication (P.) Ltd.

3. IFRS for India, Dr.A.L. Saini, Snow white publications

4. Roadmap to IFRS and Indian Accounting Standards by CA ShibaramaTripathy

5. IFRS concepts and applications by Kamal Garg, Bharath law house private limited

6. IFRS: A quick reference guide by Robert J Kirk, Elsevier Ltd.

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SEMESTER VI

DISCIPLINE SPECIFIC COURSE - 15

6.1 PRINCIPLES AND PRACTICE OF AUDITING

L:T:P-3:1:0

Course Outcome:

On successful completion of this course the students can:

CO1: Learn in depth to practice as an Auditor

CO2: Learn the characteristics of errors and frauds and minimize them in maintenance of books of accounts

CO3: Identify in detail the importance of Internal Control and Internal Check

CO4: Identify the details of audit planning

CO5: Learn in depth verification and valuation of Assets and Liabilities

CO6: Deliberate in details with examples audit of different types of organizations

Unit 1: Introduction

Meaning and definition of auditing- Nature and importance of auditing objectives of auditing-advantages, different types of audit, qualities of an auditor- audit report-auditing in a computerized environment.

Unit 2: Audit planning and control

Factors affecting audit planning - audit programme advantages-audit note book-appointment of a company auditor- qualifications, disqualifications-rights and duties of a company auditor.

Unit 3: Internal check and internal control

Meaning and objective-internal check for various transactions-limitations of internal control. Vouching-meaning and importance – vouching of cash transactions.

Unit 4: verification and valuation of assets and liabilities

Meaning- problems in valuation of assets, verification and valuation of assets and liabilities- goodwill, Stock in trade, Investments, Patents, Copy rights and trademarks, plant and machinery- capital, creditors, debentures, outstanding expenses, contingent liabilities.

Unit 5: Audit of different types of organizations

Audit of sole trader, audit of partnership firms, audit of hotels, audit of educational institutions, audit of trust, audit of co-operative societies.

References:

1. Auditing   T R Sharma
2. Practical auditing   B N Tandon
3. Practical auditing-   Spicer and Spegler

4. Auditing   Jagadeesh prakash

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SEMESTER VI

DISCIPLINE SPECIFIC COURSE -16

6.2: BUSINESS LAWS

L:T:P-3:1:0

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: Identify and appointed as member of various commerce and legal boards / committee

CO6: Specify the details of Information technologies Act

CO7: Learn the provisions of Special Contract

Unit 1: Introduction

Concept of law, Sources Of Law- Mercantile Law; Agreement, Contract-Definition, Essentials Of a Contract, Legal Rules As To Valid Offer And Acceptance; Termination Of An Offer.

Unit 2: Contractual Capacity

Minor's Agreement, Consideration-Definition, Essentials and Exceptions. Free Consent-Coercion, Undue Influence, Fraud, Misrepresentation, Mistake, Definition and Features only.

Unit 3: Special Contract

Contingent contract, quasi contracts, Wagering Agreement, Discharge of a Contract, Remedies for Breach of Contract.

Unit 4: Intellectual Property Act

Definition and Registration Procedure for Patent, Copy Right, Trademarks.

Unit 5: Information Technology Act 2000

Definition of Information-Digital Signature, Legal Recognition of Electronic Records, License to issue Digital Signature Certificate And Acceptance Of Digital Signature.

References:

1. Mercantile Law   - N.D.Kapoor P C Tulsian and Bharat

2. Business Law   - Tulsian
3. Mercantile Law   - P P S Gogna   .

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GROUP A1

SKILL ENHANCEMENT COURSE-1

COMPUTERIZED ACCOUNTING SYSTEM

L: T: P- 2:0:2

Course Outcome:

On successful completion of this course the students can:

CO1: Learn in depth the characteristics of computerized accounting system

CO2: Identify the reason for differences between cash book and bank statement

CO3: Learn in details with examples computerised accounting software

CO4: Specify in details with examples periodic reports

CO5: Learn the classification and characteristics of data entry system

CO6: Prepare the quotation, purchase order etc., using computer software

Unit 1: a) – Computerised Accounting System
Meaning of computerised Accounting Traditional / Manual System of Accounting; process of Computerised Accounting; features of Computerised Accounting; difference between manual accounting system and computerised accounting. Process/Steps in Computerised Financial Accounting; Advantages of the Computerised Financial Accounting System; Various Components of a Computerised Financial Accounting System
b) - Voucher Types of Voucher; Bank Payment Voucher; Bank Receipt Voucher; Cash Payment Voucher ; Cash Receipt Voucher ; General Voucher.

Unit 2: - Bank Reconciliation Statement
Common transactions with bank; Cashbook and bank statement ; Reasons for difference between cash book and bank statement ; Bank reconciliation statement

Unit 3:   Computerized Accounting
Scope of Computerized Accounting; Computerized Accounting Software; Creating a Corporation in Computerized Accounting Software. Chart of Accounts ; Creating Chart of Accounts ; Update Chart of accounts ; Charts of accounts Beginning Balances ; Organizational codes ; Editing charts of accounts;

Unit 4: Periodic Reports
General Journal ; Ledger; Trial Balance ; Income Statement ; Balance Sheet Inventory report; Account Receivable report; Account Payable report

Unit 5:   Data Entry System
Voucher and Entry of vouchers ; Sales Entries ; Purchase Entries; Cash Receipt Entries ; Cash Payment Entries ; Bank transaction Entries Maintain the Records of Sales &

Customers ; Quotations to customers ; Sales orders ; Sales Invoices ; Sales receipts ; Record of Customers ; Sales report ; Customer Report.

Unit 6: Maintain the Records of Purchases and Vendors/ Suppliers
Preparing the Quotations; Purchase orders; Payment to vendors; Record of vendors; Utility Bills Payable; Purchase Report; Vendors Report.

References:

1.Computer Accounting (Accounting & Finance) Paperback – <u>Michael Fardon</u>
2.Computerized Accounting Spiral-bound – 2008- <u>Arens and Ward</u> (Author)
3.Computerized Accounting -Prof.C.M.Tembhurnekar, Dr.Alok Dwivedi
4.https://margcompusoft.com/Free_accounting_software.html

ENC25001 / END25001

GROUP A1

SKILL ENHANCEMENT COURSE-2

E-FILLING OF RETURNS

L:T:P-2:0:2

Course Outcome:

On successful completion of this course the students can:

CO1: Learn in depth the types of e-filing and e-verification of returns

CO2: Specify in details with examples E-filling of returns

CO3: Understand the details of steps involved in e- filling of different forms of IT Return

CO4: Learn the details of E-filling of returns under GST

CO5: Learn the details of returns to be filled by composition tax payer

Unit 1: **E-filing of Returns**
Meaning- objectives- advantages, features of E-filing; Types of e- filing, e-filing Process flow, Types of e-Verification of Returns, How to e-file, who should file e-return;

Unit 2: ITR-1 and ITR2- ITR-3- ITR-4 introduction
Format- Heads of income covered- contents- filling the return- steps involved in filing of ITR-1, ITR-2, ITR-3, ITR-4

Unit 3: ITR-5- ITR-6; ITR-7- introduction
Format- Heads of income covered- contents- filling the return- steps involved in filing of ITR-5, ITR-6, ITR 7.

Unit 4: E-filing of returns under GST
GSTR-1- GSTR-1A, GSTR-2, GSTR   2A; GSTR-3, GSTR   3A, GSTR-3B, GSTR   9,   Assesses required to file, contents to be filled, Documents required, steps in filing the above returns;

Unit 5: **Returns to be filed by composition tax payers**
GSTR-4A, GSTR-4, GSTR-9; Returns to be submitted by an input service distributor-
GSTR 6, GSTR-6A; Returns to be filed by Tax Deductor-GSTR-7, GSTR-7A;Contents- steps to be followed in filing the above returns

References:

1.https://incometaxindiaefiling.gov.in/eFiling/Portal

2.https://www.bankbazaar.com/tax/step-by-step-guide-efile-income-tax-return-online.html

3.https://www.icicibank.com/knowledge-base/tax/steps-for-e-filing

4.https://taxguru.in/income-tax/download-free-ebook-the-process-efiling-income-tax-returns.html

5.Students Guide To e-Returns- vinod K singhania- taxmann

6.https://www.profitbooks.net/gst-returns/

ENC26001 / END26001

GROUP A1

SKILL ENHANCEMENT COURSE -3

PRINCIPLES AND PRACTICE OF GENERAL INSURANCE

L: T: P-3:1:0

Course Outcome:

On successful completion of this course the students can:

CO1: Identify the classification and characteristics of General insurance

CO2: Learn the details of fire insurance policies, insurance coverage and consequential loss

CO3: Deliberate in details with examples underwriting and settlement of claims

CO4: Understand in depth the details of claim procedure and Settlement limitation

CO5: Learn in detail with examples non life miscellaneous insurance

Unit 1: **Introduction**
Meaning of General Insurance – The Evolution and Growth of General Insurance – Types of General Insurance – Fundamentals of General Insurance –Recent innovations. Organization and Management of General Insurance Companies – Regulatory Framework for General Insurance in India.

Unit 2: **Fire Insurance**
Standard policies – Fire Insurance coverage – Consequential loss (fire) Insurance policies – Declaration policies, Marine Insurance: Marine Cargo policies – Hull policies – Institute cargo clauses – Institute hull clauses – Open policies – Accumulation of risk per location - Motor Insurance: Types of policies – Third party Insurance – Comprehensive coverage – Conditions and Exclusions – premium.

Unit 3: **Non life miscellaneous insurances**
Personal Accident Insurance, Health Insurance and Mediclaim policies, Liability Insurance, Burglary Insurance other Miscellaneous Insurances, Rural Insurance covers, Engineering Insurance and its Consequential loss covers, Aviation hull and Aviation liability.

Unit 4: **Underwriting and Settlement of Claims**
Proposal forms, Cover notes, Certificates of Insurance, Endorsements, Moral and Physical Hazards, Statistics Spreading of Risks, Premium Rating, Premium Loading.

Unit 5: **Settlement of Claims**
Claim procedure, TPAs: Claim forms, Investigation / Assessment, Essential Claim Documents, Settlement Limitation, Arbitration, Loss Minimization and Salvage.

References:

1. Insurance Institute of India – IC 34 – General Insurance
2. Insurance Institute of India – IC 45- General Insurance Underwriting
3. Module I, Principles and Practice of General Insurance, The Institute of Chartered Accountants of India: New Delhi.
4. H Narayanan, Indian Insurance: A Profile, Jaico Publishing House: Mumbai.
5. K.C. Mishra and G.E. Thomas, General Insurance - Principles and Practice, Cengage Learning: New Delhi

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GROUP A1

SKILL ENHANCEMENT COURSE - 4

LOGISTICS AND SUPPLY CHAIN MANAGEMENT

L: T: P-3:1:0

Course Outcome:

On successful completion of this course the students can:
CO1: Understand in depth supply chain management
CO2: Write down the details of designing the supply chain network
CO3: Learn in details with examples designing and planning transportation network
CO4: Learn the details of Information technology in supply chain
CO5: Identify the dimensions of logistics
CO6: Understand in depth the details of demand management and customer care

Unit 1: **Introduction to Supply Chain Management**
Supply chain – objectives, importance, decision phases, process view, competitive and supply chain strategies, achieving strategic fit, supply chain drivers, obstacles, framework, facilities, inventory, transportation, information, sourcing, pricing.

Unit 2: **Designing the Supply Chain Network**
Designing the distribution network, role of distribution, factors influencing distribution, design options – e-business and its impact, distribution networks in practice, network design in the supply chain, role of network, factors affecting the network design decisions, modelling for supply chain.

Unit 3: **Designing and Planning Transportation Networks**
Role of transportation, modes and their performance, transportation, infrastructure and policies, design options and their trade-offs, tailored transportation. SOURCING AND PRICING: Sourcing, In-house or Outsource – 3rd and 4th PLs – supplier scoring and assessment, selection, design collaboration, procurement process, sourcing planning and analysis. Pricing and revenue management for multiple customers, perishable products, seasonal demand, bulk and spot contracts.

Unit 4: **Information Technology in the Supply Chain - IT Framework**
Customer relationship management, internal supply chain management – supplier relationship management, transaction management, future of IT. Coordination in a supply chain: Lack of supply chain coordination and the Bullwhip effect, obstacle to coordination, managerial levers, building partnerships and trust , continuous replenishment and vendor-managed inventories, collaborative planning, forecasting and replenishment.

Unit 5: **Dimensions of Logistics**

Introduction: A macro and micro dimension, logistics interfaces with other areas, approach to analysing logistics systems, logistics and systems analysis, techniques of logistics system analysis – factors affecting the cost and importance of logistics.

Unit 6: **Demand Management and Customer Service**

Outbound to customer logistics systems, Demand Management, Traditional Forecasting, CPFRP, customer service, expected cost of stock-outs, channels of distribution.

References:

1. Sunil Chopra and Peter Meindl, Supply Chain Management – Strategy, Planning and Operation, Pearson.
2. Coyle, Bardi, Longley, The management of Business Logistics – A supply Chain Perspective, Thomson Press.
3. Supply Chain Management by Janat Shah Pearson Publication.
4. Donald J Bowersox, Dand J Closs, M Bixby Coluper, Supply Chain Logistics Management, TMH, Second Edition.

GROUP A2
SKILL ENHANCEMENT COURSE-5
CORPORATE TAX PLANNING

L: T: P-3:1:0

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 in respect of Free Trade Zone, Infrastructure Development and Backward areas

CO5: Learn in detail the provision of Income Tax Act relating to amalgamation

CO6: Understand the classification and characteristics of taxation relief

CO7: Deliberate the provisions of IT Act in relation to managerial decisions

Unit 1: Introduction:
Corporation tax, Tax Planning, Tax Evasion, Tax Avoidance, Tax Management, Dividend Tax, Domestic Company, Foreign Company.

Unit 2: a) **Tax Planning for new Business:** Location and Nature of Business, Forms of Business Organization

b)**Tax Planning and Financial Management Decisions**: Tax Planning relating to Capital Structure Decision, Dividend Policy, Inter-Corporate Dividends and Bonus Shares

Unit 3: **Tax Planning and Managerial Decisions**
Tax planning in respect of Own or Lease, sale of assets used for scientific research, make or buy decisions, repair, replace, renewal or renovation of an asset, shut-down or continue decisions.

Unit 4: Special Tax Provisions
Tax provisions in respect of Free Trade Zone, Tax provisions in respect of Infrastructure Development, Tax provisions in respect of Backward Areas, Tax provisions in respect of Tax Incentives to Exporters.

Unit 5: **Amalgamation**

Meaning of amalgamation under the Income-tax Act, Transactions not treated as amalgamation, Actual cost and written down value when assets are transferred in a scheme of amalgamation, When a capital asset (other than a block of assets) is transferred, When a block of asset is transferred, Assets in amalgamation not treated as transfer, Transfer of capital assets to amalgamated Indian company.

Unit 6: Tax Payment

Tax deduction at source, Tax collection at source, and Advance payment of tax, Relief for double taxation [Secs. 90, 90A and 91], ADT agreements [Sec. 90], Modes of granting relief under ADT agreements , Unilateral relief [Sec. 91], Double taxation relief in case of specified associations [Sec. 90A]

References:

1.Direct Tax Laws and Practices- Vibnod K. Singhania
2.Direct Taxes – H C Meharothra
3.Corporate tax planning & business tax procedures- Vinod K songhania

GROUP A2

SKILL ENHANCEMENT COURSE-6

COMPANY LAW AND SECRETARIAL PRACTICE

L: T: P-3:1:0

Course Outcome:

On successful completion of this course the students can:

CO1: Understand in depth features of Companies Act -2013 and types of companies

CO2: Learn in details the promotion of a Joint Stock Company and conversion

CO3: Write down the details of conducting the Board of Directors and Subcommittee meetings

CO4: Understand the procedure for alteration of Articles of Association and Memorandum of Association

CO5: Learn in detail the appointment of company secretary

CO6: Learn the preparation of minutes of various meetings

Unit 1: **Companies Act**
Introduction- companies Act 2013- features of companies Act - 2013, Types of companies-Public companies, Pvt company, statutory corporation, One person company, Dormant company, Associate company, Small company, Limited Liability Partnership- Application of Company Law to banking/insurance sector- Registrar of companies- functions, Ministry of Corporate affairs-functions; SEBI-functions of SEBI.

Unit 2: **Secretary**
Definition, Who can be company secretary, Appointment, General Legal position, Duties of a Company Secretary, Rights of Company Secretary, Liabilities of Company Secretary, Qualification for Appointment as secretary, Dismissal of the Secretary, Secretary in the Whole time practice, Secretarial Compliance certificate, Specimen form

Unit 3: Company Formation and Conversion
Company Formation and Conversion Choice of the form of the business entity, Conversion/reconversion of one form of business entity into another, Procedure for incorporation of private/public companies, Companies limited by guarantee and unlimited companies and their conversion/re-conversion registration., Obtaining certificate of commencement of business, obtaining certificate of re-registration, Commencement of new business and certification,

Unit 4: **Procedure for alteration of various clauses of memorandum**
Procedures for alteration of articles, Effect of alteration, specimen forms: Procedure for issue of Shares – Public Issue, Rights Issue and Bonus Shares, Issue of Shares at Par/Premium/Discount; Issue of Shares on Preferential /Private Placement Basis – Allotment, Calls on Shares and Issue of Certificates – Issue of Sweat Equity Shares,

Employees Stock Option Scheme (ESOPs), Employees Stock Purchase Scheme (ESPS), Shares with Differential Voting Rights

Unit 5: Meetings

Collective Decision Making Forums, Authority, Accountability, Delegation and Responsibility ; Board Meetings , Convening and Management of Meetings of Board and Committees; Preparation of Notices and Agenda Papers, General Meetings, Convening and Management of Statutory Meeting, Annual and Extra-Ordinary General Meetings, Voting through Electronic Means; Conducting a Poll and Adjournment of a Meeting; Post-Meeting Formalities, Preparation of Minutes and Dissemination of Information and Decisions

References:

1. S. Srikanth , Shanti Rekha Rajagopal ,Revathy Blakrishnan, Corporate Laws and
    Secretarial Practice, Jain Book
2. M C Kuchhal, Secretarial Practice, Vikas Publishing House, New Delhi.
3. Sangeet Kedia, Advanced Company Law And Practice, Pooja Law Publishing Company,

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GROUP A2

SKILL ENHANCEMENT COURSE-7

QUANTITATIVE DECISION TOOLS

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L: T: P-3:1:0

Course Outcome:

On successful completion of this course the students can:
CO1: Understand in depth the characteristics and features of statistics
CO2: Learn the details of methods and sources of collection of data
CO3: Understand in details with examples Measures of central tendency
CO4: Understand in detail the characteristics and application of correlation and regression
CO5: Understand in details the classification and application of correlation
CO6: Deliberate the characteristics of Index numbers
CO7: Learn the characteristics of Testing of hypothesis with application
CO8: Learn the creation of variables and entering data using SPSS

Unit 1: **Introduction**
Meaning and definition of statistics, functions, advantages, limitations- collection of data - methods of collecting primary data, and sources of secondary data - classification and tabulation-SPSS –Introduction, uses, creation of variables and entering data.

Unit 2: **Measure of central tendency**
Meaning and Definition of Averages-Arithmetic mean, Median, Mode [grouping method], standard deviation, Calculation of mean, median and Standard deviation using SPSS.

Unit 3: **Correlation**
Meaning and Definition, types of correlation, Methods of calculating correlation co-efficient [Karl pear sons and Spearman's correlation] calculation of correlation using SPSS; Regression-Meaning and Definition, Distinction between correlation and Regression, Regression equations and estimations Calculation of Regression using SPSS.

Unit 4: **Index Numbers**
Definition – Types – Methods of Construction and Problems in the Construction – Cost of living index numbers.

Note-Besides solving problems chapter-wise in class rooms, teach using SPSS in computer lab.

Unit 5: **Testing of Hypothesis**

Meaning of hypothesis, types of hypotheses, test of Significance Procedure of testing hypothesis – Z test, one sample t test, Chi square test.

References:

1. Fundamentals of Statistics: D. N. Elhance, Veena Elhance and B. M. Aggarwal
2. Statistical Methods: S. P Gupta.
3. Fundamentals of Statistics: S.C Gupta
4. Practical Statistics: R S N Pillai and Bhagavathi
5. Statistics (Theory, Methods and Application): D.C. Sancheti and V.K. Kapoor
6. Statistics for Management: Richard I. Levin and David S. Rubin
7. Statistics: Dr. B.H. Suresh, Dr. G.H. Mahadevaswamy, Nithya Publications, Mysore.

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GROUP A2
SKILL ENHANCEMENT COURSE-8
BUSINESS RESEARCH METHODS

L: T: P-3:1:0

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: Understand the details of types of Business Research and Research design

CO4: Identify and contribute to the discipline of commerce and management through the research

CO5: Deliberate the details of Data analysis

CO6: Identify the details of Research Report

CO7: Specify in details with examples sampling and hypothesis testing

Unit 1: **Introduction to Business Research**
Meaning, types, criteria of good research, scientific approach to research in physical and management science, limitations of applying scientific methods in business research problems, ethical issues in business research, research process, problem formulation, preparation of business research plan/proposal.

Unit 2: **Business Research Design**
Types of business research, Exploratory, Descriptive, and Causal research, Exploratory research: Meaning, suitability, collection, hypothesis, formulation, Descriptive research: Meaning, types of descriptive studies, data collection methods, Causal research: Meaning, various types of experimental designs, types of errors affecting research design.

Unit 3: **Data Collection**
Primary and Secondary data – Sources – advantages/disadvantages, Data collection Methods – Observations, Survey, Interview and Questionnaire design, Qualitative Techniques of data collection. Measurement and Scaling Techniques: Nominal Scale, Ordinal Scale, Interval Scale, Rating Scale, Criteria for good measurement, attitude measurement.

Unit 4: **Sampling and Hypothesis Testing**
Sampling: Meaning, Steps in Sampling process, Types of Sampling – Probability and non probability Sampling Techniques, Errors in sampling. Hypothesis: Meaning, Types, characteristics, sources, Formulation of Hypothesis, Errors in hypothesis testing.

Unit 5: **Data Analysis**
Editing, Coding, Classification, Tabulation, Univariate, Bivariate and multivariate Analysis, Interpretation.

Unit 6: **Research Report**
Types, advantages, disadvantages, Components of research reports, format, chapterisation, language, referencing.

References:

1. Marketing Research – Naresh K Malhotra – Pearson Education.
2. Business Research Methods- S.N.Murthy/U.Bhojanna- Excel Books.
3 .Business Research Methods–Donald R. Cooper & Pamela S Schindler,TMH.
4. Marketing research: Text and cases- Rajendra Nargundkar – TMH.
5. Business Research Methods – Alan Bryman & Emma Bell, Oxford.
6. Research Methodology – C R Kothari- Vishwa Prakashan.
7. Business Research Methods – William G Zikmund- Thomson,
8. Methodology of Research in Social Sciences – O R Krishnaswami, M Ranganatham, HPH.

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GROUP A2
SKILL ENHANCEMENT COURSE-9
PROJECT WORK

L:T:P- 1:0:3

    C1   –   Proposal of Project Work - 15 Marks
    C2   –   Progress of Project Work - 15 Marks
    Viva -   20 Marks
Valuation of Report – 50 Marks

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 organization

CO3: Convince and communicate effectively

CO4: Learn in detail and able to absorb as an employee by the employer

CO5: Specify and analyze the components of project report and prepare the report effectively

CO6: develop leadership qualities

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GROUP B
SEMESTER V
DISCIPLINE SPECIFIC ELECTIVE
CONSUMER AFFAIRS

L: T: P-4:1:0

Course Outcome:

On successful completion of the project work the students are able to:
CO1: Learn conceptual frame work of consumer and consumer market
CO2: Understand in depth the characteristics of consumer protection law in India
CO3: Deliberate the details of role played by the advisory bodies at different level
CO4: Indentify the grievance redressal mechanism
CO5: Specify the details of role played by industry regulator in consumer protection
CO6: Understand in depth the consumer movement in India

Unit 1: Conceptual Framework
Consumer and Markets: Concept of Consumer, Nature of markets: Liberalization and Globalization of markets with special reference to Indian Consumer Markets, E-Commerce with reference to Indian Market, Concept of Price in Retail and Wholesale, Maximum Retail Price (MRP), Fair Price, GST, labelling and packaging along with relevant laws, Legal Metrology. Experiencing and Voicing Dissatisfaction: Consumer buying process, Consumer Satisfaction/dissatisfaction-Grievances-complaint, Consumer Complaining Behaviour: Alternatives available to Dissatisfied Consumers; Complaint Handling Process: ISO 10000 suite

Unit 2: The Consumer Protection Law in India
Objectives and Basic Concepts: Consumer rights and UN Guidelines on consumer protection, Consumer goods, defect in goods, spurious goods and services, service, deficiency in service, unfair trade practice, restrictive trade practice. Organizational set-up under the Consumer Protection Act

Unit 3: Advisory Bodies
Consumer Protection Councils at the Central, State and District Levels; Adjudicatory Bodies: District Forums, State Commissions, National Commission: Their Composition, Powers, and Jurisdiction (Pecuniary and Territorial), Role of Supreme Court under the CPA with important case law.

Unit 4: Grievance Redressal Mechanism
Grievance Redressal Mechanism under the Indian Consumer Protection Law , 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 available; Temporary Injunction, Enforcement of order, Appeal, frivolous and vexatious complaints; Offences and penalties. Leading Cases decided under Consumer Protection law by Supreme Court/National

Commission: Medical Negligence; Banking; Insurance; Housing & Real Estate; Electricity and Telecom Services; Education; Defective Products; Unfair Trade Practices.

Unit -5: Role of Industry Regulators in Consumer Protection.
Banking: RBI and Banking Ombudsman. ii. Insurance: IRDA and Insurance Ombudsman iii. Telecommunication: TRAI iv. Food Products: FSSAI v. Electricity Supply: Electricity Regulatory Commission vi. Real Estate Regulatory Authority

Unit 6: **Contemporary Issues in Consumer Affairs**
Consumer Movement in India: Evolution of Consumer Movement in India, Formation of consumer organizations and their role in consumer protection, Misleading Advertisements and sustainable consumption, National Consumer Helpline, Comparative Product testing, Sustainable consumption and energy ratings.
     Quality and Standardization: Voluntary and Mandatory standards; Role of BIS, Indian Standards Mark (ISI), Ag-mark, Hallmarking, Licensing and Surveillance; Role of International Standards: ISO an Overview

 Note: Unit 2, 3 and 4 refer to the Consumer Protection Act, 1986. Any change in law would be added appropriately after the new law is notified

References:

1. Khanna, Sri Ram, Savita Hanspal, Sheetal Kapoor, and H.K. Awasthi. (2007) Consumer Affairs, Universities Press.
2. Choudhary, Ram Naresh Prasad (2005). Consumer Protection Law Provisions and Procedure, Deep and Deep Publications Pvt Ltd.
3. G. Ganesan and M. Sumathy. (2012). Globalisation and Consumerism: Issues and Challenges, Regal Publications
4. Suresh Misra and Sapna Chadah (2012). Consumer Protection in India: Issues and Concerns, IIPA, New Delhi
5. Rajyalaxmi Rao (2012), Consumer is King, Universal Law Publishing Company
6. Girimaji, Pushpa (2002). Consumer Right for Everyone Penguin Books.
7. E-books :- www.consumereducation.in
8. Empowering Consumers e-book,
9. e-book, www.consumeraffairs.nic.in

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GROUP B
SEMESTER V
DISCIPLINE SPECIFIC ELECTIVE
INTERNATIONAL BUSINESS

L: T: P-4:1:0

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

CO6: Identify the function of WTO and regional integrations

CO7: Understand in depth characteristics of foreign exchange market

CO8: Identify the details of facilities provided by the International monetary institutions

Unit 1: Introduction
Globalisation – Meaning and implications - Globalisation of markets and production – The emerging global economy - Drivers of Globalisation. Modes and entry strategies of international business – arguments for and against – trends in international trade. Differences between domestic and international business.

Unit 2: International Business Environment
Cultural aspects, values and norms, social structure, religious and ethical systems, language, education, implications of cultural differences on business. International business environment, Political and legal factors, political systems, legal systems, International business environment, Economic factors, the determinants of economic development. Tariffs, subsidies, local content requirements, administrative policies, anti dumping policies, political and economic arguments for intervention ,Development of the world trading system.

Unit 3: WTO and Regional Integrations

GATT, the Uruguay round of negotiations. WTO, genesis and functions, the future of WTO. Regional Integrations, Trading Blocks, nature and levels of integration, arguments for and against regional integration, Trading blocks, European Union, ASEAN, APEC, NAFTA, SAARC.

Unit 4: Multinational Corporations

Organisation, design and structures, head quarters and subsidiary relations in multinational corporations.

Unit5: Foreign Exchange Market

Functions, nature of foreign exchange market, the trading mechanism, exchange rate determination, balance of trade, stability of exchange rate, currency convertibility

Unit 6: International Monetary System

Funding facilities and strategies of IMF and World Bank, Expatriation and Repatriation, Ethical dimensions in International Business.

References:

1. Charles W L Hill. And Arun Kumar Jain. International Business: competing in the global market place, Mc Graw-Hill.
2. John D. Daniels Lee H Radebaugh, International Business: Environments and Operations Addison Wesley.
3. Justin Paul – International Business – Prentice Hall of India.
4. Oded Shenkar Yadong Luo: International Business – John Wiley and Co.
5. Wild J. John, Wild L. Keneth and Han C. Y. Jerry, International Business: An integrated approach, Prentice Hall
6. Alan M. Rugman and Richard M. Hodgetts – International Business by Pearson Education.

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GROUP B

SEMESTER V

DISCIPLINE SPECIFIC ELECTIVE

GOODS AND SERVICES TAX-I

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L: T: P-4:1:0

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: Understand the provisions of integrated goods and service Tax Act, 2017

CO6: Learn in depth the provisions relating to place of supply of goods imported into, or exported from India

CO7: Identify the details of provisions in relation to Time of supply of goods

Unit 1: Introduction to GST
Indirect tax Structure in India, Issues in Indirect Tax, Rationale for Transition to GST; GST-Meaning, Definition of GST, Types of GST, Features of GST, Benefits of GST, Problems on Computation of GST.

Unit 2: Definitions
Actionable claim, Address of Delivery, Aggregate Turnover, Agriculturist, Associated enterprises, Business, GST Council, Credit note and Debit note, Deemed exports, Draw-back, Electronic Credit ledger, Exempt Supplies, Input, Input service, Input Service Distributor, Input Tax, Input tax Credit, Intra-state supply of Goods, Job work, Reverse Charge, Invoice, Composition Levy, Mixed Supply, outward supply, Person, Turnover in State

Unit 3: Levy and Collection of Tax

Scope of supply; Levy of GST; Liability of tax payable person, Rate and value of tax, meaning and conditions of supply, list of transactions without consideration list of neither a supply of goods, nor supply of services; meaning and treatment of mixed supply: meaning and treatment of composite supply: reverse charge mechanism: Composition levy.

Unit 4 : The Integrated Goods and Service Tax Act,2017

Short title, extent and commencement; Definitions; Central tax, Customs frontier of India, Export of Goods and Services, Import of goods and services; Location of Recipient of service, Location of supplier of service; Appointment of officers; Levy and Collection; Power to grant exemption from tax; Inter-State supply;. Intra-State supply; Supplies in territorial waters

Unit 5: Place of supply of goods other than supply of goods imported into, or exported from India

Place of supply of goods imported into, or exported from India; Place of supply of services where location of supplier and recipient1 is in India; Place of supply of services where location of supplier or location of recipient is outside India; Special provision for payment of tax by a supplier of online information and database access or retrieval services

Unit 6: 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.

References:

1. Taxmann publications
2. Compendium on Goods and service tax-Dr. Manju S 3.www.cbec.gov.in/
4. www.ICSI.edu.in
5. www.icai.org.
6. Students Guide To GST & Customs Law Vinod K Singhania

ENE31001

GROUP B
SEMESTER V
DISCIPLINE SPECIFIC ELECTIVE
FINANCIAL MANAGEMENT-I

L: T: P-4:1:0

Course Outcome:

On successful completion of this course the students can:

CO1: Identify the details of various sources of finance

CO2: Learn the characteristics of different methods of time value of money and its application to investment decision

CO3: Learn the classification and characteristics of cost of capital

CO4: Identify the characteristics of capital structure and factors affecting the capital structure

CO5: Learn the details of Capital Budgeting

CO6: Understand the classification and characteristics of Dividend theories

Unit 1: Introduction to financial management
Meaning – scope – goals of financial management – sources of finance.

Unit 2: Time value of Money
Present value and future value concepts-present value of annuity, application of present and future value to investment decisions, preparation of amortization table.

Unit 3: Cost of capital
Meaning- importance of cost of capital in financial decisions, determination of specific costs-cost of debt- cost of preference share capital-cost of equity, cost of retained earnings-weighted average cost of capital-Leverages- meaning- types problems on Leverages.

Unit 4: Capital Structure
Meaning-optimum capital structure-features of   appropriate   capital structure-factors influencing   capital structure-theories of   capital structure-NI   approach-

NOI approach, MM approach, traditional approach, determination of optimal debt-equity mix.

Unit 5: Capital budgeting
Meaning-features, role of capital budgeting, techniques of capital budgeting-payback period, average rate of return, net present value, profitability index, internal rate of return, discounted pay back method. Application of excel in capital budgeting techniques.

Unit 6: Dividend decisions
Meaning, Dividend decisions, Dividend policies - objectives of dividend policy-determinants of dividend policy-dividend relevance- Walter's model, Gordon model-Dividend irrelevance-MM hypothesis.

References:

1. Financial Management I.M.Pandey.
2. Financial Management Ravi Kishore
3. Financial Management Dr.V.R.Palanivelu
4. Financial Management Kulkarni
5. Financial Management Tulsian P C
6. Financial Management Khan and Jain

ENE32001

GROUP B

SEMESTER V

DISCIPLINE SPECIFIC ELECTIVE

ADVANCED COST AND MANAGEMENT ACCOUNTING-I

L: T: P-4:1:0

Course Outcome:

On successful completion of this course the students can:

CO1:   Learn in depth various Costing methods

CO2:   Understand the details of contract costing and process costing

CO3:   Identify reasons for reconciliation of cost and financial accounts

CO4:   Learn in depth the details of Activity based costing

CO5:   prepare the operating cost sheet

Unit 1: Introduction to Costing Methods
Meaning, Importance and Categories, Cost accounting Standards- Generally Accepted Cost Accounting Principles (GACAP)- Purpose, Objective and Applicability.

Unit 2: **Contract costing**
Introduction- Contract account, Profit on incomplete contracts, work in progress, Contractee's Accounts, Escalation clause.

Unit 3: Process costing: Introduction, Distinction between Job costing, and process costing, process losses, inter-process profits, Joint products and by-products- Meaning, features, differences, problems on process accounts including joint and by products.

Unit 4: **Operating Costing**

Introduction, transport costing, standing charges, operating/running charges, and preparations of operating cost sheet.

Unit 5: Reconciliation of cost and financial accounts
Meaning, need for reconciliation, reasons for disagreement, reconciliation procedure, problems on reconciliation.

Unit 6: Activity based costing (ABC)
Definition, Features, Advantages, Differences between ABC and traditional costing, Allocation of overheads; Objectives of ABC, Development of ABC, Implementation of ABC, Problems on Computation of Activity Based Costing and Traditional Costing;

References:

1.Cost Accounting: N.K. Prasad
2.Cost Accounting: Nigam & Sharma :
3.Practical Costing: Khanna, Pandey & Ahuja
4: Cost Accounting: M.L. Agarwal
5.Cost Accounting: Jain & Narang
6.Cost Accounting: S.P. Iyengar

ENE33001

GROUP B
SEMESTER V
DISCIPLINE SPECIFIC ELECTIVE
RETAIL MANAGEMENT

L: T: P-4:1:0

Course Outcome:

On successful completion of this course the students can:

CO1:   Learn in depth the characteristics of retailing

CO2:   Understand in depth the details of retail consumer

CO3:   Identify and basis of retail market segmentation and strategies

CO4:   Specify the factors determining the retail location selection

CO5:   Understand in depth merchandise and managing them

CO6:   Learn in depth the details of retail operation and retail pricing

Unit 1: **Introduction to Retailing**
Concept of retailing, Functions of retailing, Terms and Definition, retail formats and types, Retailing Channels, Retail industry in India, Importance of retailing, Changing trends in retailing.

Unit 2: **Understanding the Retail Consumer**
Retail consumer behaviour, Factors influencing the Retail consumer, Customer decision making process, Types of decision making, Market research for understanding retail consume.

Unit 3: Retail Market Segmentation and Strategies

Market Segmentation and its benefits, kinds of markets, definition of Retail strategy, Strategy for effective market segmentation, Strategies for penetration of new markets, Growth strategies, Retail value chain.

Unit 4: Retail Location Selection
Importance of Retail locations, Types of retail locations, Factors determining the location decision, Steps involved in choosing a retail locations, Measurement of success of location.

Unit 5: Merchandise Management
Meaning of Merchandising, Factors influencing Merchandising, Functions of Merchandising Manager, Merchandise planning, Merchandise buying, Analyzing Merchandise performance.

Unit 6: Retail Operations and Retail Pricing
Store administration, Premises management, Inventory Management, Store Management, receipt Management, Customer service, Retail Pricing, Factors influencing retail prices pricing strategies, controlling costs.

References:

1. Retail Management 01 Edition S. C. Bhatia
2. Retail Management: Text and Cases (English, Paperback, Swapna Pradhan
3. Retail Management; Principles and Practices – R. Sudarshan
4. Retail Management PB (English, Paperback, Mathur U C)

ENF28001

GROUP C
SEMESTER VI
DISCIPLINE SPECIFIC ELECTIVE
INVESTMENT ANALYSIS AND PORTFOLIO MANAGEMENT

L: T: P-4:1:0

Course Outcome:

On successful completion of this course the students can:

CO1: Learn in depth the characteristics of investment

CO2: Understand in depth characteristics of financial system and stock market

CO3: Identify and use different models for portfolio analysis

CO4: Learn in depth capital asset pricing model

CO5: Identify the risk and return of investment

CO6: Understand in depth portfolio selection

CO7: Understand in depth the efficient market hypothesis and portfolio analysis

Unit 1: Introduction to Investment
Meaning, Financial and Economic Meaning, Characteristics, Objectives, Investment v/s Speculation, Investment v/s Gambling, Types of Investors and Investment avenues.

Unit 2: **Indian Financial System and Stock Market-Investment Planning,**
Introduction to Stock Market, Overview of Indian Financial System, Market Indices, Methods of Computation of Market Indices.

Unit 3: Portfolio Management

Meaning, Phases, Evolution, Role of Portfolio Management, Calculation of Risk and Return, Fundamental Analysis: Economic Analysis, Industry analysis and Company analysis and Technical Analysis: Meaning, Dow Theory, basic Principles, Trends and charts.

Unit 4: Share and Bond Valuation-Share

Concepts and present value, share valuation model, constant Growth Model, Multiple Growth Model, Discount rate, Multiplier Approach to share values and Regression Analysis. Bonds: Bond Returns, Prices, Pricing Theories, Bond Risks and Bond Duration.

Unit 5: Efficient Market Hypothesis and Portfolio Analysis

EMH: Random Walk Theory, the Efficient Market Hypothesis, Forms of Market Efficiency. Portfolio Analysis: Expected Return and Risk of Portfolio, Reduction of Portfolio Risk through Diversification, Portfolio with more than two Securities – solved examples.

Unit 6: Portfolio Selection

Feasible set of Portfolios, Selection of Optimal Portfolio, Limitations of Markowitz Model and Single Index Model and Multi Index Model. Capital Asset Pricing Model and Arbitrage Pricing Theory.

References:

1.Investment analysis and Portfolio Management Prasanna Chandra
2.Security Analysis and Portfolio Management Punithavathi pandian
3.Security Analysis and portfolio Management Ambika Prasad Dash
4.Security Analysis and Portfolio Management, M. Ranganatham, R. Madhumathi

ENF29001

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GROUP C

SEMESTER VI

DISCIPLINE SPECIFIC ELECTIVE

FINANCIAL DERIVATIVES

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L: T: P-4:1:0

Course Outcome:

On successful completion of this course the students can:

CO1: Learn in depth the characteristics of financial derivatives and derivatives market

CO2: Deliberate the characteristics of futures and forwards
CO3: Understand in details with examples options
CO4: Deliberate the classification and characteristics of financial swaps
CO5: Write down the details of commodity market
CO6: Identify in depth credit derivatives

Unit 1: Financial Derivatives
Introduction, -meaning- Types of financial derivatives - Features of derivatives market - Factors contributing to the growth of derivatives - functions of derivative markets - traders in derivatives markets - Derivatives market in India

Unit 2: Futures and forwards
Meaning, differences-valuation of futures, Mechanics of buying & selling futures, Margins, Hedging using futures -specification of futures - Commodity futures, Index futures, interest rate futures – arbitrage opportunities.

Unit 3: **Options:**

Types of options, option pricing, factors affecting option pricing – call and put options on dividend   and non-dividend paying   stocks put-call parity   -   mechanics   of   options - stock options - options on stock index - options on futures – interest rate options. Concept of exotic option. Hedging & Trading strategies involving options, valuation of option: basic model, one step binomial model, Black and Scholes Model,

Unit 4: Financial Swaps

features and uses of swaps - Mechanics of interest rate swaps – valuation of interest rate swaps – currency swaps – valuation of currency swaps

Unit 5: Commodity derivatives

Commodity futures market-exchanges for commodity futures in India, Forward Market Commissions and regulation-commodities traded – trading and settlements – physical delivery of commodities

Unit6: Credit Derivatives

Meaning, common credit derivatives, types of credit dervates, Credit Default swaps(CDS), Total Return swaps, Collateralized debt obligations(CDO), Indian scenario.

References:

1. Financial Derivatives- Vohra and Bagri
2. Capital Market Instruments Kotreshwar G
3. Fundamental Financial Derivatives N R   Parasuraman
4. Financial Derivatives S L Guptha

ENF30001

GROUP C

SEMESTER VI

DISCIPLINE SPECIFIC ELECTIVE

GOODS AND SERVICES TAX AND CUSTOM DUTY-II

L: T: P-4:1:0

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 in relation to value of taxable supply and input tax credit

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

CO6: Understand the procedure of registration under GST
CO7: Prepare tax invoice, credit and debit notes

Unit 1: 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 2: 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)

Unit 3: Tax Invoice, Credit and Debit Notes

Tax invoice; Prohibition of un authorised collection of tax; Amount of tax to be indicated in tax invoice and other documents ; Credit and debit notes.

Unit 4: Registration under GST

Persons liable for registration, compulsory registration, Procedure for Registration, Rejection of application for registration, cancellation of Registration

Unit 5: Returns

Brief introduction to various GSTRS-procedure for filing various returns.

Unit 6: Customs Act 1962

Meaning- Notified goods –specified goods- Prohibition of importation and exportation under sec 11- types of customs duty- Basic customs duty, Education Cess, Anti dumping duty, Safeguard Duty, IGST, GST Compensation Cess- Computation of Assessable value and applicable duties. Exports – Meaning- zero rated supply.

References:

1. Taxmann publications
2. Compendium on Goods and service tax-Dr. Manju S
3. www.cbec.gov.in/
4. Systematic Approach GST- Dr. Ravi. Gupta, Dr. Girish. Ahuja

ENF31001

GROUP C
SEMESTER VI
DISCIPLINE SPECIFIC ELECTIVE
FINANCIAL MANAGEMENT –II

L: T: P-4:1:0

Course Outcome:

On successful completion of this course the students can:

CO1: Deliberate the details of working capital management

CO2: Learn in depth the details of cash management

CO3: Understand the details of working capital financing

CO4: Deliberate in details with examples Venture capital financing

CO5: Learn in depth the details of shareholders value creation

CO6: Deliberate in depth International financial management

Unit 1: Working Capital Management
Meaning, Features, types of working capital, factors influencing working capital, level of current assets, operating cycle and cash cycle, current assets financing policy

Unit 2: Cash Management
Cash budget cash collection and disbursement, options for investment of surplus funds, credit management- credit policy variables-credit evaluation. Inventory management- need for inventories; order quantity-EOQ model- monitoring and control of inventories-ABC- JIT techniques.

Unit 3: Working Capital Financing
Leasing-types of leases, Rationale for leasing, operating leases, leasing as a financing decision; hire purchase financing- Hire purchase financing v/s lease financing, instalment sale, evaluation of Hire purchase financing

Unit 4: Venture Capital Financing
Meaning, features, development of venture capital in India, stages in venture financing- the business plan- essentials of a business plan, the process of venture capital financing-Methods of venture financing; Disinvestment mechanisms

Unit 5: Share Holder Value Creation

Financial goals and strategy, shareholder value creation- market value added, Market to book value, Economic value added(EVA)- Balanced scorecard- the learning and growth perspective, significance of balanced score card , implementation of score card.

Unit 6: International Financial Management

Foreign exchange market, foreign exchange rates- spot exchange rates, bid-ask rate, forward exchange rates- foreign exchange risk- transaction exposure, economic exposure, translation exposure, hedging of foreign exchange risk- foreign currency option, money market operations- financing international operations.

References:

1. Financial Management I.M.Pandey.
2. Financial Management Ravi Kishore
3. Financial Management Dr.V.R.Palanivelu
4. Financial Management Kulkarni
5. Financial Management Tulsian P C
6. Financial Management Khan and Jain

ENF32001

GROUP C
SEMESTER VI
DISCIPLINE SPECIFIC ELECTIVE
ADVANCED COST AND MANAGEMENT ACCOUNTING-II

L: T: P-4:1:0

Course Outcome:

On successful completion of this course the students can:

CO1: Understand the details of management accounting

CO2: Learn in depth the details of financial statement analysis techniques

CO3: Analyze the inflow and outflow of cash and able to prepare cashflow statement

CO4: Understand the characteristics of different types of ratios

CO5: Learn in depth budget and budgetary control and prepare various budget for
         different activities of the business

CO6: Learn in depth marginal costing and able to effective decision regarding make or buy,
         accepting foreign order, continuance or discontinuance of manufacturing a products

Unit 1: Introduction
 Meaning and Definition of Management Accounting, Scope and Objectives of
Management Accounting-Differences between Management Accounting and Financial
Accounting –Management accounting and Cost accounting-Limitations of Management
Accounting.

Unit 2: Analysis of Financial Statements
Common Size Statements, Comparative Statement, Trend analysis.

Unit 3: Ratio Analysis
Meaning and Objectives-Types of rations - (A) Profitability Ratios-GP ratio - NP Ratio-
Operating ratio- Operating profit ration-Return on capital employed ratio- EPS, (B)
Turnover Ratios-working capital   turnover   ratio-   Stock   Turnover ratio-Fixed assets
turnover ratio-Debtors turnover Ratio-Creditors turnover Ratio, (C) Financial ratios –
Current   Ratio-liquidity ratio-Debt-equity ratio-Proprietary Ratio-Capital gearing Ration-
Advantagesand Limitations of Ratios- Construction of Balance sheet using ratios.

Unit 4: Cost Flow Statement

Meaning, Definition, Uses and Limitations-Differences between funds flow statement and cash flow statement-Preparation of Cash flow statement (AS-7): Direct method and Indirect Method.

Unit 5: Marginal Costing
Definition - Basic concepts – Assumptions - Marginal Cost statement – Contribution-Break Even Analysis-P/V Ratio-Margin of Safety - Decision areas - Make or Buy and Pricing.

Unit 6: Budget and Budgeting Control
Definition - Basic Concepts - Budget Manual - Key factor - Classification of Budgets - Problems on cash budget, sales budget, Flexible Budget, Cash Planning and Motives for holding cash.

References:

1. Cost Accounting: N.K. Prasad
2. Cost Accounting: Nigam & Sharma :
3. Practical Costing: Khanna, Pandey & Ahuja
4. Cost Accounting: M.L. Agarwal
5.Cost Accounting: Jain & Narang
6.Cost Accounting: S.P. Iyengar

ENF33001

GROUP C
VI SEMESTER
DISCIPLINE SPECIFIC ELECTIVE
ORGANISATIONAL BEHAVIOUR

L: T: P-4:1:0

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
Meaning, definition, historical development, fundamental principles of OB, contributing disciplines, approaches, challenges and opportunities.

Unit 2: Foundations of Individual Behaviour
Individual behaviour: Foundations of individual behaviour. Ability: Intellectual abilities, Physical ability, the role of disabilities. Personality: Meaning, formation, determinants, traits of personality, personality attributes influencing OB. Attitude: Formation, components of attitudes, relation between attitude and behaviour.

Unit 3: Perception and Emotions- Perception: Process of perception, factors influencing perception, link between perception and individual decision making. Emotions: Affect, mood and emotion and their significance, basic emotions, emotional intelligence, self-awareness, self-management, social awareness, relationship management.

Unit 4: Motivation and Leadership
Motivation- meaning, theories of motivation-needs theory, two factor theory, Theory X and Y, application of motivational theories. Leadership: Meaning, styles of leadership, leadership theories, trait theory, behavioural theories, managerial grid, situational theories-Fiedler's model, SLT, transactional and transformation leadership.

Unit 5: Group Behaviour
Definition, types, formation of groups, building effective teams. Conflict: Meaning, nature, types, process of conflict, conflict resolution. Power and politics: Basis of power, effectiveness of power tactics.

Unit 6: Emerging Challenges
Emerging challenges, managing diversity, globalisation, technology transformation, e - business, promoting ethical behaviour.

References:

1.Organisational behaviour, Stephen P Robbins, Timothy A. Judge, Neharika Vohra, 14th
    Edition, Pearson
2. Organization Behaviour – Ashwathappa, Himalaya Publication House
3. Organisational Behaviour: A modern approach - Arun Kumar and Meenakshi, Vikas
    Publishing House
4. Organisational Behaviour - Fred Luthans, 12/e, McGraw Hill International
5 Management and Organisational Behaviour - Laurie J Mullins, Pearson education
6. Fundamentals of Organisational Behaviour - Slocum/Hillriegel, Cengene Learning

B.COM

Question Paper Pattern

(For all courses except Quantitative Techniques, Computerised Accounting and E-filling of returns)

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

1. ………………………………………………………………………………..………………

7. ……………………………………………………………….…………………………………….

OR

8. …………………………………………………………………………………………………….

PART-C

Answer any four of the following. Each question carries 5 marks.   **4X5=20**

9. …………………………………………………………………………………………………

10. ………………………………………………………….…………………………..………….

11. ……………………………………………………….……………………………..……….

12. ……………………………………………………………………………………………….

13. ……………………………………………………………………………… ………·····

14 …………………………………………………………………………………………………

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B.COM

Question Paper Pattern
4.5 Quantitative Techniques

Time: 3 hrs   **Max. Marks: 70**

Part-A

Answer the following. Each question carries two marks   **10X2=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 marks   **3X10=30**

7. …..………………………………………………………………………………

8. …………………………………………………………………………………….

9. ………………………………………………………….……………..……………

10. ……………………………………………………………..……………………………….

B.COM

Question Paper Pattern
3.6 Computerized Accounting System (SEC-1) / 4.6 E-filling of returns (SEC-2)

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**

5. ……………………………………………………………………..…………………………………

6. ……………………………………………………………………………………………………
7. ……………………………………………………………………………………………………
8. ……………………………………………………………………………………………………

82

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE
(Autonomous)

Ooty Road, Mysuru-570025

Model Curriculum Structure for
==Bachelor of Computer Applications (BCA)Programme==
(Basic and Honours degree),
Model Syllabus for I and II Semesters
and
Open Elective Courses in Computer Applications

As per
NATIONAL EDUCATION POLICY - 2020
(NEP-2020)

2021-22 & 2022-23 on words
(Revised)

DEPARTMENT OF COMPUTER SCIENCE

The objectives of the BCA Program

1. The primary objective of this program is to provide a foundation of computing principles and business practices for effectively using/managing information systems and enterprise software

2. It helps students analyze the requirements for system development and exposes students to business software and information systems

3. This course provides students with options to specialize in legacy application software, system software or mobile applications

4. To produce outstanding IT professionals who can apply the theoretical knowledge into practice in the real world and develop standalone live projects themselves

5. To provide opportunity for the study of modern methods of information processing and its applications.

6. To develop among students the programming techniques and the problem- solving skills through programming

7. To prepare students who wish to go on to further studies in computer science and related subjects.

8. To acquaint students to Work effectively with a range of current, standard, Office Productivity software applications

Program Outcomes: BCA (3 Years) Degree

1. **Discipline knowledge:** Acquiring knowledge on basics of Computer Science and ability to apply to design principles in the development of solutions for problems of varying complexity

2. **Problem Solving:** Improved reasoning with strong mathematical ability to Identify, formulate and analyze problems related to computer science and exhibiting a sound knowledge on data structures and algorithms.

3. **Design and Development of Solutions:** Ability to design and development of algorithmic solutions to real world problems and acquiring a minimum knowledge on statistics and optimization problems. Establishing excellent skills in applying various design strategies for solving complex problems.

4. **Programming a computer:** Exhibiting strong skills required to program a computer for various issues and problems of day-to-day applications with thorough knowledge on programming languages of various levels.

5. **Application Systems Knowledge**: Possessing a sound knowledge on computer application software and ability to design and develop app for applicative problems.

6. **Modern Tool Usage:** Identify, select and use a modern scientific and IT tool or technique for modeling, prediction, data analysis and solving problems in the area of Computer Science and making them mobile based application software.

7. **Communication:** Must have a reasonably good communication knowledge both in oral and writing.

8. **Project Management:** Practicing of existing projects and becoming independent to launch own project by identifying a gap in solutions.

9. **Ethics on Profession, Environment and Society:** Exhibiting professional ethics to maintain the integrality in a working environment and also have concern on societal impacts due to computer-based solutions for problems.

10. **Lifelong Learning:** Should become an independent learner. So, learn to learn ability.

11. **Motivation to take up Higher Studies:** Inspiration to continue educations towards advanced studies on Computer Science.

Additional Program Outcomes: BCA Degree (Hons)

The Bachelor of Computer Application (BCA (Hons)) program enables students to attain following additional attributes besides the afore-mentioned attributes, by the time of graduation:

1. Apply standard Software Engineering practices and strategies in real -time software project development

2. Design and develop computer programs/computer -based systems in the areas related to AI, algorithms, networking, web design, cloud computing, IoT and data analytics.

3. Acquaint with the contemporary trends in industrial/research settings and thereby innovate novel solutions to existing problems

4. The ability to apply the knowledge and understanding noted above to the analysis of a given information handling problem.

5. The ability to work independently on a substantial software project and as an effective team member.

I-C. Model Program Structures for the Under-Graduate Programs in Universities and Colleges in Karnataka

Bachelor of Computer Applications (Basic/Hons.) with Computer Applications as core subject

Sem.	Discipline Core (DSC) (Credits) (L+T+P)	Discipline Elective (DSE) / Open Elective (OE) (Credits) (L+T+P)	Ability Enhancement Compulsory Courses (AECC),		Skill Enhancement Courses (SEC)			Total Credits
					Skill based credits (L+T+P)	Value based (Credits) (L+T+P)		
I	CA C-1 (3+2) CA C-2 (3+2) CA C-3 (3)	OE-1 (3)	L1-1(3), L2-1(3) (4 hrs. each)	Environmental Studies (3)		Physical Education for fitness (1) (0+0+2)	Health & Wellness (1) (0+0+2)	26
II	CA C-4 (3+2) CA C-5 (3+2) CA C-6 (3)	OE-2 (3)	L1-2(3), L2-2(3) (4 hrs. each)		SEC-1: Alternative SEC in place of digital Fluency (2) (1+0+2)	Physical Education – Yoga (1) (0+0+2)	NCC/NSS/R&R(S &G) / Cultural (1) (0+0+2)	26
			Exit option with Certificate in Computer Applications (50 credits)					
III	CA C-7 (3+2) CA C-8 (3+2) CA C-9 (3)	OE-3 (3)	L1-3(3), L2-3(3) (4 hrs each)	Constitution of India (3)		Physical Education-Sports (1)(0+0+2)	NCC/NSS/R&R(S &G)/Cultural (1) (0+0+2)	26
IV	CA C-10 (3+2) CA C-11 (3+2) CA C-12 (3)	OE-4 (3)	L1-4(3), L2-4(3) (4 hrs each)		SEC-2: Alternative SEC in place of AI (2) (1+0+2)	Physical Education - Games (1) (0+0+2)	NCC/NSS/R&R(S &G)/Cultural (1) (0+0+2)	26
			Exit option with Diploma in Computer Applications (100 credits)					
V	CA C-13 (3+2) CA C-14 (3+2) CA C-15 (3)	CA E-1 (3) Vocational-1 (3)			SEC-4: Professional Communication (3)			23
VI	CA C-16 (3+2) CA C-17 (3+2) CA C-18 (3)	CA E-2 (3) Vocational-2 (3)			SEC-3: Alternative SEC in place of Cyber(2) (1+0+2)			23
			Exit Option with Bachelor of Computer Applications Degree, BCA Degree (142 credits)					
VII	CA C-19(3+2) CA C-20(3+2) Internship (2)	CA E-3 (3) Vocational-3 (3) Res. Methodology (3)						21
VIII	CA C-21 (3+2) CA C-22 (3)	CA E-4 (3) Vocational-4 (3) Research Project(6)*						20
			Award of Bachelor of Computer Applications Honours Degree, BCA (Hons.) Degree (183 credits)					

NEP 2020 Model Syllabus - BCA. for 2021-22 onwards

Year	Sem	Course Code	Title	Hours / Week			Credits			Maximum Marks						Exam Duration	Total Marks
										Th. IA		Pr. IA		Exam			
				L	T	P	L	T	P	C1	C2	C1	C2	Th.	Pr.		
I	I	FAA410 [CAC 01]	Fundamentals of Computers	3	0	0	3	0	0	20	20	-	-	60	-	2½ Hours	100
		FAA410 [CAC 01P]	LAB: Information Technology	0	0	4	0	0	2	-	-	10	15*	-	25	3 Hours	50
		FAA420 [CAC 02]	Programming in C	3	0	0	3	0	0	20	20	-	-	60	-	2½ Hours	100
		FAA420 [CAC 02P]	LAB: C Programming Lab	0	0	4	0	0	2	-	-	10	15*	-	25	3 Hours	50
		FAA430 [CAC 03 A/B]	Mathematical Foundation / Accountancy	3	0	0	3	0	0	20	20	-	-	60	-	2½ Hours	100
		OE – 1	**OPEN ELECTIVE – 1**	3	0	0	3	0	0	20	20	-	-	60	-	2½ Hours	100
	II	FAB410 [CAC 04]	Data Structures using C	3	0	0	3	0	0	20	20	-	-	60	-	2½ Hours	100
		FAB410 [CAC 04P]	LAB: Data Structure	0	0	4	0	0	2	-	-	10	15*	-	25	3 Hours	50
		FAB420 [CAC 05]	Object Oriented Concepts using JAVA	3	0	0	0	0	2	20	20	-	-	60	-	2½ Hours	100
		FAB420 [CAC 05P]	LAB: JAVA Lab	0	0	4	0	0	2	-	-	10	15*	-	25	3 Hours	50
		FAB430 [CAC 06]	Discrete Mathematical Structures	3	0	0	3	0	0	20	20	-	-	60	-	2½ Hours	100
		OE – 2	**OPEN ELECTIVE – 2**	3	0	0	3	0	0	20	20	-	-	60	-	2½ Hours	100
		#FAB210 [SEC – 1]	**DIGITAL FLUENCY**	1	0	2	1	0	1	-	-	10	15*	25	-	1 Hour	50
Exit option with Certificate in Computer Applications (50 credits)																	

#Syllabus & Details Refer BSc in Computer Science Syllabus copy

Year	Sem	Course Code	Title	Hours / Week			Credits			Th. IA		Pr. IA		Exam		Exam Duration	Total Marks
				L	T	P	L	T	P	C1	C2	C1	C2	Th.	Pr.		
II	III	FAC410 [CAC 07]	Data Base Management Systems	3	0	0	3	0	0	20	20	-	-	60	-	2½ Hours	100
		FAC410 [CAC 07P]	DBMS LAB	0	0	4	0	0	2	-	-	10	15*	-	25	3 Hours	50
		FAC420 [CAC 08]	C# and DOT NET Framework	3	0	0	3	0	0	20	20	-	-	60	-	2½ Hours	100
		FAC420 [CAC 08P]	C# and DOT NET Framework LAB	0	0	4	0	0	2	-	-	10	15*	-	25	3 Hours	50
		FAC430 [CAC 09]	Computer Communication and Networks	3	0	0	3	0	0	20	20	-	-	60	-	2½ Hours	100
		OE – 3	**OPEN ELECTIVE – 3**	3	0	0	3	0	0	20	20	-	-	60	-	2½ Hours	100
			Constitution of India	3	0	0	3	0	0	20	20	-	-	60	-	2½ Hours	100
	IV	FAD410 [CAC10]	Python Programming	3	0	0	3	0	0	20	20	-	-	60	-	2½ Hours	100
		FAD410 [CAC10P]	Python programming LAB	0	0	4	0	0	2	-	-	10	15*	-	25	3 Hours	50
		FAD420 [CAC11]	Computer Multimedia and Animation	3	0	0	3	0	0	20	20	-	-	60	-	2½ Hours	100
		FAD420 [CAC11P]	Multimedia and Animation LAB	0	0	4	0	0	2	-	-	10	15*	-	25	3 Hours	50
		FAD430 [CAC12]	Operating System Concepts	3	0	0	3	0	0	20	20	-	-	60	-	2½ Hours	100
		OE – 4	**OPEN ELECTIVE – 4**	3	0	0	3	0	0	20	20	-	-	60	-	2½ Hours	100
		FAD210 [SEC – 2]	**Artificial Intelligence or some other**	1	0	2	1	0	1	-	-	10	15*	25	-	1 Hour	50
Exit option with Diploma in Computer Applications (100 credits)																	

Year	Sem	Course Code	Title	Hours / Week			Credits			Maximum Marks						Exam Duration	Total Marks
										Th. IA		Pr. IA		Exam			
				L	T	P	L	T	P	C1	C2	C1	C2	Th.	Pr.		
III	V	FAE410 [CAC13]	Internet Technologies	3	0	0	3	0	0	20	20	-	-	60	-	2½ Hours	100
		FAE410 [CAC13P]	JAVA Script, HTML and CSS LAB	0	0	4	0	0	2	-	-	10	15*	-	25	3 Hours	50
		FAE420 [CAC14]	Statistical Computing and R Programming	3	0	0	3	0	0	20	20	-	-	60	-	2½ Hours	100
		FAE420 [CAC14P]	R Programming LAB	0	0	4	0	0	2	-	-	10	15*	-	25	3 Hours	50
		FAE430 [CAC15]	Software Engineering	3	0	0	3	0	0	20	20	-	-	60	-	2½ Hours	100
		FAE440 [CAE-1A]	**DISCIPLINE SPECIFIC ELECTIVE - 1**	3	0	0	3	0	0	20	20	-	-	60	-	2½ Hours	100
		FAE450 [VOC-1]	**VOCATIONAL 1 (Anyone from table -IA)**	3	0	0	3	0	0	20	20	-	-	60	-	2½ Hours	100
		FAE210 [SEC – 4]	**Professional Communication**	2	0	0	2	0	0								
	VI	FAF410 [CAC 16]	PHP and MySQL	3	0	0	3	0	0	20	20	-	-	60	-	2½ Hours	100
		FAF410 [CAC 16P]	LAB: PHP and MySQL	0	0	4	0	0	2	-	-	10	15*	-	25	3 Hours	50
		FAF410 [CAC 17]	Artificial Intelligence and Applications	3	0	0	3	0	0	20	20	-	-	60	-	2½ Hours	100
		FAC410 [CA -P1]	PROJECT Work	0	0	4	0	0	2	-	-	10	15*	-	25	3 Hours	50
		CAE 2A	**DISCIPLINE SPECIFIC ELECTIVE – 2**	3	0	0	3	0	0	20	20	-	-	60	-	2½ Hours	100
		VOC-2	**VOCATIONAL 2 (Anyone from table -IA)**	3	0	0	3	0	0	20	20	-	-	60	-	2½ Hours	100
		FAD210 [SEC – 3]	**Cyber Security or some other SEC**	1	0	2	1	0	1	-	-	10	15*	25	-	1 Hour	50
Exit Option with Bachelor of Computer Applications Degree, BCA Degree (142 credits)																	

Year	Sem	Corse Code	Title	Hours / Week			Credits			Maximum Marks						Exam Duration	Total Marks
										Th. IA		Pr. IA		Exam			
				L	T	P	L	T	P	C1	C2	C1	C2	Th.	Pr.		
IV	VII	CAC 18	Analysis and Design of Algorithms	3	0	0	3	0	0	20	20	-	-	60	-	2½ Hours	100
		CAC 18P	Algorithms LAB	0	0	4	0	0	2	-	-	10	15*	-	25	3 Hours	50
		CAC 19	Data Mining and KnowledgeManagement	3	0	0	3	0	0	20	20	-	-	60	-	2½ Hours	100
		CAC 19P	Data Mining and KnowledgeManagement LAB	0	0	4	0	0	2	-	-	10	15*	-	25	3 Hours	50
		CAI 01	Internship	0	0	4	0	0	2	-	-	10	15*	-	25	3 Hours	50
		CAE 2A	**DISCIPLINE SPECIFIC ELECTIVE – 3**	3	0	0	3	0	0	20	20	-	-	60	-	2½ Hours	100
			Research Methodology	3	0	0	3	0	0	20	20	-	-	60	-	2½ Hours	100
	VIII	CAC 20	Automata Theory and CompilerDesign	3	0	0	3	0	0	20	20	-	-	60	-	2½ Hours	100
		CAC 20P	Compiler Lab	0	0	4	0	0	2	-	-	10	15*	-	25	3 Hours	50
		CAC 21	Cryptography and Network Security	3	0	0	3	0	0	20	20	-	-	60	-	2½ Hours	100
		CA-P2	**Research Project**	0	0	12	0	0	6	-	-	20	20	-	60	**3 Hours**	**100**
		CAE 4A	**DISCIPLINE SPECIFIC ELECTIVE – 4**	3	0	0	3	0	0	20	20	-	-	60	-	2½ Hours	100
Award of Bachelor of Computer Applications Honours Degree, BCA (Hons.) Degree (183 credits)																	
Note: 15* is spilt 10 marks for Practical's C2 + 5 marks for practical Record/Report																	

Table - IA

Course-Type	Course Code	Compulsory/ Elective	Listof option of elective courses. (A suggestive list)
DISCIPLINE SPECIFIC ELECTIVE COURSES	DSE 1A	Elective	Cyber Law and CyberSecurity
			Cloud Computing
			Business Intelligence
	DSE 2A	Elective	Fundamentals of DataScience
			Mobile ApplicationDevelopment
			Embedded Systems
	DSE 3A	Elective	Data Compression
			IoT
			Data Analytics
	CAE 4A	Elective	Open-Source Programming
			Storage Area Networks
			Pattern Recognition
			Machine Learning
VOCATIONAL	VOC 1 VOC 2 VOC 3 VOC 4	Elective	DTP, CAD and Multimedia
			Hardware and Server Maintenance
			Web Content Management Systems
			Computer Networking
			Health Care Technologies
			Digital Marketing
			Office Automation
OPEN ELECTIVE OFFER TO OTHER PROGRAMME STUDENTS (L: T: P) = (3: 0:0)			
OPEN ELECTIVE (For BA, BSc, BCom, BSW, BBA, BBM students studying Core Courses other than Computer Science/ Computer Applications)	OE – 1 OE – 2 OE – 3 OE – 4	Elective	Business Intelligent
			Big Data Analytics
SKILL ENHANCEMENT COURSE (L: T: P) = (1: 0:1)			
SEC	SEC-2	Compulsory	Open-Source Tools

NEP2020 Model Course Content for BCA, Semesters I and II

Semester: I

Course Code: **CAC01 [FAA410]**	Course Title: **Fundamentals of Computers**
Course Credits: **03**	Hour of Teaching / Week: **03 Hours**
Formative Assessment Marks: **40**	Total Contact Hours: **42 Hours**
Exam Marks: **60**	Exam Duration: **2½ Hours**

Course Outcomes (COs):

- Introduction to computers, classification of computers, anatomy of computer, constituents and architecture, microcontrollers
- Operating systems, functions of operating systems, classification of operating systems, kernel, shell, basics of Unix, shell programming, booting
- Databases, why databases are used, users, SQL, data types in SQL, introduction of queries - select, alter, update, delete, truncate, using where, and or in not in
- Internet basics, features, applications, services, internet service providers, domain name system, browsing, email, searching
- Web Programming basics, introduction of HTML and CSS programming
- Introduction of computers, classification of computers, anatomy of computer, constituents and architecture, microcontrollers.

Course Content	Hours
Unit - 1	
Fundamentals of Computers: Introduction to Computers - Computer Definition, Characteristics of Computers, Evolution and History of Computers, Types of Computers, Basic Organisation of a Digital Computer; Number Systems – different types, conversion from one number system to another; Computer Codes – BCD, Gray Code, ASCII and Unicode; Boolean Algebra – Boolean Operators with Truth Tables; Types of Software – System Software and Utility Software; Computer Languages - Machine Level, Assembly Level & High Level Languages, Translator Programs – Assembler, Interpreter and Compiler; Planning a Computer Program - Algorithm, Flowchart and Pseudo code with Examples. **Introduction to computers:** Characteristics of computers, Classification of Digital Computer Systems: Microcomputers, Minicomputers, Mainframes, Super computers.	14
Unit-2	
Anatomy of Computer: Introduction, Functions & Components of a Computer, Central Processing Unit, Microprocessor, Storage units, Input and output Devices. How CPU and memory works. Program execution with illustrative examples. Introduction to microcontrollers. **Operating System Fundamentals:** Operating Systems: Introduction, Functions of an operating System, Classification of Operating Systems, System programs, Application programs, Utilities, The Unix Operating System, Basic Unix commands, Microkernel Based Operating System, Booting.	14
Unit-3	
Introduction to Database Management Systems: Database, DBMS, Why Database -File system vs DBMS, Database applications, Database users, Introduction to SQL, Data types, Classification of SQL-DDL with constraints, DML, DCL, TCL **Internet Basics:** Introduction, Features of Internet, Internet application, Services of Internet, Logical and physical addresses, Internet Service Providers, Domain Name System. **Web Basics:** Introduction to web, web browsers, http/https, URL, HTML5, CSS	14

Text Books:
1. Pradeep K. Sinha and Priti Sinha: Computer Fundamentals (Sixth Edition), BPB Publication
2. David Riley and Kenny Hunt, Computational thinking for modern solver, Chapman & Hall/CRC,
Reference:
1. J. Glenn Brook shear," Computer Science: An Overview", Addision-Wesley, Twelfth Edition,
2. R.G. Dromey, "How to solve it by Computer", PHI,

Course Code: **CAC01P [FAA410]**	Course Title: **Information Technology Lab**
Course Credits: **02**	Hours/Week: **04 Hours**
Formative Assessment Marks**: 25**	Total Contact Hours: **52 Hours**
Exam Marks: **25**	Exam Duration: **03 Hours**

Part A: Hardware

1. Identification of the peripherals of a computer, components in a CPU and their functions.
2. Assembling and disassembling the system hardware components of personal computer.
3. Basic Computer Hardware Trouble shooting.
4. LAN and WiFi Basics.
5. Operating System Installation – Windows OS, UNIX/LINUX, Dual Booting.
6. Installation and Uninstallation of Software – Office Tools, Utility Software (like Anti-Virus, System Maintenance tools); Application Software - Like Photo/Image Editors, Audio Recorders/Editors, Video Editors …); Freeware, Shareware, Payware and Trialware; Internet Browsers, Programming IDEs,
7. System Configuration – BIOS Settings, Registry Editor, MS Config, Task Manager, System Maintenance, Third-party System Maintenance Tools (Similar to CCleaner and Jv16 PowerTools …)

Part B: Software

1. Activities using Word Processor Software
2. Activities using Spreadsheets Software
3. Activities using Presentation Software
4. Activities involving Multimedia Editing (Images, Video, Audio …)
5. Tasks involving Internet Browsing
6. Flow charts: Installation and using of flowgarithms software for different arithmetic tasks like sum, average, product, difference, quotient and remainder of given numbers, calculate area of Shapes (Square, Rectangle, Circle and Triangle), arrays and recursion.

NOTE: In addition to the ones listed above, universities can include other activities so as for the student to become proficient in using personal computers for multiple purposes for which modern computers can be put to use.

Reference:
1. Computational Thinking for the Modern Problem Solver, By Riley DD, Hunt K.A CRC press, 2014
2. Ferragina P, Luccio F. Computational Thinking: First Algorithms, Then Code. Springer

Web References:
http://www.flowgorithm.org/documentation/

Evaluation Scheme for Lab Examination

Assessment Criteria		Marks
Activity – 1 from Part A	Write up on the activity/ task	5
	Demonstration of the activity/ task	5
Activity-2 from Part B	Write up on the activity/ task	5
	Demonstration of the activity/ task	5
Viva Voice based on Lab Activities		05
Total		**25**

Course Code: **CAC02 [FAA420]**	Course Title: **Programming in C**
Course Credits: **03**	Hour of Teaching / Week: **03 Hours**
Formative Assessment Marks: **40**	Total Contact Hours: **42 Hours**
Exam Marks: **60**	Exam Duration: **2½ Hours**

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:
• Confidently operate Desktop Computers to carry out computational tasks
• Understand working of Hardware and Software and the importance of operating systems
• Understand programming languages, number systems, peripheral devices, networking, multimedia and internet concepts
• Read, understand and trace the execution of programs written in C language
• Write the C code for a given problem
• Perform input and output operations using programs in C
• Write programs that perform operations on arrays

Course Content	Hours
Unit - 1	
Introduction to C Programming: Overview of C; History and Features of C; Structure of a C Program with Examples; Creating and Executing a C Program; Compilation process in C. **C Programming Basic Concepts:** C Character Set; C tokens - keywords, identifiers, constants, and variables; Data types; Declaration & initialization of variables; Symbolic constants. **Input and output with C:** Formatted I/O functions - *printf* and *scanf,* control stings and escape sequences, output specifications with *printf* functions; Unformatted I/O functions to read and display single character and a string - *getchar, putchar, gets* and *puts* functions. **C Operators & Expressions:** Arithmetic operators; Relational operators; Logical operators; Assignment operators; Increment & Decrement operators; Bitwise operators; Conditional operator; Special operators; Operator Precedence and Associatively; Evaluation of arithmetic expressions; Type conversion.	14
Unit - 2	
Control Structures: Decision making Statements - S*imple if, if_else*, *nested if_else, else_if ladder, Switch Case*, *goto, break* & *continue* statements; Looping Statements - Entry controlled and exit controlled statements, *while, do-while, for* loops, Nested loops. **Derived data types in C:** Arrays: One Dimensional arrays - Declaration, Initialization and Memory representation; Two Dimensional arrays - Declaration, Initialization and Memory representation. **Strings:** Declaring & Initializing string variables; String handling functions - *strlen, strcmp, strcpy and strcat;* Character handling functions - *toascii, toupper, tolower, isalpha, isnumeric* etc.	14
Unit - 3	
Pointers in C: Understanding pointers - Declaring and initializing pointers, accessing address and value of variables using pointers; Pointers and Arrays; Pointer Arithmetic; Advantages and disadvantages of using pointers; **User Defined Functions:** Need for user defined functions; Format of C user defined functions; Components of user defined functions - return type, name, parameter list, function body, return statement and function call; Categories of user defined functions - With and without parameters and return type. **User defined data types:** Structures - Structure Definition, Advantages of Structure, declaring structure variables, accessing structure members, Structure members initialization, comparing structure variables, Array of Structures; Unions - Union definition; difference between Structures and Unions.	14

Text Books:
1. C: The Complete Reference, By Herbert Schildt.
2. C Programming Language, By Brain W. Kernighan
3. Kernighan & Ritchie: The C Programming Language (PHI)

Reference Books:
1. P. K. Sinha & Priti Sinha: Computer Fundamentals (BPB)
2. E. Balaguruswamy: Programming in ANSI C (TMH)
3. Kamthane: Programming with ANSI and TURBO C (Pearson Education)
4. V. Rajaraman: Programming in C (PHI – EEE)
5. S. Byron Gottfried: Programming with C (TMH)
6. Yashwant Kanitkar: Let us C
7. P.B. Kottur: Programming in C (Sapna Book House)

Course Code: **CAC02P [FAA420]**	Course Title: **C Programming Lab**
Course Credits: **02**	Hour of Teaching / Week: **04 Hours**
Formative Assessment Marks: **25**	Total Contact Hours: **52 Hours**
Exam Marks: **25**	Exam Duration: **03 Hours**

Programming Lab
Part A:
1. Program to read radius of a circle and to find area and circumference
2. Program to read three numbers and find the biggest of three
3. Program to demonstrate library functions in math.h
4. Program to check for prime
5. Program to generate n primes
6. Program to read a number, find the sum of the digits, reverse the number and check it for palindrome
7. Program to read numbers from keyboard continuously till the user presses 999 and to find the sum of only positive numbers
8. Program to read percentage of marks and to display appropriate message (Demonstration of else-if ladder)
9. Program to find the roots of quadratic equation (demonstration of switch Case statement)
10. Program to read marks scored by n students and find the average of marks (Demonstration of single dimensional array)
11. Program to remove Duplicate Element in a single dimensional Array
12. Program to perform addition and subtraction of Matrices

Part B:
1. Program to find the length of a string without using built in function
2. Program to demonstrate string functions.
3. Program to demonstrate pointers in C
4. Program to check a number for prime by defining isprime() function
5. Program to read, display and to find the trace of a square matrix
6. Program to read, display and add two m x n matrices using functions
7. Program to read, display and multiply two m x n matrices using functions
8. Program to read a string and to find the number of alphabets, digits, vowels, consonants, spaces and special characters.
9. Program to Reverse a String using Pointer
10. Program to Swap Two Numbers using Pointers
11. Program to demonstrate student structure to read & display records of n students.
12. Program to demonstrate the difference between structure & union.
Note: Student has to execute a minimum of 10 programs in each part to complete the Lab course

Evaluation Scheme for Lab Examination

Assessment Criteria		Marks
Program – 1 from Part A	Flowchart / Algorithm	02
	Writing the Program	05
	Execution and Formatting	03
Program -2 from Part B	Flowchart/Algorithm	02
	Writing the Program	05
	Execution and Formatting	03
Viva Voice based on Lab Activities		05
Total		**25**

Course Code: **CAC03(A) [FAA430]**	Course Title: **Mathematical Foundation**
Course Credits: **03**	Hour of Teaching / Week: **03 Hours**
Formative Assessment Marks: **40**	Total Contact Hours: **42 Hours**
Exam Marks: **60**	Exam Duration: **2½ Hours**

Course Outcomes (COs):

• Study and solve problems related to connectives, predicates and quantifiers under different situations.

• Develop basic knowledge of matrices and to solve equations using Cramer's rule.

• Know the concept of Eigen values.

• To develop the knowledge about derivatives and know various applications of differentiation.

• Understand the basic concepts of Mathematical reasoning, set and functions

Course Content	Hours
Unit - 1	
Basic concepts of set theory: Mathematical logic introduction-statements Connectives-negation, conjunction, disjunction- statement formulas and truth tables- conditional and bi Conditional statements- tautology contradiction-equivalence of formulas-duality law-Predicates and Quantifiers, Arguments.	14
Unit - 2	
Operations on sets: power set- Venn diagram Cartesian product-relations - functions- types of functions - composition of functions. **Matrix algebra:** Introduction-Types of matrices-matrix operations- transpose of a matrix -determinant of matrix - inverse of a matrix- Cramer's rule	14
Unit - 3	
Matrix: finding rank of a matrix - normal form-echelon form cayley Hamilton theorem-Eigen values **Differential calculus:** Functions and limits - Simple Differentiation of Algebraic Functions – Evaluation of First and Second Order Derivatives – Maxima and Minima	14

Text Books:

- P. R. Vittal-Business Mathematics and Statistics, Margham Publications, Chennai,

Reference Books:

- B. S. Vatsa-Discrete Mathematics –New Age International Limited Publishers, New Delhi

Course Code: **CAC03(B) [FAA440]**	Course Title: **Accountancy**
Course Credits: **03**	Hour of Teaching / Week: **03 Hours**
Formative Assessment Marks: **40**	Total Contact Hours: **42 Hours**
Exam Marks: **60**	Exam Duration: **2½ Hours**

Course Outcomes (COs):

• Study and understand Accounting, systems of Book, Branches of accounting advantage and limitations

• Know the concept of accounting, financial accounting process and Journalization

• Maintenance different account book and reconciliations

• Preparations of different bills, and trial balance.

• Understand the basic concepts of Mathematical reasoning, set and functions

Course Content	Hours
Unit - 1	
Introduction: History and Development of Accounting, Meaning, Objectives and functions of Accounting, Book keeping V/s Accounting, Users of accounting data, systems of book keeping and accounting, branches of accounting, advantages and limitations of accounting **Accounting Concepts and Convention:** Meaning, need and classification, accounting standards meaning, need and classification of Indian accounting standards. Accounting principles V/s accounting standard	14
Unit - 2	
Financial Accounting Process: Classification of accounting transactions and accounts, rules of debit and credit as per Double Entry System. Journalization and Ledger posting. **Preparation of Different Subsidiary Books:** Purchase Day book Sales Day Book, Purchase Returns Day Book, Sales Returns Day Book, Cash Book. Bank Reconciliation Statement: Meaning, Causes of Difference, Advantages, Preparation of Bank Reconciliation Statements.	14
Unit - 3	
Account Procedure: Honor of the Bill, Dishonor of the Dill, Endorsement, Discounting, Renewal, Bill for collection, Retirement of the Bill, Accommodation Bills, Bill Receivable Book and Payable Book. Preparation of Trial Balance: Rectification of errors and Journal Proper **Preparation of Final Accounts:** Meaning, need and classification, Preparation of Manufacturing, Trading, Profit and loss account and Balance – Sheet of sale-traders and partnership firms.	14

Text Books:

1. S. Ramesh, B.S. Chandrashekar, A Text Book of Accountancy.
2. V.A. Patil and J.S. Korihalli, Book – keeping and accounting, (R. Chand and Co. Delhi).
3. R. S. Singhal, Principles of Accountancy, (Nageen Prakash pvt. Lit. Meerut).
4. M. B. Kadkol, Book – Keeping and Accountancy, (Renuka Prakashan, Hubil)
5. Vithal, Sharma:Accounting for Management, Macmillan Publishers, Mumbai.

Reference Books:

1. B.S. Raman, Accountancy, (United Publishers, Mangalore).
2. Tulsian, Accouning and Finacial Management – I: Financial Accounting – Person Education.

Semester: II

Course Code: **CAC04 [FAB410]**	Course Title: **Data Structures using C**
Course Credits: **03**	Hour of Teaching / Week: **03 Hours**
Formative Assessment Marks: **40**	Total Contact Hours: **42 Hours**
Exam Marks: **60**	Exam Duration: **2½ Hours**

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:

• Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms

• Describe common applications for arrays, records, linked structures, stacks, queues, trees, and graphs

• Write programs that use arrays, records, linked structures, stacks, queues, trees, and graphs

• Demonstrate different methods for traversing trees

• Compare alternative implementations of data structures with respect to performance

• Describe the concept of recursion, give examples of its use

• Discuss the computational efficiency of the principal algorithms for sorting, searching, and hashing

Course Content	Hours
Unit - 1	
Introduction to data structures: Definition; Types of data structures - Primitive & Non-primitive, Linear and Non-linear; Operations on data structures. Dynamic memory allocation: Static & Dynamic memory allocation; Memory allocation and de-allocation functions - *malloc*, *calloc*, *realloc* and *free.* Algorithm Specification, Performance Analysis, Performance Measurement Recursion: Definition; Types of recursions; Recursion Technique Examples - GCD, Binomial coefficient nCr, Towers of Hanoi; Comparison between iterative and recursive functions. **Arrays:** Basic Concepts – Definition, Declaration, Initialisation, Operations on arrays; Types of arrays; Arrays as abstract data types (ADT); Representation of Linear Arrays in memory;	14
Unit - 2	
Traversing linear arrays; Inserting and deleting elements; Sorting – Selection sort, Bubble sort, Quick sort, Selection sort, Insertion sort; Searching - Sequential Search, Binary search; Iterative and Recursive searching; Multidimensional arrays; Representation of multidimensional arrays; Sparse matrices. **Linked list**: Basic Concepts – Definition and Representation of linked list, Types of linked lists - Singly linked list, Doubly liked list, Header liked list, Circular linked list; Representation of Linked list in Memory; Operations on Singly linked lists – Traversing, Searching, Insertion, Deletion; Memory allocation; Garbage collection,	14
Unit - 3	
Stacks: Basic Concepts – Definition and Representation of stacks; Operations on stacks; Applications of stacks; Infix, postfix and prefix notations; Conversion from infix to postfix using stack; Evaluation of postfix expression using stack; Application of stack in function calls. **Queues**: Basic Concepts – Definition and Representation of queues; Types of queues - Simple queues, Circular queues, Double ended queues, Priority queues; Operations on Simple queues; **Trees:** Definition; Tree terminologies –node, root node, parent node, ancestors of a node, siblings, terminal & non-terminal nodes, degree of a node, level, edge, path, depth; **Binary tree:** Type of binary trees - strict binary tree, complete binary tree, binary search	14

tree and heap tree; Array representation of binary tree. Traversal of binary tree; preorder, inorder and postorder traversal;

Text Books
1. Ellis Horowitz and Sartaj Sahni: Fundamentals of Data Structures

References
1. Tanenbaum: Data structures using C (Pearson Education)
2. Kamathane: Introduction to Data structures (Pearson Education)
3. Y. Kanitkar: Data Structures Using C (BPB)
4. Kottur: Data Structure Using C
5. Padma Reddy: Data Structure Using C
6. Sudipa Mukherjee: Data Structures using C – 1000 Problems and Solutions (McGraw Hill Education, 2007)

Course Code: **CAC04P [FAB410]**	Course Title: **Data Structures Lab**
Course Credits: **02**	Hour of Teaching / Week: **04 Hours**
Formative Assessment Marks: **25**	Total Contact Hours: **52 Hours**
Exam Marks: **25**	Exam Duration: **03 Hours**

Programming Lab
Part A:
1. Program to find GCD using recursive function
2. Program to display Pascal Triangle using binomial function
3. Program to generate n Fibonacci numbers using recursive function.
4. Program to implement Towers of Hanoi.
5. Program to implement dynamic array, find smallest and largest element of the array.
6. Program to create two files to store even and odd numbers.
7. Program to create a file to store student records.
8. Program to read the names of cities and arrange them alphabetically.
9. Program to sort the given list using selection sort technique.
10. Program to sort the given list using bubble sort technique.

Part B:
1. Program to sort the given list using insertion sort technique.
2. Program to sort the given list using quick sort technique.
3. Program to sort the given list using merge sort technique.
4. Program to search an element using linear search technique.
5. Program to search an element using recursive binary search technique.
6. Program to implement Stack.
7. Program to convert an infix expression to postfix.
8. Program to implement simple queue.
9. Program to implement linear linked list.
10. Program to display traversal of a tree.

Evaluation Scheme for Lab Examination

Assessment Criteria		Marks
Program – 1 from Part A	Flowchart / Algorithm	02
	Writing the Program	05
	Execution and Formatting	03
Program -2 from Part B	Flowchart/Algorithm	02
	Writing the Program	05
	Execution and Formatting	03
Viva Voice based on C Programming		05
Total		**25**

Course Code: **CAC05 [FAB420]**	Course Title: **Object Oriented Concepts using JAVA**
Course Credits: **03**	Hour of Teaching / Week: **03 Hours**
Formative Assessment Marks: **40**	Total Contact Hours: **42 Hours**
Exam Marks: **60**	Exam Duration: **2½ Hours**

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:

• Understand the features of Java and the architecture of JVM

• Write, compile, and execute Java programs that may include basic data types and control flow constructs and how type casting is done

• Identify classes, objects, members of a class and relationships among them needed for a specific problem and demonstrate the concepts of polymorphism and inheritance

• The students will be able to demonstrate programs based on interfaces and threads and explain the benefits of JAVA's Exceptional handling mechanism compared to other Programming Language

• Write, compile, execute Java programs that include GUIs and event driven programming and also programs based on files

Course Content	Hours
Unit - 1	
Introduction to Java: Basics of Java programming, Data types, Variables, Operators, Control structures including selection, Looping, Java methods, Overloading, Math class, Arrays in java. **Objects and Classes:** Basics of objects and classes in java, Constructors, Finalizer, Visibility modifiers, Methods and objects, Inbuilt classes like String, Character, String Buffer, File, this reference.	14
Unit - 2	
Inheritance and Polymorphism: Inheritance in java, Super and sub class, Overriding, Object class, Polymorphism, Dynamic binding, Generic programming, Casting objects, Instance of operator, Abstract class, Interface in java, Package in java, UTIL package. **Event and GUI programming:** Event handling in java, Event types, Mouse and key events, GUI Basics, Panels, Frames, Layout Managers: Flow Layout, Border Layout, Grid Layout, GUI components like Buttons, Check Boxes, Radio Buttons, Labels, Text Fields, Text Areas, Combo Boxes, Lists, Scroll Bars, Sliders, Windows, Menus, Dialog Box, Applet and its life cycle, Introduction to swing, Exceptional handling mechanism.	14
Unit - 3	
I/O programming: Text and Binary I/O, Binary I/O classes, Object I/O, Random Access Files. **Multithreading in java:** Thread life cycle and methods, Runnable interface, Thread synchronization, Exception handling with try catch-finally, Collections in java, Introduction to JavaBeans and Network Programming.	14

Text Books

1. Programming with Java, By E Balagurusamy – A Primer, Fourth Edition, Tata McGraw Hill Education Private Limited.
2. Core Java Volume I – Fundamentals, By Cay S. Horstmann, Prentice Hall
3. Object Oriented Programming with Java: Somashekara, M.T., Guru, D.S., Manjunatha, K.S

Reference Books:

1. Java 2 - The Complete Reference – McGraw Hill publication.
2. Java - The Complete Reference, 7th Edition, By Herbert Schildt– McGraw Hill publication.

Course Code: **CAC05P [FAB410]**	Course Title: **JAVA Lab**
Course Credits: **02**	Hour of Teaching / Week: **04 Hours**
Formative Assessment Marks: **25**	Total Contact Hours: **52 Hours**
Exam Marks: **25**	Exam Duration: **03 Hours**

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:

• Implement Object Oriented programming concept using basic syntaxes of control Structures

• Identify classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem

• Demonstrates how to achieve reusability using inheritance

• Demonstrate understanding and use of interfaces, packages, different exception handling mechanisms and concept of multithreading for robust faster and efficient application development.

• Identify and describe common user interface components to design GUI in Java using Applet & AWT along with response to events

Practice Lab

1. Program to print the following triangle of numbers

      1

      1 2

      1 2 3

      1 2 3 4

      1 2 3 4 5

2. Program to simple java application, to print the message, "Welcome to java"

3. Program to display the month of a year. Months of the year should be held in an array.

4. Program to find the area of rectangle.

5. program to demonstrate a division by zero exception

6. Program to create a user defined exception say Pay Out of Bounds.

Programming Lab

PART A: Java Fundamentals OOPs in Java

1. Program to assign two integer values to X and Y. Using the 'if' statement the output of the program should display a message whether X is greater than Y.

2. Program to list the factorial of the numbers 1 to 10. To calculate the factorial value, use while loop. (Hint Fact of 4 = 4*3*2*1)

3. Program to add two integers and two float numbers. When no arguments are supplied, give a default value to calculate the sum. Use function overloading.

4. Program to perform mathematical operations. Create a class called AddSub with methods to add and subtract. Create another class called MulDiv that extends from AddSub class to use the member data of the super class. MulDiv should have methods to multiply and divide A main function should access the methods and perform the mathematical operations.

5. Program with class variable that is available for all instances of a class. Use static variable declaration. Observe the changes that occur in the object's member variable values.

6. Program

 a. To find the area and circumference of the circle by accepting the radius from the user.

b. To accept a number and find whether the number is Prime or not

7. Program to create a student class with following attributes;

Enrollment No: Name, Mark of sub1, Mark of sub2, mark of sub3, Total Marks. Total of the three marks must be calculated only when the student passes in all three subjects. The

pass mark for each subject is 50. If a candidate fails in any one of the subjects his total mark must be declared as zero. Using this condition write a constructor for this class. Write separate functions for accepting and displaying student details. In the main method create an array of three student objects and display the details.

8. In a college first year class are having the following attributes Name of the class (BCA, BCom, BSc), Name of the staff No of the students in the class, Array of students in the class

9. Define a class called first year with above attributes and define a suitable constructor. Also write a method called best Student () which process a first-year object and return the student with the highest total mark. In the main method define a first-year object and find the best student of this class

10. Program to define a class called employee with the name and date of appointment. Create ten employee objects as an array and sort them as per their date of appointment. ie, print them as per their seniority.

11. Create a package 'student. Fulltime. BCA 'in your current working directory

a. Create a default class student in the above package with the following attributes: Name, age, sex.

b. Have methods for storing as well as displaying

PART B: Exception Handling & GUI Programming

1. Program to catch Negative Array Size Exception. This exception is caused when the array is initialized to negative values.

2. Program to handle Null Pointer Exception and use the "finally" method to display a message to the user.

3. Program which create and displays a message on the window

4. Program to draw several shapes in the created window

5. Program to create an applet and draw grid lines

6. Program which creates a frame with two buttons father and mother. When we click the father button the name of the father, his age and designation must appear. When we click mother similar details of mother also appear.

7. Create a frame which displays your personal details with respect to a button click

8. Create a simple applet which reveals the personal information of yours.

9. Program to move different shapes according to the arrow key pressed.

10. Program to create a window when we press M or m the window displays Good Morning, A or the window displays Good After Noon E or e the window displays Good Evening, N or n the window displays Good Night

11. Demonstrate the various mouse handling events using suitable example.

12. Program to create menu bar and pull-down menus.

Note: Student has to execute a minimum of 10 programs in each part to complete the Lab course

Evaluation Scheme for Lab Examination

Assessment Criteria		Marks
Program – 1 from Part A	Flowchart / Algorithm	02
	Writing the Program	05
	Execution and Formatting	03
Program -2 from Part B	Flowchart/Algorithm	02
	Writing the Program	05
	Execution and Formatting	03
Viva Voice based on **Object Oriented Programming with JAVA**		05
Total		**25**

Course Code: **CAC06 [FAA430]**	Course Title: **Discrete Mathematical Structures**
Course Credits: **03**	Hour of Teaching / Week: **03 Hours**
Formative Assessment Marks: **40**	Total Contact Hours: **42 Hours**
Exam Marks: **60**	Exam Duration: **2½ Hours**

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:

- To understand the basic concepts of Mathematical reasoning, set and functions.
- To understand various counting techniques and principle of inclusion and exclusions.
- Understand the concepts of various types of relations, partial ordering and
- equivalence relations.
- Apply the concepts of generating functions to solve the recurrence relations.
- Familiarize the fundamental concepts of graph theory and shortest path algorithm

Course Content	Hours
Unit - 1	
The Foundations: Logic and proofs: Propositional Logic, Applications of Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy. **Basic Structures**: Sets, Functions, Sequences, Sums, and Matrices: Sets, set operations, Functions, Sequences and Summations, matrices.	14
Unit - 2	
Counting: Basics of counting, Pigeonhole principle, Permutation and combination, Binomial Coefficient and Combination, Generating Permutation and Combination**.** **Advanced Counting Techniques**: Applications of Recurrence Relations, Solving Linear Recurrence, Relations, Divide and Conquer Algorithms and Recurrence Relations, Generating functions, Inclusion-Exclusion, Applications of Inclusion-exclusion. **Induction and Recursion**: Mathematical Induction, Strong Induction and Well-Ordering, Recursive Definitions and Structural Induction, Recursive Algorithms, Program Corrections.	14
Unit - 3	
Relation: Properties of relation, Composition of relation, Closer operation on relation, Equivalence relation and partition. Operation on relation, Representing relation. **Graphs**: Graphs and Graph models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring.	14

Text Book:

1. Discrete Mathematics and Its Applications, Kenneth H. Rosen: Seventh Edition, 2012.

References:

2. Discrete Mathematical Structure, Bernard Kolman, Robert C, Busby, Sharon Ross, 2003.
3. Graph Theory with Applications to Engg and Comp. Sci: Narsingh Deo-PHI 1986.
4. Discrete and Combinatorial Mathematics Ralph P. Grimaldi, B. V. Ramatta, Pearson, Education, 5 Edition.
5. Discrete Mathematical Structures, Trembley and Manobar.

Course Code: **OE01**	Course Title: **Business Intelligence**
Course Credits: **03**	Hour of Teaching / Week: **03 Hours**
Formative Assessment Marks: **40**	Total Contact Hours: **42 Hours**
Exam Marks: **60**	Exam Duration: **2½ Hours**

Course outcomes:

- gain knowledge of Business Intelligence
- build business projects
- generate and manage BI reports
- do BI Deployment, Administration & Security.

Course Content	Hours
Unit - 1	
Introduction to Business Intelligence: Understanding the scope of today's BI solutions and how they fit into existing infrastructure Assessing new options such as SaaS and cloud-based technology. Describe BI, its components & architecture, previewing the future of BI Crafting a better experience for all business users, End User Assumptions, setting up Data for BI, The Functional Area of BI Tools, Query Tools and Reporting, OLAP and Advanced Analytics, Supporting the requirements of senior executives, including performance management.	14
Unit - 2	
Elements of Business Intelligence Solutions: Reports & ad hoc queries; Analyze OLAP data; Dashboards & Scorecards development, Metadata Models; Automated tasks & events; Mobile & disconnected BI; Collaboration capabilities; Real time monitoring capabilities; Software development kit; Consume BI through portals, web applications, Desktop applications. **Building the BI Project:** Planning the BI project, Project Resources; Project Tasks, Risk Management and Mitigation, Cost-justifying BI solutions and measuring success, Collecting User Requirements, Requirements-Gathering Techniques; Prioritizing & Validating BI Requirements, Changing Requirements; BI Design and Development, Best Practices for BI Design; Post-Implementation Evaluations, Maintaining Your BI Environment.	14
Unit - 3	
Reporting authoring: Building reports with relational vs Multidimensional data models; Types of Reports Data Grouping & Sorting, Filtering Reports, Adding Calculations to Reports, Conditional formatting, Adding Summary Lines to Reports. Drill up, drill- down, drill-through capabilities. Run or schedule report, different output forms. **BI Deployment, Administration & Security:** Centralized Versus Decentralized Architecture, BI Architecture Alternatives, phased & incremental BI roadmap, System Sizing, Measurements and Dependencies, System Sizing, Measurements, and Dependencies. Setting Early Expectations and Measuring the Results. End-User Provisos. OLAP Implementations. Expanding BI Authentication Authorization, Access Permissions, Groups and Roles, Single-sign on Server Administration, Manage Status & Monitoring, Audit, Mail server & Portal integration, Back Up and Restore.	14

TEXT BOOKS
1. Business Intelligence (IBM ICE Publication).
REFERENCE BOOKS
1. http://en.wikipedia.org/wiki/Business_intelligence.
2. http://www.webopedia.com/TERM/B/Business_Intelligence.html.
3. Http://www.cio.com/article/40296/Business_Intelligence_Definition_and_Solutions.

Course Code: **OE 02**	Course Title: **Big Data Analytics**
Course Credits: **03**	Hour of Teaching / Week: **03 Hours**
Formative Assessment Marks: **40**	Total Contact Hours: **42 Hours**
Exam Marks: **60**	Exam Duration: **2½ Hours**

Course outcomes:

- Explain the importance of data and data analysis.
- Interpret the probabilistic models for data.
- Illustrate hypothesis, uncertainty principle.
- Demonstrate the regression analysis

Course Content	Hours
Unit - 1	
Overview Of Big Data: History of big data, its elements, career related knowledge, advantages, disadvantages. Using Big Data in Businesses: Focus on the application perspective of Big Data covering, using big data in marketing, analytics, retail, hospitality, consumer good, defense etc. Technologies for Handling Big Data: Introduction to Hadoop, functioning of Hadoop, Cloud computing (features, advantages, applications) etc	14
Unit - 2	
Understanding Hadoop Ecosystem: Hadoop and its ecosystem which includes HDFS, Map Reduce, YARN, HBase, Hive, Pig, Sqoop, Zookeeper, Flume, Oozie etc. Dig Deep to understand the fundamental of Map Reduce and HBase: framework of Map Reduce and uses of map reduce. Understanding Big Data Technology Foundations: big data stack i.e. data source layer, ingestion layer, source layer, security layer, visualization layer, visualization approaches etc.	14
Unit - 3	
Databases And Data Warehouses: Databases, polygot persistence and their related introductory knowledge. Using Hadoop to store data: Module of HDFS, HBase and ways to store and manage data along with their commands. Learn to Process Data using Map Reduce: Emphasizes on developing simple map reduce framework and the concept applied.	14

Text Books:

1. Big Data Now: 2014 Edition by "Raymond I Morrison"
2. Analytics in a Big Data World: The essential guide to data science and its application

References:

1. Hadoop For Dummies, Dirk deRoos, For Dummies, 2014
2. Big Data Analytics, Introduction to Hadoop, Spark, and Machine-Learning by Raj Kamal Preeti Saxena.
3. Big Data Analytics: A Hands-On Approach Paperback – 7 Sep 2018, by Arshdeep Bahga, Vijay Madisetti.

NEP2020 Model Course Content for BCA, Semesters III and IV

Semester: III

Course Code: **CAC07 [FAC410]**	Course Title: **Database Management Systems**
Course Credits: **03**	Hour of Teaching / Week: **03 Hours**
Formative Assessment Marks: **40**	Total Contact Hours: **42 Hours**
Exam Marks: **60**	Exam Duration: **2½ Hours**

Course Outcomes (COs):

At the end of the course, students will be able to:

- Explain the various database concepts and the need for database systems.
- Identify and define database objects, enforce integrity constraints on a database using DBMS.
- Demonstrate a Data model and Schemas in RDBMS.
- Identify entities and relationships and draw ER diagram for a given real-world problem.
- Convert an ER diagram to a database schema and deduce it to the desired normal form.
- Formulate queries in Relational Algebra, Structured Query Language (SQL) for database manipulation.
- Explain the transaction processing and concurrency control techniques.

Course Content	Hours
Unit - 1	
Database Architecture: Introduction to Database system applications. Characteristics and Purpose of database approach. People associated with Database system. Data models. Database schema. Database architecture. Data independence. Database languages, interfaces, and classification of DBMS. E-R Model: Entity-Relationship modeling: E – R Model Concepts: Entity, Entity types, Entity sets, Attributes, Types of attributes, key attribute, and domain of an attribute. Relationships between the entities. Relationship types, roles and structural constraints, degree and cardinality ratio of a relationship. Weak entity types, E -R diagram.	14
Unit – 2	
Relational Data Model: Relational model concepts. Characteristics of relations. Relational model constraints:Domain constrains, key constraints, primary & foreign key constraints, integrity constraints and null values Relational Algebra: Basic Relational Algebra operations. Set theoretical operations on relations. JOIN operations Aggregate Functions and Grouping. Nested Sub Queries-Views.	14
Unit – 3	
Data Normalization: Anomalies in relational database design. Decomposition. Functional dependencies – Axioms, minima and maxima cover. Normalization. First normal form, Second normal form, Third normal form. Boyce-Codd normal form. Query Processing Transaction Management: Introduction Transaction Processing. Single user & multiuser systems. Transactions: read & write operations. Need of concurrency control: The lost update problem, Dirty read problem. Types of failures. Transaction states. Desirable properties (ACID properties) of Transactions.	14

References:

1. Fundamentals of Database Systems, Ramez Elamassri, Shankant B. Navathe, 7th Edition, Pearson, 2015
2. An Introduction to Database Systems, Bipin Desai, Galgotia Publications, 2010.
3. Introduction to Database System, C J Date, Pearson, 1999.
4. Database Systems Concepts, Abraham Silberschatz, Henry Korth, S.Sudarshan, 6th Edition, McGraw Hill, 2010.
5. Database Management Systems, Raghu Rama Krishnan and Johannes Gehrke, 3rd Edition, McGraw Hill, 2002

Course Code: **CAC07P [FAC410]**	Course Title: **DBMS Lab**
Course Credits: **02**	Hour of Teaching / Week: **04 Hours**
Formative Assessment Marks: **25**	Total Contact Hours: **52 Hours**
Exam Marks: **25**	Exam Duration: **03 Hours**

Course Outcomes (COs):

Student would be able to create tables, execute queries

- Execute a single line query and group functions.
- Execute DDL Commands.
- Execute DML Commands
- Execute DCL and TCL Commands.
- Implement the Nested Queries.
- Implement Join operations in SQL
- Create views for a particular table
- Implement Locks for a particular table

Activity 1:

Database: Student (DDL, DML Statements)

Table: Student

Name	RegNo	Class	Major
Smith	17	1	CS
Brown	8	2	CS

Table: Course

CourseName	CourseNumber	CreditHours	Department
Introduction to Computer Science	CS1310	4	CS
Data Structure	CS3320	4	CS
Discrete Mathematics	MATH2410	3	MATH
Database Management Systems	CS3380	3	CS

Table: Section

Section_Identifier	CourseNumber	Year	Instructor
85	MATH2410	98	King
92	CS1310	98	Andreson
102	CS3320	99	Knuth
112	MATH2410	99	Chang
119	CS1310	99	Andreson
135	CS3380	99	Stone

Table: Grade_Report

RegNo	Section_Identifier	Grade
17	112	B
17	119	C
8	85	A
8	92	A
8	102	B
8	135	A

- Create Tables using create statement
- Insert rows to individual tables using insert statement
- Alter table section add new field section and update the records Delete brown's grade report
- Drop the table section

Activity 2: (Select clause, Arithmetic Operators)

Database: Employee
Create Following **tables** and insert **tuples** with suitable constraints
Table: Employee

Emp_Id	First_Name	Last_Name	Hire_Date	Address	City
1001	George	Smith	11-May-06	83 first street	Paris
1002	Mary	Jones	25-Feb-08	842 Vine Ave	Losantiville
1012	Sam	Tones	12-Sep-05	33 Elm St.	Paris
1015	Peter	Thompson	19-Dec-06	11 Red Road	Paris
1016	Sarath	Sharma	22-Aug-07	440 MG Road	New Delhi
1020	Monika	Gupta	07-Jun-08	9 Bandra	Mumbai

Table: Empsalary

Emp_Id	Salary	Benefits	Designation
1001	10000	3000	Manager
1002	8000	1200	Salesman
1012	20000	5000	Director
1015	6500	1300	Clerk
1016	6000	1000	Clerk
1020	8000	1200	Salesman

Write queries for the following
1. To display FIRSTNAME, LASTNAME, ADDRESS AND CITY of all employees living in PARIS.
2. To display the content of employee table in descending order of FIRSTNAME
3. Select FIRSTNAME and SALARY of salesman
4. To display the FIRSTNAME, LASTNAME, AND TOTAL SALARY of all employees from the table EMPLOYEE and EMPSALARY. Where TOTAL SALARY is calculated as SALARY+BENEFITS
5. List the Names of employees, who are more than 1 year old in the organization
6. Count number of distinct DESINGATION from EMPSALARY
7. List the employees whose names have exactly 6 characters
8. Add new column PHONE_NO to EMPLOYEE and update the records
9. List employee names, who have joined before 15-Jun-08 and after 16-Jun-07
10. Generate Salary slip with Name, Salary, Benefits, HRA-50%, DA-30%, PF-12%, Calculate gross. Order the result in descending order of the gross.

Activity 3: (Logical, Relational Operators)

Database: Library

Create Following **tables** and insert **tuples** with suitable constraints

Table: Books

Book_Id	Book_Name	Author_Name	Publishers	Price	Type	Quantity
C0001	The Klone	Lata Kappor	EPP	355	Novel	5
F0001	The Tears	William Hopkins	First Publ	650	Fiction	20
T0001	My First	Brain & Brooke	ERP	350	Text	10
T0002	C++	A.W.Rossaine	TDH	350	Text	15
F0002	Thunderbolts	Ana Roberts	First Publ.	750	Fiction	50

Table: Issued

Book_Id	Quantity_Issued
T0001	4
C0001	5
F0001	2
T0002	5
F0002	8

Write queries for the following

1. To show Book name, Author name and price of books of **First Publ**. publisher
2. Display Book id, Book name and publisher of books having quantity more than 8 and price less than 500
3. Select Book id, book name, author name of books which is published by other than ERP publishers and price between 300 to 700
4. Generate a Bill with Book_id, Book_name, Publisher, Price, Quantity, 4% of VAT "Total"
5. Display book details with book id"s C0001, F0001, T0002, F0002 (Hint: use IN operator)
6. Display Book list other than, type Novel and Fiction
7. Display book details with author name starts with letter "A"
8. Display book details with author name starts with letter "T" and ends with "S"
9. Select Book_Id, Book_Name, Author Name , Quantity Issued where Books.Books_Id = Issued.Book_Id
10. List the book_name, Author_name, Price. In ascending order of Book_name and then on descending order of price

Activity 4: (Date Functions)

Database: Lab

Create Following **table** and insert **tuples** with suitable constraints

Table: Equipment_Details

No.	ItemName	Costperitem	Quantity	Dateofpurchase	Warranty	Operational
1	Computer	30000	9	21/5/07	2	7
2	Printer	5000	3	21/5/06	4	2
3	Scanner	8000	1	29/8/08	3	1
4	Camera	7000	2	13/6/05	1	2
5	UPS	15000	5	21/5/08	1	4
6	Hub	8000	1	31/10/08	2	1
7	Plotter	25000	2	11/1/09	2	2

(Use date functions and aggregate functions)

1. To select the ItemName purchase after 31/10/07
2. Extend the warranty of each item by 6 months
3. Display ItemName , Dateof purchase and number of months between purchase date and present date
4. To list the ItemName in ascending order of the date of purchase where quantity is more than 3.
5. To count the number, average of costperitem of items purchased before 1/1/08
6. To display the minimum warranty, maximum warranty period
7. To Display the day of the date, month, year of purchase in characters
8. To round of the warranty period to month and year format.
9. To display the next Sunday from the date ¨07-JUN-96¨
10. To list the ItemName, which are within the warranty period till present date

Activity 5: (Numeric, character functions) Use Functions for the following
1. Find the mod of 165,16
2. Find Square Root of 5000
3. Truncate the value 128.3285 to 2 and -1 decimal places
4. Round the value 92.7683 to 2 and -1 decimal places
5. Convert the string ¨Department¨ to uppercase and lowercase
6. Display your address convert the first character of each word to uppercase and rest are in lowercase
7. Combine your first name and last name under the title Full name
8. A) Take a string length maximum of 15 displays your name to the left. The remaining space should be filled with "*"
9. Take a string length maximum of 20 displays your name to the right. The remaining space should be filled with "#"
10. Find the length of the string "JSS College, Mysore"
11. Display substring ¨BASE¨ from ¨DATABASE¨
12. Display the position of the first occurrence of character "o" in Position and Length
13. Replace string Database with Data type
14. Display the ASCII value of " " (Space)
15. Display the Character equivalent of 42

Activity 6:

Database: Subject

Create Following **table** and insert **tuples** with suitable constraints

Table - Physics

Regno	Name	Year	Combination
AJ00325	Ashwin	First	PCM
AJ00225	Swaroop	Second	PMCs
AJ00385	Sarika	Third	PME
AJ00388	Hamsa	First	PMCs

Table – Computer Science

Regno	Name	Year	Combination
AJ00225	Swaroop	Second	PMCs
AJ00296	Tajas	Second	BCA
AJ00112	Geetha	First	BCA
AJ00388	Hamsa	First	PMCs

1. Select all students from physics and Computer Science
2. Select student common in physics and Computer Science
3. Display all student details those are studying in second year

4. Display student those who are studying both physics and computer science in second year
5. Display the students studying only physics
6. Display the students studying only Computer Science
7. select all student having PMCs combination
8. select all student having BCA combination
9. select all student studying in Third year
10. Rename table Computer Science to CS

Activity 7: (views)

Database: Railway Reservation System
Create Following **table** and insert **tuples** with suitable constraints

Table: Train Details

Train_No	Train_Name	Start_Place	Destination
RJD16	Rajdhani Express	Bangalore	Mumbai
UDE04	Udhyan Express	Chennai	Hyderabad
KKE55	Karnataka Express	Bangalore	Chennai
CSE3	Shivaji Express	Coimbatore	Bangalore
JNS8	Janashatabdi	Bangalore	Salem

Table: Availability

Train_No	Class	Start_Place	Destination	No_of_seats
RJD16	Sleeper Class	Bangalore	Mumbai	15
UDE04	First Class	Chennai	Hyderabad	22
KKE55	First Class AC	Bangalore	Chennai	15
CSE3	Second Class	Coimbatore	Bangalore	8
JNS8	Sleeper Class	Bangalore	Salem	18

1. Create view **sleeper** to display train no, start place, destination which have sleeper class and perform the following
   a. insert new record
   b. update destination =" Manglore" where train no=" RJD16"
   c. delete a record which have train no =" KKE55"
2. Create view **details** to display train no, train name, class
3. Create view total_seats to display train number, start place, use count function to no of seats, group by start place and perform the following
   a. insert new record
   b. update start place= "Hubli" where train no= "JNS8"
   c. delete last row of the view
4. Rename view sleeper to class
5. Delete view details

Activity 8 (group by, having clause)
Database: Bank system
Create Following **table** and insert **tuples** with suitable constraints

Table: Account

Account_No	Cust_Name	Brach_ID
AE0012856	Reena	SB002
AE1185698	Akhil	SB001
AE1203996	Daniel	SB004
AE1225889	Roy	SB002
AE8532166	Sowparnika	SB003
AE8552266	Anil	SB003
AE1003996	Saathwik	SB004
AE1100996	Swarna	SB002

Table: Branch

Branch_ID	Branch_Name	Branch_City
SB001	Malleshwaram	Bangalore
SB002	MG Road	Bangalroe
SB003	MG Road	Mysore
SB004	Jainagar	Mysore

Table: Depositor

Account_No	Branch_Id	Balance
AE0012856	SB002	12000
AE1203996	SB004	58900
AE8532166	SB003	40000
AE1225889	SB002	150000

Table: Loan

Account_No	Branch_Id	Balance
AE1185698	SB001	102000
AE8552266	SB003	40000
AE1003996	SB004	15000
AE1100996	SB002	100000

1. Display Total Number of accounts present in each branch
2. Display Total Loan amount in each branch
3. Display Total deposited amount in each branch by descending order
4. Display max, min loan amount present in each city.
5. Display average amount deposited in each branch, each city
6. Display maximum of loan amount in each branch where balance is more than 25000
7. Display Total Number of accounts present in each city
8. Display all customer details in ascending order of brachid
9. Update Balance to 26000 where accno=AE1003996
10. Display Customer Names with their branch Name

Evaluation Scheme for Lab Examination:

Assessment Criteria	Marks
Writing 2 Programs	10
Execution of 1 Program	10
Viva and Record	05
Total	25

Course Code: **CAC08 [FAC420]**	Course Title: **C# and .Net Technologies**
Course Credits: **03**	Hour of Teaching / Week: **03 Hours**
Formative Assessment Marks: **40**	Total Contact Hours: **42 Hours**
Exam Marks: **60**	Exam Duration: **2½ Hours**

Course Outcomes (COs):

At the end of the course, students will be able to:

- Describe Object Oriented Programming concepts like Inheritance and Polymorphism in C# programming language.
- Interpret and Develop Interfaces for real-time applications.
- Build custom collections and generics in C#.

Course Content	Hours
Unit - 1	
Introduction to .Net Technologies: Introduction to Web Technologies. HTML Basics, Scripts. Sample Programs. Advantages and Disadvantages of Client-side and Server-side Scripts. Overview of Client-side Technologies and Server-side Technologies. Introduction to C#:Overview of C#, Literals, Variables, Data Types, Operators, Expressions, Control Structures-Methods, Arrays, Strings, Structures, Enumerations.	14
Unit – 2	
OOPS with C#: Classes, Objects, Inheritance, Polymorphism, Interfaces, Operator Overloading Delegates, Events, Errors and Exceptions. Introduction to VB.NET: Introduction VB.NET -IDE – Creating a shortcut to start VB.NET. Maneuverings the Toolbar Auto-hide, Docking and Undocking, Placing and Resizing the Windows, Forms, Properties Window and Solution Explorer. Writing and Event Procedure. Execution Basic Keywords. Data Types. VB.NET statements. Conditional statements: If Else, Select Case, Switch and Choose Loops: Do, For Next, For Each Next, While loop. Arrays.	14
Unit – 3	
Application Development on .NET: C#.NET: Building Windows Applications, VB.NET: Windows Forms. Working with Controls, Timer, Picture-box, Group-box, Combo-box, Horizontal and Vertical Scrollbar, Numeric-up-down, Track-bar, and Progress-bar. Subroutines and Functions in VB.NET. Database applications ADO.NET Connectivity: Introduction to ADO.NET, ADO vs ADO.NET. Architecture: Data reader, Data adopter, Accessing Data with ADO.NET. Programming Web Applications with Web Forms. ASP .NET applications with ADO.NET	14

References:
1. "Programming in C#", E. Balagurusamy, 4th Edition, Tata McGraw-Hill, 2017.
2. "Visual Basic.NET", Shirish Chavan, 3rd Edition, Pearson Education, 2009.
   3. "ASP.NET and VB.NET Web Programming", Matt J. Crouch, Edition 2012.
   4. "Computing with C# and the .NET Framework", Arthur Gittleman, 2nd Edition, Jones & Bartlett Publishers, 2011

Course Code: **CAC08P [FAC420]**	Course Title: **C# and .Net Technologies Lab**
Course Credits: **02**	Hour of Teaching / Week: **04 Hours**
Formative Assessment Marks: **25**	Total Contact Hours: **52 Hours**
Exam Marks: **25**	Exam Duration: **03 Hours**

Practicals:

1. Develop a C# .NET console application to demonstrate the conditional statements.
2. Develop a C# .NET console application to demonstrate the control statements.
3. Develop an application in C#.NET that demonstrates the windows controls
4. Demonstrate Multithreaded Programming in C#.NET
5. Demonstrate subroutines and functions in C#.NET
6. Develop an application for deploying various built-in functions in VB.NET
7. Develop an MDI application for Employee Pay-roll transactions in VB.NET
8. Construct a console application to demonstrate the OOP Concepts
9. Develop a web application in VB.NET for dynamic Login Processing
10. Develop a Windows application with database connectivity for core-banking transactions

Evaluation Scheme for Lab Examination:

Assessment Criteria	Marks
Writing 2 Programs	10
Execution of 1 Program	10
Viva and Record	05
Total	25

Course Code: **CAC09 [FAC430]**	Course Title: **Computer Networks**
Course Credits: **03**	Hour of Teaching / Week: **03 Hours**
Formative Assessment Marks: **40**	Total Contact Hours: **42 Hours**
Exam Marks: **60**	Exam Duration: **2½ Hours**

Course Outcomes (COs):

At the end of the course, students will be able to:

• Explain the transmission technique of digital data between two or more computers and a computer network that allows computers to exchange data.

• Apply the basics of data communication and various types of computer networks in real world applications.

• Compare the different layers of protocols.

• Compare the key networking protocols and their hierarchical relationship in the conceptual model like TCP/IP and OSI.

Course Content	Hours
Unit - 1	
Introduction: Computer Networks and its applications, Network structure, network architecture, Topologies, LAN, WAN, MAN, The OSI reference model, The TCP/IP reference model. The Physical Layer: Transmission Media – Twisted pair, coaxial cable, optical fiber, radio transmission, microwaves and infrared transmission, Switching – message switching, Multiplexing.	14
Unit – 2	
The Data Link Layer: Data Link Layer design issues, Error detection – Single parity checking, Checksum, polynomial codes – CRC, Error correction- Hamming code, Elementary data link protocols, sliding window protocols The Network Layer: Network layer design issues, Routing algorithms – Flooding, Distance vector routing, Hierarchical routing, Link state routing, Congestion, control algorithms – Leaky bucket, token bucket algorithm, admission control, Hop by Hop choke packets.	14
Unit – 3	
The Transport Layer, Presentation Layer and Application Layer: Elements of Transport service, Elements of Transport, protocols, Internet transport protocols (TCP & UDP), Presentation Layer – Introduction, protocol, Application Layer DNS, Electronic Mailing, and World Wide Web.	14

References:

1. Computer Networks, Andrew S. Tanenbaum, 5th Edition, Pearson Education, 2010.
2. Data Communication & Networking, Behrouza A Forouzan, 3rd Edition, Tata McGraw Hill,2001.
3. Data and Computer Communications, William Stallings, 10th Edition, Pearson Education, 2017.
4. Data Communication and Computer Networks, Brijendra Singh, 3rd Edition, PHI, 2012.
5. Data Communication & Network, Dr. Prasad, Wiley Dreamtech.
6. http://highered.mheducation.com/sites/0072967757/index.htmls

Semester: IV

Course Code: **CAC10 [FAD410]**	Course Title: **Python Programming**
Course Credits: **03**	Hour of Teaching / Week: **03 Hours**
Formative Assessment Marks: **40**	Total Contact Hours: **42 Hours**
Exam Marks: **60**	Exam Duration: **2½ Hours**

Course Outcomes (COs):

At the end of the course, students will be able to:

- Explain the basic concepts of Python Programming.
- Demonstrate proficiency in the handling of loops and creation of functions.
- Identify the methods to create and manipulate lists, tuples and dictionaries.
- Discover the commonly used operations involving file handling.
- Interpret the concepts of Object-Oriented Programming as used in Python.
- Develop the emerging applications of relevant fields using Python.

Course Content	Hours
Unit - 1	
Introduction to Features and Applications of Python; Python Versions; Installation of Python; Python Command Line mode and Python IDEs; Simple Python Program. Python Basics:Identifiers; Keywords; Statements and Expressions; Variables; Operators; Precedence and Association; Data Types; Indentation; Comments; Built-in Functions- Console Input and Console Output, Type Conversions; Python Libraries; Importing Libraries with Examples. Python Control Flow: Types of Control Flow; Control Flow Statements- if, else, elif, while loop, break, continue statements, for loop Statement; range () and exit () functions. Exception Handling: Types of Errors; Exceptions; Exception Handling using try, except and finally. Python Functions: Types of Functions; Function Definition- Syntax, Function Calling, Passing Parameters/arguments, the return statement; Default Parameters; Command line Arguments; Key Word Arguments; Recursive Functions; Scope and Lifetime of Variables in Functions.	14
Unit – 2	
Strings: Creating and Storing Strings; Accessing Sting Characters; the str() function; Operations on Strings- Concatenation, Comparison, Slicing and Joining, Traversing; Format Specifiers; Escape Sequences; Raw and Unicode Strings; Python String Methods. Lists: Creating Lists; Operations on Lists; Built-in Functions on Lists; Implementation of Stacks and Queues using Lists; Nested Lists. Dictionaries: Creating Dictionaries; Operations on Dictionaries; Built-in Functions on Dictionaries; Dictionary Methods; Populating and Traversing Dictionaries. Tuples and Sets: Creating Tuples; Operations on Tuples; Built-in Functions on Tuples; Tuple Methods; Creating Sets; Operations on Sets; Built-in Functions on Sets; Set Methods File Handling: File Types; Operations on Files– Create, Open, Read, Write, Close Files; File Names and Paths; Format Operator.	14

Unit – 3	
Object Oriented Programming: Classes and Objects; Creating Classes and Objects; Constructor Method; Classes with Multiple Objects; Objects as Arguments; Objects as Return Values; Inheritance- Single and Multiple Inheritance, Multilevel and Multipath Inheritance; Encapsulation- Definition, Private Instance Variables; Polymorphism- Definition, Operator Overloading. GU Interface: The tkinter Module; Window and Widgets; Layout Management- pack, grid and place. Python SQLite: The SQLite3 module; SQLite Methods- connect, cursor, execute, close; Connect to Database; Create Table; Operations on Tables- Insert, Select, Update. Delete and Drop Records. Data Analysis: NumPy- Introduction to NumPy, Array Creation using NumPy, Operations on Arrays; Pandas- Introduction to Pandas, Series and DataFrames, Creating DataFrames from Excel Sheet and .csv file, Dictionary and Tuples. Operations on DataFrames. Data Visualisation: Introduction to Data Visualisation; Matplotlib Library; Different Types of Charts using Pyplot- Line chart, Bar chart and Histogram and Pie chart.	14

References:

1. Think Python How to Think Like a Computer Scientist, Allen Downey et al., 2nd Edition, Green Tea Press.
   Freely available online@https://www.Greenteapress.com/thinkpython/thinkCSpy.pdf,2015.
2. 2. Introduction to Python Programming, Gowrishankar S et al., CRC Press, 2019.
3. Python Data Analytics: Data Analysis and Science Using Pandas, matplotlib, and the Python Programming Language, Fabio Nelli, Apress®, 2015
4. Advance Core Python Programming, MeenuKohli, BPB Publications, 2021.
5. Core PYTHON Applications Programming, Wesley J. Chun, 3rd Edition, Prentice Hall, 2012.
6. Automate the Boring Stuff, Al Sweigart, No Starch Press, Inc, 2015.
7. Data Structures and Program Design Using Python, D Malhotra et al., Mercury Learning and Information LLC, 2021.
8. http://www.ibiblio.org/g2swap/byteofpython/read/
9. https://docs.python.org/3/tutorial/index.html

Course Code: **CAC10P [FAD410]**	Course Title: **Python Programming Lab**
Course Credits: **02**	Hour of Teaching / Week: **04 Hours**
Formative Assessment Marks: **25**	Total Contact Hours: **52 Hours**
Exam Marks: **25**	Exam Duration: **03 Hours**

Programs for Practical Component:

   Part-A

1. Check if a number belongs to the Fibonacci Sequence
2. Solve Quadratic Equations
3. Find the sum of n natural numbers
4. Display Multiplication Tables
5. Check if a given number is a Prime Number or not
6. Implement a sequential search
7. Create a calculator program

8. Explore string functions
9. Implement Selection Sort
10. Implement Stack
11. Read and write into a file

Part-B

1. Demonstrate usage of basic regular expression
2. Demonstrate use of advanced regular expressions for data validation.
3. Demonstrate use of List
4. Demonstrate use of Dictionaries
5. Create SQLite Database and Perform Operations on Tables
6. Create a GUI using Tkinter module
7. Demonstrate Exceptions in Python
8. Drawing Line chart and Bar chart using Matplotlib
9. Drawing Histogram and Pie chart using Matplotlib
10. Create Array using NumPy and Perform Operations on Array
11. Create DataFramefrom Excel sheet using Pandas and Perform Operations on DataFrames

Note: A minimum of 10 Programs should be done in each Part.

Evaluation Scheme for Lab Examination:

Assessment Criteria	Marks
Writing 2 Programs	10
Execution of 1 Program	10
Viva and Record	05
Total	25

Course Code: **CAC11 [FAD420]**	Course Title: **Multimedia Animation**
Course Credits: **03**	Hour of Teaching / Week: **03 Hours**
Formative Assessment Marks: **40**	Total Contact Hours: **42 Hours**
Exam Marks: **60**	Exam Duration: **2½ Hours**

Course Outcomes (COs):

At the end of the course, students will be able to:

- Write a well-designed, interactive Web site with respect to current standards and practices.
- Demonstrate in-depth knowledge of an industry-standard multimedia development tool and its associated scripting language.
- Determine the appropriate use of interactive versus standalone Web applications.

Course Content	Hours
Unit - 1	
Web Design: Origins and evolution of HTML, Basic syntax, Basic text markup, Images, Lists, Tables, Forms, Frame, Overview and features of HTML5. CSS: Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, The <span> and <div> tags; Overview and features of CSS3. JavaScript: Object orientation and JavaScript; General syntactic characteristics; Primitives, operations, and expressions; Screen output and keyboard input. Introduction to Animation: Definition, The Start and End States, Interpolation, Animations in HTML.	14
Unit – 2	
CSS Animations, creating a Simple Animation, CSS Animation Property, Keyframes, Declaring Multiple Animations, Wrap-up. CSS Transitions, Adding a Transition, Transitions in Detail, The Longhand Properties, Longhand Properties vs. Shorthand Properties, Working with Multiple Transitions. HTML5 – SVG: Viewing SVG Files, Embedding SVG in HTML5, HTML5– SVG Circle, HTML5 – SVG Rectangle, HTML5 – SVG Line, HTML5 – SVG Ellipse, HTML5 – SVG Polygon, HTML5 – SVG Polyline, HTML5 – SVG Gradients, HTML5 – SVG Star.	14
Unit – 3	
HTML5–CANVAS: The Rendering Context, Browser Support, HTML5 Canvas Examples, Canvas - Drawing Rectangles, Canvas - Drawing Paths, Canvas - Drawing Lines, Canvas - Drawing Bezier Curves, Canvas - Drawing Quadratic Curves, Canvas - Using Images, Canvas - Create Gradients, HTML5 - Styles and Colors, Canvas - Text and Fonts, Canvas - Pattern and Shadow, Canvas - Save and Restore States, Canvas - Translation, Canvas - Rotation, Canvas - Scaling, Canvas - Transforms, HTML5 Canvas - Composition, Canvas – Animations.	14

References:

1. The Complete Reference HTML and CSS, 5th Edition, Thomas A Powell, 2017
2. Animation in HTML, CSS, and JavaScript, Kirupa Chinnathambi, Createspace Independent Pub, 2013.
3. https://www.w3.org/Style/CSS/current-work#CSS3
4. http://bedford-computing.co.uk/learning/cascading-style-sheets-css/

Course Code: **CAC11P [FAD420]**	Course Title: **Multimedia Animation Lab**
Course Credits: **02**	Hour of Teaching / Week: **04 Hours**
Formative Assessment Marks: **25**	Total Contact Hours: **52 Hours**
Exam Marks: **25**	Exam Duration: **03 Hours**

List of Lab programs

Part-A

1. Write an HTML program tocreate and display navigations menus using list tags and anchor tag
2. Write an HTML program to display Multi-mediadata (text, images, audios, videos, gifs, etc) on a webpage
3. Write an HTML program to create student Registrations form on submitting the form check whether fields are empty or not using JavaScript. If any fields are empty display an error message
4. Write an HTML program to create bio-data (CV or Resume) and to change the following CSS properties
   - Font
   - Text
   - Background
5. Write an HTML program to create div and apply the following CSS properties on created div
   - Margin
   - Padding
   - Border
   - Box shadow
6. Write an HTML program to create a box and using CSS transform and transition properties move the box to the center of the web page on loading web-page
7. Write an HTML program to create a circle and create an animation of bouncing of the circle for 10 sec
8. Write an HTML program to create page loading animations

Part-B

1. Write an HTML program to draw line, polyline and rectangle and fill rectangle with red color using svg tag.
2. Write an HTML program to draw star and multiple circle and with different color using svg tag Write an HTML program to create logo with linear gradient properties using svg tag.
3. Write an HTML program to draw Square and Rectangle using canvas tag and JavaScript
4. Write an HTML program to draw bezier curve using canvas tag and JavaScript
5. Write an HTML Program to import an external image into a canvas and then to draw on that image
6. Write an HTML program to draw a rectangle box using canvas and to change background color to red, scale of the rectangle to 2 on move-over (hover)properties.
7. Write an html program to draw a circle using canvas and to apply the rotations animations on loading the page

Evaluation Scheme for Lab Examination:

Assessment Criteria	Marks
Writing 2 Programs	10
Execution of 1 Program	10
Viva and Record	05
Total	25

Course Code: **CAC12 [FAD430]**	Course Title: **Operating System Concepts**
Course Credits: **03**	Hour of Teaching / Week: **03 Hours**
Formative Assessment Marks: **40**	Total Contact Hours: **42 Hours**
Exam Marks: **60**	Exam Duration: **2½ Hours**

Course Outcomes (COs):

At the end of the course, students will be able to:

- Explain the fundamentals of the operating system.
- Comprehend multithreaded programming, process management, process synchronization, memory management and storage management.
- Compare the performance of Scheduling Algorithms
- Identify the features of I/O and File handling methods.

Course Content	Hours
Unit - 1	
Introduction to Operating System: Definition, History and Examples of Operating System; Computer System organization; Types of Operating Systems; Functions of Operating System; Systems Calls; Operating System Structure. Process Management: Process Concept- Process Definition, Process State, Process Control Block, Threads; Process scheduling- Multiprogramming, Scheduling Queues, CPU Scheduling, Context Switch; Operations on Processes- Creation and Termination of Processes; Inter process communication (IPC)- Definition and Need for Inter process Communication; IPC Implementation Methods- Shared Memory and Message Passing; CPU Scheduling: Basic concepts; Scheduling Criteria; Scheduling Algorithms; Multiple-processor scheduling; Thread scheduling; Multiprocessor Scheduling; Real-Time CPU Scheduling.	14
Unit – 2	
Multithreaded Programming: Introduction to Threads; Types of Threads; Multithreading- Definition, Advantages; Multithreading Models; Thread Libraries; Threading Issues. Process Synchronization: Introduction; Race Condition; Critical Section Problem and Peterson's Solution; Synchronization Hardware, Semaphores; Classic Problems of Synchronization- Readers and Writers Problem, Dining Philosophers Problem; Monitors. Deadlocks: System Model; Deadlocks Characterization; Methods for Handling Deadlocks; Deadlock Prevention; Deadlock Avoidance; Deadlock Detection; and Recovery from Deadlock.	14
Unit – 3	
Memory Management: Logical and Physical Address Space; Swapping; Contiguous Allocation; Paging; Segmentation; Segmentation with Paging. Virtual Memory: Introduction to Virtual Memory; Demand Paging; Page Replacement; Page Replacement Algorithms; Allocation of frames, Thrashing. File System: File Concepts- Attributes, Operations and Types of Files; File System; File Access methods; Directory Structure; Protection; File System Implementation- File System Structure, Allocation Methods, Free Space Management	14

References:
1. Operating System Concepts, Silberschatz" et al., 10thEdition, Wiley, 2018.
2. Operating System Concepts - Engineering Handbook, Ghosh PK, 2019.
3. Understanding Operating Systems, McHoes A et al., 7th Edition, Cengage Learning, 2014.
4. Operating Systems - Internals and Design Principles, William Stallings, 9th Edition, Pearson.
5. Operating Systems – A Concept Based Approach, Dhamdhere, 3rd Edition, McGraw Hill Education India.
6. Modern Operating Systems, Andrew S Tanenbaum, 4th Edition, Pearson.

Skill Enhancement Courses (SEC) for BCA
Semester: IV

Course Code: **SEC-2** **[FAD210]**	Course Title: **Open-Source Tools**
Course Credits: 1 + 1 = **02**	Hour of Teaching / Week: Theory (**1Hour**) + Practical (**2 Hours**)
Formative Assessment Marks: **25**	Total Contact Hours: **(13 T + 26 P Hours)**
Exam Marks: **25**	Exam Duration: **1 Hours**

Course Outcomes (COs):
- Recognize the benefits and features of Open Source Technology and to interpret, contrast and compare open source products among themselves
- Use appropriate open source tools based on the nature of the problem
- Write code and compile different open-source software.

Course Content	Hours
Module 1: Open-Source Software's	
I. Introduction to Open sources, Need of Open Sources, Open Source – Principles, Standard Requirements, Advantages of Open Sources. II. Free Software – FOSS III. Licenses – GPL, LGPL, Copyrights, Patents, Contracts & Licenses and Related Issues IV. Application of Open Sources. Open Source Operating Systems : FEDORA, UBUNTU	06
Module 2: Programming with case studies	
I. Usage of design Tools like Argo UML or equivalent II. Version Control Systems like Git or equivalent III. Bug Tracking Systems (Trac, BugZilla) IV. BootStrap V. Apache VI. Berkeley Software Distribution VII. Mozilla (Firefox) VIII. Wikipedia IX. Joomla X. GNU Compiler Collection XI. Libre Office	07

Text Book:

1. Kailash Vadera, Bhavyesh Gandhi, "Open Source Technology", Laxmi Publications Pvt. Ltd 2012, 1st Edition.

Reference Book:

1. Fadi P. Deek and James A. M. McHugh, "Open Source: Technology and Policy", Cambridge Universities Press 2007.

ECE21001

V SEMESTER
DSE 1A: Elective: Data Communication and Computer Networks
Credit (L: T: P = 4: 0: 0)

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 fibre, 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

ECE21101

V SEMESTER
DSE 1A: Elective: Data Communication and Computer Networks Lab
Credit (L: T: P = 0: 0: 2)

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 broaECAst tree for it.
13. Network address with automatic subnet address generation:

ECE21201

V SEMESTER

DSE 1B: Elective: Computer Graphics
Credit (L: T: P = 4: 0: 0)

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 Color 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 color concepts – RGB color model – YIQ color model – CMY colour model – HSV color model – HLS color model; Color 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.

ECE21301

V SEMESTER
DSE 1B: Elective: Computer Graphics Lab
Credit (L: T: P = 0: 0: 2)

1. Implementation of Bresenham's 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

ECE21401

V SEMESTER

DSE 1C: Elective: Multimedia Systems and Applications
Credit (L: T: P = 4: 0:0)

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 &colours, computerized colours, colour 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.

ECE21501

V SEMESTER
DSE 1C: Elective: Multimedia Systems and Applications Lab
Credit (L: T: P = 0: 0: 2)

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, pie, oval, circle, rectangle, square, pencil, brush and lasso tool
2. Create an animation using text tool to set the font, size, colour 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 centre 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 Good Bye (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).

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OR

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Project:
Design a minimum 10 page interactive website using Joomla or WordPress.

ECE22001

V SEMESTER

DSE 2A: Elective: ASP.Net
Credit (L: T: P = 4: 0: 0)

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.

ECE22101

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V SEMESTER
DSE 2A: Elective: ASP.Net Lab
Credit (L: T: P = 0: 0: 2)

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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.

ECE22201

V SEMESTER
DSE 2B: Elective: Visual Programming
Credit (L: T: P = 4: 0:0)

{Note: Use any open source alternative such as Tkinter with Python /SharpDevelop/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 msg box 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))

ECE22301
V SEMESTER
DSE 2B: Elective: Visual Programming Lab
Credit (L: T: P = 0: 0: 2)

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 of 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:

ECE22401

V SEMESTER

DSE2C: PHP Programming with MySQL
Credit (L: T: P = 4: 0: 0)

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

Unit - 2   15 Hours

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

Unit - 3   15 Hours

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
Using Cookies: What are Cookies? – Setting Cookies – Using Cookie variables – Session Basics: What's a session? – Understanding Session variables – Managing User preferences with Sessions – Graphics: Drawing functions.

Unit - 4   **15 Hours**

INTRODUCTION TO DATABASE: What is RDBMS technology?, Introduction to SQL, Connecting to the MYSQL, Selecting a database, Adding data to a table, Displaying returned data on Web pages ,Finding the number of row, Inserting, Deleting , Entering and updating data, Executing multiple queries, Understanding Primary and Foreign Key, Understanding Database Normalization, Dealing with Dates and Times

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
5. Julie Meloni and Matt Telles, PHP 6, Course Technology, CENGAGE Learning, India Edition, 2008.
6. Kevin Tatroe, Peter MacIntyre and RasmusLerdorf, Programming PHP, O'REILLY media, 3rd edition, 2013.

ECE22501

V SEMESTER

DSE2C: PHP Programming with MySQL Lab
Credit (L: T: P = 0: 0: 2)

1. Write a PHP program to find the factorial of a number.
2. Write a PHP program using Conditional Statements.
3. Write a PHP program to find the maximum value in a given multi-dimensional array.
4. Write a PHP program to find the GCD of two numbers using user-defined functions.
5. Design a simple web page to generate multiplication table for a given number using PHP.
6. Design a web page that should compute one's age on a given date using PHP.
7. Write a PHP program to download a file from the server.
8. Write a PHP program to store the current date and time in a COOKIE and display the 'Last Visited' date and time on the web page.
9. Write a PHP program to store page views count in SESSION, to increment the count on each refresh and to show the count on web page.
10. Write a PHP program to draw the human face.
11. Write a PHP program to design a simple calculator.
12. Design an authentication web page in PHP with MySQL to check username and password.

ECE23001

V SEMESTER

DSE 3A: Elective: Analysis and Design of Algorithms

(Credit L: T: P = 4: 0: 0)

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**

The Greedy Method: General Method - Container Loading - Knapsack Problem - Tree

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.

Unit - 4   **15 Hours**

Vertex Splitting – Job Sequencing With Deadlines - Minimum Cost Spanning Trees - Optimal

Storage on Tapes – Optimal Merge Patterns - #Single Source Shortest Paths#.

Backtracking: The General Method – The 8-Queens Problem – Sum of Subsets – Graph Coloring – Hamiltonian Cycles – Knapsack Problem Branch and Bound: The Method - 0/1 Knapsack 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.
4. Ellis Horowitz, SatrajSahni and SanguthevarRajasekaran, Fundamentals of Computer Algorithms,Universities Press, Second Edition, Reprint 2009.
5. A.A.Puntambekar, Analysis and Design Of Algorithms, Technical Publications, 2008

ECE23101

V SEMESTER

DSE 3A: Elective: Analysis and Design of Algorithms Lab

(Credit L: T: P = 0: 0: 2)

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.

ECE23201

V SEMESTER

DSE 3B: Elective: Mobile Applications

Credit (L: T: P = 4: 0: 0)

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 Hours

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 Hours

Development tools: Apple iOS toolchain: Objective-C, Xcode IDE, Interface Builder, Device simulator.
Frameworks: Objective-C and Foundation Frameworks, Cocoa Touch, UI Kit, Others: Core Graphics, Core Animation, Core Location and Maps, Basic Interaction.

Unit - 3   15 Hours

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 Hours

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

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.

ECE23301

V SEMESTER

DSE 3B: Elective: Mobile Applications Lab

Credit (L: T: P = 0: 0: 2)

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

ECE23401

V SEMESTER

DSE 3C: Elective: Machine Learning

Credit (L: T: P = 4: 0: 0)

Course Outcome:

After successful completion of the course, the student is able to

CO1.   Deliberate the details of Concepts of Machine Learning
CO2.   Learn in details with examples for Machine Learning Software
CO3.   Specify the details of Linear Algebra
CO4.   Deliberate in details with examples Linear & Logistic Regression
CO5.   Write down in depth Regularization and its utility
CO6.   Learn in details with methods of Neural Networks

Unit - 1   **15 Hours**

Introduction: Concept of Machine Learning, Applications of Machine Learning, Key elements of Machine Learning, Supervised vs. Unsupervised Learning, Statistical Learning: Bayesian Method, The Naive Bayes Classifier

Unit - 2   **15 Hours**

Softwares for Machine Learning and Linear Algebra Overview: Plotting of Data, Vectorization, Matrices and Vectors: Addition, Multiplication, Transpose and Inverse using available tool such as MATLAB.

Unit - 3   **15 Hours**

Linear Regression: Prediction using Linear Regression, Gradient Descent, Linear Regression with one variable, Linear Regression with multiple variables, Polynomial Regression, Feature Scaling/Selection.
Logistic Regression: Classification using Logistic Regression, Logistic Regression vs. Linear Regression, Logistic Regression with one variable and with multiple variables.

Unit - 4   **15 Hours**

Regularization: Regularization and its utility: The problem of Overfitting, Application of Regularization in Linear and Logistic Regression, Regularization and Bias/Variance.
Neural Networks: Introduction, Model Representation, Gradient Descent vs. Perceptron Training, Stochastic Gradient Descent, Multilayer Perceptrons, Multiclass Representation, Backpropagation Algorithm.

Readings
1. Ethem Alpaydin, "Introduction to Machine Learning" 2nd Edition, The MIT Press, 2009.
2. Tom M. Mitchell, "Machine Learning", First Edition by Tata McGraw-Hill Education, 2013.
3. Christopher M. Bishop, "Pattern Recognition and Machine Learning" by Springer, 2007.
4. Mevin P. Murphy, "Machine Learning: A Probabilistic Perspective" by The MIT Press, 2012.

ECE23501

V SEMESTER

DSE 3C: Elective: Machine Learning Lab

Credit (L: T: P = 0: 0: 2)

For practical Labs for Machine Learning, students may use software like MABLAB/Octave or Python. For later exercises, students can create/use their own datasets or utilize datasets from online repositories like UCI Machine Learning Repository (http://archive.ics.uci.edu/ml/).

1. Perform elementary mathematical operations in Octave/MATLAB like addition, multiplication, division and exponentiation.
2. Perform elementary logical operations in Octave/MATLAB (like OR, AND, Checking for Equality, NOT, XOR).
3. Create, initialize and display simple variables and simple strings and use simple formatting for variable.
4. Create/Define single dimension / multi-dimension arrays, and arrays with specific values like array of all ones, all zeros, array with random values within a range, or a diagonal matrix.
5. Use command to compute the size of a matrix, size/length of a particular row/column, load data from a text file, store matrix data to a text file, finding out variables and their features in the current scope.
6. Perform basic operations on matrices (like addition, subtraction, multiplication) and display specific rows or columns of the matrix.
7. Perform other matrix operations like converting matrix data to absolute values, taking the negative of matrix values, additing/removing rows/columns from a matrix, finding the maximum or minimum values in a matrix or in a row/column, and finding the sum of some/all elements in a matrix.
8. Create various type of plots/charts like histograms, plot based on sine/cosine function based on data from a matrix. Further label different axes in a plot and data in a plot.
9. Generate different subplots from a given plot and color plot data.
10. Use conditional statements and different type of loops based on simple example/s.
11. Perform vectorized implementation of simple matrix operation like finding the transpose of a matrix, adding, subtracting or multiplying two matrices.
12. Implement Linear Regression problem. For example, based on a dataset comprising of existing set of prices and area/size of the houses, predict the estimated price of a given house.
13. Based on multiple features/variables perform Linear Regression. For example, based on a number of additional features like number of bedrooms, servant room, number of balconies, number of houses of years a house has been built – predict the price of a house.
14. Implement a classification/ logistic regression problem. For example based on different features of students' data, classify, whether a student is suitable for a particular activity. Based on the available dataset, a student can also implement another classification problem like checking whether an email is spam or not.
15. Use some function for regularization of dataset based on problem 14.
16. Use some function for neural networks, like Stochastic Gradient Descent or backpropagation - algorithm to predict the value of a variable based on the dataset of problem 14.

ECE24101

V SEMESTER

SEC 2A: Elective: Object Oriented Modelling& Design with UML
Credit (L: T: P = 0: 0: 2)

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

Object Oriented Modeling& 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.

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

ECE24301

V SEMESTER

SEC 2B: Elective: JQuery
Credit (L: T: P = 0: 0: 2)

Course Outcome:
After successful completion of the course, the student is able to
CO1.   Deliberate in details with examples JQuery
CO2.   Learn the details of JQuery Overview
CO3.   Specify the details of Steps for Implementation of JQuery
CO4.   Learn the details of Design and use of JQuery

JQuery Lab

1.   Test if jQuery is loaded.
2.   Scroll to the top of the page with jQuery.
3.   Disable right click menu in html page using jquery.
4.   Blink text using jQuery.
5.   Create a Zebra Stripes table effect.
6.   Print a page using jQuery.
7.   Limit character input in the text area including count.
8.   Create a div using jQuery with style tag.
9.   Move one DIV element inside another using jQuery.
10.   Add a list element within an unordered list element.
11.   Remove all the options of a select box and then add one option and select it.
12.   How to get the value of a textbox using jQuery?
13.   Remove style added with .css() function using jQuery.
14.   Distinguish between left and right mouse click with jQuery.
15.   Check if an object is a jQuery object.
16.   How to detect whether the user has pressed 'Enter Key' using jQuery.
17.   How to get textarea text using jQuery.
18.   Access form input fields using jQuery.
19.   Convert a jQuery object into a string.
20.   How to detect a textbox's content has changed using jQuery?
21.   Remove a specific value from an array using jQuery.
22.   Add options to a drop-down list using jQuery.
23.   Delete all table rows except first one using jQuery.
24.   Count Child elements using jQuery.
25.   Restrict "number"-only input for textboxes including decimal points.
26.   Set value in input text using jQuery.
27.   Set a value in a span using jQuery.
28.   Find the class of the clicked element.
29.   Set href attribute at runtime using jquery.
30.   Find the total width of an element (including width, padding, and border) in jQuery.
31.   Change options of select using jQuery.
32.   Access HTML form data using jQuery.

ECE24501

V SEMESTER

SEC 2B: Elective: MongoDB
Credit (L: T: P = 0: 0: 2)

Course Outcome:

After successful completion of the course, the student is able to

CO1.   Deliberate in details with examples MongoDB

CO2.   Learn the details of MongoDB Overview

CO3.   Specify the details of Steps for Implementation of MongoDB

CO4.   Learn the details of Design and use of MongoDB

MongoDB Lab

1.   Write a MongoDB query to display all the documents in the collection restaurants.
2.   Write a MongoDB query to display the fields restaurant_id, name, borough and cuisine for all the documents in the collection restaurant.
3.   Write a MongoDB query to display the fields restaurant_id, name, borough and cuisine, but exclude the field _id for all the documents in the collection restaurant.
4.   Write a MongoDB query to display the fields restaurant_id, name, borough and zip code, but exclude the field _id for all the documents in the collection restaurant.
5.   Write a MongoDB query to display all the restaurant which is in the borough Bronx.
6.   Write a MongoDB query to display the first 5 restaurant which is in the borough Bronx.
7.   Write a MongoDB query to display the next 5 restaurants after skipping first 5 which are in the borough Bronx.
8.   Write a MongoDB query to find the restaurants who achieved a score more than 90.
9.   Write a MongoDB query to find the restaurants that achieved a score, more than 80 but less than 100.
10. Write a MongoDB query to find the restaurants which locate in latitude value less than -95.754168.
11. Write a MongoDB query to find the restaurants that do not prepare any cuisine of 'American' and their grade score more than 70 and latitude less than -65.754168.
12. Write a MongoDB query to find the restaurants which do not prepare any cuisine of 'American' and achieved a score more than 70 and located in the longitude less than -65.754168.
     Note : Do this query without using $ and operator.
13. Write a MongoDB query to find the restaurants which do not prepare any cuisine of 'American ' and achieved a grade point 'A' not belongs to the borough Brooklyn. The document must be displayed according to the cuisine in descending order.
14. Write a MongoDB query to find the restaurant Id, name, borough and cuisine for those restaurants which contain 'Wil' as first three letters for its name.
15. Write a MongoDB query to find the restaurant Id, name, borough and cuisine for those restaurants which contain 'ces' as last three letters for its name.

16. Write a MongoDB query to find the restaurant Id, name, borough and cuisine for those restaurants which contain 'Reg' as three letters somewhere in its name.

17. Write a MongoDB query to find the restaurants which belong to the borough Bronx and prepared either American or Chinese dish.

18. Write a MongoDB query to find the restaurant Id, name, borough and cuisine for those restaurants which belong to the borough Staten Island or Queens or Bronxor Brooklyn.

19. Write a MongoDB query to find the restaurant Id, name, borough and cuisine for those restaurants which are not belonging to the borough Staten Island or Queens or Bronxor Brooklyn.

20. Write a MongoDB query to find the restaurant Id, name, borough and cuisine for those restaurants which achieved a score which is not more than 10.

21. Write a MongoDB query to find the restaurant Id, name, borough and cuisine for those restaurants which prepared dish except 'American' and 'Chinees' or restaurant's name begins with letter 'Wil'.

22. Write a MongoDB query to find the restaurant Id, name, and grades for those restaurants which achieved a grade of "A" and scored 11 on an ISODate "2014-08-11T00:00:00Z" among many of survey dates..

23. Write a MongoDB query to find the restaurant Id, name and grades for those restaurants where the 2nd element of grades array contains a grade of "A" and score 9 on an ISODate "2014-08-11T00:00:00Z".

24. Write a MongoDB query to find the restaurant Id, name, address and geographical location for those restaurants where 2nd element of coord array contains a value which is more than 42 and upto 52..

25. Write a MongoDB query to arrange the name of the restaurants in ascending order along with all the columns.

26. Write a MongoDB query to arrange the name of the restaurants in descending along with all the columns.

27. Write a MongoDB query to arrange the name of the cuisine in ascending order and for that same cuisine borough should be in descending order.

28. Write a MongoDB query to know whether all the addresses contains the street or not.

29. Write a MongoDB query which will select all documents in the restaurants collection where the coord field value is Double

30. Write a MongoDB query which will select the restaurant Id, name and grades for those restaurants which returns 0 as a remainder after dividing the score by 7

31. Write a MongoDB query to find the restaurant name, borough, longitude and attitude and cuisine for those restaurants which contains 'mon' as three letters somewhere in its name.

32. Write a MongoDB query to find the restaurant name, borough, longitude and latitude and cuisine for those restaurants which contain 'Mad' as first three letters of its name.

ECF21001

VI SEMESTER

DSE 4A: Elective: Operation Research
Credit (L: T: P = 4: 0: 0)

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

ECF21101

VI SEMESTER

DSE 4A: Elective: Operation Research Lab
Credit (L: T: P = 0: 0:2)

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

ECE21201

VI SEMESTER
DSE 4B: Elective: Enterprise Resource Planning
Credit (L: T: P = 4: 0: 0)

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

ECE21301

VI SEMESTER
DSE 4B: Elective: Enterprise Resource Planning Lab
Credit (L: T: P = 0: 0: 2)

Students should be Prepare ERP Solution Report for his / her Case Study under the supervision of Teacher/ Lecturer

ECF21401

VI SEMESTER
DSE 4C: Elective: E-Commerce Technologies
Credit (L: T: P = 4: 0: 0)

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, Banner, Exchange, Shopping Bots.

Unit - 2   **15 Hours**

Internet Security: Internet Security Issues Overview –Computer Security Classifications-Intellectual Property threats- Threats to the security of client computers-Threats to the security of communication channels- Threats to the security of Server computers- digital Certificates
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)

Unit - 3   **15 Hours**

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. Online payment basics- Payment cards-E-cash-Holding Electronic cash: online and offline

Cash-Advantages and disadvantages of electronic cash system-electronic wallets-
Microsoft.NET passport-yahoo Wallet-EGML standard-stored value cards-magnetic strip
Cards-smart cards.

Unit - 4   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.
Technologies for Electronic Commerce: Web Server Hardware and Software- Web server
Basics- Types of web sites- web clients and web servers-Software for Web servers-website
and utility programs-Web server hardware-Web Hosting Choices.

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

ECF21501

VI SEMESTER
DSE 4C: Elective: E-Commerce Technologies Lab
Credit (L: T: P = 0: 0: 2)

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. HyperText Markup Language (HTML)
2. Cascading Style Sheets (CSS)
3. JavaScript
4. ASP
5. PHP
6. XML
7. Joomla

ECF22001

VI SEMESTER

DSE 5A: Cloud Computing
Credit (L: T: P = 4: 0: 0)

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 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

ECF22101

VI SEMESTER

DSE 5A: Cloud Computing Lab
Credit (L: T: P = 0: 0: 2)

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)

ECF22201

VI SEMESTER
DSE 5B: Elective: Data Mining and Data Warehousing
Credit (L: T: P = 4: 0: 0)

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 v/s 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

ECF22301

VI SEMESTER
DSE 5B: Elective: Data Mining and Data Warehousing Lab
Credit (L: T: P = 0: 0: 2)
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.　Pre-processing: 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, NormalizeNumericToBinary ,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

ECF22401

VI SEMESTER
DSE 5C: Elective: Artificial Intelligence and Expert Systems
Credit (L: T: P = 4: 0: 0)

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.

ECF22501

VI SEMESTER
DSE 5C: Elective: Artificial Intelligence and Expert Systems Lab
Credit (L: T: P = 0: 0: 2)

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.

ECF23001

VI SEMESTER

DSE 6: 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 THREE (03) 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.

ECF24101

VI SEMESTER

SEC 3A: Elective: AJAX
Credit (L: T: P = 0: 0: 2)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Deliberate in details with examples AJAX

CO2. Learn the details of AJAX Overview

CO3. Specify the details of Steps for Implementation of AJAX

CO4. Learn the details of Design and use of AJAX

Term work: Design& Develop Small web application using AJAX

Reference Books:

1.   Steven Holzner, "Ajax A Beginner's Guide", The McGraw-Hill Companies.

2.   Edmond Woychowsky,"Ajax: Creating Web Pages with AsynchronousJavaScript and XML", Pearson Education, Inc.

3.   Thomas A. Powell, "Ajax: The Complete Reference", McGraw-Hill Companies.

ECF24301

VI SEMESTER

SEC 3B: Elective: Angular JS
Credit (L: T: P = 0: 0: 2)

Course Outcome:

After successful completion of the course, the student is able to

CO5. Deliberate in details with examples Angular JS

CO6. Learn the details of Angular JS Overview

CO7. Specify the details of Steps for Implementation of Angular JS

CO8. Learn the details of Design and use of Angular JS

Term work: Design & Develop Small web application using AngularJS

Reference Books:

1. Valeri Karpov, Diego Netto, "Professional AngularJS", WROX
2. Sheppard, Miller, Liptak, "Sams Teach Yourself-AngularJS for .NET Developer in 24 Hours", Pearson Education India; First edition

ECF24501

VI SEMESTER

SEC 3C: Elective: Wordpress
Credit (L: T: P = 0: 0: 2)

Course Outcome:
After successful completion of the course, the student is able to
CO1.   Deliberate in details with examples Word press
CO2.   Learn the details of Word pressOverview
CO3.   Specify the details of Steps for Implementation of Word press
CO4.   Learn the details of Design and use of Word press

Term work: Design & Develop Small Web Site usingWord press

Reference Books:

1. Lisa Sabin-Wilson, Cory Miller, Kevin Palmer, Andrea Rennick, and Michael Torbert, " WordPress® All-in-One For Dummies®", Wiley Publishing, Inc.
2. Tris Hussey, "WordPress Absolute Beginner's Guide", Que Publishing

ECF25101

VI SEMESTER

SEC 4A: Elective: Python Programming
Credit (L: T: P = 0: 0: 2)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Learn the details of Python Programming Structure
CO2. Deliberate the characteristics of Python Programming
CO3. Understand in details with examples - Python Programming Languages
CO4. Specify in depth OOPs, Event Driven and GUI features in Python

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)

Reference Books:

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

ECF25301

VI SEMESTER

SEC 4B: Elective: R Programming
Credit (L: T: P = 0: 0: 2)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Learn the details of R Programming Structure
CO2. Deliberate the characteristics of R Programming
CO3. Understand in details with examples - R Programming Languages

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

Reference Books:

1. William N. Venables and David M. Smith, An Introduction to R. 2nd Edition. Network Theory Limited.2009
2. Norman Matloff, the Art of R Programming - A Tour of Statistical Software Design, No Starch Press.2011

ECF25501

VI SEMESTER

SEC 4C: Elective: CodeIgniter
Credit (L: T: P = 0: 0: 2)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Learn the details of CodeIgniter - Application Development Framework
CO2. Deliberate the Features of CodeIgniter

Term work: Design & Develop Small web application using CodeIgniter framework

Reference Books:

https://www.guru99.com/codeigniter-tutorial.html
https://www.javatpoint.com/codeigniter-preventing-enabling-from-csrf

JSS COLLEGE OF ARTS, COMMERCE & SCIENCE

ESTD-1964

REVISED SYLLABUS

B. Voc. (Food Processing & Engineering)

2022 - 2023

DEPARTMENT OF FOOD PROCESSING & ENGINEERING

Scheme of Instruction For B. Voc. (Food Processing & Engineering)								
General Education Component (NEP)								
(L-Lecture; T-Tutorial; P-Practical/Practice) (1 Credit = 15 Hrs)								
Semes ters	Paper No.	Title	L:T:P	Theory Hours	Tutorial Hours	Practi cal Hour s	Total Hours	Total Credit
Sem I	FPA010A	Udyoga Siri -1	03:00:0 0	45	0	0	45	3
	FPA020A	Reverberations-1	03:00:0 0	45	0	0	45	3
	FPA050A	Environment Studies	03:00:0 0	45	0	0	45	3
	FPA060A	Business Organization	03:00:0 0	45	0	0	45	3
	FPA070A	Biomolecule	02:00:0 1	30	0	0	15	3
	FPA0130A	Health, Wellness & Yoga	00:00:0 2	0	0	0	30	2
	FPA080A	Process Machineries for Pulp Processing	01:00:0 2	15	0	30	45	3
	FPA090A	Introduction to the Food Processing Industry	01:00:0 2	15	0	30	45	3
	FPA100A	Production of Fruit Pulp	01:00:0 2	15	0	30	45	3
	FPA110A	Food Safety Hygiene & Sanitation	01:00:0 2	15	0	30	45	3
								12
Sem II	FPB010A	Vignana siri-II	03:00:0 0	45	0	0	45	3
	FPB020A	Reverberations-II	03:00:0 0	45	0	0	45	3

	FPB050A	Digital Fluency	01:00:00	15	0	0	15	1
	FPB060A	People Management	03:00:00	45	0	0	45	3
	FPB080A	Fundamentals of Microbiology	00:00:02	30	0	0	30	2
	FPB130P	Rovers and Rangers	00:00:02	0	0	0	30	
	FPB090A	Plantation Crops Technology	01:00:02	15	0	30	45	3
	FPB100A	Food Engineering Processing: Principles & Applications	01:00:02	15	0	30	45	3
	FPB110A	Principles and techniques in Food Manufacturing	01:00:02	15	0	30	45	3
	FPB07A	Enzymology & Bio energetics	02:00:01	30	0	15	45	3
								12
	FFC140	Indian Constitution	03:00:00	45	0	0	45	3
	FFC440	ICT	02:00:01	30	0	15	45	3
Sem III	FFC410	Biochemistry-III	02:00:01	30	0	15	45	3
	FFC420	Microbiology-III	02:00:01	30	0	15	45	3
								12
	FFD450	Bio statistics	02:00:01	30	0	15	45	3
	FFD410	Biochemistry-IV	02:00:01	30	0	15	45	3
Sem IV	FFD420	Microbiology-IV	02:00:01	30	0	15	45	3
	FFD130	Environmental Studies	03:00:00	45	0	0	45	3
								12
	FFE410	Biochemistry-V	04:00:02	60	0	30	90	6
Sem V	FFE420	Microbiology-V	04:00:02	60	0	30	90	6
								12
Sem VI	FFF410	Biochemistry-V	04:00:02	60	0	30	90	6
	FFF420	Microbiology-V	04:00:02	60	0	30	90	6
								12

1st Semester NEP Syllabus for B.Voc 2022-23 Batch

Sl no.	PROCESS MACHINERIES FOR PULP PROCESSING (PRACTICAL)	Hrs
	UNIT 1: INTRODUCTION TO PULP PROCESSING	
1.	Safety measures and personal protective equipment (PPE) in the work area Familiarization with the process machineries and their components Setting up and preparing the work area for pulp processing Cleaning and maintenance of process machineries Troubleshooting common issues in pulp processing equipment	8
	UNIT 2: FRUIT AND VEGETABLE PREPARATION FOR PULP PROCESSING	
2.	Sorting and grading fruits and vegetables Washing and sanitizing raw materials Pre-processing techniques such as peeling, slicing, and removing seeds or pits Proper storage and handling of prepared fruits and vegetables	6
	UNIT 3: PULP EXTRACTION AND REFINING	
3.	Operating pulp extraction equipment Adjusting and monitoring extraction parameters Refining pulp using appropriate techniques Quality control tests to assess pulp consistency and quality Unit 4: Packaging and Storage of Fruit Pulp	8
	UNIT 4: PACKAGING AND STORAGE OF FRUIT PULP	
4.	Packaging fruit pulp using suitable materials and techniques Sealing and labeling of packaged fruit pulp Storage and preservation techniques for maintaining product quality Quality control checks for packaged fruit pulp	8
	Total Practical	**30**
SL.no.	**(THEORY)**	**Hrs**
1.	Overview of pulp processing Importance of fruit and vegetable processing in the food industry Types of fruits and vegetables used for pulp processing Basic principles of pulp production Introduction to process machineries used in pulp processing	4
2.	Selection and procurement of fruits and vegetables Sorting and grading of raw materials	3

	Washing and sanitization techniques Pre-processing methods for different types of fruits and vegetables	
3.	Extraction methods for pulp production Equipment used for pulp extraction Refining techniques for achieving desired pulp consistency and texture Quality control measures during the extraction and refining process	4
4	Packaging materials and considerations for fruit pulp Packaging techniques to ensure product safety and shelf life Storage conditions and requirements for fruit pulp Quality control measures during packaging and storage	4
	Total Theory	**15**
Total Practical Hours: 30 hours Total Theory Hours: 15 hours L:T:P = 1:0:2		

Reference Books

"Fruit and Vegetable Processing: Improving Quality" by S. J. Gould

"Food Process Engineering Operations" by George D. Saravacos and Athanasios E. Kostaropoulos

"Food Processing Technology: Principles and Practice" by P.J. Fellows

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B.Voc in Food Processing and Engineering.
1ˢᵗ Semester:
PROCESS MACHINERIES FOR PULP PROCESSING

Section A:

(5X1 Marks)

Multiple Choice Questions
Choose the most appropriate answer for each question.
1.
2.
3.
4.
5.

Section B

(5X3=15 Marks)

Answer any three questions from this section.
1.
2.
3.
4.
5.

Section C

(10X1=10 marks)

Answer any one question from this section.

1.

2.

3

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1st Semester NEP Syllabus for B.Voc 2022-23 Batch

Sl no.	INTRODUCTION TO FOOD PROCESSING INDUSTRY (PRACTICAL)	Hrs
	UNIT 1: Principles of Food Processing Industry	
1.	Safety and hygiene practices in food processing (2 hours) Introduction to equipment and machinery used in food processing (2 hours) Demonstration of proper cleaning and maintenance procedures (2 hours) Hands-on experience in handling and storing fruits and vegetables (2 hours) Understanding and implementing basic quality control measures (2 hours)	8
	UNIT 2: FRUIT AND VEGETABLE PROCESSING	
2.	Hands-on experience in fruit and vegetable harvesting techniques (2 hours) Practical demonstration of sorting, grading, and washing techniques (2 hours) Cutting, peeling, and slicing fruits and vegetables (2 hours) Canning process: Preparing fruits or vegetables, filling jars, and sealing (3 hours) Thermal processing: Pasteurization or sterilization techniques (2 hours) Freezing fruits and vegetables using appropriate techniques (2 hours) Drying fruits and vegetables through dehydration methods (2 hours) Introduction to fermentation: Making fermented products from fruits and vegetables (2 hours)	10
	UNIT 3: UNIT 3: ASEPTIC PACKAGING	
3.	Sterilization methods for aseptic packaging (2 hours) Hands-on experience in operating aseptic packaging equipment (2 hours) Packaging line operations and quality control (2 hours)	8
	UNIT 4: FOOD PROCESSING INDUSTRY REGULATIONS AND MANAGEMENT	
4.	Food processing industry regulations and standards (1 hour) Good Manufacturing Practices (GMP) and Hazard Analysis and Critical Control Points (HACCP) (1 hour) Quality assurance and quality control in food processing (1 hour)	4

		Total Practical	30
SL.no.	**(THEORY)**		**Hrs**
1.	Overview of the food processing industry (1 hour) Importance of fruit and vegetable processing (1 hour) Major processes involved in food processing (1 hour) Introduction to aseptic packaging (1 hour)		4
2.	Harvesting and post-harvest handling of fruits and vegetables (1 hour) Sorting, grading, and washing techniques (1 hour) Cutting, peeling, and slicing methods (1 hour) Preservation methods: Canning (chemical preservation), thermal processing, and freezing (1 hour) Preservation methods: Drying and fermentation (1 hour)		5
3.	Principles and advantages of aseptic packaging (1 hour) Aseptic processing techniques (1 hour) Aseptic packaging materials and equipment (1 hour)		3
4	Food processing industry regulations and standards (1 hour) Good Manufacturing Practices (GMP) and Hazard Analysis and Critical Control Points (HACCP) (1 hour) Quality assurance and quality control in food processing (1 hour)		3
		Total Theory	**15**
Total Practical Hours: 30 hours Total Theory Hours: 15 hours L:T:P = 1:0:2			

Reference Books

"Food Processing Technology: Principles and Practice" by P.J. Fellows

"Food Processing Handbook" by James G. Brennan

"Food Processing: Principles and Applications" by Stephanie Clark and Stephanie Jung

"Food Processing Technology: Principles and Practice" by Geoffrey Campbell-Platt

"Food Processing: From Field to Fork" by Sarah E. Kemp and Nikolaos Tzortzoglou

"Postharvest Technology and Food Process Engineering" by Amalendu Chakraverty

"Food Processing Operations Modeling: Design and Analysis" by L. Grierson

"Food Process Engineering and Technology" by Zeki Berk

"Food Process Engineering and Quality Assurance" by Gaurav Tewari and Vijay Kothari

"Handbook of Food Processing: Food Preservation" by Stephanie Clark, Malcolm C. Bourne, and Robert J. Loewe

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B.Voc in Food Processing and Engineering.
1ˢᵗ Semester: Introduction to Food Processing Industry

Section A:

(5X1 Marks)

Multiple Choice Questions
Choose the most appropriate answer for each question.
1.
2.
3.
4.
5.

Section B

(5X3=15 Marks)

Answer any three questions from this section.
1.
2.
3.
4.
5.

Section C

(10X1=10 marks)

Answer any one question from this section.

1.

2.

3

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1st Semester NEP Syllabus for B.Voc 2022-23 Batch

Sl no.	PRODUCTION OF FRUIT PULP (PRACTICAL)	Hrs
	UNIT 1: INTRODUCTION TO FRUIT PULP PRODUCTION	
1.	Hands-on activities related to fruit pulp production Introduction to fruit pulp production equipment and tools Safety guidelines for handling fruits and equipment	2
	UNIT 2: FRUIT SELECTION AND PREPARATION	
2.	Sorting, cleaning, and washing of fruits Removal of seeds, skins, and undesirable parts Techniques for peeling and slicing fruits Proper handling and storage of prepared fruits	8
	UNIT 3: EXTRACTION AND PROCESSING METHODS	
3.	Demonstrations of different extraction methods Hands-on exercises for pulp extraction techniques Enzyme treatments and their application in fruit pulp processing	8
	UNIT 4: FRUIT PULP PRESERVATION AND PACKAGING	
4.	Techniques for pulp preservation Hands-on exercises for different preservation methods Packaging and labelling procedures for fruit pulp	9
	UNIT 5: PRODUCT DEVELOPMENT AND MARKETING	
5.	Market analysis and target consumer identification Packaging and branding strategies Marketing channels and distribution networks	3
	Total Practical	**30**
SL.no.	**(THEORY)**	**Hrs**
1.	Overview of fruit pulp production Importance of fruit pulp in the food industry Types of fruits used for pulp production Nutritional value and health benefits of fruit pulp Market trends and demand for fruit pulp	4
2.	Selection criteria for fruits used in pulp production Proper handling and storage of fruits for pulp production	2
3.	Different methods of fruit pulp extraction (e.g., pressing, milling, blending) Factors influencing the choice of extraction method	4

	Enzyme treatments and their effects on pulp quality	
4	Techniques for pulp preservation (e.g., freezing, canning, aseptic packaging) Packaging materials and their suitability for fruit pulp	3
5	Value-added products using fruit pulp (e.g., juices, smoothies, jams) Product development and innovation in the fruit pulp industry	2
	Total Theory	**15**
Total Practical Hours: 30 hours Total Theory Hours: 15 hours L:T:P = 1:0:2		

Reference

1. "Fruit Processing: Nutrition, Products, and Quality Management" by Rakesh K. Singh
2. "Postharvest Technology of Fruits and Vegetables: Handling, Processing, Fermentation, and Waste Management" by Amalendu Chakraverty
3. "Fruit and Vegetable Processing: Principles and Applications" by S. R. Prabha and T. K. Goswami
4. "Fruit Processing and Packaging: Technologies, Equipment, and Applications" by Shantanu Bhattacharya

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B.Voc in Food Processing and Engineering.
1ˢᵗ Semester: Production of Fruit Pulp

Section A:

(5X1 Marks)

Multiple Choice Questions
Choose the most appropriate answer for each question.
1.
2.
3.
4.
5.

Section B

(5X3=15 Marks)

   Answer any three questions from this section.
1.
2.
3.
4.
5.

Section C

(10X1=10 marks)

Answer any one question from this section.

 1.

 2.

 3

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1st Semester NEP Syllabus for B.Voc 2022-23 Batch

Sl no.	FOOD SAFETY AND, HYGIENE AND SANITATION (PRACTICAL)	Hrs
	UNIT 1: INTRODUCTION TO FOOD SAFETY AND SANITATION	
1.	Hands-on training in cleaning and sanitizing procedures (2 hours) Demonstrations of personal hygiene and protective measures (1 hour) Introduction to HACCP principles through case studies (3 hours)	6
	UNIT 2: FOOD SAFETY PRACTICES IN PROCESSING FOOD PRODUCTS	
2.	Simulated scenarios for temperature control and monitoring (2 hours) Identification and control of allergens in a processing unit (2 hours) Equipment and utensil maintenance and sanitation (2 hours) Pest control practices and inspections (2 hours)	8
	UNIT 3: IMPLEMENTING SAFETY AND SANITATION IN THE WORK AREA	
3.	Work Area Design and Layout for Food Safety (2 hours) Good Manufacturing Practices (GMPs) (2 hours) Training and Supervision of Employees (2 hours) Waste Management and Disposal (1 hour) Emergency Preparedness and Response (1 hour)	8
	UNIT 4: MONITORING AND AUDITING FOOD SAFETY AND SANITATION	
4.	Internal Monitoring and Self-Inspection (2 hours) Food Safety Audits and Inspections (2 hours) Corrective Actions and Continuous Improvement (2 hours) Food Safety Culture and Communication (1 hour) Emerging Trends and Technologies in Food Safety (1 hour)	8
	Total Practical	**30**

SL.no.	(THEORY)	Hrs
1.	Importance of Food Safety and Sanitation in the Food Industry (1 hour) Regulatory Framework and Standards (1 hour) Hazards and Risks in Food Processing (1 hour)	3
2.	Food Handling and Storage Practices (1 hour) Cross-Contamination Prevention (1 hour) Safe Use and Maintenance of Equipment and Utensils (1 hour) Pest Control in Food Processing Areas (1 hour)	4
3.	Standard Operating Procedures (SOPs) (1 hour) Work Area Design and Layout for Food Safety (1 hour) Waste Management and Disposal (1 hour) Emergency Preparedness and Response (1 hour)	4
4	Theory: 4 hours Documentation and Record-Keeping (1 hour)	4

	Corrective Actions and Continuous Improvement (1 hour) Food Safety Culture and Communication (1 hour) Emerging Trends and Technologies in Food Safety (1 hour)	
	Total Theory	**15**
Total Practical Hours: 30 hours Total Theory Hours: 15 hours L:T:P = 1:0:2		

Reference Books

- "Principles of Food Sanitation" by Norman G. Marriott and Robert B. Gravani
- "Food Safety: Basic Concepts, Recent Issues, and Future Challenges" edited by Alexandru Mihai Grumezescu
- "Food Hygiene and Sanitation" by S. R. Sangwan
- "Food Safety: Emerging Issues, Technologies, and Systems" edited by Steven C. Ricke
- "Food Safety Management: A Practical Guide for the Food Industry" by Yasmine Motarjemi and Huub Lelieveld

Other Sources

- Food and Agriculture Organization (FAO): www.fao.org/food-safety
- World Health Organization (WHO): www.who.int/foodsafety/en
- Centers for Disease Control and Prevention (CDC): www.cdc.gov/foodsafety/index.html
- Food Safety and Inspection Service (FSIS): www.fsis.usda.gov/food-safety
- European Food Safety Authority (EFSA): www.efsa.europa.eu

Section A:

(5X1 Marks)

Multiple Choice Questions
Choose the most appropriate answer for each question.
1.
2.
3.
4.
5.

Section B

(5X3=15 Marks)

Answer any three questions from this section.
1.
2.
3.
4.
5.

Section C

(10X1=10 marks)

Answer any one question from this section.

1.

2.

3

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IInd Semester NEP Syllabus for B.Voc 2022-23 Batch

Sl no.	PLANTATION CROP TECHONOLOGY (THEORY)	Hrs
	Unit 1: Introduction to plantation crops	
1.	Definition of plantation crops Importance and contribution to the economy Major plantation crops and their geographical distribution	4
	Unit 2: Harvesting and Post-Harvest Technology	
2.	Post-harvest handling and processing Value addition and storage techniques	3
	UNIT 3: Processing of plantation crops	
3.	Maturity indices and harvesting techniques Processing of coffee, Tea, areca nut, coconut, cocoa, Cashew, Palm etc Value addition products from plantation crop products	4
	Unit 4: Sustainability and Environmental Issues:	
4.	Sustainable practices in plantation agriculture Biodiversity and conservation Environmental impacts and mitigation measures	4
	Total Theory	**15**
Sl. no.	**(PRACTICAL)**	**Hrs**
1.	value Addition: Practical involve processing plantation crops to create value-added products like tea processing, coffee roasting, or Tea processing and areca nut, cashew	10
2.	Post-Harvest Handling: Students may learn about post-harvest techniques, including grading, sorting, and packaging of harvested crops.	6
3.	Quality assessment and sensory evaluation of value added plantation crops	8
4.	Plantation Establishment: Practical sessions focus on proper planting techniques, spacing, and layout for different plantation crops like tea, coffee, rubber, or oil palm.	6
	Total Practical	**30**
Total Practical Hours: 30 hours Total Theory Hours: 15 hours L:T:P = 1:0:2		

Reference books

"Cereal Processing: Food Cycle Technology Sourcebook" by L. W. Rooney and S. S. Murthy

"Bakery Food Manufacture and Quality: Water Control and Effects" by S. Cauvain and L. S. Young

"Confectionery Science and Technology" by R. J. Clarke

"Fruit and Vegetable Processing: Improving Quality" edited by W. Jongen

"Food Processing Technology: Principles and Practice" by P. J. Fellows

"Handbook of Food Processing Equipment" by G. M. Campbell-Platt

"Principles of Food Processing" by A. Singh and R. Heldman

"Food Packaging: Principles and Practice" edited by G. L. Robertson

"Food Quality Assurance: Principles and Practices" by I. M. Mujtaba and C. R. White Jr.

"Food Process Engineering: Emerging Trends in Research and Their Applications" edited by C. Anandharamakrishnan and A. Nema

Section A:

(5X1=5 Marks)

Multiple Choice Questions
Choose the most appropriate answer for each question.

1.
2.
3.
4.
5.

Section B

(5X3=15 Marks)

  Answer any three questions from this section.

1.
2.
3.
4.
5.

Section C

(10X1=10 marks)

Answer any one question from this section.

  1.

  2.

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IInd Semester NEP Syllabus for B.Voc 2022-23 Batch

Sl no.	Food Engineering Processing: Principles and Applications (THEORY)	Hrs
	Unit 1: Introduction to Food Engineering	
1.	Food engineering minimizes waste and optimizes resources in food processing. Food engineers promote sustainability and efficiency in the food industry through innovative practices. Food engineering contributes to food security by improving production efficiency and ensuring the availability of safe and nutritious food.	3
	Unit 2: Overview of Unit Operations and Unit Processes in Food Engineering	
2.	Introduction to unit operations and unit processes Examples of unit operations in food engineering Examples of unit processes in food engineering	3
	UNIT 3: Principles of heat transfer: conduction, convection, and radiation	
3.	Heat exchangers and their applications in food processing Heat transfer during processing operations: Pasteurization Sterilization Baking	6
	UNIT 4: Mass Transfer in Food Processing (3 hours)	
4.	Mass Transfer in Food Processing (3 hours) Principles of mass transfer: diffusion, evaporation, and adsorption Mass transfer in drying and dehydration processes Mass transfer in concentration and extraction processes	3
	Total Theory	**15**
Sl. no.	**(PRACTICAL)**	**Hrs**
1.	Heat Transfer Practical Hands-on experiments on heat transfer principles Measurement of heat transfer coefficients Operation and maintenance of heat exchangers	10
2.	Mass Transfer Practical Hands-on experiments on mass transfer principles Measurement of diffusion coefficients Drying and dehydration experiments	10
3.	Food Processing Operations Practical Practical demonstrations of food processing operations involving heat and mass transfer Pasteurization techniques and equipment	10

	Sterilization techniques and equipment Baking processes and equipment		
	Total Practical	**30**

Total Practical Hours: 30 hours Total Theory Hours: 15 hours L:T:P = 1:0:2

Reference Books

1."Food Process Engineering and Technology" by Zeki Berk

This book provides an overview of food process engineering principles and their applications. It covers topics such as heat and mass transfer, food preservation, food quality, and processing operations. Available for free download in PDF format: http://www.hesperianpress.com/pdf/Food_Process_Engineering_and_Technology.pdf

2"Food Engineering: Integrated Approaches" by Gustavo Barbosa-Canovas et al.

This book offers a comprehensive overview of food engineering principles and their integration in food processing. It covers topics such as food preservation, thermal processing, separation techniques, and packaging. Available for free download in PDF format: https://www.intechopen.com/books/food-engineering-integrated-approaches

3"Fundamentals of Food Process Engineering" by Romeo T. Toledo

This book provides an introduction to the fundamental principles of food process engineering. It covers topics such as heat and mass transfer, food preservation, dehydration, and thermal processing. Available for free download in PDF format: http://www.hesperianpress.com/pdf/Fundamentals_of_Food_Process_Engineering.pdf

"4Unit Operations in Food Processing" by R.L. Earle

This book focuses on the unit operations involved in food processing. It covers topics such as fluid flow, heat transfer, size reduction, mixing, and separation processes. Available for free online reading: https://www.nzifst.org.nz/unitoperations/

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B.Voc in Food Processing and Engineering.
Food Engineering Processing: Principles and Applications

2nd   Semester:

Section A:

(5X1=5 Marks)

Multiple Choice Questions
Choose the most appropriate answer for each question.
1.
2.
3.
4.
5.

Section B

(5X3=15 Marks)

Answer any three questions from this section.
1.
2.
3.
4.
5.

Section C

(10X1=10 marks)

Answer any one question from this section.

1.

2.
....

IInd Semester NEP Syllabus for B.Voc 2022-23 Batch

Sl no.	PRINCIPLES AND TECHNIQUES IN FOOD MANUFACTURING (THEORY)	Hrs
	Unit 1: Fruit and Vegetable Processing and Preservation	
1.	Importance of fruit and vegetable selection for processing Pre-processing techniques: sorting, cleaning, washing, and grading Juice extraction methods and clarification techniques Canning of fruit and vegetables products	4
	Unit 2: Cereal Processing	
2.	Theory (Total Hours: 3) Overview of cereal processing industry Common cereal grains and their characteristics Principles of cereal milling Flour production process and quality considerations	3
	UNIT 3: Bakery Confectionery Production	
3.	Bakery product formulation and ingredient selection Mixing techniques and equipment in bakery production Dough fermentation and proofing principles Baking principles and oven technologies	4
	Unit 5: Packaging and Quality Assurance	
4.	Packaging materials and techniques for food processing Quality assurance and shelf-life extension techniques	4
	Total Theory	**15**
Sl. no.	(PRACTICAL)	Hrs
1.	Sorting, cleaning, and grading of fruits and vegetables Juice extraction experiments and quality analysis Hands-on experience in fruit and vegetable drying techniques Packaging and storage of processed fruits and vegetables	10
2.	Sorting, cleaning, and grading of fruits and vegetables Juice extraction experiments and quality analysis Hands-on experience in fruit and vegetable drying techniques Packaging and storage of processed fruits and vegetables	6
3.	Formulation and preparation of bakery product recipes Hands-on mixing and dough preparation Fermentation and proofing experiments Baking and quality assessment of bakery products	8
4.	Hands-on packaging of food products Quality assessment and sensory evaluation techniques	6
	Total Practical	**30**
	Total Practical Hours: 30 hours Total Theory Hours: 15 hours L:T:P = 1:0:2	

Reference books

"Cereal Processing: Food Cycle Technology Sourcebook" by L. W. Rooney and S. S. Murthy

"Bakery Food Manufacture and Quality: Water Control and Effects" by S. Cauvain and L. S. Young

"Confectionery Science and Technology" by R. J. Clarke

"Fruit and Vegetable Processing: Improving Quality" edited by W. Jongen

"Food Processing Technology: Principles and Practice" by P. J. Fellows

"Handbook of Food Processing Equipment" by G. M. Campbell-Platt

"Principles of Food Processing" by A. Singh and R. Heldman

"Food Packaging: Principles and Practice" edited by G. L. Robertson

"Food Quality Assurance: Principles and Practices" by I. M. Mujtaba and C. R. White Jr.

"Food Process Engineering: Emerging Trends in Research and Their Applications" edited by C. Anandharamakrishnan and A. Nema

JSS COLLEGE OF ARTS, COMMERCE & SCIENCE
(Autonomous)Ooty Road, Mysore-25.
B.Voc in Food Processing and Engineering.
PRINCIPLES AND TECHNIQUES IN FOOD MANUFACTURING

2nd   Semester:

Section A:

(5X1=5 Marks)

Multiple Choice Questions
Choose the most appropriate answer for each question.
1.
2.
3.
4.
5.

Section B

(5X3=15 Marks)

  Answer any three questions from this section.
1.
2.
3.
4.
5.

Section C

(10X1=10 marks)

Answer any one question from this section.

  1.

  2.
●●●

SYLLABUS
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	10	4
	Letter of Application/Letter of Grievances/Resume Preparation		
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**

B.Voc Semester - III

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

INDIAN CONSTITUTION
COMMON PAPER TO ALL DEGREE CLASSES (FOR B.Voc 45 HOURS 3/WEEK)

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

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

(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.

Paper code: FPA520   **MICROBIOLOGY**   **30hours-2 Credits**
I B.Voc., I Semester

TITLE: FUNDAMENTALS OF MICROBIOLOGY

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**

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.

1. General characteristics of bacteria, fungi, actinomycete, virus, protozoa and algae. Organization of cell wall, cell membrane, flagella capsules and formation of spores in bacteria.
2. 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

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**

TITLE: FOOD MICROBIOLOGY-1

UNIT:I   10Hrs

A.   Introduction to Food Microbiology: Definition, Concept and Scope. Food as a
     substrate for microorganisms. Food as a substrate   for   microorganisms, Factors influencing
     microbial growth in foods (intrinsic and extrinsic   factors)**.**

B.   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

A. Methods of food preservation: Physical method – high temperature, low temperature,
canning. Drying – solar drying, drum drying, spray drying. Radiation.
B. 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

A.Food borne intoxication and infection:
  Bacterial intoxication- Botulism & staphylococcal intoxication
  Bacterial infection- Salmonellosis.
  Mycotoxin – Origin, types and importance of toxins with reference to Aflatoxins.

UNIT-IV   10 Hrs

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).

PRACTICALS   3hrsX5 practicals

1. Isolation and enumeration of microorganisms from spoiled fruits and vegetables
2. Isolation and enumeration of Microorganisms present in food Utensils.
3.   Detection of number of bacteria in milk by SPC
4. Turbidity test to detect boiled and unboiled milk.
5. Methylene blue reductase test to determine the quality of milk.

Paper code: FPD520   **MICROBIOLOGY**   **30hours-2 Credits**
II B.Voc., IV Semester

TITLE: FOOD MICROBIOLOGY-II

UNIT-I   **06 Hrs**

Food fermentations: Bread, cheese, vinegar, fermented vegetables, Fermented dairy products: Kefir, Kumiss, sour cream, dahi & lassi. Experimental and Industrial production methods. Oriental Fermented foods, their quality standards and control.

UNIT-II   **06Hrs**

Food produced by Microbes: Microbial cells as food (single cell proteins)- mushroom cultivation. Bioconversions- production of alcohol, fermented beverages- beer and wine & types of wine. Genetically modified foods.

UNIT-III   **10Hrs**

Detection of food-borne microorganisms: Culture, Microscopic and Sampling methods. Chemical: Thermostable nuclease *Limulus* Lysate for Endotoxins, Nucleic Acid (DNA) probes, DNA Amplification (PCR), Adenosine- Triphosphate Measurement, Radiometry, Fluoro-and Chromogenic substrates. **Immunologic Methods**: Fluorescent Antibody, Enrichment Serology, Salmonella 1-2. Test, Radioimmunoassay, ELISA.

UNIT-IV   **08Hrs**

Microbial indicators of food safety and quality control: Principles of quality control and microbiological criteria, Indicators of product quality and microbiological safety of foods, Hazard analysis and critical control points (HACCP), Good manufacturing process (GMP) Microbiological standards Codex Alimentarius and Food legislation.

PRACTICALS   **3hrsX5=15 practicals**

1. Production of sauerkraut
2. Identification of Bacteria from idli batter and curds
3. Preparation of wine from grapes.
4. Role of yeast in bread making
5. Culturing of *Chlorella / Spirulina.*

Paper code: FPE520　　　　**MICROBIOLOGY**　　　　**60 hours -4 Credits**
III B.Voc., V Semester
INDUSTRIAL MICROBIOLOGY-1
Unit –I　　　　　　　　　　**15hours**

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.

Unit-II　　　　　　　　　　**15 hours**
A.　.Fermenters and fermentation process: Design, types and basic function of fermenters,
　　　sterilization, devices for aeration and agitation (in brief).
B.　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.

Unit-III　　　　　　　　　　**15 hours**
　Downstream processing: Steps in recovery and purification of fermented products –
　Precipitation, Filtration, Centrifugation, Distillation, Cell disruption, Solvent recovery,
　chromatography, Drying and crystallization.

UNIT: IV　　　　　　　　　　**15 hours**
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**.** Role of microorganisms in the production and recovery of minerals and petroleum.

Practicals:

1.　Preparation of alcohol using jaggery or molasses.
2. Estimation of percentage alcohol in a given sample by specific gravity method.
3**.** Production of citric acid using *Aspergillus niger*
4. Cultivation of edible mushroom
5. Isolation of antibiotic/ amino acid/organic acid producing microbes and their preservation.
6. Production of penicillin in the Laboratory
7. Antibiotic sensitivity test by Kirby-Baner method
8. Study of fermenters –Seed tank and Pilot scale
9. Production of any vitamin and its quantification by bioassay.
10. Alcoholic fermentation and determination of total acidity and non-reducing sugars

Paper code: FPF520   **MICROBIOLOGY**   **60 hours -4 Credits**

III B.Voc., VI Semester

TITLE: PATHOGENIC MICROBIOLOGY

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.
  6. 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.

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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+

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.
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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

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15	Sri. G.S. Siddegowda	Assistant Prof. Dept. of Microbiology Maharani's Science College Mysore
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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
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Paper -I   (30 hours -2 Credits)
BIOMOLECULES

SECTION-I : Amino Acids & Proteins: 09 Hrs

1. Introduction to Bio-chemistry.
2. **Amino Acids:** Definition, biological functions of Amino acids. Classification based on the nature of "R" groups (Polarity). Stereoisomerism and RS system of designating optical isomers (D & L rotation). Protein and non-protein amino acids. Specialized role of amino acids. Physical and Chemical properties of amino acids. Titration curve of amino acids.
3. **Proteins:** Peptide bond formation and structure, classification of proteins based on structure with examples. Secondary structure**: -** α-Helix, β-sheet, β-barrel and β-turn. Tertiary structure – Fibrous proteins (collagen) and Globular proteins (Myoglobin). Quaternary Structure– hemoglobin. Denaturation and renaturation of proteins by Anfinsen's experiment. Salting in & salting out 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 their biological importance). Oligosaccharides (structure of maltose, lactose, sucrose, cellobiose, trehalose) and functions.
3. Homo-and hetero-polysaccharides (structures of starch, glycogen, cellulose, chitin). Polysaccharides of bacterial cell well.

SECTION-III: Lipids   08 Hrs

1. Definition and classification and biological functions of lipids, fatty acids (saturated and unsaturated). Essential fatty acids and its functions. Physical properties of lipids- melting point, boiling point 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.
4. Prostaglandins, Leukotrienes, Thromboxanes and their importance.

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.

PRACTICALS   **(15 Hrs -1 Credit)**

1. Calibration of volumetric glassware's (Burette, pipette).   **3 Hrs**
2. Qualitative tests for : (a) Carbohydrates. (b) Amino acids and proteins (c) Cholesterol and
   lipids   **3 Hrs X 2**
3. Estimation of amino acid by formal titration   **3 Hrs**
4. Estimation of reducing sugars by DNS method   **3 Hrs**

Semester II

<div align="center">

Paper II   **(30 hours – 2 credits)**

ENZYMOLOGY AND BIOENERGETICS

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SECTION-I : Enzymology   08 hrs

Introduction to enzymes - General characteristics of enzymes. Prosthetic group. 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. Theories of enzymes catalysis: Acidbase catalysis, covalent catalysis.

SECTION-II: Enzyme Purification :   08 hrs

Isolation and purification of enzymes- Preliminary fractionation procedures and precipitation techniques. Chromatography methods: Principle, Construction and applications of Gel filtration, adsorption, ion exchange and affinity chromatography. 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- Reversible inhibition (competitive, uncompetitive, non-competitive). Antibiotics as inhibitors. Allosteric enzymes and enzyme regulation. Isoenzymes and their clinical significance.

SECTION-IV: Bioenergetics   05 hrs

Laws of thermodynamics, Entropy, Enthalpy, Gibbs free energy. Types of rections- Endergonic & Endergonic. Structure and role of ATP & other high energy compounds (Phosphocreatine, phosphoenolpyruvate). Redox reactions, Redox potential and its applications. Commercial importence of enzymes

PRACTICALS   (15 Hrs – 1 Credit)
.
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**

Paper – III   **(30 hours-2 Credits)**

METABOLISM

SECTION-I: Carbohydrate Metabolism   **08 Hrs**

Digestion, Absorption and transport of Carbohydrates, Metabolic Pathways- Glycolysis, TCA cycle, Pentose Phosphate Pathway, Glucuronate pathway, 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: Protein Metabolism   **08 Hrs**

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: Nucleic acid Metabolism   **06 Hrs**

Degradation of purines and pyrimidines. Biosynthesis of purines, pyrimidine nucleotides.
Catabolism of Heme & Formation of Bile pigments. Diseases associated with Nucleic acid metabolism.

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**

Paper IV   **(30 hours -2 Credits)**

BIOCHEMICAL TECHNIQUES

SECTION-I: Spectroscopic Techniques   **8 Hrs**
:
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: Electrophoretic & Centrifugation Techniques   **8 Hrs**

Principles and applications of the following electrophoresis techniques. Paper electrophoresis, PAGE, SDS- PAGE.
Principle of differential and density gradient centrifugation. Ultra centrifuge – construction and applications

SECTION-III: Chromatographic Techniques   **8   Hrs**

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: Radio Isotopic Techniques   **6 Hrs**

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.

PRACTICAL   **(15 Hrs = 1 Credits)**

1. Identification of amino acids by circular paper chromatography.   **3 Hrs**
2. Identification of amino acids by ascending 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**
6. Estimation of protein by Lowry/BCA method.   **3 Hrs**

Semester V

Paper V   (60 hours-4 Credits)

BIOCHEMISTRY AND NUTRITION-1

SECTION-I: Introduction   15 Hrs

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
Water Metabolism: Distribution in the body, factors maintaining water balance and factors influencing water balance

SECTION-II: Proteins   15 Hrs

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

SECTION-III: Vitamins   15 Hrs

Classification, example with structure, dietary sources, daily requirement, biological roles and deficiency disorders with symptoms– Thiamine, Riboflavin, Niacin, pantothenic acid, Pyridoxine, Biotin, Folic acid and Vitamin C .
Structures, dietary sources, daily requirement, biological roles and deficiency disorders with symptoms- Vitamin A, D, E & K. Hypervitaminosis.

SECTION-IV: Minerals   15 Hrs

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.

PRACTICAL   (30 Hrs = 2 Credits)

1. Estimation of haemoglobin in blood.   **3Hrs**
2. Identification of Sugars in fruit juice using paper chromatography.   **3Hrs**
3. Estimtion of vitamin E in serum.   **3Hrs**
4. Determination of proteins by dye binding assay.   **3Hrs**
5. Proximate analysis of food samples- Moisture, fibre, protein fat and carbohydrate **3HrsX3**
6. Detection of adulterants in food.   **3Hrs**
7. Estimation of Calcium in ragi.   **3Hrs**
8. Estimation of Vitamin – C in lemon or gooseberries by DPPH method   **3Hrs**

Paper -VI (60 hours -4 Credits)

BIOCHEMISTRY AND NUTRITION-2

SECTION-I: Dietary Carbohydrates & Health 15 Hrs

Review functions of carbohydrates. Digestion, absorption, utilization and storage, hormonal regulation of blood glucose. Dietary requirements and source of carbohydrates, Dietary fiber, role of fiber in lipid metabolism, colon function, blood glucose level and GI tract functions.

SECTION-II : Dietary Lipid & Health 15 Hrs

Review of classification, sources, functions, digestion, absorption, utilization and storage. 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

SECTION-III : Digestion & Antinutritional factors 15 Hrs

Gastrointestinal tract secretions - Composition and functions of Saliva, gastric, bile, pancreatic and intestinal Juices. Appetite, gastrointestinal tract hormones.

Digestion, absorption and transport of Proteins.

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.

SECTION-IV- Assessment of Nutritional Status, Food & Drug Interactions 15 Hrs

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.

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.

PRACTICAL   (**30 Hrs = 2 Credits**)

1. Estimation of DNA by diphenylamine method.   **3Hrs**
2. Determination of saponification value of an oil or fat.   **3Hrs**
3. Determination of Iodine value of an oil or fat.   **3Hrs**
4. Determination of Acid value of an oil or fat.   **3Hrs**
5. Estimation of SGPT in serum   **3Hrs**
6. Estimation of SGOT in serum.   **3Hrs**
7. Extraction of RNA from yeast and its estimation by Orcinol method. **3Hrs**
8. Determination of total protein and A/G ratio in serum.   **3Hrs**
9. Estimation of serum phospholipids.   **3Hrs**
10. Immobilization of enzymes/ cells by entrapment in alginate gel   **3Hrs**
11. Demonstration of ELISA   **3Hrs**

SEMESTER VII

Paper VII: Food Chemistry   Theory: 30 Hrs

Sl. No.		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, auto-oxidation, 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 colours, natural and synthetic, Regulatory aspects –Natural and synthetic permitted food colours.	1
10.	Food toxicants – anti nutritional factors and their occurrence, effects and methods of elimination or inactivation- protease inhibitors, lectins, lathyrogens, phytates and flatulence factors.	2
11.	Food Contaminants, Pesticidal residues – permitted limits. Toxicology and	2

public health.

Sl. No.	Practical	Hrs
1.	Determination of moisture content of foods using different methods	3
2.	Determination of crude proteins by microkjeldahl method	3
3.	Determination of crude fat by soxlet method	3
4.	Sensory acceptability of food products: Physical Attributes (Appearance, color, texture, taste and overall acceptansibility).	3
5.	Determination of minerals and acid insoluble ash and estimation of Calcium and phosphorus	3
6.	Assay of amylases, papain and lipases	3
7.	Estimation of iron in drumsticks	3
8.	Determination of food colors	3

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B.Voc Degree Examinations according to NEP 2021

60 : 40 pattern

Theory papers: Total marks = 100 marks

  C1= 20 marks(IA)C2= 20marks(IA)

  C3= 60marks (Main exam.)

Practical papers: Total marks = 50 marks
    C1= 10 marks (IA)

   C2= 10 marks(IA) +05(Record)

   C3= 25 marks (Main Exam.)

   IA = Internal assessment (Assignment/seminar/test/viva-voce).

B.Voc. DEGREE EXAMINATION

MODEL QUESTION PAPER

BIOCHEMISTRY

TIME : 2.30 hrs   **MAX. MARKS: 60**

NOTE: ALL SECTIONS ARE COMPULSORY

SECTION – A

1. Answer any FIVE of the following   5 x 2 = 10

   a.
   b.
   c.
   d.
   e.
   f.
   g.

SECTION – B

Answer any FOUR of the following   4x 5 =20

2.
3.
4.
5.
6.
7.

SECTION – C

Answer any THREE of the following   3 x 10 = 30

8.
9.
10.
11.
12.

Note: *section C may include sub questions a, b*

MODEL QUESTION PAPER (PRACTICALS)

BIOCHEMISTRY

Time: 3 h   **Max. Marks: 25**

1.   Write the principle and procedure of_____experiment   05

2.   Major experiment (Conduct and report the results)   15

3.   Viva-voce   05

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)

2021-22

DEPARTMENT OF COMPUTER SCIENCE

Revised Scheme of Instruction for B.Voc – Food Processing & Engineering 2016-17

General Education Component – Computer Science

Semester	Title	L: T: P	Theory Hrs	Tutorial Hrs	Practical Hrs	Total Hrs	Credits
Semester I	COMPUTER FUNDAMENTALS & DOS	2:0:1	30	0	15	45	3
Semester II	C PROGRAMMING	2:0:1	30	0	15	45	3

COMPUTER SCIENCE

PAPER - I

COMPUTER FUNDAMENTALS & DOS

(2 hrs theory / week)   **30 hours - 2 Credits**

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

BCA Question Paper Pattern

Time 3 Hours   Max. Marks: 60

Part A

I. Answer any 2 sub questions from each main   3 X 10 =   30

   1. A.   2 X 5 = 10
      B.
      C.

   2. A.   2 X 5 = 10
      B.
      C.

   3. A.   2 X 5 = 10
      B.
      C.

Part B

II. Answer all Questions from the following   3 X 10 =   30

   4. A.   10
              OR
      B.   10

   5. A.   10
              OR
      B.   10

   6. A.   10
              OR
      B.   10

(Note: one Question from each Unit and marks of Questions may have internal split-ups.)

BSc Question Paper Pattern

Time 3 Hours   Max. Marks: 60

Part A

I. Answer all Questions from the following   04 X 05 = 20

  1. A.   05

                         OR

      B.   05

  2. A.   05

                         OR

      B.   05

  3. A.   05

                         OR

      B.   05

  4. A.   05

                         OR

      B.   05

Part B

II. Answer all Questions from the following   04 X 10 = 40

  5. A.   10

                    OR

      B.   10

  6. A.   10

                    OR

      B.   10

  7. A.   10

                    OR

      B.   10

  8. A.   10

                    OR

      B.   10

(Note: one Question from each Unit and marks of Questions may have internal split-ups.)

BCA / B.Sc. Question Paper Pattern

Time 2 Hours   Max. Marks: 30

Part A

I. Answer any Five sub questions from the following   05 X 02 = 10

  1. A.
     B.
     C.
     D.
     E.
     F.

Part B

II. Answer any Four questions from the following   04 X 05 = 20

  1. A.
     B.
     C.
     D.
     E.

(Note: one Question from each Unit and marks of Questions may have internal split-ups.)

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)

2021-2022

DEPARTMENT OF FOOD PROCESSING AND ENGINEERING

General Component

Semester - VII

Sl. no.	PRODUCT DEVELOPMENT AND ENTRPREUNERSHIP	Hrs
1	Sensory evaluation of foods - Importance, need and application for product formulation, Basic tastes, threshold tests for basic tastes, Sensory panel, type, selection and training. Types of sensory tests- Subjective and objective sensory evaluation. Instrumental tests for sensory attributes – color, texture and odor.	8
2	Product Development - Designing new product – types and drawing forces, Need for product development. Stages of product development, Consumer research. Role of sensory evaluation in consumer product acceptance.	5
3	Entrepreneurship - Starting and managing an enterprise - Steps in preparing a business plan, Components of management, Developing managerial skills, Managing a food industry. Factors influencing entrepreneurship groups Qualities of an entrepreneur	6
4	Consumer Behaviour & Marketing - Factors influencing food purchases, product acceptance, purchasing trends. Changing food trends.	3
5	Special food processing technologies and novel food ingredients – Membrane technology (reverse osmosis and ultra-filtration), agglomeration, agitation, air classification, extrusion, automation in food industries.	8

Sl. no.	Practical	Hrs
1	Sensory analysis: Different types of sensory tests for basic tastes and sensory attributes of products.	5
2	Project on different sensory techniques and responses utilizing prepared food products, analysis and presentation of sensory data.	3
3	Stepwise development of a new food product, standardization, acceptability studies and submission of project report.	4
4	Survey on types of convenience foods / consumer behaviour / analysis of food labelling.	3

General Component

Semester – VIII

SI. 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	5

Sl. No.		
	indication and Industrial design	
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

B.Voc (Food Processing and Engineering) Syllabus	
Honours degree **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 control pathological spoilages and insect infestation	4
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	3

	Contamination. Intrinsic &extrinsic factors influencing the growth of Microorganisms in foods	
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 waste, Hazardous waste .Quality and Safety of Frozen Foods: Fruits, Vegetable	3
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	14

	COP methods and procedures, GHP, GMP and HACCP; waste management-pre and post production.	
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 sanitizers	8
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

Fruit Pulp Processing Technician

SECTOR: FOOD PROCESSING
SUB-SECTOR: FRUITS & VEGETABLES
OCCUPATION: PROCESSING
REF ID: FIC/Q0106, V1.0
NSQF LEVEL: 4

TABLE OF CONTENTS

Fruit Pulp Processing Technician

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,startmachine, 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		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	100	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 5 2 3 storage areas according to safe food practices				
	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%**	

Model Curriculum

Supervisor-Fruits and Vegetables Processing

SECTOR:	**FOOD PROCESSING**
SUB-SECTOR:	**FRUITS & VEGETABLES**
OCCUPATION:	**PROCESSING**
REF ID:	**FIC/Q0109, V1.0**
NSQF LEVEL:	**5**

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Supervisor-Fruits and Vegetables Processing

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of a "Supervisor-Fruits and Vegetables processing", in the "Food Processing" Sector/Industry and aims at building the following key competencies amongst the learner

Program Name	Supervisor-Fruits and Vegetables Processing		
Qualification Pack Name & Reference ID. ID	FIC/Q0109, v1.0		
Version No.	1.0	**Version Update Date**	01/08/2018
Pre-requisites to Training	Preferably Class 12 and 2 years' experience in fruit and vegetable processing unit		
Training Outcomes	**After completing this programme, participants will be able to:** - ensure preparation of work area and process machineries for fruit & vegetable processing, - execute production planning of fruits & vegetable processing, - supervise and coordinate activities of workers engaged in production of fruits & vegetable products, - perform documentation and record keeping of raw material, ingredients and the finished good, - apply sanitation and hygiene practices in the work environment, - manage and lead the team.		

This course encompasses <u>6</u> out of <u>6</u> National Occupational Standards (NOS) of "<u>Supervisor-Fruits and Vegetables Processing</u>" Qualification Pack issued by "<u>Food Industry Capacity and Skill Initiative</u>".

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1	**Introduction to Training Program and Overview of Food Processing Industry** **Theory Duration** (hh:mm) 07:00 **Practical Duration** (hh:mm) 00:00 **Corresponding NOS Code** Bridge Module	• Define food processing • List the various sub sectors of food processing industry • Define fruits and vegetables Processing • List the various units within a fruits and vegetables processing industry • State the roles and responsibilities of supervisor-fruits and vegetables processing	
2	**Organizational Standards and Norms** **Theory Duration** (hh:mm) 05:00 **Practical Duration** (hh:mm) 10:00 **Corresponding NOS Code** Bridge Module	• State the roles and responsibilities of a Supervisor-fruits and vegetables processing • 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	Protective Gloves, Head Caps, Lab Coat, Safety Goggles, Safety Boots, Mouth Masks, Sanitizer, Food Safety Manual
3	**Ensure Preparation and Maintenance of Work Area and Process Machineries for Production of Fruit and Vegetable Products** **Theory Duration** (hh:mm) 10:00 **Practical Duration** (hh:mm) 20:00	• Check if the work area is cleaned using approved sanitizers • Describe the importance of cleanliness of the work area • Check if the work area is safe and hygienic for food production • Check the working and performance of all machineries and tools used for fruits and vegetables processing • Check if the equipment are washed with approved sanitizers • Check if the disposal of waste material is as per SOP	Fruit Washer, Peeler, Fruit Pulper , Juice Extractor, Clarifier, Filter, Pasteurizer, Steam Jacketed Kettles, Packaging Machines, Protective Gloves, Head Caps, Lab Coat, Safety Goggles, Safety Boots, Mouth Masks, Sanitizer, Food Safety Manual

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Corresponding NOS Code FIC/N0131		
4.	**Execute production planning of Fruit and Vegetable Products** **Theory Duration** (hh:mm) 10:00 **Practical Duration** (hh:mm) 20:00 **Corresponding NOS Code** FIC/N0132	• Perform the grouping of ingredients for same type of products • Plan production sequence • Demonstrate the allotting of responsibilities • Perform calculation for raw material requirement • Perform a check on the availability of raw material, ingredients and packaging materials	Fruit Washer, Peeler, Fruit Pulper , Juice Extractor, Clarifier, Filter, Pasteurizer, Steam Jacketed Kettles, Packaging Machines, Protective Gloves, Head Caps, Lab Coat, Safety Goggles, Safety Boots, Mouth Masks, Sanitizer, Food Safety Manual
5.	**Supervise Production of Fruit and Vegetable Products** **Theory Duration** (hh:mm) 15:00 **Practical Duration** (hh:mm) 40:00 **Corresponding NOS Code** FIC/N0133	• Perform a check if all the machineries are clean and in good working conditions • Demonstrate assembling of all components of machines • Perform a pre check on all machineries • Review of the production order • Check if the production area is clean for processing of fruits and vegetables • Check the quality report of fruits and vegetables to ensure conformance to the industry standards • Demonstrate the monitoring of control panel of each fruits and vegetables processing machinery • Co-ordinate with the maintenance team and ensure machine breakdowns are attended • Check for timely production of the food product • Complete all the documents related to production and pass them on to manager • Demonstrate cleaning the machineries used with recommended sanitizers following CIP (clean-in-place) procedure • Demonstrate cleaning the equipment and tools used using recommended cleaning agents and sanitizers	Fruit Washer, Peeler, Fruit Pulper , Juice Extractor, Clarifier, Filter, Pasteurizer, Steam Jacketed Kettles, Packaging Machines, Protective Gloves, Head Caps, Lab Coat, Safety Goggles, Safety Boots, Mouth Masks, Sanitizer, Food Safety Manual
6.	**Complete Documentation and Record Keeping**	• State the need for documenting and maintaining records of raw materials, processes and finished products • State the method of documenting and	Food Safety Manual, Log Books.

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Related to Packaging Food Products **Theory Duration** (hh:mm) 06:00 **Practical Duration** (hh:mm) 05:00 **Corresponding NOS Code** FIC/N0134	recording the details of raw material to final finished product • Demonstrate the process of documenting records of production plan, process parameters, and finished products	
7.	**Food Safety, Hygiene and Sanitation for Packaging Food Products** **Theory Duration** (hh:mm) 10:00 **Practical Duration** (hh:mm) 35:00 **Corresponding NOS Code** FIC/N9001	• State the importance of safety, hygiene and sanitation in the baking industry • Apply the industry standards to maintain a safe and hygiene workplace • Apply HACCP principles to eliminate food safety hazards in the process and products • Apply safety practices in the work area	Protective Gloves, Head Caps, Aprons, Safety Goggles, Safety Boots, Mouth Covers, Sanitizer, Food Safety Manual ,Log Books etc.
8.	**Leadership Skills** **Theory Duration** (hh:mm) 04:00 **Practical Duration** (hh:mm) 10:00 **Corresponding NOS Code** FIC/N9004	• Perform a check if the team is aware about the schedule and expectations from them • Conduct regular meetings with the team members • Tell the team member to participate in various activities organized by the organization • Demonstrate counselling of team members • Conduct training of team members • Provide feedback to the team members	Computer/Laptop, Log Books
9.	**Professional and Core Skills** **Theory Duration** (hh:mm) 04:00	• Plan a general aptitude self-assessment test • Identify personal strengths and weaknesses • Plan and schedule the work order	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Practical Duration (hh:mm) 10:00 **Corresponding NOS Code** Bridge Module	• Manage time effectively to complete the tasks assigned • Identify and resolve potential problems and take preventive measure to prevent it • State the importance of decision making • State the importance of listening	
10.	**IT Skills** **Theory Duration** (hh:mm) 04:00 **Practical Duration** (hh:mm) 15:00 **Corresponding NOS Code** Bridge Module	• 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	Computer/Laptop
	Total Duration **240:00** **Theory Duration** **75:00** **Practical Duration** **165:00**	**Unique Equipment Required**: Fruit Washer, Peeler, Fruit Pulper , Juice Extractor, Clarifier, Filter, Pasteurizer, Steam Jacketed Kettles, Packaging Machines, Protective Gloves, Head Caps, Lab Coat, Safety Goggles, Safety Boots, Mouth Masks, Sanitizer, Food Safety Manual, Log Books, Computer/Laptop	

Grand Total Course Duration: **240Hours, 0 Minutes**
Recommend OJT Hours: **60Hours, 0 Minutes**

(This syllabus/ curriculum has been approved by **SSC: Food Industry Capacity and Skill Initiative)**

Trainer Prerequisites for Job role: "Supervisor- Fruits and Vegetables Processing" mapped to Qualification Pack: "FIC/Q0109, 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/Q0109", 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 hands on experience in a Fruits/Vegetables Unit • M.Sc/M.Tech/ME in Food Technology or Food Engineering with 1-2 years of hands on experience in a Fruits/Vegetables Unit
4a	Domain Certification	Certified for Job Role: "Supervisor-Fruits & Vegetables Processing" mapped to QP: "FIC/Q0109, 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: "MEP/Q0102". 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 hands on experience in a Fruits/Vegetables Unit • M.Sc/M.Tech/ME in Food Technology or Food Engineering with 1-2 years of hands on experience in a Fruits/Vegetables Unit

Annexure: Assessment Criteria

Assessment Criteria	
Job Role	Supervisor-Fruits and Vegetables Processing
Qualification Pack	FIC/Q0109, v1.0
Sector Skill Council	Food Processing

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. Assessment will be conducted for all compulsory NOS, as well as the selected elective NOS/set of NOS.
OR
4. Assessment will be conducted for all compulsory NOS, as well as the selected optional NOS/set of NOS.
5. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training center (as per assessment criteria below)
6. Individual assessment agencies will create unique evaulations for skill practical for every student at each examination/training center based on this criteria
7. To pass the Qualification Pack , every trainee should score a minimum of 70% of aggregate marks to successfully clear the assessment.
8. In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack

Total Marks: 600	Compulsory NOS				
Assessable outcomes	**Assessment criteria for outcomes**	**Total Marks**	**Out Of**	**Theory**	**Skills Practical**
1. FIC/N0131: Prepare and maintain work area and process machineries for production of fruits & vegetables	PC.1 ensure work area is cleaned using approved sanitizers and cleanliness is maintained to keep it free from dust, waste, flies and pests	**100**	15	5	10
	PC2. Ensure that the work area is safe and hygienic for food processing		20	8	12
	PC3. ensure disposal of waste materials as per defined SOPs and industry requirements		15	6	9
	PC4. ensure the working and performance of all machineries and tools used for production of fruits and vegetable products like washer, peeler, slicer, pulper, pasteurizer, drier,refractometer, salinometer, double jacketed kettle, juice extractor, clarifier, evaporator, retort, packaging machines etc.		20	8	12
	PC5. ensure machineries and tools are cleaned using recommended sanitizers following the SOP		10	4	6
	PC6. ensure tools required for process are placed accessible, to use when necessary		5	1	4
	PC7. ensure minor repairs/ faults of all machines are attended		15	3	12
			100	35	65
2. FIC/N0132: execute production planning of fruits & vegetable products	PC1. plan production sequence by • grouping products of same type (varieties of juices, pulps, jams, pickles etc) • using same equipment and machinery for various products such that one product does not impact the quality of the other • planning maximum capacity utilization of machineries • considering the process time for each product • planning efficient utilization of resources/manpower • prioritizing urgent orders		27	10	17
	PC2. calculate the batch size based on the production order and machine capacity		7	2	5
	PC3. calculate lead time for production of various products planned		11	3	8
	PC4. prepare shift schedule for assistants/technicians		5	2	3
	PC5. allot responsibilities work to the assistants/technicians and helpers		5	2	3
	PC6. calculate the raw material requirement		5	2	3

Total Marks: 600	Compulsory NOS				
Assessable outcomes	**Assessment criteria for outcomes**	**Total Marks**	**Out Of**	**Theory**	**Skills Practical**
	(considering the process loss) to produce finished product(s) as per production order				
	PC7. calculate the raw materials, packaging materials and manpower requirement for completing the order		5	2	3
	PC8. check the availability of raw materials, packaging materials, equipment and manpower		9	3	6
	PC9. prepare indent for issue of raw materials and packaging materials from store		3	1	2
	PC10. ensure transfer of raw materials and packaging materials from store production and packaging area through helpers		2	0.5	1.5
	PC11. ensure checking the weight of raw materials and packaging materials received from store and check its conformance of quality to organisation standards through physical parameters like appearance, colour, texture etc		8	2.5	5.5
	PC12. verify quality documents from supplier and internal lab to ensure its conformance to standards		9	4	5
	PC13. ensure raw materials (including ingredients, additives, preservatives etc) for the batch are weighed accurately following the formulations		4	2	2
			100	35	65
3. FIC/N0133: Supervise production of fruit and vegetable products	PC1. check and ensure cleanliness and sterilization of all fruit and vegetable processing machineries like washer, peeler, slicer, pulper, drier, juice extractor, juice clarifier, evaporator, retort, pasteurizer, steam jacketed kettle, packaging machines etc	**100**	2	0.5	1.5
	PC2.check and ensure maintenance has been carried out on all fruit and vegetable processing machineries and equipments		2	0.5	1.5
	PC3.check and ensure all process machineries are clean and in good mechanical condition		2	0.5	1.5
	PC4. check assembling of fittings like stirrer, blades, pipes and other parts to equipment and ensure all machineries are ready for production		5	0.5	4.5
	PC5. start each process machineries and ensure its working and performance and check if required tools are kept accessible to attend repairs/faults in case of breakdown		2	0.5	1.5

Total Marks: 600	Compulsory NOS				
Assessable outcomes	Assessment criteria for outcomes	Total Marks	Out Of	Theory	Skills Practical
	PC6. review production orders or schedules to ascertain product details such as type of products to be produced, quantities, specifications of products and scheduled delivery dates in order to plan production operation		2	1	1
	PC7. check and ensure production area is safe and clean		2	0	2
	PC8. verify the quality report on raw materials to ensure its conformance to quality standards		2	1	1
	PC9. monitor control panel of each fruit and vegetable processing machinery and ensure applicable process parameters like temperature, pressure, time etc (as applicable) are set in accordance with standards for production of various fruit and vegetable products		3	1	2
	PC10. observe control points and equipments at regular intervals to ensure operational performance and optimum utilization		3	1	2
	PC11. stop production following stop procedure, in case of machine breakdowns during production		3	1	2
	PC12. co-ordinate with maintenance team and ensure machine breakdowns are attended to immediately in order to prevent operational delays		3	1	2
	PC13. suggest control measures and corrective actions for any problems related to production, process and products, if required consult with manager and resolve problems		4	1.5	2.5
	PC14. ensure product quality by establishing and enforcing organization standards in each stage of production process		3	1	2
	PC15. monitor packaging of finished products, perform random check on weight of packed products, check label details like date of manufacture, batch number, expiry date etc and ensure products are packed as per organisation and regulatory standards		4	1.5	2.5
	PC16. monitor production activities, coordinate with cross function team and ensure production is started and completed as scheduled		4	1.5	2.5
	PC17. ensure timely production with minimum or no wastage, and quality of products		4	1.5	2.5

Total Marks: 600	Compulsory NOS				
Assessable outcomes	**Assessment criteria for outcomes**	**Total Marks**	**Out Of**	**Theory**	**Skills Practical**
	produced meets organisation and regulatory standards				
	PC18. analyze production performance records and data, investigate issues related to fruit and vegetable products processing, discuss with manger and identify solutions to prevent/correct problems, and ensure to implement suggested corrective action		4	1.5	2.5
	PC19. evaluate new equipment and techniques while producing new products and on installation of new machineries		4	2	2
	PC20. maintain safe and clean work environment by educating team on procedures to maintain compliance		3	1.5	1.5
	PC21. monitor activities and performance of assistants, technicians, operators and helpers		7	3	4
	PC22. provide production information to the manager by compiling, sorting, and analysing production performance records of all shifts		4	1.5	2.5
	PC23. update manager on day-to-day activities, discuss problem, suggest or understand suggested preventive and corrective action, and implement corrective actions immediately		4	1	3
	PC24. update manager on day-to-day activities, discuss problem, suggest or understand suggested preventive and corrective action, and implement corrective actions immediately		6	2	4
	PC25. monitor cleaning of work area, equipments and tools using recommended cleaning agents and sanitizers		8	3	5
	PC26. ensure minor repairs/faults (if any) of all components and machines are attended to before the start of next production		4	1	3
	PC27. ensure periodic (daily/weekly/monthly/quarterly/half yearly/annual) maintenance of all machines and equipment following the sop or following suppliers instructions/manuals		6	3	3
			100	35	65
4. FIC/N0134: Complete documentation	PC1. Document and maintain records of details of raw materials type and variety, grown area, grown season, quantity,	**100**	10	6	4

Total Marks: 600	Compulsory NOS				
Assessable outcomes	**Assessment criteria for outcomes**	**Total Marks**	**Out Of**	**Theory**	**Skills Practical**
and record keeping related to production of fruit and vegetable products	vendor/supplier details, date of manufacture, expiry date, quality report from supplier and internal lab etc. as per organisation standards				
	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 such as product details, production sequence, equipments and machinery details, efficiency and capacity utilization of equipment	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 (if any) or deviations related to process and production	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	

Total Marks: 600	Compulsory NOS				
Assessable outcomes	**Assessment criteria for outcomes**	**Total Marks**	**Out Of**	**Theory**	**Skills Practical**
	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
			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		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	**100**	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
	PC15.Label raw materials and finished products and store them in different storage areas according to safe food practices		5	2	3

Total Marks: 600	Compulsory NOS				
Assessable outcomes	**Assessment criteria for outcomes**	**Total Marks**	**Out Of**	**Theory**	**Skills Practical**
	PC16.Follow stock rotation based on FEFO/FIFO		10	4	6
			100	35	65
6. FIC/N9004 (Manage and lead a team)	PC1. ensure that the team is aware of the schedule and job expectations on a daily basis		12	4	8
	PC2. involve the team in regular meetings to communicate information intended for them		12	4	8
	PC3. ensure communication to the team on any changes in policies/ processes by the organization through required verbal/ written mechanisms		12	4	8
	PC4. ensure participation of the team in various engagement initiatives organized by the organization		8	2	6
	PC5. counsel and address issues among the team for any work related issues		12	4	8
	PC6. support the manager in deployment of the team as per production schedule and the organizational norms and guidelines		6	2	4
	PC7. ensure periodic training of the team and support the team by delivering trainings		6	3	3
	PC8. share knowledge of processes, techniques and products with the team to enhance their skill levels		6	3	4
	PC9. provide feedback to the manager pertaining to performance of the team		6	3	3
	PC10. motivate workers, initiate and develop cooperation within and between departments, develop personal growth opportunities		4	1	3
	PC11. maintain effective supervisor-worker relations, create safe work environment, establish effective communication methods, identify and solve employee problems, manage conflict, respond to grievances		4	2	2
	PC12. manage employees and team performance, provide new employee orientation, educate team on procedures to maintain compliance, train or provide adequate training and motivate employees		4	1	3
	PC13. coach, counsel and discipline employees, initiate, coordinate and enforce systems, policies and procedures through team		4	2	2
	PC14. evaluate, investigate complaints or performance concerns, implement		4	2	2

Total Marks: 600	Compulsory NOS				
Assessable outcomes	Assessment criteria for outcomes	Total Marks	Out Of	Theory	Skills Practical
	disciplinary action as needed in consultation with proper authorities				
			100	35	65

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

TABLE OF CONTENTS

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

| | | 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

		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

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 Prac tical
	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		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	100	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%	

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)

to the

MODEL CURRICULUM

Complying to National Occupational Standards of
Job Role/ Qualification Pack: **'Production Manager'**
QP No. **'FIC/Q9003, 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)

Production Manager

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Production Manager

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	

Production Manager

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**)*

Production Manager

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

Production Manager

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

Production Manager

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%	

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE
(Autonomous)

Ooty Road, Mysuru-570025

Model Curriculum Structures for
Bachelor of Science (Basic and Honours) Programme
with Computer Science as Major & Minor Course
Model Syllabus for I and II Semesters
and
Open Elective Courses in Computer Science

As per
NATIONAL EDUCATION POLICY - 2020
(NEP-2020)

2021-22

DEPARTMENT OF COMPUTER SCIENCE

The objectives of the B.Sc. - Computer Science Program

1. The primary objective of this program is to provide a foundation of computing principles for effectively using information systems and enterprise softwares.
2. It helps students analyze the requirements for system programming and exposes students for information systems
3. This programme provides students with options to specialize in various software system.
4. To produce outstanding Computer Scientists who can apply the theoretical knowledge into practice in the real world and develop standalone live projects themselves
5. To provide opportunity for the study of modern methods of information processing and its applications.
6. To develop among students the programming techniques and the problem- solving skills through programming
7. To prepare students who wish to go on to further studies in computer science and related subjects.
8. To acquaint students to Work effectively with a range of current, standard, Office Productivity software applications.

Program Outcomes:

1. **Discipline knowledge:** Acquiring knowledge on basics of Computer Science and ability to apply to design principles in the development of solutions for problems of varying complexity

2. **Problem Solving:** Improved reasoning with strong mathematical ability to Identify, formulate and analyze problems related to computer science and exhibiting a sound knowledge on data structures and algorithms.

3. **Design and Development of Solutions:** Ability to design and developmentof algorithmic solutions to real world problems.

4. **Programming a computer:** Exhibiting strong skills required to program a computer for various issues and problems of day-to-day scientific applications.

5. **Application Systems Knowledge**: Possessing a minimum knowledge to practice existing computer application software.

6. **Communication:** Must have a reasonably good communication knowledge both in oral and writing.

7. **Ethics on Profession, Environment and Society:** Exhibiting professional ethics to maintain the integrality in a working environment and also have concern on societal impacts due to computer-based solutions for problems.

8. **Lifelong Learning:** Should become an independent learner. So, learn to learn ability.

9. **Motivation to take up Higher Studies:** Inspiration to continue educations towards advanced studies on Computer Science.

Additional Program Outcomes for B. Sc. (Hons) in Computer Science

The four years Bachelors in Computer Science (Hons) program enables students to attain the following additional attributes besides the afore-mentioned attributes:

1. Apply standard Software Engineering practices and strategies in real -time software project development

2. Design and develop computer programs/computer-based systems in the areas related to AI, algorithms, networking, web design, cloud computing, IoT and data analytics.

3. Acquaint with the contemporary trends in industrial/research settings and thereby innovate novel solutions to existing problems

4. The ability to apply the knowledge and understanding noted above to the analysis of a given information handling problem.

5. The ability to work independently on a substantial software project and as an effective team member.

IIIA. Model Program Structures for the Under-Graduate Programs in Universities and Colleges in Karnataka

Bachelor of Science (Basic/Hons.) in subjects with practical with both subjects as majors

Sem.	Discipline Core (DSC) (Credits) (L+T+P)	Discipline Elective (DSE) / Open Elective (OE) (Credits) (L+T+P)	Ability Enhancement Compulsory Courses (AECC),		Skill Enhancement Courses (SEC)			Total Credits
					Skill based credits (L+T+P)	Value based (Credits) (L+T+P)		
I	Discipline A1(4+2) Discipline B1(4+2)	OE-1 (3)	L1-1(3), L2-1(3) (4 hrs. each)	Environmental Studies (3)		Physical Education for fitness (1) (0+0+2)	Health & Wellness (1) (0+0+2)	25
II	Discipline A2(4+2) Discipline B2(4+2)	OE-2 (3)	L1-2(3), L2-2(3) (4 hrs. each)		SEC-1: Digital Fluency (2)(1+0+2)	Physical Education - Yoga(1) (0+0+2)	NCC/NSS/R&R(S&G) /Cultural (1) (0+0+2)	25
Exit option with Certificate (50 credits)								
III	Discipline A3(4+2) Discipline B3(4+2)	OE-3 (3)	L1-3(3), L2-3(3) (4 hrs. each)	Constitution of India (3)		Physical Education-Sports (1) (0+0+2)	NCC/NSS/R&R(S&G) /Cultural (1)(0+0+2)	25
IV	Discipline A4(4+2) Discipline B4(4+2)	OE-4 (3)	L1-4(3), L2-4(3) (4 hrs. each)		SEC-2: Artificial Intelligence (2) (1+0+2)	Physical Education -Games (1) (0+0+2)	NCC/NSS/R&R(S&G) /Cultural (1)(0+0+2)	25
Exit option with Diploma (100 credits) or continue the third year with both the subjects as majors								
V	Discipline A5(3+2), Discipline A6(3+2) Discipline B5(3+2), Discipline B6(3+2)				SEC-3: SEC such as Cyber Security (2) (1+0+2)			23
VI	Discipline A7(3+2), Discipline A8(3+2) Discipline B7(3+2) Discipline B8(3+2) Internship (2)				SEC-4: Professional Communication (2)			24
Exit option with Bachelor of Arts, B.A./ Bachelor of Science, B. Sc. Basic Degree (146 credits) or choose one of the Disciplines as Major								
VII	Discipline A/B-9(3+2) Discipline A/B-10(3+2) Discipline A/B-11(3)	DS-A/B Elective-1(3) DS-A/B Elective-2(3) Res.Methodology(3)						22
VIII	Discipline A/B-12(3+2) Discipline A/B-13(3) Discipline A/B-14(3)	DS-A/B Elective-3(3) Research Project (6) *						20

NEP 2020 Syllabus – B.Sc. (Cs M) and B.Sc. (P Cs) 2021-22 onwards

Year	Sem	Combination	Course Code	Title	Hours / Week			Credits			Maximum Marks						Exam Duration	Total Marks
											Th. IA		Pr. IA		Exam			
					L	T	P	L	T	P	C1	C2	C1	C2	Th.	Pr.		
I	I	Cs M	FSA45034 [DSC-1]	Computer Fundamentals and Programming in C	4	0	0	4	0	0	20	20	-	-	60	-	3 Hours	100
		P Cs	FSA45035 [DSC-1]	Computer Fundamentals and Programming in C	4	0	0	4	0	0	20	20	-	-	60	-	3 Hours	100
		Cs M	FSA45034 [DSC-1L]	C Programming Lab	0	0	4	0	0	2	-	-	10	15*	-	25	3 Hours	50
		P Cs	FSA45035 [DSC-1L]	C Programming Lab	0	0	4	0	0	2	-	-	10	15*	-	25	3 Hours	50
		IBA EG	FHA21031	SEC-DIGITAL FLUENCY	1	0	1	1	0	2	-	-	10	15*	-	25	1 Hours	50
		IBA HP	FHA21032		1	0	1	1	0	2	-	-	10	15*	-	25	1 Hours	50
		IBA KG	FHA21033		1	0	1	1	0	2	-	-	10	15*	-	25	1 Hours	50
		IBA HE	FHA21034		1	0	1	1	0	2	-	-	10	15*	-	25	1 Hours	50
		IBA JP	FHA21035		1	0	1	1	0	2	-	-	10	15*	-	25	1 Hours	50
			FSA880	OE-Open Elective Office Automation	3	0	0	3	0	0	-	-	10	15*	-	25	2 Hours	50
			FSA890	OE- C – Programming Concepts	3	0	0	3	0	0	-	-	10	15*	-	25	2 Hours	50
	II	Cs M	FSB45034 [DSC-2]	Data Structures using C	4	0	0	4	0	0	20	20	-	-	60	-	3 Hours	100
		P Cs	FSB45035 [DSC-2]	Data Structures using C	4	0	0	4	0	0	20	20	-	-	60	-	3 Hours	100
		Cs M	FSB45034 [DSC-2 L]	Data structures Lab	0	0	4	0	0	2	-	-	10	15*	-	25	3 Hours	50

Class	Code	Title														
P Cs	FSB45035 [DSC-2 L]	Data structures Lab	0	0	4	0	0	2	-	-	10	15*	-	25	3 Hours	50
I BCA	FAB210															
I B.Sc. PC	FSB21031															
I B.Sc. PM	FSB21032															
I B.Sc. PE	FSB21033															
I B.Sc. CsM	FSB21034	SEC-DIGITAL FLUENCY														
I B.Sc. PCs	FSB21035															
I B.Sc. BtZ	FSB21036															
I B.Sc. CBt	FSB21037															
I B.Sc. CZ	FSB21038															
I B.Sc. BZ	FSB21039															
I B.Sc. BtBc	FSB21040															
I B.Sc. MbBt	FSB21041															
I B.Sc. MbBc	FSB21042															
	FSB880	OE – E Commerce	3	0	0	4	0	0	-	-	10	15*	-	25	2 Hours	50
	FSB890	OE-Web Designing	3	0	0	4	0	0	-	-	10	15*	-	25	2Hours	50

Note: 15* is spilt 10 marks for Practical's C2 + 5 marks for practical Record/Report

Discipline Specific Elective Courses:		
Group 1: - IoT - Cyber Law and Cyber Security - Web Programming - PHP and MySQL - Clouds, Grids, and Clusters - Software Testing	**Group-2:** - Information and Network Security - Data Compression - Discrete Structures - Opensource Programming - Multimedia Computing - Big Data	**Group-3:** - Data Analytics - Storage Area Networks - Pattern Recognition - Digital Image Processing - Parallel Programming - Digital Signal Processing
Open Electives in Computer Science: (For BA, BSc, BCom, BSW, BBA, BBM students studying Core Courses other than Computer Science/ Computer Applications)		
• Office Automation • Multimedia Processing • Computer Animation • Accounting Package	• C Programming Concepts • Python Programming Concepts • R Programming	• E-Content Development • E-Commerce • Web Designing

Model Syllabus for BSc (Basic and Honors), Semesters I and II

Semester: I

Course Code: DSC-1	**Course Title:** Computer Fundamentals and Programming in C
Course Credits: 04	Hour of Teaching/Week: 04
Total Contact Hours: 52	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 03

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:

• Confidently operate Desktop Computers to carry out computational tasks

• Understand working of Hardware and Software and the importance of operating systems

• Understand programming languages, number systems, peripheral devices, networking, multimedia and internet concepts

• Read, understand and trace the execution of programs written in C language

• Write the C code for a given problem

• Perform input and output operations using programs in C

• Write programs that perform operations on arrays

Course Content

Content	Hours
Unit - 1	
Fundamentals of Computers: Introduction to Computers - Computer Definition, Characteristics of Computers, Evolution and History of Computers, Types of Computers, Basic Organisation of a Digital Computer; Number Systems – different types, conversion from one number system to another; Computer Codes – BCD, Gray Code, ASCII and Unicode; Boolean Algebra – Boolean Operators with Truth Tables; Types of Software – System Software and Utility Software; Computer Languages - Machine Level, Assembly Level & High Level Languages, Translator Programs – Assembler, Interpreter and Compiler; Planning a Computer Program - Algorithm, Flowchart and Pseudo code with Examples. **Introduction to C Programming:** Over View of C; History and Features of C; Structure of a C Program with Examples; Creating and Executing a C Program; Compilation process in C.	13
Unit - 2	
C Programming Basic Concepts: C Character Set; C tokens - keywords, identifiers, constants, and variables; Data types; Declaration & initialization of variables; Symbolic constants. **Input and output with C:** Formatted I/O functions - *printf* and *scanf,* control stings and escape sequences, output specifications with *printf* functions; Unformatted I/O functions to read and display single character and a string - *getchar, putchar, gets* and *puts* functions. **C Operators & Expressions:** Arithmetic operators; Relational operators; Logical operators; Assignment operators; Increment & Decrement operators; Bitwise operators; Conditional operator; Special operators; Operator Precedence and Associatively; Evaluation of arithmetic expressions; Type conversion.	13
Unit - 3	
Control Structures: Decision making Statements - S*imple if, if_else, nested if_else, else_if ladder, Switch-case*, *goto, break* & *continue* statements; Looping Statements - Entry controlled and Exit controlled statements, *while, do-while, for* loops, Nested loops.	13

Arrays: One Dimensional arrays - Declaration, Initialization and Memory representation; Two Dimensional arrays - Declaration, Initialization and Memory representation. Strings: Declaring & Initializing string variables; String handling functions - *strlen, strcmp, strcpy and strcat;* Character handling functions - *toascii, toupper, tolower, isalpha, isnumeric* etc.	
Unit - 4	
Pointers in C: Understanding pointers - Declaring and initializing pointers, accessing address and value of variables using pointers; Pointers and Arrays; Pointer Arithmetic; Advantages and disadvantages of using pointers; **User Defined Functions:** Need for user defined functions; Format of C user defined functions; Components of user defined functions - return type, name, parameter list, function body, return statement and function call; Categories of user defined functions - With and without parameters and return type. **User defined data types:** Structures - Structure Definition, Advantages of Structure, declaring structure variables, accessing structure members, Structure members initialization, comparing structure variables, Array of Structures; Unions - Union definition; difference between Structures and Unions.	13

Text Books

1. Pradeep K. Sinha and Priti Sinha: Computer Fundamentals (Sixth Edition), BPB Publication
2. E. Balgurusamy: Programming in ANSI C (TMH)

References

1. Kamthane: Programming with ANSI and TURBO C (Pearson Education)
2. V. Rajaraman: Programming in C (PHI – EEE)
3. S. ByronGottfried: Programming with C (TMH)
4. Kernighan & Ritche: The C Programming Language (PHI)
5. Yashwant Kanitkar: Let us C
6. P.B. Kottur: Programming in C (Sapna Book House)

Course Code: **DSC-1L**	**Course Title: C Programming Lab**
Course Credits: 02	Hour of Teaching/Week: 04
Total Contact Hours: 52	Formative Assessment Marks: 25
Exam Marks: 25	Exam Duration: 03

Practice Lab

The following activities be carried out/ discussed in the lab during the initial period of the semester.

1. Basic Computer Proficiency a. Familiarization of Computer Hardware Parts
   b. Basic Computer Operations and Maintenance.
   c. Do's and Don'ts, Safety Guidelines in Computer Lab
2. Familiarization of Basic Software – Operating System, Word Processors, Internet Browsers, Integrated Development Environment (IDE) with Examples.
3. Type Program Code, Debug and Compile basic programs covering C Programming fundamentals discussed during theory classes.

Programming Lab

Part A:

1. Write a C Program to read radius of a circle and to find area and circumference
2. Write a C Program to read three numbers and find the biggest of three

3. Write a C Program to demonstrate library functions in *math.h*

4. Write a C Program to check for prime

5. Write a C Program to generate n primes

6. Write a C Program to read a number, find the sum of the digits, reverse the number and check it for palindrome

7. Write a C Program to read numbers from keyboard continuously till the user presses 999 and to find the sum of only positive numbers

8. Write a C Program to read percentage of marks and to display appropriate message (Demonstration of else-if ladder)

9. Write a C Program to find the roots of quadratic equation (demonstration of switch-case statement)

10. Write a C program to read marks scored by n students and find the average of marks (Demonstration of single dimensional array)

11. Write a C Program to remove Duplicate Element in a single dimensional Array

12. Program to perform addition and subtraction of Matrices

Part B:

1. Write a C Program to find the length of a string without using built in function

2. Write a C Program to demonstrate string functions.

3. Write a C Program to demonstrate pointers in C

4. Write a C Program to check a number for prime by defining *isprime( )* function

5. Write a C Program to read, display and to find the trace of a square matrix

6. Write a C Program to read, display and add two m x n matrices using functions

7. Write a C Program to read, display and multiply two m x n matrices using functions

8. Write a C Program to read a string and to find the number of alphabets, digits, vowels, consonants, spaces and special characters.

9. Write a C Program to Reverse a String using Pointer

10. Write a C Program to Swap Two Numbers using Pointers

11. Write a C Program to demonstrate student structure to read & display records of n students.

12. Write a C Program to demonstrate the difference between structure & union.

Note: Student has to execute a minimum of 10 programs in each part to complete the Lab course

Evaluation Scheme for Lab Examination

Assessment Criteria		Marks
Program – 1 from Part A	Flowchart / Algorithm	02
	Writing the Program	05
	Execution and Formatting	03
Program -2 from Part B	Flowchart/Algorithm	02
	Writing the Program	05
	Execution and Formatting	03
Viva Voice based on C Programming		05
Total		**25**

Semester: II

Course Code: **DSC-2**	**Course Title:** Data Structures using C
Course Credits: 04	Hour of Teaching/Week: 04
Total Contact Hours: 52	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 03 Hours

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:

• Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms

• Describe common applications for arrays, records, linked structures, stacks, queues, trees, and graphs

• Write programs that use arrays, records, linked structures, stacks, queues, trees, and graphs

• Demonstrate different methods for traversing trees

• Compare alternative implementations of data structures with respect to performance

• Describe the concept of recursion, give examples of its use

• Discuss the computational efficiency of the principal algorithms for sorting and searching

Course Content

Content	Hours
Unit - 1	
Introduction to data structures: Definition; Types of data structures - Primitive & Non-primitive, Linear and Non-linear; Operations on data structures. Algorithm Specification, Performance Analysis, Performance Measurement Recursion: Definition; Types of recursions; Recursion Technique Examples - Fibonacci numbers, GCD, Binomial coefficient $_nC_r$, Towers of Hanoi; Comparison between iterative and recursive functions.	13
Unit - 2	
Arrays: Basic Concepts – Definition, Declaration, Initialisation, Operations on arrays; Types of arrays; Arrays as abstract data types (ADT); Representation of Linear Arrays in memory; Traversing linear arrays; Inserting and deleting elements; Sorting – Selection sort, Bubble sort, Quick sort, Selection sort, Insertion sort; Searching - Sequential Search, Binary search; Iterative and Recursive searching; Multidimensional arrays; Representation of multidimensional arrays; Sparse matrices. Dynamic memory allocation: Static & Dynamic memory allocation; Memory allocation and de-allocation functions - *malloc, calloc, realloc* and *free.*	13
Unit - 3	
Linked list: Basic Concepts – Definition and Representation of linked list, Types of linked lists - Singly linked list, Doubly liked list, Header liked list, Circular linked list; Representation of Linked list in Memory; Operations on Singly linked lists – Traversing, Searching, Insertion, Deletion; Memory allocation; Garbage collection. Stacks: Basic Concepts – Definition and Representation of stacks; Operations on stacks; Applications of stacks; Infix, postfix and prefix notations; Conversion from infix to postfix using stack; Evaluation of postfix expression using stack; Application of stack in function calls.	13

Unit - 4	
Queues: Basic Concepts – Definition and Representation of queues; Types of queues - Simple queues, Circular queues, Double ended queues, Priority queues; Operations on Simple queues; Trees: Definition; Tree terminologies –node, root node, parent node, ancestors of a node, siblings, terminal & non-terminal nodes, degree of a node, level, edge, path, depth; Binary tree: Type of binary trees - strict binary tree, complete binary tree, binary search tree and heap tree; Array representation of binary tree. Traversal of binary tree; *preorder, inorder* and *postorder* traversal; Reconstruction of a binary tree when any two of the traversals are given.	13

Text Books

1. Satraj Sahani: Fundamentals of Data Structures

References

1. Tanenbaum: Data structures using C (Pearson Education)
2. Kamathane: Introduction to Data structures (Pearson Education)
3. Y. Kanitkar: Data Structures Using C (BPB)
4. Kottur: Data Structure Using C
5. Padma Reddy: Data Structure Using C
6. Sudipa Mukherjee: Data Structures using C – 1000 Problems and Solutions (McGraw Hill Education, 2007))

Course Code: **DSC-2Lab**	**Course Title: Data Structures Lab**
Course Credits: 02	Hour of Teaching/Week: 04
Total Contact Hours: 52	Formative Assessment Marks: 25
Exam Marks: 25	Exam Duration: 03

Programming Lab
Part A:
1. Write a C Program to find GCD using recursive function
2. Write a C Program to display Pascal Triangle using binomial function
3. Write a C Program to generate n Fibonacci numbers using recursive function.
4. Write a C Program to implement Towers of Hanoi.
5. Write a C Program to implement dynamic array, find smallest and largest element of the array.
6. Write a C Program to create two files to store even and odd numbers.
7. Write a C Program to create a file to store student records.
8. Write a C Program to read the names of cities and arrange them alphabetically.
9. Write a C Program to sort the given list using selection sort technique.
10. Write a C Program to sort the given list using bubble sort technique.

Part B:
1. Write a C Program to sort the given list using insertion sort technique.
2. Write a C Program to sort the given list using quick sort technique.
3. Write a C Program to sort the given list using merge sort technique.
4. Write a C Program to search an element using linear search technique.
5. Write a C Program to search an element using recursive binary search technique.
6. Write a C Program to implement Stack.
7. Write a C Program to convert an infix expression to postfix.

8. Write a C Program to implement simple queue.
9. Write a C Program to implement linear linked list.
10. Write a C Program to display traversal of a tree.

Evaluation Scheme for Lab Examination

Assessment Criteria		Marks
Program – 1 from Part A	Flowchart / Algorithm	02
	Writing the Program	05
	Execution and Formatting	03
Program -2 from Part B	Flowchart/Algorithm	02
	Writing the Program	05
	Execution and Formatting	03
Viva Voice based on C Programming		05
Total		**25**

Open Elective courses offered by the Department of Computer Science

Open Elective 1: Office Automation
Course Outcomes (COs):
- Be familiar various office automation tools.
- Create and format a document**.**
- Create and analyse data using Excel.
- Create and customize a presentation for a specific topic.

Unit-1   **14 Hrs**
Introduction, Block diagram of a computer, Input and output devices, memory and storage devices, Types of software, Introduction to operating system – functions, types of operating system and examples.
Introduction to word processing – creating and saving a document, formatting a document – Line spacing, paragraph, Fonts, inserting symbols, header and footer, shape, Tables, Find and replace, Mail merge, saving a document in different formats.

Unit-3   **14 Hrs**
Introduction to spread sheet – entering different types of data like text, numbers, date, , functions and formulae- different categories of functions, chart-creating and formatting a chart, filter, working with single and multiple work books, cell referencing, printing and previewing a document.

Unit-3   **14 Hrs**
Introduction to presentation tools-creating and viewing a presentation, applying design template, formatting options, inserting different objects in a presentation, customize a presentation, adding audio to a presentation, Slide animation, preview Slide transitions Slide show options, adding effect to presentation.

Reference books
1. Computer Basics with Office Automation- Archana Kumar, Dreamtech press, First Edition.
2. The Handbook of Office Automation- Ralph Tomas Reilly, Iuniverse publication, First Edition.

Open Elective-2: C Programming Concepts

Course Outcomes (COs): After completing this course satisfactorily, a student will be able to

• Confidently operate Desktop Computers to carry out computational tasks.
• Understand working of Hardware and Software and the importance of operating systems.
• Understand programming languages, number systems, peripheral devices, networking,
• multimedia and internet concepts.
• Read, understand and trace the execution of programs written in C language.
• Write the C code for a given problem.
• Perform input and output operations using programs in C.
• Write programs that perform operations on arrays.

Unit-1   **14 Hrs**

Fundamentals of Computers: Introduction to Computers -Hardware, software System software, Application software, Utility software, Operating System; Computer Languages – Machine Level, Assembly Level & High-Level Languages, Translator Programs – Assembler, Interpreter and Compiler; Planning a Computer Program – Algorithm and Flowchart with Examples.
Introduction to C Programming: Over View of C; History and Features of C; Structure of a C Program with Examples; Creating and Executing a C Program; Compilation process in C. C Programming Basic Concepts: C Character Set; C tokens - keywords, identifiers, constants, and variables; Data types; Declaration & initialization of variables; Symbolic constants.

Unit-2   **14 Hrs**

Input and output with C: Formatted I/O functions - printf and scanf, control stings and escape sequences, output specifications with printf functions; Unformatted I/O functions to read and display single character and a string - getchar, putchar, gets and puts functions, C Operators & Expressions: Arithmetic operators; Relational operators; Logical operators; Assignment operators; Increment & Decrement operators; Bitwise operators; Conditional operator; Special operators; Operator Precedence and Associatively; Evaluation of arithmetic expressions; Type conversion. Control Structures: Decision making Statements - Simple if, if_else, nested if_else, else_if ladder, Switch-case, goto, break & continue statements; Looping Statements - Entry controlled and Exit controlled statements, while, do-while, for loops, Nested loops.

Unit-3   **14 Hrs**

User Defined Functions: Need for user defined functions; Format of C user defined functions; Components of user defined functions - return type, name, parameter list, function body, return statement and function call; Categories of user defined functions - With and without parameters and return type.
Arrays: One Dimensional arrays - Declaration, Initialization and Memory representation; Two Dimensional arrays - Declaration, Initialization and Memory representation. Strings: Declaring & Initializing string variables; String handling functions - strlen, strcmp, strcpy and strcat; Character handling functions - toascii, toupper, tolower, isalpha, isnumeric etc. Basics of Pointers in C: Understanding pointers - Declaring and initializing pointers, accessing address and value of variables using pointers; Pointer Arithmetic; Advantages and disadvantages of using pointers;

Text Books:
1. Pradeep K. Sinha and Priti Sinha: Computer Fundamentals (Sixth Edition), BPB Publication
2. E. Balgurusamy: Programming in ANSI C (TMH)
References:
1. Kamthane: Programming with ANSI and TURBO C (Pearson Education)
2. V. Rajaraman: Programming in C (PHI –EEE)
3. S. ByronGottfried: Programming with C (TMH)
4. Kernighan & Ritche: The C Programming Language (PHI)
5. Yashwant Kanitkar: Let us C 6. P.B. Kottur: Programming in C (Sapna Book House)

<div align="center">**Course Content**</div>

Semester: I / II

Course Title: **Digital Fluency**   Course Credits: 2

Total Contact Hours: 15 hours of theory and 30 hours of practical's

Duration of ESA:

Formative Assessment Marks: **50 marks**

Summative Assessment Marks: 50 marks

Model Syllabus Authors:

Course Outcomes (COs):

At the end of the course the student should be able to:

(Write 3-7 course outcomes. Course outcomes are statements of observable student actions that serve as evidence of knowledge, skills and values acquired in this course)

1. Have an intelligent conversation on the key concepts and applications of Artificial Intelligence (AI), Big Data Analytics (BDA), Internet of Things (IoT), Cloud Computing, and Cybersecurity

2. Develop holistically by learning essential skills such as effective communication, problem-solving, design thinking, and teamwork

3. Build his/her personal brand as an agile and expansive learner – one who is interested in horizontal and vertical growth?

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

This mapping needs to be done considering POs of respective programs.

Course Outcomes (COs) /
Program Outcomes (POs)
1 2 3 4 5 6 7 8 9 10 11 12

1. Have an intelligent conversation
on the key concepts and
applications of AI, BDA, IoT,
Cloud Computing, and
Cybersecurity

2. Develop holistically by learning
essential skills such as effective
communication,
problem-solving, design thinking,
and teamwork

3. Build his/her personal brand as an
agile and expansive learner – one
who is interested in horizontal and
vertical growth

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark 'X' in the intersection cell if a course outcome addresses a particular program outcome.

Course Content (Digital 101)

Details of topic	**Duration**
Module 1: Emerging Technologies	05 hours

Overview of Emerging Technologies:

i. Artificial Intelligence, Machine Learning, Deep Learning,

ii. Database Management for Data Science, Big Data Analytics,

iii. Internet of Things (IoT) and Industrial Internet of Things (IIoT)

iv. Cloud computing and its service models & v. Cyber Security and Types of cyber attack

Module 2: Applications of Emerging Technologies   05 hours
Applications of emerging technologies:
i. Artificial Intelligence
ii. Big Data Analytics
iii. Internet of Things
iv. Cloud Computing
v. Cyber Security

Module 3: Building Essential Skills Beyond Technology   05 hours
Importance of the following:
i. Effective Communication Skills
ii. Creative Problem Solving & Critical Thinking
iii. Collaboration and Teamwork Skills
iv. Innovation & Design Thinking
v. Use of tools in enhancing skills

References to learning resources:
1. The learning resources made available for the course titled "Digital 101" on Future
Skills Prime Platform of NASSCOM

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 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, 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

Relational Database Schema – COMPANY
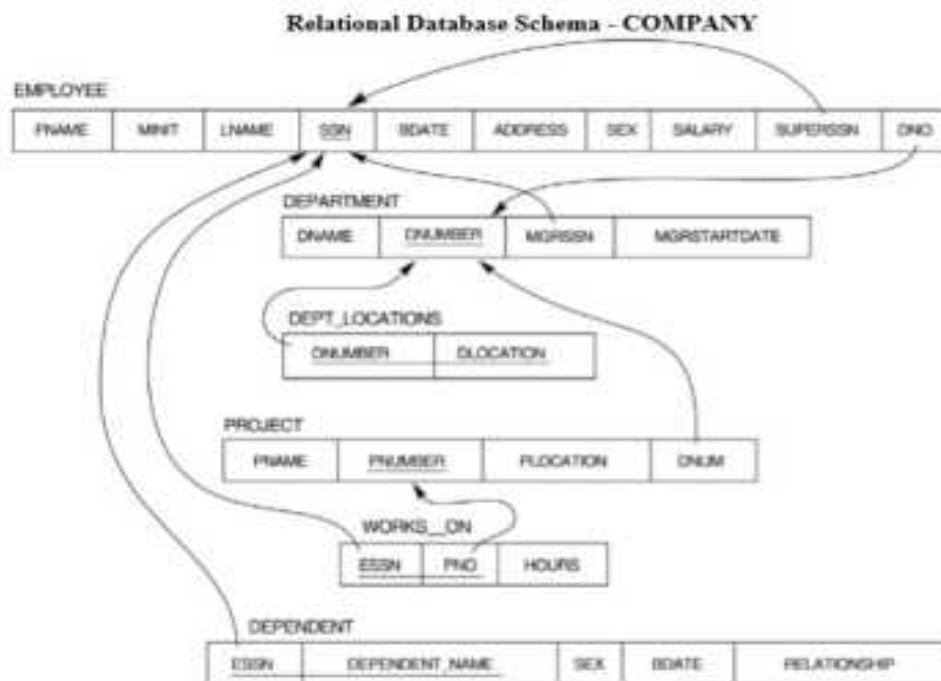
1. Create tables with relevant foreign key constraints
2. Populate the tables with data
3. Perform the following queries on the database :

    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/res earch.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

SCHEME OF INSTRUCTION
B.VOC ANIMATION AND MULTIMEDIA

SKILL EDUCTION COMPONENT

NVEQF LEVEL	Exit Point Level		Normal Calendar Duration	Vocational Content	L:T:P	Total credits	Theory Hrs	Tutorial Hrs	Practical Hrs	total		General content	L:T:P	Theory Hrs	Tutorial Hrs	Practical Hrs	Total Hrs	Credits
LEVEL 4	CRTIFICATE	Character Designer	SEM 1	MES / N 0501 Understanding the script	2:0:1	3	30	0	15	45		CL Kannada	3:0:0	45	0	0	45	3
												Mathematics	3:0:0	45	0	0	45	3
				MES / N 0502 Ensuring consistency across all scenes	2:0:1	3	30	0	15	30		physics	2:0:1	30	0	15	45	3
				MES / N 0503 Design Characters	3:0:4	7	50	0	50	100		Computer science	2:0:1	30	0	15	45	3
				MES / N 0513 Manage and store assets	1:0:2	3	20	0	15	35		Total		150	0	30	180	12
				MES / N 0104 Maintain workplace health and safety	1:0:1	2	15	0	15	30								
				Total		18	145	0	110	225								
LEVEL 5	DIPLOMA	Script Researcher	SEM 2	MES / N 3001 Understand and details the concept	3:0:3	6	45	0	45	90		CL English	3:0:0	45	0	0	45	3
				MES / N 3002 Undertake research for scripts	3:0:2	5	45	0	30	75		Mathematics	3:0:0	45	0	0	45	3
				MES / N 3005 Assist in drafting scripts	2:0:2	5	30	0	30	60		physics	2:0:1	30	0	15	45	3
				MES / N 0104 Maintain workplace health and safety	1:0:2	3	20	0	15	35		Computer science	2:0:1	30	0	15	45	3
				Total		18	140	0	125	265		Total		150	0	30	180	12
LEVEL 6	ADVANCED DEPLOMA	Animation Director	SEM 3	MES / N 1304 Communicate requirements to the team	2:0:4	6	40	0	40	80		Physics	2:0:1	30	0	15	45	3
												Electronics	2:0:1	35	0	15	45	3
				MES / N 1306 Direct the animation process	6:0:6	12	90	0	90	180		Computer science	2:0:1	30	0	15	45	3
												Indian constitution	3:0:1	45	0	0	45	3
												Total		150	0	30	180	12
			SEM 4	MES / N 1307 Direct the post-production process	7:0:7	14	105	0	105	210		Physics	2:0:1	30	0	15	45	3
												Electronics	2:0:1	30	0	15	45	3
				MES / N 0104 Maintain workplace health and safety	2:0:1	3	30	0	20	50		Computer science	2:0:1	30	0	15	45	3
												Environmental science	3:0:1	45	0	0	45	3
				Total		36	265	0	255	520		TOTAL		150	0	30	180	12

LEVEL	B.VOC	Live Action Director	SEM	Course	L:T:P	Cr						Course	L:T:P					Cr
LEVEL 7	B.VOC		SEM 5	MES / N 1301	3:0:3	6	45	0	**45**	**90**								
				(Evaluate production concepts and ideas)														
	LIVE ACTION DIRECTER	Live Action Director	SEM 5	MES / N 1302 (Sourcing financiers)	3:0:2	5	45	0	30	75		Advertising – Concepts and Principles	2:0:2	30	0	30	60	4
				MES / N 1303 (Conceptualise the creative vision)	2:0:2	4	30	0	30	60		Photography and Cinematography	2:0:2	30	0	30	60	4
				MES / N 1304 (Communicate requirements to the team)	1:0:2	3	20	0	20	40		Introduction to television broadcasting	4:0:0	45	0	0	60	4
				Total		36	265	0	255	520		TOTAL		150	0	30	180	12
			SEM 6	MES / N 1305 (Direct the production process)	3:0:3	6	45	0	45	90								
				MES / N 1307 (Direct the post-production process)	4:0:3	7	60	0	45	105		Film Aesthetics and appreciation	2:0:2	30	0	30	60	4
				MES / N 1308 (Manage the production's marketing and release)	1:0:1	2	15	0	15	30		Introduction to modern media	20:2	30	0	30	60	4
				MES / N 0104 (Maintain workplace health and safety)	1:0:2	3	20	0	20	40		Media Ethics, laws and Censorship.	4:0:0	45	0	0	60	4
				Total		**18**	**140**	**0**	**125**	**265**		**Total**		**105**	**0**	**60**	**180**	**12**

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 To 2022-23

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.

L4 – Sem 1 - GC - Communication Language Kannada

¸Á»vÀå WÀIPÀ

12

UÀÄmÉUÀ¼ÀÄ
1.   PÁªÀå
1.   AiÀiÁªÀ PÁ®zÀ ±Á¸ÀÛçªÉÃ£ÀÄ ºÉÃ½zÀgÉÃ£ÀÄ?   -
PÀÄ«ÉA¥ÀÄ
2.   ¥ÀÄIÖ «zsÀªÉÉ   - ¨ÉÃAzÉæ
3.   gÀAUÉÃÃ°   - ¥ÀÄw£À
4.   ªÀÄÄA¨ÉÊ eÁvÀPÀ   - fJ¸ïJ¸ï
5.   CqÀÄUÉ ªÀÄ£ÉAiÀÄ ºÀÄqÀÄV   - ªÉÊzÉÃ»
6.   £À£Àß d£ÀUÀ¼ÀÄ   - ¹zÀÞ°AUÀAiÀÄå

2. UÀzÀå   12
UÀÄmÉUÀ¼ÀÄ

1.   ¤gÀAvÀgÀ ¤ÃjUÁV ¤ªÀÀ¯ÉèÃ NI   - £ÁUÉÃ±ï ºÉUÀqÉ
2.   ªÀÄiÁ»w vÀÀAvÀæeÁÕ£À : MAzÀÄ ¸ÀÆÜ® £ÉÆÃl   - f.J£ï. £ÀgÀ¹AºÀªÀÄÆwð
3.   ªÀÄÄÆqsÀ£ÀßÄ©PÉÀ¼À ©Ãr£À°è   -
¨sÀÄªÀ£ÉÃ±Àéj ºÉUÀqÉ
4.   ¨ÉÃqÀzÀ Cwy¼ÀÄ   - J J£ï
ªÀÄÆwðgÁAiÀÄAgÀÄ

¨sÀÄvÁ WÀIPÀ
3. DqÀ½vÀ ªÀÄvÀÄÛ ªÀÄÂdªÀå PÀ£ÀßqÀ   21
UÀÄmÉUÀ¼ÀÄ

1.   DqÀ½vÀ ¨sÀÄªÉ¬ÀiÀÁV PÀ£ÀßqÀ ¸ÀégÀÆ¥À ªÀÄvÀÄÛ ®PÀët
2.   ¸ÀPÁðj ¥ÀvÀæ ¸ÀégÀÆ¥À – C¢üPÀÈvÀ eÁÕ¥À£À ªÀÄvÀÄÛ ¸ÀÄvÉÆÃ¯É
3.   ««zsÀ jÃwAiÀÄ CfðUÀ¼ÀÄ - gÀeÉ, ªÉÃvÀ£À, §rÛ, ¥ÀzÉÆÃ£Àßw EvÀgÉ
4.   ªÀÄÂdªÀ PÀ£ÀßqÀzÀ ¸ÀégÀÆ¥À ªÀÄvÀÄÛ ®PÀët
5.   ªÀÄÂdªÀ ¥ÀvÀæzÀ ««zsÀ CAUÀUÀ¼ÀÄªÀÄÂdªÀ ¥ÀvÀæUÀ¼ÀÄ-
«ZÁgÀuÁ ¥ÀvÀæ, DzÉÃ±À ¥ÀvÀæ, GzÀå¥ÀvÀæ, ªÀ ¸ÀÆ° ¥ÀvÀæ,
          ¥ÀjZÀAiÀÄ ¥ÀvÀæ, ¥ÀgÀªÀÄ±Àð£À ¥ÀvÀæ, ªÀÅ¤ªÁÕgÉÆÃ¥ÀtA ¥ÀvÀæ
          ¥ÀvÀæ, ¥Àj¥ÀvÀæ
6.   UÀtPÀzÀ°è PÀ£ÀßqÀ PÀ£ÀßqÀzÀ CªÀeÁÞ£À vÀtUÀ¼ÀÄ- £ÀÄr,
§gÀºÀ- ¥Áj¨sÁ¶PÀ ¥ÀzÀUÀ¼ÀÄ
7.   ¨sÀÄªÁªÀgÀ : ¸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.   ©AzÀ ©A¢UÉ   -   ªÉÊzÉÃ»
3.   ¥ÀQëPÁ²   -   PÀÄªÉA¥ÀÄ
4.   ¸ÀªÀÄUÀæPÁªÀå   -   ¨ÉÃAzÉæ
5.   ±ÀvÀÄæ«®èzÀ ¸ÀªÀÄÀgÀ   -   £ÁUÉÃ±ïºÉUÉØ
6.   ªÁå®ÀºÀºÁjPÀ PÀ£À£ßqÀ   -   JZïï J¸ï PÉ
7.   DqÀ½vÀ¥À£À£ßqÀ gÀAeÉÃgÀ   -   qÁ C±ÉÃ¥ïPÀÄªÀiÁgï

                        ªÀÄvÀÄÛ EvÀgÀgÀÄ
8.   PÀbÉÃj PÉÊ¦r CzsÀåAiÀÄ£À ¸ÀA¸ÉÜ   -   PÀÄªÉA¥ÀÄ PÀ£À£ßqÀ
9.   ¯ÉÃR£ÀPÀ¯É   -   J¸ï ¥ÀæºÁèzÀgÀÁ¸ï
10. DqÀ½vÀ¨ sÁµÉ PÉ®ªÀÅ «ªÀÄUÀUÀ¼ÀÄ   -   ¥ÀæzsÀ£À
     UÀÄgÀÄZÀÄvÀÛ

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 T^2 –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 Bovell Michael Newman Wiley, Creative Leaps(Reference), John Wiley & Sons (Asia), 2003
  ✓ Innovative Promotions That Work, Lisa I.Cyr, Rock Port Publishers, 2006.
  ✓ Mass Media, Anmol Publications Pvt ltd., J.L Kumar, New Delhi.2006
  ✓ The Public Relations, 2nd Edition, 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.
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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 – Media Ethics,Laws And Censorship:

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 AND SCIENCE

(AUTONOMOUS)

Ooty road, Mysuru - 570025.

DEPARTMENT OF BOTANY

Schematic Syllabus under Choice Based Credit System (CBCS) & Continuous Assessment Grading Pattern (CAGP) as per UGC template

w.e.f.

2019-2020

TABLE OF CONTENTS

DEPARTMENT OF BOTANY
PROFORMA OF INSTRUCTIONS AND EXAMINATION FOR B.Sc. PROGRAMME IN BOTANY (CBCS)
DURATION OF THE COURSE: 3YEARS (6SEMESTER)
PROGRAMME: BSc BBM/CBZ, PROGRAMME CODE: BSc07/08 (2019-20)

Year	Sem	Core course	Title of the paper	Course Code	Lecture + Practical's hours per week	No. of credits			Total credits	Total hours		Maximum Marks in exam/Assessment				
						L	T	P		Th	Pr		IA(Theory)		Total	
													C-1	C-2		
I B.Sc	I	DSC-I :Theory	Biodiversity of Microbes and Archegoniate	DMA23007/08	04	4: 0 : 0			06	60	60	70	15	15	100	3h
		DSC-I: Pract.	Biodiversity of Microbes and Archegoniate	DMA23107/08	04	0: 0: 2						35	7.5	7.5	50	3h
	II	DSC-II: Theory	Plant Ecology Morphology and Angiosperm Taxonomy	DMB23007/08	04	4: 0 : 0			06	60	60	70	15	15	100	3h
		DSC-II: Pract.	Plant Ecology Morphology and Angiosperm Taxonomy	DMB23107/08	04	0: 0: 2						35	7.5	7.5	50	3h
II B.Sc	III	DSC-III:Theory	Plant Anatomy and Embryology of Angiosperm	DMC23007/08	04	4: 0 : 0			06	60	60	70	15	15	100	3h
		DSC-III:Pract.	Plant Anatomy and Embryology of Angiosperm	DMC23107/07	04	0: 0: 2						35	7.5	7.5	50	3h
	IV	DSC-IV: Theory	Plant Physiology and Metabolism	DMD23007/08	04	4: 0 : 0			06	60	60	70	15	15	100	3h
		DSC-IV:Pract.	Plant Physiology and Metabolism	DMD23107/08	04	0: 0: 2						35	7.5	7.5	50	3h
III B.Sc.	V	DSEA: Theory	No. of courses:1 DSE- A: Cell and Molecular Biology	DME23007/08	04	4: 0 : 0			06	60	60	70	15	15	100	3h
		DSE:Practicals	Based on theory	DME23107/08		0: 0: 2										
		DSEB: Theory	DSE-B: Economic Botany and Biotechnology	DME23207/08												3h
		DSE:Practicals	Based on theory	DME23307/08												
		SEC	No. of courses:1 SEC-A : Ethnobotany	DME23407/08	02	2:0:0			02	30	-	35	7.5	7.5	50	2h
			SEC-B : Floriculture	DME23607/08												
	VI	DSEB: Theory	No. of courses:1 DSE-A: Genetics and Plant Breeding	DMF23007/08	04	4: 0 : 0			06	60	60	70	15	15	100	
		DSE:Practicals	Based on theory	DMF23107/08												3h
		DSEB: Theory	DSE -B : Analytical Techniques and Plant Sciences	DMF23207/08		0: 0: 2										3h
		DSE:Practicals	Based on theory	DMF23307/08												

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DEPARTMENT OF BOTANY

PROCEEDINGS OF THE MEETING OF BOARD OF STUDIES FOR THE PROGRAMMES B. Sc. IN BOTANY, BIOCHEMISTRY, MICROBIOLOGY (B.Sc. 07) AND CHEMISTRY, BOTANY, ZOOLOGY, (B.Sc. 08) HELD ON 14 JUNE 2019 AT 11.00 AM IN THE CHAMBER OF THE CHAIRMAN, DEPARTMENT OF BOTANY, JSS COLLEGE, OOTY ROAD, MYSURU-25

MEMBERS	SIGNATURE
Dr. S Prathibha Associate Professor, Dept. of Botany, JSS College, Ooty Road Mysuru Chairman	
Dr. Sowmya Associate Professor, Department of Botany Yuvaraja's college, Mysuru Member (VC Nominee)	
Dr. Syed Fasihuddin Associate professor of Botany Govt. Science College Bengaluru- 560001 Member (AC Nominee)	
Dr. V. N. Muralidhar Associate professor of Botany Govt. first grade College Sira- 572137 Tumkur District Member (AC Nominee)	

At the outset, the Chairman, BOS in Botany, welcomed the members to the meeting of BOS and briefed about the agenda to be discussed. The following agenda were placed by the Chairman which were discussed and resolved as follows:

Agenda 1: To frame/ revise, discuss and approve the Scheme/ Syllabus under Choice Based Credit System for the programmes: B.Sc. in Botany, Biochemistry, Microbiology and Chemistry, Botany, Zoology from the academic year 2019-20 onwards.

The Chairman appraised the members about the introduction of Choice Based Credit System to the above said programmes with the course matrix in 2017-18. Accordingly, a draft revised/ modified Scheme/ Syllabus was presented and placed before the Board for their opinion and approval.

Resolution: The BOS went through the Scheme/ Syllabus and discussed in length about various aspects of the same. After incorporation of the changes suggested by the members of BOS, the Syllabus was approved. Details of changes made with respect to the introduction of revised/ modified Scheme/ Syllabus in the existing courses is shown in Annexure-I.

Agenda 2: To prepare the Panel of Examiners for the examinations for the year 2019-20.

The Chairman presented the proposed Panel of Examiners to I to VI Semester examinations of 2019-20.

Resolution: After incorporating of certain changes suggested by the members, the Panel of Examiners was approved.

Agenda 3: Approval of Reference Books

The Chairman presented the proposed list of Reference Books to the Members.

Resolution: After incorporating of certain changes suggested by the members, the list of Reference Books was approved.

Agenda 4: Any other matter with the permission of the Chairman

The career oriented course Horticulture syllabi was thoroughly analysed and the contents were restructured according to the present day requirement. Question paper pattern, Maximum marks allotted and the hours per unit are also changed as per the BOS member's corroboration to bring uniformity

Finally the meeting was concluded with the Chairman thanking the Members for their active participation in the deliberations of the meeting.

Chairman

Annexure-I:

Revision/ modification made in the existing Syllabus for 2019-2020 batch onwards:

Existing	Proposed	Justification	Approved
I B.Sc. I Sem DSC-I			
Biodiversity of Microbes and Archegoniate (CMA23007/08):	**Biodiversity of Microbes and Archegoniate (DMA23007/08):**		
Unit 1: Microbial diversity:			
A. **Virus**- replication	Deleted	Repetition	**Approved**
D. Fungi- *Puccinia*	Yeast	Yeast is most important from economic point of view	**Approved**
Unit 2: Archegoniate:			
A. Pteridophytes -*Marsilea*	Deleted	Better to study in higher level	**Approved**
Practicals: Gram's Staining of Bacteria		Repetition in Microbiology	
Study of *Marsilea*	Deleted	Better to study in higher level	**Approved**
Study of *Puccinia*	Yeast	Yeast is most important from economic point of view	
I B.Sc. II Sem DSC-II			
Plant Ecology Morphology and Angiosperm Taxonomy	**Plant Ecology Morphology and Angiosperm Taxonomy**		

(CMB23007/08):	(DMB23007/ 08):		
Unit-3: Taxonomy: C. Angiosperm families: Apiaceae	Arecaceae	To Represent Monocot family	**Approved**
Practicals: Apiaceae	Solanaceae & Arecaceae	Routinely used vegetables belong Solanaceae family & to represent Monocot family	**Approved**
II B.Sc. III Sem-DSC III			
Plant Anatomy Embryology (CMC23007/08):	**Plant Anatomy and Embryology of Angiosperm (DMC23007/ 08):**		
Unit 3: Adaptive and protective systems	Brief Account of Epidermis, cuticle, Stomata & Trichome. Added	Blown up syllabi	**Approved**
Practicals:	Content Restructured	Appropriate	
Unit 4: Embryology	**Unit 4: Embryology of Angiosperms**		
Structure of pollen grains	Types of Tetrad, Male gametophyte & Embryosac development-Monosporic,Bisporic,Tetrasporic added	For detailed embryological studies.	
Mechanism & Adaptation of Pollination	deleted	Studied previously in lower levels	**Approved**
Practicals:	Content Restructured	Appropriate	
III B.Sc. V Sem-DSC IV			
Plant Physiology and Metabolism. (CMD23007/08):	**Plant Physiology and Metabolism**		

	(DMD23007/08):		
Unit 1: Plant-water relations: **Unit 2: Mineral nutrition** **Unit 3: Translocation in phloem** **Unit 4: Photosynthesis** **Unit 5: Respiration** **Unit 6: Enzymes** **Unit 7: Nitrogen metabolism** **Unit 8: Plant growth regulators** **Unit 9: Plant response to light and temperature**	**UNIT 1 Plant – Water Relations:** **1.Fundamental concepts,** **2.Short Distance Transport,** **3. Long distance Transport,** **4.Transpiration,** **5.Mineral nutrition,** **6.Translocation of solutes** **UNIT 2 – Enzymes:** **UNIT 3 – Bioenergetics:** **UNIT 4 -Nitrogen Metabolism:** **UNIT 5 - Plant Growth and Movements:**	Content Restructured	**Approved**
Practicals:	Content Restructured	Appropriate	**Approved**
III B.Sc. V Sem-DSE I			
DSE-1: Cell and Molecular Biology (CME23007/08):	**DSE-1: Cell and Molecular Biology (DME23007/08):**		
Unit 1-Techniques in Biology: Sample Preparation for light microscopy; Sample Preparation for electron microscopy; X-ray diffraction analysis.	**deleted**	Repetition in microbiology	**Approved**
Unit 2-Cell Membrane and Cell Wall : Carbohydrates in the membrane; Faces of the membranes;	**deleted**	Better to study in higher classes	**Approved**

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Unit 7-Genetic material: DNA replication (Prokaryotes and eukaryotes): bidirectional replication, semi–conservative method	**Unit 7-Gene concept:** Semi-conservative method required	Appropriate	**Approved**
III B.Sc. V Sem SEC-I			
Floriculture	**Contents restructured**	Appropriate	**Approved**
III B.Sc. VI Sem DSE-II			
DSE-2: Genetics and Plant Breeding (CMF23007/08)	**DSE-2: Genetics and Plant Breeding (DMF23007/08)**		
Unit 1- Heredity: lethal genes Pleiotropism, co- dominance 9:7; 9:4:3; 13:3; 12:3:1	**deleted**	Repetition in Zoology	**Approved**
Practicals:	Complementary factors; supplementary factors, Duplicate factors, Epistatis	Proper terminologies have been used instead of ratios	**Approved**
	Genetic problems on Mendel's laws included	For better elucidation of theoretical concepts	**Approved**

Chairman

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Programme Outcomes for BSc. in Chemistry, Botany, Zoology:

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. Appreciate the central role of chemistry in our society and use this as a basis for ethical behaviour in issues facing chemists including an understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine.

PO5. Explain why chemistry is an integral activity for addressing social, economic, and environmental problems.

PO6. Identify the taxonomic position of plants using principles and methods of nomenclature and classification in Botany.

PO7. Understand the impact of the plant diversity in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. Use interdisciplinary approaches with quantitative skills to work on biological problems.

PO9. Identify the major groups of organisms with an emphasis on animals and be able to classify them within a phylogenetic framework.

PO10. Compare and contrast the characteristics of animals that differentiate them from other forms of life.

PO11. Give specific examples of the physiological adaptations, development, reproduction and behaviour of different forms of life.

Programme specific Outcomes for BSc. in Chemistry, Botany and Zoology

After completing the graduation in the Bachelor of Science the students are able to:

PS01: Communicate effectively the fundamentals and applications of chemical and Biological sciences

PS02: Possess deeper understanding of Natural laws, accuracy and validity of both theoretical and practical knowledge

PS03: Explicate ecological interconnectedness of life, by tracing energy and nutrient flows through the environment

PS04: Analyse the avenues and remedies for burning environmental issues

PS05: Pursue, enhance and appreciate conservation practices for sustainable use of plants and development

PS06: Interact with the social activities with ethical approach due to collaborative field visits, botanical tours and academic trips.

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

LIST OF APPROVED PANEL OF EXAMINERS:

Sl. No	Name	Designation and DOB	Joining Date
	Internal Examiners		
1.	Dr.Prathibha S Jss College, Ooty Road, Mysore	Asso. Prof. 28/04/1964	28/08/1986
2.	Kiran B L Jss College, Ooty Road, Mysore	Asst. Prof. 30/12/1992	23/09/2015
3.	Divya gouda Jss College, Ooty Road, Mysore	Asst. Prof.	
	External Examiners		
4.	Shivanna M Bharathi College, Bharathi Nagarar	Asso. Prof. 30/06/1958	19/11/1985
5.	Ravikumar B S AVK College For Women, Hassan	Asso. Prof. 13/07/1962	16/07/1987
6.	Nagarathnamma Govt College For Women, Mandya	Asso. Prof. 01/06/1959	10/08/1992
7.	Mallikarjunamiah M N Govt. first grade boys college, Mandya.	Asso. Prof. 05/11/1963	14/08/1992
8.	Hemavathi C Maharani`s Science College For Women, Mysore	Asso. Prof. 05/04/1966	17/08/1992
9.	Vijay C R Maharani`s Science College For Women, Mysore	Asso. Prof. 01/10/1962	29/12/1992
10.	Shivalingaiah Maharani`s Science College for Women, Mysore	Asst. Prof. 01/06/1968	08/01/1996
11.	Purushotham S P Maharani`s Science College for Women, Mysore	Asst. Prof. 15/05/1967	02/08/1996
12.	Lingaraju D P AVK College for Women, Hassan	Asst. Prof. 26/02/1965	23/10/2002
13.	Basavaraju G L Govt College for Women, Mandya	Asst. Prof. 21/07/1976	30/01/2004
14.	Devika M Saradavilas College, Mysore	Asst. Prof. 14/03/1970	14/12/2005
15.	Suresh N S Maharani`s Science College for Women, Mysore	Asst. Prof. 25/02/1975	02/05/2006
16.	Jayalakshmi B Maharani`s Science College for Women, Mysore	Asst. Prof. 18/11/1974	14/07/2006
17.	Sowmya H K Govt Science College,Hassan	Asst. Prof. 18/06/1970	22/12/2007
18.	Thoyajaksha Govt Science College, Hassan	Asst. Prof. 20/07/1970	24/12/2007
19.	Sandhya Rani D Maharani`s Science College for Women, Mysore	Asst. Prof. 24/08/1972	24/12/2007
20.	Pushpalatha H G Maharani`s Science College for Women, Mysore	Asst. Prof. 23/12/1979	26/12/2007
21.	Ashok N Pyati Maharani`s Science College for Women, Mysore	Asst. Prof. 22/04/1970	28/12/2007
22.	Indushree PES College, Mandya	Asst. Prof.	
23.	Lalitha V Maharani`s Science College for Women, Mysore	Asst. Prof.	

24.	Gayathrri Devi N Jss College for women Chamarajanagar	Asst. Prof.	
25.	Revanamaba B Maharani`s Science College for Women, Mysore	Asst. Prof.	
26.	Dr.M.K. Mahesh Yuvarajas college, Mysore.	Asso. Prof.	
27.	Shravani, K.A Yuvarajas college, Mysore.	Asst. Prof.	
28.	Dr.krishna Yuvarajas college, Mysore.	Asst. Prof.	
29.	Dr.krishnamurthy Yuvarajas college, Mysore.	Asst. Prof.	
30.	Kalpashree Yuvarajas college, Mysore	Asst. Prof.	
31.	Dr. Sowmya, R Yuvarajas college, Mysore	Asst. Prof.	
32.	Deepa hebbar Maharani`s Science College for Women, Mysore	Asst. Prof.	

I B.Sc., I Semester DSC-I
Biodiversity of Microbes and Archegoniate
Theory (Credits: 4)

Lectures: 60 Hours
(4 hours/week)

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.

Unit 1- Microbial diversity:

A.   Virus   **(4 Lectures)**
General structure, DNA virus (T_4-phage); Lytic and lysogenic cycle, RNA virus (TMV);
Economic importance.

B. Bacteria   **(5 Lectures)**
Definition, Classification (Based on Shape, Arrangement and flagellation) and Economic
importance; ultra structure, Reproduction – vegetative (fission, Budding) asexual (Endospore)
Sexual (Genetic recombination-Conjugation, Transformation and Transduction).

C. Algae   **(14 Lectures)**
General characteristics; Classification, Reproduction and Economic importance of algae.
Type study- *Nostoc, Spirogyra, Sargassum.*

D. Fungi   **(16 Lectures)**
1. General characteristics, classification , nutrition , reproduction and economic importance.
Type Study - *Rhizopus, saaccharomyces* (Yeast)*, Penicillium,*
2. Lichens: Distribution, classification and Economic importance, structure and reproduction.

Unit 2- Archegoniate:

A. Bryophytes   **(7 Lectures)**

General characteristics, Classification and Economic importance . Type Study- *Marchantia* and
Polytrichum

B. Pteridophytes   **(7 Lectures)**

General characteristics and classification, Stelar evolution. Type Study - *Selaginella* and
Equisetum.

C. Gymnosperms   **(7 Lectures)**
General characteristics, classification and Economic importance. Type Study- *Cycas* and *Pinus.*

DMA2318/ DMA2317

I B.Sc., I Semester DSC-I
Biodiversity of Microbes and Archegoniate
Practical (Credits: 2)

Lectures: 60 Hours
(4 hours/week)

1. Study of TMV and of T_4- Phage through Microphotographs
2. Study of Bacteria.
3. Study of *Nostoc* (Specimen and permanent slides)
4. Study of *Spirogyra* (Specimen and permanent slides)
5. Study of *Sargassum* (Specimen and permanent slides)
6. Study of *Rhizopus*
7. Study of *Yeast*
8. Study of *Penicillium*
9. Study of Lichens
10. Study of *Marchantia*
11. Study of *Polytrichum*
12. Study of *Selaginella*
13. Study of *Equisetum*
14. Study of *Cycas*
15. Study of *Pinus*

Suggested Readings

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.

I B.Sc., I Semester DSC-I
Scheme of theory question paper
Biodiversity of Microbes and Archegoniate

Time: 3.00 Hours   **Max. Marks: 70**

Blue print:

Units	Hours Allotted	No. of questions from each category			Total Marks 70
		2 marks (5/8)=10	**5marks (4/6)=20**	**10marks (4/6)=40**	
Unit I :Microbial Diversity					
A&B.Virus and Bacteria	09	2X1=2	5X1=5	10X1=10	**17**
C. Algae	14	2X2=4	5X2=10	10X1=10	**24**
D. Fungi	16	2X1=2	5X3=15	10X1=10	**27**
Unit II: Archegoniate					
A. Bryophytes	07	2X1=2	-	10X1=10	**12**
B. Pteridophytes	07	2X1=2	-	10X1=10	**12**
C. Gymnosperms	07	2X2=4	-	10X1=10	**14**
Total	**60**	**8X2=16**	**4X6=30**	**6X6=60**	**106**

I B.Sc., I Semester DSC-I
Biodiversity of Microbes and Archegoniate
Scheme of practical question paper

Time: 4 Hours   **Max. Marks: 35(25+05+05)**

I. Identify the specimens 'A' and 'B' with reasons and labeled sketches

                                                        3x2=06 marks

 (**A**-Algae and   **B**-Microphotographs of virus/Bacteria/fungi)

   Identification   – 1 mark
   Reasons with labelled sketch   – 2 marks

II. Prepare a stained temporary slide of 'C'. Sketch, label and Identify with reasons.
   Leave the preparation for evaluation.   **4x01=04 marks**

 (C-*Nostoc/Rhizopus/Saccharomyces* (yeast) / *Penicillium*)

   Identification   – 1 marks
   Preparation/staining and mounting– 2 marks
   Reasons with labelled sketch   – 1 marks

III. Write critical notes on 'D', 'E' and 'F'   **3x3=09 marks**
 (D-Algae/Fungi, E-Lichens/Bryophytes, F- Pteridophytes /Gymnosperms)

   Identification   _ 1 mark
   Reasons with lablled sketch   – 2 marks

IV. Identify the Microslides 'G', 'H', and 'I' with reasons and labeled
 Sketches   **02x03=06 marks**

 (G-Algae/Fungi, H-Lichens/Bryophytes, I- Pteridophytes /Gymnosperms)

   Identification   – 1 mark
   Reasons with lablled sketch   – 1 marks
 V. Practical record   **05marks**

 VI. Viva- Voce   **05marks**

Note: Each student should submit the **duly valued and certified practical record** at the time of practical examination.

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I B.Sc., I Semester DSC-I
Biodiversity of Microbes and Archegoniate
Practical Question paper

Time: 4 Hours   **Max. Marks: 35 (25+05+05)**

 I. Identify the specimens 'A' and 'B' with reasons and labeled sketches   3x2=06 marks

II. Prepare a stained temporary slide of 'C'. Sketch, label and Identify with
 Reasons leave the preparation for evaluation.   4x1=04 marks

III. Write critical notes on 'D', 'E' and 'F'   3x3=09 marks

IV. Identify the Microslides 'G', 'H' and 'I' and with reasons and labeled Sketches

                                                         2x3=06 marks

V. Practical record   05 marks

VI. Viva- Voce   05marks

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I B.Sc., II Semester DSC-II
Plant Ecology, Morphology and Angiosperm Taxonomy
Theory (Credits: 4)

Lectures: 60 Hours
(4 hours/week)

Course outcome:

After completion of the course the student is able to:

CO1   Specify the characteristics of ecosystem

CO2   Learn the classification and characteristics of Plant communities

CO3   Understand in details with examples plant morphology

CO4   Understand in depth Herbarium

Unit 1- Plant Ecology:

A. Introduction to Ecology and Ecological factors: **(6 Lectures)**

Introduction to ecology, Climatic factors- Light, temperature and water. Edaphic factors- soil formation, types and profile. Shelford law of tolerance.

B. Ecosystem   **(6 Lectures)**

Structure and components of an ecosystem, study of pond and forest ecosystem, energy flow and trophic levels; Food chains, food webs, Ecological pyramids. Biogeochemical cycles- Carbon, Nitrogen and Phosphorous.

C. Plant communities   **(6 Lectures)**

Morphological Adaptations of hydrophytes and xerophytes. Plant Succession, Hydrosere and Xerosere.

Unit 2- Leaf and Floral Morphology: **(15 Lectures)**
A.   Leaf- Structure, types and phyllotaxy.
B.   Types of Inflorescence
C.   Flower- structure of a typical flower (*Tribulus terrestris* / *Muntingia calabura*), Variation
in   floral morphology and floral organs in detail.
D.   Types of Inflorescence
E.   Types of fruits

Unit-3: Taxonomy:

A. Introduction to plant taxonomy   **(8 Lectures)**
1.   Taxonomic hierarchy
2.   Types of classification (artificial, natural and phylogenetic)
3.   Systems of classification- Bentham and Hooker, Engler and Prantl
4.   Plant Nomenclature-Binomial system and ICBN principles.

B. Herbarium technique: **(5 Lectures)**

1. Herbarium- Techniques and importance
2. Botanical gardens

C. Angiosperm families: (14 Lectures)

Study of the following families according to Bentham and Hooker's system of classification.--Malvaceae, Leguminosae (Papilionaceae, Caesalpiniaceae and Mimosaceae), Apocynaceae Asteraceae and Arecaceae.

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I B.Sc., II Semester DSC-II
Plant Ecology, Morphology and Angiosperm Taxonomy
Practical (credits: 2)   Lectures: 60 Hours
(4 hours/week)

1. Study of Ecological instruments used to measure microclimatic variables: Soil thermometer, Maximum and Minimum Thermometer, Anemometer, Psychrometer/Hygrometer, Rain gauge.
2. Study of morphological adaptations of the following
a. Hydrophytes   Eg: *Hydrilla. Pistia and Eichhornia*
b. Xerophytes   Eg: *Opuntia, Euphorbia Tirucalli,Nerium and Casuarina*
3. 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. Study of root modifications
5. Study of stem modifications
6. Study of leaf-structure, types, phyllotaxy and modifications.
7. Parts of a typical flower (*Tribulus terrestris* / *Muntingia calabura*)
8. Floral organs in detail with their variations.
9. Types of inflorescence
10. Types of fruits
11. Study of families Malvaceae, Apocynaceae
12. Study of families Leguminosae (Papilionaceae, Caesalpiniaceae and Mimosaceae)
13. Study of families and Asteraceae
14. Study of Solanaceae and Arecaceae
15. Mounting of a properly dried and pressed specimen of any wild plant with herbarium label

Suggested Readings:

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.

I B.Sc., II Semester DSC-II
Plant Ecology, Morphology and Angiosperm Taxonomy
Scheme of theory question paper

Time: 3.00 Hours   Max. Marks: 70

Units	Hours Allotted	No. of questions from each category			Total Marks 70
		2 marks (5/8)=10	5marks (4/6)=20	10marks (4/6)=40	
Unit 1: A. Plant Ecology	06	-	-	10x1=10	**10**
B. Ecosystem	06	-	5x2=10	-	**10**
C. Plant communities	06	2x1=2	-	10x1=10	**12**
Unit II: Leaf and Floral Morphology, Fruits	15	2x3=6	5x2=10	10x1=10	**26**
Unit III: Taxonomy A. Introduction to plant taxonomy	08	2x2=4	-	10x1=10	**14**
B. Herbarium technique	05	2x1=2	5x1=5	-	**07**
C.Angiosperm families	14	2x1=2	5x1=5	10x2=20	**27**
Total	**60**	**8x2=16**	**5x6=30**	**10x6=60**	**106**

I B.Sc., II Semester DSC-II
Plant Ecology, Morphology and Angiosperm Taxonomy
Scheme of practical question paper

Time: 4 Hours   **Max. Marks: 35 (25+05+05)**

I. Write critical notes on 'A' 'B' and 'C' with reasons and labeled
   Sketches.   **3x3=9 marks**

(A-Ecological instruments, B-Hydrophytes/xerophytes/parasites/epiphytes,
C-Underground root & stem modifications/Leaf phyllotaxy /leaf types/)

Identification   – 1 mark
Labeled sketch with reasons   – 2 marks

II. Assign the plant 'D' to its respective family giving reasons.   **4x1=4 marks**
(D- Malvaceae/Apocynaceae/Asteraceae/Arecaceae
Family name   – 1 mark
Salient features   – 3 marks

III. Describe the plant 'E' in technical terms.   **4x1=4 marks**
(Papilionaceae /Caesalpiniaceae)
Family name   – 1 mark
Technical terms   – 3 marks

IV. Draw the floral diagram and write the floral formula of the
   give plant 'F'   **4x1=4 marks**
(Malvaceae, Solanaceae, Apocynaceae)
Floral formula   -1mark
Floral diagram   -3marks

V. Identify the specimen 'G' and 'H'   **2x2=4marks**
(J-Inflorescence, H- Fruits)
Identification   – 1 mark
Reasons   – 1mark

VI. Practical   **05marks**

VII. Viva- Voce   **05marks**

Note: each student should submit the **duly valued and certified practical record** at the time of practical examination.

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Plant Ecology, Morphology and Angiosperm Taxonomy
Practical Question Paper

Time: 4 Hours   **Max. Marks: 35 (25+05+05)**

I. Write critical notes on 'A' 'B' and 'C' with reasons and labeled
 Sketches   **3x3=9 marks**

II. Assign the plants 'D' to its respective family giving reasons.   **4x1=4marks**

III. Describe the plant 'E' in technical terms.   **4x1=4 marks**

IV. Draw the floral diagram and write the floral formula of the
    give plant 'F'   **4x1=4marks**

V. Identify the specimen 'G' and 'H'

                                                                       2x2=4marks

VII. Practical record   **05marks**

VIII. Viva-Voce   **05marks**

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Plant Anatomy and Embryology of Angiosperms
Theory (Credits: 4)

Lectures: 60 Hours
(4 hours/week)

Course outcome:

After completion of the course the student is able to:

CO1   Understand the details of histology
CO2   Understand the details of anatomy
CO3   Understand the characteristics of secondary growth
CO4   Learn the details of embryology

Unit 1: Histology and Anatomy   (18 Lectures)

Meristem- structure, classification, based on origin, position and function. Study of Simple and complex tissues.
Internal Structure of dicot and monocot root,stem and leaf.

Unit 2: Secondary Growth   (4 Lectures)

Process of secondary growth in dicot stem.

Unit 3: Adaptive and protective systems   (7 Lectures)

Anatomical adaptations in xerophytes (Nerium & Causarina) and Hydrophytes (Hydrilla & Eichhornia). Epidermis, cuticle, Stomata & Trichome. (Brief Account)

Unit 4: Embryology of Angiosperms   (8 Lectures)

T.S of mature anther, Microsporogenesis, types of tetrads and Male gametophyte, Megasporogenesis- types of ovules, L.S of Anatropous ovule, Embryosac development- Monosporic (Polygonum), Bisporic (Allium), Tetrasporic (Frittilaria) structure of Mature Embryo sac.

Unit 5: Pollination and fertilization   (11 Lectures)

Definition, types, contrivances for self and cross pollinations
Process of Double Fertilization, Post Fertilization changes

Unit 6: Embryo and endosperm   (6 Lectures)

Structure and development of Dicot (Capsella) and Monocot embryo (Maize). Endosperm-nucellar, cellular, helobial and ruminate.

Unit 7: Experimental Embryology   (6 Lectures)

Brief account of apomixis (recurrent and non-recurrent), apospory, polyembryony, parthenocarpy.

II B.Sc., III Semester DSC-III
Plant Anatomy and Embryology of Angiosperms
Practical (Credits: 2)

Lectures: 60 Hours
(4 hours/week)

1. Study of Meristems through permanent slides and photographs- apical, intercalary and lateral meristems.
2. Study of simple Tissues (parenchyma, collenchyma and sclerenchyma) through Permanent slides and photographs.
3. Study of complex Tissue (xylem and phloem) through Permanent slides and photographs.
4. Study of Anatomical characteristics of Root: Monocot- *Zea mays* and Dicot- *Helianthus*.
5. Study of Anatomical characteristics of Stem: Monocot- *Zea mays*; Dicot-*Helianthus*.
6. Study of Anatomical characteristics of Monocot and Dicot Leaf.
7. Adaptive anatomy: Xerophyte (*Nerium & Causaurina*); Hydrophyte (*Hydrilla & Eichhornia)*.
8. Structure of anther (young and mature) and mounting of Pollen grains.
9. Calculation of percentage of germinated pollen in a given medium (Hanging drop method).
10. Types of ovules: Anatropous, Orthotropous, Circinotropous, Amphitropous/ Campylotropous.
11. Female gametophyte: Polygonum (monosporic) type of Embryo sac Development.
12. Pollination types and seed dispersal mechanisms. (Photographs and specimens).
13. Dissection/ mounting of embryo/endosperm from seeds.

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Suggested Readings

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.

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II B.Sc., III Semester DSC-III
Plant Anatomy and Embryology of Angiosperms
Scheme of theory question paper

Time: 3.00 Hours   **Max. Marks: 70**

Blue print:

Units	Hours Allotted	No. of questions from each category			Total Marks 70
		2 marks (5/8)=10	5marks (4/6)=20	10marks (4/6)=40	
Unit 1: Histology and Anatomy	18	2X1=2	5X2=10	10X2=20	**32**
Unit 2: Secondary Growth	04	2X1=2	5X1=5	-	**07**
Unit 3: Adaptive and protective systems	07	2X1=2	5X2=10	-	**12**
Unit 4: Embryology	08	2X1=2	-	10X1=10	**12**
Unit 5: Pollination andfertilization	11	2X1=2	-	10X2=20	**22**
Unit 6: Embryo and endosperm	06	2X1=2	-	10X1=10	**12**
Unit 7: Experimental Embryology	06	2X2=4	5X1=5	-	**09**
Total	**60**	**8X2=16**	**5X6=30**	**10X6=60**	**106**

II B.Sc., III Semester DSC-III
Plant Anatomy and Embryology of Angiosperms
Scheme of practical question paper

Time: 4 Hours   **Max. Marks: 35 (25+05+05)**

I. Write critical notes on 'A' 'B' and 'C' with reasons and labeled sketches   2x3=6 marks
   (A-Meristem- Apical, intercalary and lateral, B-Simple tissues,
     C-Complex tissues)

    Identification   – 1 mark
    Labeled sketch with reasons   – 1marks

II. Prepare a stained temporary slide of 'D. Sketch, label and identify with
   reasons Leave the preparation for evaluation   5x1=5 marks
    (D-Dicot stem/ Monocot stem Anatomy)

    Identification   – 1 mark
    Mounting and Preparation   -2 marks
    Labeled sketch with reasons   – 2 marks

III. Identify the microslides/ photographs 'E' 'F' & 'G' sketch,
label with reasons   3x3=09 marks

(E-root/ leaf, F-Xerophytes/ Hydrophytes, G-T.S of anther/ types of ovule
    Identification   – 1 mark
    Labeled sketch with reasons   – 2marks

IV. 'H'- Dissect Embryo/Endosperm, sketch label with reasons/ Mounting of Pollen
grains / calculate the percentage of germinated pollen

                                                        5x1=5 marks

    Identification   – 1 mark
    Labeled sketch with reasons   – 4marks

V. Practical record   05 marks

VI. Viva-Voce   05 marks

Note: Each student should submit the **duly valued and certified practical record** at the time
of practical examination.

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II B.Sc., III Semester DSC-III
Plant Anatomy and Embryology of Angiosperms
Practical question paper

Time: 4 Hours   **Max. Marks: 35 (25+05+05)**

I. Write critical notes on 'A' 'B' and 'C' with reasons and labeled sketches   2x3=6 marks

II.   Prepare a stained temporary slide of 'D. Sketch, label and identify with reasons.

   Leave the preparation for evaluation   05marks

III. Identify the microslides/ photographs 'E' 'F'& 'G', sketch, label with reasons
                                                    3x3=9 marks

IV. 'H'- Dissect Embryo/Endosperm, sketch label with reasons/ Mounting of Pollen grains / calculate the percentage of germinated pollen.

V. Practical record   5 marks

VI. Viva-Voce   5 marks

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DMD23008/DMD23007   **II B.Sc., IV Semester DSC-IV**
Plant Physiology and Metabolism
Theory (Credits: 4)

Lectures: 60 Hours
(4 hours/week)

Course outcome:

After completion of the course the student is able to:

CO1   Learn in depth translocation in phloem
CO2   Specify the classification and characteristics of enzyme
CO3   Understand the details of photosynthesis
CO4   Identify the characteristics of plant response to light and temperature

UNIT 1 - Plant – Water Relations: **(20 Lectures)**
1. **Fundamental concepts:** Importance of water to plants, Diffusion, Imbibition, Osmosis, Endosmosis and Exosmosis, Plasmolysis, Osmotic Pressure, Water potential and its components.
2. **Short Distance Transport:** Absorption of water – Active and passive absorption, Absorption of minerals – Donnan's equilibrium (Passive absorption), Carrier-ion concept (Active absorption)
3. **Long distance Transport:** Ascent of sap; Root pressure theory (Vital theory), TCT Theory (Physical theory), Soil plant atomspheric continum (SPAC)
4. **Transpiration:** Types, Mechanism of stomatal movement; Starch-sugar interconversion theory, Potassium ion pump theory, Significance of transpiration, Antitranspirants, Guttation.
5. **Mineral nutrition:** Macro and Micro nutrients; Role of Nitrogen, Phosphorous, Potassium, Sulphur, Manganese and Zinc, Hydroponics.
6. **Translocation of solutes:** Path of translocation, Munch's mass flow hypothesis with merits and demerits.

UNIT 2 – Enzymes: **(4 Lectures)**
Properties, Classification and Mode of action (Lock & Key theory, Induced fit theory)

UNIT 3 – Bioenergetics: **(18 Lectures)**
1. Photosynthesis : Introduction, Photosynthetic apparatus, Mechanism – Light and Dark reactions

(C_3 pathway/Calvin Cycle), C_4 pathway, Significance of Photosynthesis.

2.Respiration : Introduction,,Types, Ultrastructure of Mitochondrion, Mechanism of Aerobic

respiration – Glycolysis, Krebs' cycle and Terminal Oxidation of reduced coenzymes , Anaerobic

respiration – alcoholic & lactic acid fermentation, Significance .

UNIT 4 -Nitrogen Metabolism: **(6 Lectures)**

Nitrogen fixation (Symbiotic and Non Symbiotic), Nitrate reduction, Aminoacids & their synthesis
(Transamination & Reductive amination)

UNIT 5 - Plant Growth and Movements: **(12 Lectures)**
1. Growth: Definition, Phases of growth and Growth curve
2. Growth regulators Chemical nature, application of Auxins, Gibberellins, Cytokinins, Abcissic acid (ABA) & Ethylene.
3. Photoperiodism and Vernalisation : A brief account.
4. Plant movements : Tropisms & their types (Phototropism, Thigmotropism,   Hydrotropism & Geotropism)

Plant Physiology and Metabolism
Practicals (2 credits)   **Lectures: 60 Hours**
                                                 (4 hours/week)

I. Minor Experiments:
1.   a) Root pressure experiment

      b) Ganong's Potometer experiment

2.   c) Ganong's light screen experiment

     d) Mohl's half leaf experiment

3.   f) Kuhne's experiment to demonstrate fermentation.

     g) Phototropism

4.   h) Geotropism

     i) Arc Auxanometer experiment

5.   j) Bolting.

     k) Effect of auxins on rooting.

II. Major Experiments:

1. Determination of Osmotic Potential by Plasmolytic method using *Rhoeo discolor*
         (Epidermal peel)

2. Experiment to demonstrate the Relationship between Absorption and Transpiration.

3. Experiment to demonstrate the Suction force due to transpiration.

4. Separation of photosynthetic pigments using paper Chromatography.

5. Evolution of Oxygen during photosynthesis

6. Calculation of stomatal index and stomatal frequency.

III. Biochemical tests:
  Qualitative biochemical tests for Carbohydrates, fats and protein**.**

<p align="center">*******</p>

Suggested Readings
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.

II B.Sc., IV Semester DSC-IV
Plant Physiology and Metabolism
Scheme of theory question paper

Time: 3.00 Hours   **Max. Marks: 70**

Blue print:

Units	Hours Allotted	No. of questions from each category			Total Marks 70
		2 marks (5/8)=10	5marks (4/6)=20	10marks (4/6)=40	
Unit 1: Plant-water relations	20	2X3=6	5X2=10	10X2=20	**36**
Unit 2: Enzymes	4	2X1=2	5X1=5	-	**7**
Unit 3: Bioenergetics	18	2X2=4	5X1=5	10X2=20	**29**
Unit 4: Nitrogen metabolism	6		5X1=5	10X1=10	**15**
Unit 5: Plant Growth and Movements:	12	2X2=4	5X1=5	10X1=10	**19**
Total	**60**	**8X2=16**	**5X6=30**	**10X6=60**	**106**

DMD23108/DMD23107   **II B.Sc., IV Semester DSC-IV**
Plant Physiology and Metabolism
Scheme of practical question paper

Time: 4 Hours   **Max. Marks: 35 (25+05+05)**

I. Perform the major experiment 'A' write the principle, Requirements, Procedure and record the result with inference and leave the setup for evaluation   **9x1 = 9 marks**

(Determination of osmotic potential of plant cell sap by plasmolytic method. Study of plasmolysis and deplasmolysis on Rhoeo leaf

OR

Calculation of stomatal index and stomatal frequency of a mesophyte and a xerophytes

OR

Experiment to demonstrate the Relationship between Absorption and Transpiration.

OR

Separation of photosynthetic pigments by paper chromatography

OR

Evolution of Oxygen during photosynthesis

OR

Experiment to demonstrate the Suction force due to transpiration

Principle	-2 marks	Procedure	-3 marks
Requirements	-1 mark	Result and inference	-1 marks
Setting	-2 marks		

II. Comment on 'B' &'C' (Minor experiments)   **4x2 =8 marks**

 (Root pressure experiment/ Ganong's Potometer experiment / Ganong's light screen experiment/ Mohl's half leaf experiment/ Kuhne's experiment / Phototropism/ Arc Auxanometer experiment/ Bolting/ Effect of auxins on rooting)

Identification   -1 marks
Critical notes   -2 marks
Labeled sketch   -1 marks

III. Perform the biochemical test of the given sample 'D' & 'E'
Procedure -3marks   Result-1 marks   **4x2=8 marks**

IV. Practical record   **05 marks**

V. Viva-Voce   **05 marks**

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Plant Physiology and Metabolism
Practical Question Paper

Time: 4 Hours   **Max. Marks: 35 (25+05+05)**

I. Perform the major experiment 'A' write the principle, Requirements, Procedure and record the result with inference and leave the setup for evaluation   9x1 =9 marks

II. Comment on 'B' & 'C' (Minor experiments)   4x2=8 marks

II. Perform the biochemical test of the given sample 'D' & 'E'   4x2=8 marks

IV. Practical record   05 marks

V. Viva-Voce   05 marks

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III B.Sc., V Semester DSE-V
Cell and Molecular Biology
Theory (4 credits)   **Lectures: 60 Hours**
                                                   (4 hours/week)

Course outcome:

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

Unit 1- Microscopy: (5 Lectures)

Principles of microscopy; Light Microscopy; Phase contrast microscopy; Fluorescence microscopy; Electron microscopy (EM)- Scanning EM and Scanning Transmission EM (STEM).

Unit 2- Cell: (4 Lectures)

Cell Theory; Ultra structure of Prokaryotic and eukaryotic cells;

Unit 3- Cell Wall and Cell Membrane: (4 Lectures)

Cell wall- Structure; Cell Membrane- Fluid mosaic model and functions

Unit 4- Cell Organelles: (13 Lectures)

Ultrastructure and functions of Nucleus, Mitochondrion, Chloroplast, Endoplasmic reticulum, Golgi bodies, Lysosomes, Ribosomes, Peroxisomes and Glyoxisomes

Morphology of chromosomes in general, Ultrastructure of Chromosome (Nucleosome concept), Karyotype and Ideogram

Unit 5-Cell Division: (6 Lectures)

Cell cycle, Mitosis and Meiosis and their significance

Unit 6- Nucleic acids: (12 Lectures)

A. **DNA**: Chemistry, Structure and Replication in Eukaryotes (semi- conservative method) DNA as a genetic material Griffith's and Avery's transformation experiments, Hershey-Chase bacteriophage experiment.

B.RNA: Chemistry, Structure, Types (mRNA, tRNA, rRNA) and structure. Frankel Conrat's experiment

Unit 7-Gene concept: (12 Lectures)

A. Cistron, Recon, Muton- Prokaryotic and Eukaryotic gene structure, Split gene concept.

B. Genetic code- features, Wobble concept. Protein synthesis: Transcription, Splicing and Translation. Central dogma of molecular Biology.

Unit 8-Regulation of gene expression: (4 Lectures)

Lac operon and Tryp operon concepts.

DME23108/DME23107　　　　**III B.Sc., V Semester DSE-V**
Cell and Molecular Biology
　　　　　　　　Practical (2 credits)　　　　　**Lectures: 60 Hours**
　　　　　　　　　　　　　　　　　　　　(4 hours/week)

1. Preparation of fixatives and stains: FAA, Carnoy's fixative, safranine, acetocarmine and aceto-orcein.

2. Study of viruses, prokaryotic cell (bacteria) and eukaryotic cell with the help of light and electron micrographs.

3. Study of cell organelles through photographs.

4. Study of structure of plant cell through temporary mounts- Onion peeling and tomato pulp

5. Study of Mitosis (temporary mounts and permanent slides).

6. Study of Meiosis (temporary mounts and permanent slides).

7. Study the structure of nuclear pore complex by photograph (from Gerald Karp)

8. Structure of DNA and RNA (mRNA, rRNA, tRNA).

9. Study DNA packaging through photographs- solenoid model.

10. Lac operon and Tryp operon concepts.

Suggested Readings

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.

Cell and Molecular Biology
Scheme of theory question paper

Time: 3.00 Hours   **Max. Marks: 70**

Blue print:

Units	Hours Alloted	No. of questions from each category			Total Marks 70
		2 marks (5/8)=10	5marks (4/6)=20	10marks (4/6)=40	
Unit 1: Microscopy	5	-	-	10X1=10	**10**
Unit 2: Cell	4	2X1=2	5X1=5	-	**07**
Unit 3: Cell Membrane and Cell Wall	4	2X1=2	5X1=5	-	**07**
Unit 4: Cell Organelles	13	2X1=2	-	10X2=20	**22**
Unit 5: Cell Division	06	2X1=2	-	10X1=10	**12**
Unit 6: Nucleic acid	12	2X1=2	5X2=10	10X1=10	**22**
Unit 7: Gene concept	12	2X2=4	5X1=5	10X1=10	**19**
Unit 8: Regulation of gene expression	04	2X1=2	5X1=5	-	**07**
Total	**60**	**8X2=16**	**5X6=30**	**10X6=60**	**106**

Cell and Molecular Biology
Scheme of practical question paper

Time: 4 Hours   Max. Marks: 35 (25+05+05)

I. Prepare a temporary squash of given material 'A'. Sketch, label and identify with reasons. Leave the preparation for evaluation.   **07 marks**
 (Onion root tip/ flower bud)
Preparation   - 4marks
Identification   - 1mark
Sketch and label - 1mark
Reasons   - 1mark

II. Identify the cytological slide/Photograph 'B' with labeled

diagram and reasons.   **04 marks**

(Mitosis/ Meiosis)

Identification   - 1mark

Sketch and label - 1mark

Reasons   - 2marks

III. Comment on 'C' and 'D' (charts/photographs)   **3 X 2= 06marks**

C- Cell organelle **(**Identification - 1mark, labeled Sketch and Reason - 2marks**)**

D- Fixative/ stain **(**Identification - 1mark,labeled Sketch and Reason - 2marks,**)**

IV. Prepare a temporary mount of a plant cell 'E'   **04 marks**

(Onion peeling/ tomato pulp)

Preparation   - 2 marks

Sketch and label   - 2 marks

V. Write critical notes on 'F and 'G'   **2 X 2 = 04 marks**
 F-DNA/ DNA packaging/RNA types
 G- Nuclear pore complex/ Lac operon/Tryp operon

Identification   - 1 mark
Reasons   - 1 marks

VI. Practical record   **05marks**

VII. Viva-voce   **05marks**

***

Cell and Molecular Biology
Practical question paper

Time: 4 Hours   Max. Marks: 35 (25+05+05)

I. Prepare a temporary squash of given material 'A'. Sketch, label and identify
     with reasons. Leave the preparation for evaluation.   **07 marks**

II. Identify the cytological slide/photograph 'B' with labeled diagram
     and reasons.   **04 marks**

III. Comment on 'C' and 'D' (charts/photographs)   **3 X 2= 06 marks**

IV. Prepare a temporary mount of a plant cell 'E'   **04 marks**

V. Write critical notes on F and G   **2 X 2 = 04 marks**

VI. Practical record   **05 marks**

VII. Viva-voce   **05marks**

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DME23208/DME23207   **III B.Sc., V Semester DSE-II**
Economic Botany and Biotechnology
Theory (4 credits)   **Lectures: 60 Hours**
(4 hours/week)

Course outcome:

After completion of the course the student is able to:

CO1   Understand in details with application, if applicable, economic botany
CO2   Specify the details of plant tissue culture
CO3   Understand in details with examples recombinant DNA technology

Unit 1: Cereals and Millets   **(4 Lectures)**

Rice, Wheat, Maize, Ragi (Botanical name, family, part used, morphology and uses)

Unit 2: Legumes   **(6 Lectures)**

 General account with special reference to Pigeon pea, Green gram, Black gram, Bengal gram
(Botanical name, family, part used, morphology and uses)

Unit 3: Spices and condiments   **(8 Lectures)**

General account with special reference to clove, black pepper, cinnamom, cardamom, garlic,
onion, chilli and coriander (Botanical name, family, part used, morphology and uses)

Unit 4: Beverages   **(4 Lectures)**

Tea and coffee (Botanical name, family, part used, morphology and uses)

Unit 5: Oils and Fats   **(4 Lectures)**

General description with special reference to groundnut, sunflower, mustard (Botanical name,
family, part used, morphology and uses)

Unit 6: Fibre Yielding Plants   **(4 Lectures)**
General description with special reference to Cotton, Jute, kapok and sunn hemp (Botanical
name, family, part used, morphology and uses)

Unit 7: Introduction to biotechnology   **(2 lecture)**

Unit 8: Plant tissue culture   **(10 Lectures)**
Micropropagation ; haploid production through androgenesis and gynogenesis; brief account of
embryo & endosperm culture with their applications

Unit 9: 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.

III B.Sc., V Semester DSE-II
Economic Botany and Biotechnology
Practical (2 credits)

Lectures: 60 Hours
(4 hours/week)

1. Study of Cereals and Millets

2. Study of Legumes

3. Study of Spices and condiments

4. Study of Beverages

5. Study of Oils and Fats

6. Study of Fibre Yielding Plants

7. Familiarization with basic equipments in tissue culture.

8. Study through photographs: Anther culture, somatic embryogenesis,

9. Study through photographs: endosperm and embryo culture; micropropagation.

10. Study of molecular techniques: PCR, Blotting techniques and PAGE.

Suggested Readings

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.

III B.Sc., V Semester DSE-II

Economic Botany and Biotechnology
Scheme of Theory Question Paper

Time: 3.00 Hours   **Max. Marks: 70**

Blue print:

Units	Hours allotted	No. of questions from each category			Total Marks 70
		2 marks (5/8)=10	5marks (4/6)=20	10marks (4/6)=40	
Unit 1: Cereals and Millets	4		5X1=5	-	**07**
Unit 2Legumes	6	2X1=2	-	10X1=10	**12**
Unit 3: Spices and condiments	8	-	5X1=5	10X1=10	**15**
Unit 4: Beverages	4	-	5X1=5	-	**05**
Unit 5: Oils and Fats	4	2X1=2	5X1=5	-	**07**
Unit 6: Fibre Yielding Plants	4	2X1=2	-	10X1=10	**12**
Unit 7: Introduction to biotechnolog	2	2X1=2	-	-	**02**
Unit 8: Plant tissue culture	10	2X1=2	5X1=5	10X1=10	**17**
Unit 9: Recombinant DNA Techniques	18	2X2=4	5X1=5	10X2=20	**29**
Total		**8X2=16**	**5X6=30**	**10X6=60**	**106**

Floriculture
Theory (2 credits)   Lectures: 30 Hours
                                         (2 hours/week)

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

Unit 1- Establishment and management of Nurseries: (7 Lectures)

Definition, importance of nurseries, classification of nurseries, and management of nurseries

1. **Basic requirements for Nurseries**: Agro-climatic conditions, Topography, Selection of site Selection of soil, Seed bed preparation, Water supply and irrigation.

   Parts of nursery- a) Building structures, b) Propagating structures- raising of seedlings

2. **Management of nursery:** Irrigation, Nutrition, Weed control, Plant protection, Uprooting, packing and transplantation

Unit 2-Gardening and Landscaping   (8 Lectures)

A. Features of a garden:

1. Introduction, living elements, hedges, edges, trees, flower beds, lawn, Shrubbery, climbers and creepers, paths, Steps, arches, pergola, rockery, Water garden, sunken garden, carpet beds, topiary, trophy, ,non living elements.

2. Gardening: Introduction, Formal style, Informal style, planning a garden, creating a garden, establishment of the garden.

3. Some Famous gardens of India

B. Landscaping:

1. Home garden, Public garden. Educational institution, commercial complexes and companies.

2. Importance, Scope of floriculture and landscape gardening.

Unit 3-Garden Plants: (5 Lectures)

Introduction, Annuals, Biennials, Perennials, Shrubs, Trees, Climbers(Divine Vines) Succulents, Cacti,Ferns, Gymnosperms, Palms, Orchids, Bulbous Ornamentals.

Unit 4- Commercial Floriculture: (8 Lectures)

Introduction, Importance of Floriculture from social, Economic, Health and Aesthetic point of view. Marketing and floristry in Indian scenario. Future and scope of Floriculture in India-Employment opportunities. Packaging of cut flowers; Flower arrangements; Methods to prolong vase life; Cultivation of Important cut flowers (Rose, Chrysanthemum, Gerbera, Gladiolous, Marigold, Orchids).

Unit 5- Diseases and pests of ornamental plants: (2 Lectures)

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References

1. Randhawa, G.S. and Mukhopadhyay, A. 1986. Floriculture in India Allied Publishers

Floriculture
Scheme of Theory Question Paper

Blue print: **Max. Marks: 50**

Units	Hours allotted	No. of questions from each category			Total Marks 50
		2 marks (5/8)=10	5marks (4/6)=20	10marks (2/4)=20	
Unit 1: Establishment and management of Nurseries.	7	2X2=4	5X1=5	10X1=10	19
Unit 2: Gardening and Landscaping:	8	2X2=4	5X2=10	10X1=10	24
Unit 3: Garden Plants:	5	2X2=4	5X2=10	-	14
Unit 4: Commercial Floriculture	8	2X1=2	-	10X2=20	22
Unit 5: Diseases and Pests of Ornamental Plants.	2	2X1=2	5X1=5	-	07
Total	**30**	**8X2=16**	**5X6=30**	**10X4=40**	**86**

DME23408 /DME23407   **III B.Sc., V Semester   SEC-II**

Ethnobotany
Theory (Credits 2)

Lectures: 30 Hours
(2 hours/week)

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

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)

Ethnobotany
Scheme of Theory Question Paper

Blue print: **Max. Marks: 50**

Units	Hours allotted	No. of questions from each category			Total Marks 50
		2 marks (5/8)=10	**5marks (4/6)=20**	**10marks (2/4)=20**	
Unit 1: Ethnobotany	6	2X2=4	5X1=5	10X1=10	**19**
Unit 2: methodology of Ethanobotanical studies	6	2X3=6	5X2=10	-	**16**
Unit 3: role of ethonobotany in modern medicine	10	2X2=4	5X1=5	10X2=20	**29**
Unit 4: Ethnobotany and legal aspects	8	2X1=2	5X2=10	10X1=10	**22**
Total	**30**	**8X2=16**	**5X6=30**	**10X4=40**	**86**

DMF23008/ DMF23007   **III B.Sc., VI Semester DSE-III**

Genetics and Plant Breeding
Theory (4 credits)   **Lectures: 60 Hours**
(4 hours/week)

Course outcome:
After completion of the course the student is able to:

CO1   Specify the details of heredity

CO3   Write down the classification and characteristics of mutations

CO4   Learn the details of plant breeding

CO2   Identify in details with examples linkage

Unit 1- Heredity: **(24 Lectures)**

1. Brief life history of Mendel

2. Terminologies

3. Laws of Inheritance

4. Modified Mendelian Ratios: incomplete dominance; complementary factors; supplementary factors, Duplicate factors, Epistatis.

6. Pedigree Analysis

7. Cytoplasmic Inheritance: leaf variegation in *Mirabilis jalapa*, Male sterility.

8. Chromosome theory of Inheritance.

9. Quantitative inheritance-Concept, mechanism, examples. Monogenic vs polygenic Inheritance.

Unit 2- Sex-determination and Sex-linked Inheritance: **(6 Lectures)**

Sex – determination in *Melandrium album* by XX-XY method, Bridges Genic balance theory, Sex-linked Inheritance

Unit 3- Linkage and Crossing over: **(8 Lectures)**

Linkage: complete & incomplete linkage, coupling & repulsion, recombination frequency, linkage in Maize, two point test cross, linkage maps, Coincidence and interference. Crossing over: concept and significance.

Unit 4-Mutations and Chromosomal Aberrations: **(6 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 and Methods of crop improvement: **(12 lectures)**

Introduction, objectives and Methods: Plant introduction, selection, Hybridization- Emasculation and bagging.   Mutation breeding, polyploidy breeding, genetic or molecular plant breeding. Methods of propagation– Procedure, advantages and limitations

Unit 6- Inbreeding depression and heterosis: **(4 lectures)**

Inbreeding depression and Heterosis; Applications. Germplasm maintenance, Pollen banks and Quarantine measures.

Genetics and Plant Breeding
Practical (2 credits)

Lectures: 60 Hours
(4 hours/week)

1. Mendel's laws through seed ratios. Laboratory exercises in probability and chi-square.

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).

Suggested Readings

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.

III B.Sc., VI Semester DSE-III
Genetics and Plant Breeding
Scheme of Practical Question Paper

Time: 4 Hours   **Max. Marks: 35 (25+05+05)**

I. Perform the experiment 'A'.   **6 marks**

 (Emasculation and bagging)

Preparation   -2 marks

Sketch and label   - 2marks

Reasons   - 2marks

II. Conduct experiment 'B'.   **4 marks**

(Induction of polyploidy)
        Principle   -1 marks
        Requirements   -1 marks
        Procedure   -1 marks
        Result and inference   -1 marks

III. Problems on Chromosome mapping using point test cross data'C'.   4 marks

IV. Comment on the given specimen 'D'   **3 marks**

(Pedigree analysis)

Identification   - 1mark

Reasons   - 2marks

V. Problems on gene interaction 'E'   **4 marks**

VI. Identify the given photographs 'F' & 'G'   **2x2=4 marks**
(F- Aneuploidy & G- Translocation)

Identification   - 1mark

Reasons   - 1marks

VI. Practical record   **5 marks**

VII. Viva-Voce   **5 marks**

Time: 3.00 Hours   **Max. Marks: 70**

Blue print:

Units	Hours Allotted	No. of questions from each category			Total Marks 70
		2 marks (5/8)=10	5marks (4/6)=20	10marks (4/6)40	
Unit 1:Heredity	24	2X3=6	5X1=5	10X3=30	**41**
Unit 2: Sex-determination and Sex-linked Inheritance	4	2X1=2	5X1=5	-	**7**
Unit 3: Linkage and Crossing over	8	2X1=2	-	10X1=10	**12**
Unit 4: Mutations and Chromosomal Aberrations	4	2X1=2	5X1=5	-	**7**
Unit 5: Plant Breeding	4	2X1=2	5X1=5	-	**07**
Unit 6: Methods of crop improvement	8	-	5X1=5	10X1=10	**15**
Unit 7: Inbreeding depression and heterosis	4	2X1=2	5X1=5	-	**02**
Unit 8: Crop improvement and breeding	4	-	-	10X1=10	**10**
Total	**60**	**8X2=16**	**5X6=30**	**10X6=60**	**106**

Analytical Techniques in Plant Science
                    Theory (4 credits)   **Lectures: 60 Hours**
                                                                (4 hours/week)

Course outcome:
After completion of the course the student is able to:

CO2   Learn the details of Spectrophotometry

CO3   Write down the details of chromatography

CO1   Specify the details of cell fractioning

CO4   Identify in details with application, if applicable, biostatistics

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, $CsCl_2$ 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.

DMF23308/ DMF23307   **III B.Sc., VI Semester DSE-IV**
Analytical Techniques in Plant Science
                                                          Practicals (2 credits)   Lectures: 60 Hours
                                                                                                          (4 hours/week)

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).

Suggested Readings

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

Time: 3.00 Hours   **Max. Marks: 70**

Blue print:

Units	Hours Allotted	2 marks (5/8)=10	5marks (4/6)=20	10marks (4/6)40	Total Marks 70
		No. of questions from each category			
Unit 1: Imaging and related techniques	15	2X2=4	5X2=10	10X1=10	24
Unit 2: Cell fractionation	8	2X1=2	5X1=5	10X1=10	17
Unit 3: Radioisotopes	4	2X2=4	-	-	4
Unit 4: Spectrophotometry	4	2X1=2	-	10X1=10	12
Unit 5: Chromatography	8	-	5X1=5	10X1=10	15
Unit 6: Characterization of proteins and nucleic acids	6	2X1=2	5X1=5	-	7
Unit 7: Biostatistics	15	2X1=2	5X1=5	10X2=20	27
Total	**60**	**8X2=16**	**5X6=30**	**10X6=60**	**106**

Botany Pattern of theory question paper (CBCS)
DSC I-DSC IV
(I semester to IV)

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

Instructions to the candidates:
   Draw neat labelled diagrams where ever necessary.

I. Explain / define any FIVE of the following.   **2x5=10**

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

II. Write short notes on any FOUR of the following.   **5x4=20**

   9.
   10.
   11.
   12.
   13.
   14.

III. Give comprehensive and detailed account of any FOUR of the following.   **10x4=40**

   15.
   16.
   17.
   18.
   19.
   20.

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Botany Pattern of theory question paper (CBCS)
DSE
(V semester to VI)

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

Instructions to the candidates:
Draw neat labelled diagrams where ever necessary.

II. Explain / define any FIVE of the following.   **2x5=10**

   1.

   2.

   3.

   4.

   5.

   6.

   7.

   8.

 II.   **Write short notes on any FOUR of the following.**   **5x4=20**

   9.

   10.

   11.

   12.

   13.

   14.

III.   **Give comprehensive and detailed account of any FOUR of the following.**   **10x4=40**

   15.

   16.

   17.

   18.

   19.

   20.

***

Botany Pattern of theory question paper (CBCS)
SEC
(V semester)

Time: 2 Hours   **Max. Marks: 50**

Instructions to the candidates:
Draw neat labelled diagrams where ever necessary.

III.   Explain / define any FIVE of the following.   **2x5=10**
    1.
    2.
    3.
    4.
    5.
    6.
    7.
    8.

II.   Write short notes on any FOUR of the following.   **5x4=20**
    9.
    10.
    11.
    12.
    13.
    14.

III.   Give comprehensive and detailed account of any TWO of the
    following.   **10x2=20**

    15.
    16.
    17.
    18.

***

Suggested Readings:

Author	Title of the Book	Publisher
VIRUSES AND BACTERIA		
R.C.Dubey and D.K. Maheshwari	A textbook of Microbiology	S. Chand & company, Ramnagar N.Delhi-110005.
P.D. Sharma	Microbiology	Rastogi Publications; Shivaji road Meerat; 250002; India
P. D. Sharma	Microbiology and Plant pathology	Rastogi Publications; Shivaji road Meerat; 250002; India
H. C. Dube	Text book of fungi, Bacteria & Virus	Vani Educational books , Vikas house 20/4, Industrial area, Sahidabad, 201010, Ghaziabad, UP.
Power & Daginawala	General Microbiology. Vol. I	Himalaya Publishing house, Bombay
Power & Daginawala	General Microbiology. Vol. II	Himalaya Publishing house, Bombay
Pelzar Michael.J Prescott, Lansing and Others	Text Book of Microbiology Microbiology	Orient and Longman, New Delhi.
Ananthanarayana .R . Jayaram Panicker	Text Book of Microbiology	Tata Mc graw Hill
a) salle. A. J.	Functional Principles of Bacteriology	Himalaya Publishing house, Bombay
Vinita Kale and Kishore Bhusari	Applied Microbiology.	ELBS Publisher , New Delhi
Frazier William. C.	Food Microbiology	Prentice Hall of India N.Delhi
Cruckishank	Text book of Medical Microbiology	Vardaman Publishers , Bangalore. Vol. III & Vol. IV.
Rangaswamy.G.	Diseases of crop plants in India.	Tata McGraw Hill Publishing company.
Sundar Rajan	College Microbiology	
William. C. Frazier and Dennis C. West hoff. 3rd Edn	Food Microbiology	R. Chand & company, Publishers, N.Delhi.
ALGAE		Pradeep Pub., Jalandhar.
K.N. Bhatia	A Treatise on Algae	Mc graw Hill , New york.
		Thomas, Nelson and Sons
Chopra. G.L	A Text book of Algae	Rastogi Publications
G. M. Smith	Cryptogamic Botany Vol. I	
Prescott, G.W	The Algae to Review	Cambridge University Press
Kumar, M.A and Kashyap.	Recent advances in physiology	

A.K. Fritsch. F. E.	Structure and Reproduction of Algae Vol. I & Vol. II	Mac Milan, Publishing New York.
ChapmanV.J&Chapman D.J.	The Algae 2nd Edn.	Rastogi Publications; Shivaji road Meerat; 250002; India
Singh, Pande , Jain.	A text book of Botany	S. Chand & company, Ltd. Ramnagar N.Delhi-110005.
B. P. Pandey	Simplified course in Botany	Black well Publishers.
Darley. M. W.	Algal Biology	Mc Grawhill, New york.
FUNGI		Wiley Eastern Ltd. New Delhi.
Smith. G. M.	Cryptogamic Botany Vol. I	
Allexopolos. C. J. and	Introduction to Mycology	Pradeep publications, Jalandar
Mims. C. W.		Mac Milan & Co Calcutta
Chopra G. L. and Verma. V	Text book of Fungi	Prentice Hall of India New Delhi.
Mundkur, B. B.	Fungi & Plant diseases	Rastogi Publications
Rangaswamy, G.	Diseases of India 3rd Edition	S. Chand and Company, New Delhi.
Sharma. P. D.	The fungi	
Vashista, R.R	Fungi	S. Chand and Company, New Delhi.
BRYOPHYTA	Bryophyta	S. Chand and Company, New Delhi.
Pandey. B.P.		
	Bryophyta	Central book depot, Allahabad.
Vashista. B. P.		Mc Grawhill, New York
	Bryophyta	Pradeep Publications, Jalandar.
Parihar. N.S.	Cryptogamic Botany vol. I	
G. M. Smith	Class Book and Pteridophytes	
G. L. Chopra		
	Bryophytes and Pteridophytes	
Chauhan D.K.S		MC Graw Hill, New York.
ANATOMY	Introduction to Plant Anatomy	Wiley Eastern, New Delhi.
Eames A.J. and Mac		S. Chand and Company.
Daniels, L. H	Anatomy of seed plants	Rastogi publications, Meerat.
Katherien Esau	Introduction to Plant Anatomy	
Pandey. B. P	Anatomy of seed plants	Rastogi publications, Meerat.
Singh. V., Pandey, P.C and Jain, D.K.		
Tayal M. S.	Plant anatomy	
Ganguli Das L Datta	College Botany Vol. I	
Venkateshvaralu	Cytology and Anatomy	
EMBRYOLOGY OF ANGIOSPERMS & TAXANOMY		Vikas publishing HOUSE, New Delhi.
Bhojwani. S. S. &	The Embryology of Angiosperms	Rastogi publications, Shivaji Road, Meerat, 250002.
Bhatnagar, S. P.	The Embryology of Angiosperms	MC Graw Hill publishing

Singh, Pandey, Jain		Company, New Delhi.
Maheshwari , P	The Embryology of Angiosperms	Ind. Sci. Acad. Bull. No.41, New Delhi.
Johri, B.M.	Comparative Embryology of Angiosperms	MC Graw Hill, New York. Narosa publishing House New Delhi.
	Morphology of Angiosperms	
Eames A. J.	Plant cell and Tissue culture.	
Reinert . J and Yeoman M.M	Plant Anatomy	
	Taxonomy of Vascular plants	
Vashishta	A Text book of systematic	
George H.M. Lawarance.	Botany	Harper C Row, New York.
R.N. sutaria	Botany for Degree Students.	
A. C. Dutta		Mc Graw Hill, New York.
PTERIDOPHYTA	Morphology of plants and Fungi	
Bold , H.C., Alexopoulos, C.J		Central book depot. Allahabad.
& Delevoryas, T.	Morphology of vascular plants (lower groups).	
Eames, Arthur, J.	The Biology and Morphology of Pteridophytes.	Vikas publishing House, New Delhi.
Parihar, N.S. 1977		Vani educational books, New Delhi.
	Text book of Botany, Vol. II	
	An introduction to Pteridophyta.	Hutchinson university library,
Pandey, S.N.& Others	The Morphology of Pteridophytes	London.
Rashid,A.1986		S. Chand and Co., New Delhi.
Sporne,K.R.1970	Pteridophyta	
		Asia publishing house, New
Vashista,P.C. 1987	An Introduction to	Delhi.
GYMNOSPERMS	Gymnosperms.	K. Nath and Co.
Datta, S.C.	Gymnosperms.	Prasaranga, University of
Pandey, B.P.	Anavrutha beeja sasyagalu	Mysore, Mysore.
Ramaswamy, S.N. 1984	(Gymnosperms)	Ratna Prakashana Mandir, Agra
	Text book of Botany Vol. II.	Hutchinson university library,
Saxena and Sarabhai 1993	The Morphology of	London.
Sporne, K.R.1969	Gymnosperms.	Shashidhar Malaviya Prakashan.
		S.Chand & Co. New Delhi.
Trivedi, B.S.& Singh, D.K	An Introduction to	Wiley, New York.
Vashista, B.R.	Gymnosperms.	Narosa, New Delhi.
Andrews, H.N. 1961	Gymnosperms.	
Biswas, C. & Johri, B.M.	Studies in palaeobotany.	
1997	The Gymnosperms.	Wiley-Estern, New Delhi.
PLANT PHYSIOLOGY		
Conn, E.E. and		Centar book Depot, Allahabad.
Stumpf,P.K.1976	Out line of Biochemistry	Affiliated East West, New Delhi.
Datta, S.C.		Affiliated East West, New Delhi.
Delvin, R.M. 1969	Plant physiology	

Delvin, R.M. & Barker, A.V. 1971	Plant physiology	S.Chand & Co. New Delhi.
Jain, V.K. 1990	Photosynthesis	East West Press Pvt. Ltd. New Delhi.
Kumar, H.D. & Singh, H.N 1975, 1993	Fundamentals of Plant physiology	Atma Ram & Sons, New Delhi.
Krishnamurthy, H.N.	Plant Metabolism I Edn. & II Edn.	
		Prentice Hall of India Pvt. Ltd.
Lehninger, A.L. 1978	Physiology of plant Growth and Development.	
Noggle, G.R. and Fritz George, J. 1977.	Biochemistry	S.Vishwanatha, Pvt. Ltd.
Rao, K.N. Sudhakar Rao and Bharatan, S. 1987	Introductory Plant physiology	Wiley Eastern, New Delhi.
Rabinowitch, E. & Govindjee. 1970	The function of plant.	First Indian Edn. CBZ Publishers and Distributers, New Delhi.
Salisbury, E.E. & ross, C.W. 1986	Photosynthesis	
	Plant physiology	
ECOLOGY & ENVIRONMENTAL BIOLOGY		Ann Arbor Science, Michigan.
Aarne Vesilid, P & Jeffrey Pierce, J. 1983		McGraw Hill.
		John Wiley and Sons, New York.
BentonAllen.H & Warner,WE	Environmental Pollution and Control	Tata-McGraw Hill publishing Co. New Delhi.
Colinvaux paul, A. 1973		S.Chand & Co, New Delhi.
Dash,M.C.	Field Biology an Ecology	
	Introduction to Ecology	Prentice Hall of india New Delhi.
Dara, S.S. 1993	Fundamentals of Ecology	Ratna Prakashan mandir, Agra.
		Vishal Publications, Jalandar.
Kormondy Edward, J. 1986	A Text book of Environmental	
Kochhar, P.L. 1990	Chemistry and Pollution Control.	Vikas, New Delhi.
Kotpal, R.L. 7 Bali, N.P. 1987	Concept of Ecology	Macmllan Education Ltd.
	Plant Ecology	London.
Kumar,H.D. 1990	Concept of Ecology	Longman Inc., newe York.
Lloyd, J.R.1980		Oxford and IBH, New Delhi.
Mason, C.E.1981	Concept of Ecology	Saunders, W.B. Philadelphia
Misra.K.C. 1989	Man and the ecosystem.	Wiley, New York.
Odum,E.P. 1971	Biology of fresh water Pollution	
Odum,E.P. 1983	Manual of plant Ecology	Divyajyoti prakashan Jodhpur.
	Fundamentals of Ecology	
Pratap Mowli, P & Venkata Subbaya, N. 1989.	Basic Ecology	Rastogi Publications, Meerut I Edn. Rastogi
Sharma, P.D.	Air Pollution and Control	Publications,Meerut.
Sharma, P.D.		Anmol Publications, New Delhi.
Trivedi, R.N. 1993	Ecology and Environment	
	Environmental Biology	Vishal Publications jalandhar.

Vashista, P.C. 1989	Text book of Environmental Sciences	S.Chand & Co., New Delhi.
Verma, P.S. and Agarwal, V.K. 1992	Plant Ecology	Macmillan, new York.
Whittaker, R.H. 1975	Principles of Ecology	
	Communities and Ecosystems	
CYTOLOGY,GENETICS AND ELOLUTION	II Edn.	Wiley Eastern Ltd.
Ahluwalia Kavita, B. 1985.		Addiison Wesley Longman, California.
Booker, R.J 1999	Genetics	Oxford and IBH, New Delhi
	Genetics-Analysis and Principles	Benjamin Cummings.
Archana Sharma, 1990		
Ayala, F.J. and Klug, Jr. 1984	The Chromosomes	Tata mcGrawHill, New Delhi
Cherayil,J.D 1974	Modern Genetics II Edn.	W.B.Saunders and Co. Philadelphi
De Robertis, E.D.P. Solez, F.A & Nowinski, W.W.1966	Gene and Genetics Cell Biology	Surjeet publications, New Delhi
Dobzhansky, T., Ayala, J., Stebbins	Evolution	Oxford and IBH publishing Co., New Delhi
Dobzhansky, T. 1951	Genetics and Origin of species	Harper and Row publishers, John Wiley and Sons,
Dowben Robert, M 1971	Cell biology	
Gardner, E.J &Snustad,D.P. 1984&1990	Principles of Genetics	Rastogi publications,meerut.
Gupta, P.K 1987	Genetics	Prentice Hall of India. New York.
Hexter, W and Yost Henry, T. 1977	The Science of Genetics	Macmillan, India, New Delhi
Jha, A.P. 1993.	Genes and Evolution	George allen & Unwin, London.
Huxley, j. 1974	Evolution	15th Edn. Rattan prakashan Mandir, Agar.
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Loewy ariel,g. & Philip Siekevitz. 1974	Cell structure and function	Holt, Rinehart and Winston, New York.
Marril David, j. 1962	Evolution and Genetics	Konark Publishers pvt.Ltd. A. 149, Main Vikar Marg, New Delhi
Nair, P.G.K. Prabhakar Achar, K.	A Text book of Genetics & Evolution	
Fair banks, D.J. and Anderson, W.R. 1999	Genetics – the community of life	Brooks-Cole, California.
Pawar, C.B.1983	Essentials of Cytology	Himalayan publishing house, Bombay.
Savage, J.M. 1969	Evolution	Oxford and IBH, New Delhi
Stansfields, W.D.1977	The Science of Evolution	Calif polytechnic state university and Macmillan, New York.
Sinnot, E.W., Dunn, L.C.,	Principles of Genetics	

		McGraw Hill, New York
& Dobzhansky, T 1958 Snustad, D.P., Simmons, M.J. & Jenkins, J.R. 1997	Principles of Genetics	John Wiley, New York.
Swanson Carl, P. 1963	Cytology and Cytogenetics	
Swanson Carl, P & Webster Peter, L.	The Cell	Macmillan & Co,. Ltd. London. Prentice Hall of India Pvt. Ltd,.
Strickberger Monroe, W. 1968	Genetics	New Delhi Macmillan Company, New York.
Strichberger Monroe, W. 1996	Evolution	John & Bartlett Sandburry.
Winchester, A.M. 1966	Genetics	Oxford & IBH, New Delhi
PLANT BREEDING, ECONOMIC BOTANY AND TAXONONY		
Allard, R.W. 1960	Principles of Plant Breeding	
Bailey,L.H. 1966	Manual of cultivated plants	John Wiley, New York
Chandrasekharn, S.N., Parthasarathy,S.V.1973	Cytogenetics and Plant Breeding	Macmillan & Co., New York. Varadachary and Co., Madras.
Chaudhari, H.K. 1980	Elementary principles of Plant Breeding	Oxford and IBH publishing Co., New Delhi.
Hartman, h.T. & Kester, D.E. 1976	Plant Breeding	Principles and practices, Prentice Hall of India Pvt. Ltd., New Delhi.
Hill, Albert, F. 1983	Economic Botany	
Jain S.C.	Medicinal plants	
Hutchison, J. 1973	The families of Flowering plants	.Tata-McGraw Hill publishing Co. New Delhi.
Lawrence, George, H.M. 1964.	Taxanomy of Vascular plants	Oxford University Press, London.
Naik, V.N. 1984	Taxonomy of Angiosperms	Oxford and IBH publishing Co., New Delhi
Johri, B.M.& Bhatnagar,S.P.	Taxonomy of Angiosperms	Tata-McGraw Hill publishing Co. New Delhi.
	Taxonomy of Angiosperms	Narosa publishing House New Delhi.
Pullaiah, T.1998	Vascular Plant Systematics	Regency Publications, New
Radford,A.E., Dickison,W.C., Massey, Jr & Bell, C.R 1974	Breeding Asian Field Crops	Delhi. Harper & Row, New York.
Poehlman, J.M. & Dhirendranath, B.	Flora of Shimoga District	Oxford and IBH publishing Co., New Delhi
Ramaswamy, S.N., Radhakrishna Rao,M & Govindappa.D.A.2001	Flora of Bangalore District.	Prasaranga, University of Mysore, Mysore.
Ramaswamy, S.V.& Razi, B.A. 1973	Classification of Flowering Monocotyledons Vol.I. (Indian Reprint Edition)	Prasaranga, University of Mysore, Mysore.
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Rendle, A.B. 1979	(Indian Reprint Edition) Atext book of Economic Botany.	Vikas Publishing house, New Delhi.
Samba Murthy,A.V.S.S.& Subramanyam. N.S. 1973	Flora of Karanataka, Vol. I & Vol.II	Tata-McGraw Hill publishing Co. New Delhi.
Saldhana, Cecil, J. 1984	Flora of Hassan district (Karnataka, India)	
Saldhana, Cecil, J., &Nicolson Dan, H. 1976	Text book of Botany, Vol. III. Plant Taxonomy	Oxford and IBH publishing Co., New Delhi
Saxena and Sarabhai. 1993 O.P. Sharma	Flora of India series 2: Flora of Karnataka.	Amerind Publishing Co. Pvt.Ltd., New Delhi. Ratan Prakashan Mandir.Agra.
Sharma, B.D., Singh, N.P., Raghavan, R.S. & Miss. Deshpande,U.R. 1984	Taxonomy of Angiosperms Introduction toPrinciples of plant taxonomy	Tata-McGraw Hill publishing Co. Ltd.4/12, Asif ali road, New Delhi.
Singh, V. Sivarajan, V.V. 1984	Dictionary of Economic plants in India	Botanical Survey of India & Dept. of Environment, New Delhi.
Umarao Singh,, Wadhwani, A.M. & Johri, B.M. 1983	Taxonomy of Angiosperms	
Vashishta, P.C. 1976		Rastogi Publications.
GENERAL	A Text book of Practical Botany Vol.I & II	Kalyani Publications,New Delhi.
Ashok Bendre and Ashok Kumar	Practical Botany Vol.I & II	ICAR,New Delhi. R.Chand & Co., New Delhi
Dr. H.M. Srivastava	College Botany Vol. I, II, III &IV	Rastogi Publications, Shivaji road, Meerut.
Sundararajan, S. Kottakkal Arya Vaidya sala''s	Medicinal Plants Vol. 1- 5	Pradeep publications opp. Sitta Mandhir, Jalandhar.
BOOKS ON BIODIVERSITY	Global Biodiversity Assesment	Subha's Publications, Bangalore. Cambridge University press, U.K.
Heywood, H & Watson, R.J. 1995	Biodiversity and Ecosystem functions	Springer-verlag, Berlin.
Schulze,E.D.& Mooney, H (eds.) 1992	Biodiversity and Ecosystem function, Scope.	
Mooney, H.A.et.al. (eds). 1996	Biodiversity: Implications for global food security	John wiley, Chichester.
Swamynathan, M.S. & Jana, S. 1992	Endemic plants of the Indian region Vol. I.	Macmillan India Ltd. Madras. BSI Calcutta
Ahmedullh, M. & Nayar,M.P.1987	Threatened Plants of India- A State-of-the-Art report	BSI Calcutta
Jain, S.K.& Sastry,A.R.K 1980	Indian plant red data book Vol.I	BSI Calcutta
Puri, S.K.	Biodiversity Database projects in India.	Indira Ghandi Conservation Monitory Centre, New Delhi.

LIST OF APPROVED PANEL OF EXAMINERS:

Sl. No	Name	Designation and DOB	Joining Date	Phone number
	Internal Examiners			
1.	Dr.Prathibha S JSS College, Ooty Road, Mysore	Asso. Prof. 28/04/1964	28/08/1986	9243707241
2.	Gayathri Devi N Jss College, Ooty Road, Mysore	Asst. Prof.	01-01-2005	8050684736
3.	Kiran B L JSS College, Ooty Road, Mysore	Asst. Prof.	23-09-2015	9638219347
	External Examiners			
5.	Dr. Ravikumar B S AVK College For Women, Hassan	Asso. Prof. 13/07/1962	16/07/1987	8861716456
6.	Mallikarjunamiah M N Maharani`s Science college For Women, Mysore	Asso. Prof. 05/11/1963	14/08/1992	9880006223
7.	Dr. Hemavathi C Govt. First grade college, Vijayanagar, Mysuru	Asso. Prof. 05/04/1966	17/08/1992	9980748813
8.	Dr. Vijay C R Maharani`s Science College For Women, Mysore	Asso. Prof. 01/10/1962	29/12/1992	9448028585
9.	Dr. Shivalingaiah Maharani`s Science College for Women, Mysore	Asst. Prof. 01/06/1968	08/01/1996	9036766869
10.	Dr. Purushotham S P Maharani`s Science College for Women, Mysore	Asst. Prof. 15/05/1967	02/08/1996	9448115524
11.	Dr. Lingaraju D P AVK College for Women, Hassan	Asst. Prof. 26/02/1965	23/10/2002	9108585024
12.	Dr. Basavaraju G L Govt College for Women, Mandya	Asst. Prof. 21/07/1976	30/01/2004	
13.	Dr. Devika M Saradavilas College, Mysore	Asst. Prof. 14/03/1970	14/12/2005	9880024483
14.	Dr. Pruthviraj Sri Mahadeshwara Govt. First grade college	Asso. Prof.		9448925262
15.	Dr. Nataraju Maharani`s Science College for Women, Mysore	Asso. Prof.		9448033901
16.	Dr. Suresh N S Maharani`s Science College for Women, Mysore	Asst. Prof. 25/02/1975	02/05/2006	9242243601
17.	Dr. Jayalakshmi B Maharani`s Science College for Women, Mysore	Asst. Prof. 18/11/1974	14/07/2006	9482640645
18.	Sowmya H K Govt Science College,Hassan	Asst. Prof. 18/06/1970	22/12/2007	7338466887
19.	Dr. Thoyajaksha Govt Science College, Hassan	Asst. Prof. 20/07/1970	24/12/2007	9743779983
20.	Sandhya Rani D Maharani`s Science College for Women, Mysore	Asst. Prof. 24/08/1972	24/12/2007	9448602597
21.	Dr. Pushpalatha H G Maharani`s Science College for Women, Mysore	Asst. Prof. 23/12/1979	26/12/2007	9480442844
22.	Dr. Ashok N Pyati Maharani`s Science College for Women, Mysore	Asst. Prof. 22/04/1970	28/12/2007	7204661365
23.	Dr. Deepa Hebbar Maharani`s Science College for Women, Mysore	Asso. Prof.		9632869690

24.	Indushree PES College, Mandya	Asst. Prof.		8151917465
25.	Dr. Lalitha V Maharani`s Science College for Women, Mysore	Asst. Prof.		8105004148
26.	Revanamaba B Maharani`s Science College for Women, Mysore	Asst. Prof.		9448528471
27.	Dr. Sharvani, K.A Yuvarajas college, Mysore.	Asst. Prof.		9845885896
28.	Dr. Krishna Yuvarajas college, Mysore.	Asst. Prof.		
29.	Dr. Krishnamurthy Yuvarajas college, Mysore.	Asst. Prof.		
30.	Kalpashree Yuvarajas college, Mysore	Asst. Prof.		8088413446
31.	Dr. Anil Kumar Yuvaraja College, Mysuru	Asst. Prof.		8970945497
32.	Dr. Girijamba Maharani`s Science College for Women, Mysore	Asst. Prof.		9945616792
33.	Dr. Netra Maharani`s Science College for Women, Mysore	Asst. Prof.		9620782198
34.	Dr. Poornima Yuvaraja College, Mysuru	Asst. Prof.		8217642534
35.	Nayana, K. N. Yuvaraja College, Mysuru	Asst. Prof.		9964041544
36.	Dr. Shamala Maharani`s Science College for Women, Mysore	Asst. Prof.		7019453250

Aims of Bachelor's degree programme in Botany

The broad aims of the bachelor's degree programme in Botany are:

1. To provide an environment that ensures the cognitive development of students in a holistic manner. A dialogue about plants and their significance is fostered in this framework, rather than didactic monologues on mere theoretical aspects

2. To provide the latest subject matter, both theoretical as well as practical, such a way to foster their core competency and discovery learning. A botany graduate as envisioned in this framework would be sufficiently competent in the field to undertake further discipline-specific studies, as well as to begin domain-related employment.

3. To mould a responsible citizen who is aware of the most basic domain-independent knowledge, including critical thinking and communication.

4. To enable the graduate to prepare for national as well as international competitive examinations, especially UGC-CSIR NET, and UPSC Civil Services Examination.

Program Learning Outcomes

The students graduating with the Degree B.Sc. Three years and B. Sc. (Honors) Botany should be able to acquire.

Core competency: Students will acquire core competency in the subject Botany, and allied subject areas.

1. The student will be able to identify major groups of plants and compare the characteristics of lower (e.g. algae and fungi) and higher (angiosperms and gymnosperms) plants.

2. Students will be able to use the evidence-based comparative botany approach to explain the evolution of organisms and understand the genetic diversity on the earth. The students will be able to explain various plant processes and functions, metabolism, concepts of gene, genome, and how organism's function is influenced at the cell, tissue, and organ level.

3. Students will be able to understand the adaptation, development, and behavior of different forms of life.

4. The understanding of networked life on earth and tracing the energy pyramids

through nutrient flow is expected from the students.

5. Students will be able to demonstrate the experimental techniques and methods of their area of specialization in Botany.

Analytical ability:

The students will be able to demonstrate the knowledge in understanding research and addressing practical problems.

1. Application of various scientific methods to address different questions by formulating the hypothesis, data collection, and critically analyze the data to decipher the degree to which their scientific work supports their hypothesis.

Critical Thinking and problem-solving ability:

An increased understanding of fundamental concepts and their applications of scientific principles is expected at the end of this course. Students will become critical thinkers and acquire problem-solving capabilities.

Digitally equipped:

Students will acquire digital skills and integrate the fundamental concepts with modern tools. **Ethical and Psychological strengthing:** Students will also strengthen their ethical and moral values and shall be able to deal with psychological weaknesses.

Team Player: Students will learn team workmanship in order to serve efficiently institutions, industry, and society

Independent Learner:

Apart from the subject-specific skills, generic skills, especially in botany, the program outcome would lead to gain knowledge and skills for further higher studies, competitive examinations, and employment. Learning outcomes-based curriculum would ensure equal academic standards across the country and a broader picture of their competencies. The Bachelor's program in Botany and Botany honors may be mono-disciplinary or multidisciplinary with following broad objectives.

1. Critically evaluation of ideas and arguments by collecting relevant information about the plants, to recognize the position of the plant in the broad classification and Phylogenetic level.

2. Identify problems and independently propose solutions using creative approaches, acquired through interdisciplinary experiences, and a depth and breadth of knowledge/expertise in the field of Plant Identification.

3. Accurately interpretation of collected information and use taxonomical information to evaluate and formulate a position of the plant in taxonomy.

4. Students will be able to apply the scientific method to questions in botany by formulating testable hypotheses, collecting data that address these hypotheses, and analyzing those data to assess the degree to which their scientific work supports their hypotheses.

5. Students will be able to present scientific hypotheses and data both orally and in writing in the formats that are used by practicing scientists.

6. Students will be able to access the primary literature, identify relevant works for a particular topic, and evaluate the scientific content of these works.

7. Students will be able to apply fundamental mathematical tools (statistics, calculus) and physical principles (physics, chemistry) to the analysis of relevant biological situations.

8. Students will be able to identify the major groups of organisms with an emphasis on plants and be able to classify them within a phylogenetic framework. Students will be able to compare and contrast the characteristics of plants, algae, and fungi that differentiate them from each other and other forms of life.

9. Students will be able to use the evidence of comparative biology to explain how the theory of evolution offers the only scientific explanation for the unity and diversity of life on earth. They will be able to use specific examples to explicate how descent with modification has shaped plant morphology, physiology, and life history.

10. Students will be able to explain the ecological interconnectedness of life on earth by tracing energy and nutrient flow through the environment. They will be able to relate the physical features of the environment to the structure of populations, communities, and ecosystems

11. Students will be able to demonstrate proficiency in the experimental techniques and methods of analysis appropriate for their area of specialization within biology.

B. Sc. Botany Programme outcomes as per NEP 2020

Name of the Degree Program: B.Sc.   **Discipline Core: Botany**

Total Credits for the Program: 176   **Starting year of implementation: 2021-22**

Program Outcomes:

By the end of the program the students will be able to:

(Refer to literature on outcome based education (OBE) for details on Program Outcomes)

PO1: Skill development for the proper description using botanical terms, identification, naming and classification of life forms especially plants and microbes.

PO2: Acquisition of knowledge on structure, life cycle and life processes that exist among plant and microbial diversity through certain model organism studies.

PO3: Understanding of various interactions that exist among plants and microbes; to develop the curiosity on the dynamicity of nature.

PO4: Understanding of the major elements of variation that exist in the living world through comparative morphological and anatomical study.

PO5: Ability to explain the diversity and evolution based on the empirical evidences in morphology, anatomy, embryology, physiology, biochemistry, molecular biology and life history.

PO6: Skill development for the collection, preservation and recording of information after observation and analysis- from simple illustration to molecular database development.

PO7: Making aware of the scientific and technological advancements- Information and Communication, Biotechnology and Molecular Biology for further learning and research in all branches of Botany..

PO8: Internalization of the concept of conservation and evolution through the channel of spirit of inquiry.

PO 9: To enable the graduates to prepare for national as well as international level competitive examinations like UGC-CSIR, UPSC, KPSC etc.

PO10: To enable the students for practicing the best teaching pedagogy as a biology teacher including the latest digital modules.

PO 11: The graduates should be knowledgeable and competent enough to appropriately deliver on aspects of global importance like climate change, SDGs, green technologies etc at the right opportunity.

PO 12: The graduate should be able to demonstrate sufficient proficiency in the hands-on experimental techniques for their area of specialization within biology during research and in the professional career

B. Sc. Botany Programme specific outcomes as per NEP 2020

PSO1: The framework of curriculum for the Bachelor's program in Botany aims to transform the course content and pedagogy to provide a multidisciplinary, student-centric, and outcome-based, holistic education to the next generation of students.

PSO2: Aside from structuring the curriculum to be more in-depth, focused, and comprehensive with significant skill-set for all exit levels; keeping in mind the job prospects; the emphasis has been to maintain academic coherence and continuum throughout the program of study and help build a strong footing in the subject, thereby ensuring a seamless transition into their careers.

PSO3: Special attention is given to eliminate redundancy, discourage rote learning, and espouse a problem-solving, critical thinking, and inquisitive mindset among learners.

The curriculum embraces the philosophy that science is best learned through experiential learning, not limited to the confines of a classroom but rather through hands-on training, projects, field studies, industrial visits, and internships.

PSO4: This updated syllabus, with modern technology, helps students stay informed on the leading- edge developments in plant sciences and promotes curiosity, innovation, and a passion for research, that will serve them well in their journey into scientific adventure and discovery beyond graduation.

PSO5: The goal is to equip students with holistic knowledge, competencies, professional skills, and a strong positive mindset that they can leverage while navigating the current stiff challenges of the job market.

SUGGESTED METHODOLOGY FOR TEACHING, LEARNING AND EVALUATION

TEACHING-LEARNING

The whole programme is an Outcome Based Education. Different methods are to be used for teaching learning evaluation; in order to attain the fixed outcomes.

Theory:

Student: Review of Literature, Assignment, Presentation, e-learning, Discussion and Debate with peer group, teachers and experts.

Teacher: Lecture, Demonstration, Presentation, Discussion and Debate.

Practical:

Student: Identification, Comparison, Differentiation and Categorization of different plants and their parts by observing Permanent Slides, Hand sectioning etc., Demonstration, Experimentation, Field visit, Report Writing and Keeping records

Teacher: Demonstration, Experimentation, Field visit, Certification

Project: The finalization of the topic should be done at the beginning of the fourth semester and the list should be kept with the HOD for the perusal of the University Examination authorities. There should be at least three projects from a department. The selection of the topic and group should be student centered as far as possible. A project log book/register is to be maintained by each student and submitted along with the project report during the final submission.

Student: Suggestion of Topic, Discussion with the Project guide and Peer group, Review of Literature, Project planning and Designing, Experimentation, Data Analysis and Project Report Preparation and Presentation.

Teacher: Confirmation of Topic, Demonstration, Planning of Experimentation, Guidance and Correction and Certification.

Experiential Learning (Internships etc.):

Student should choose one of the topics for self-study from the beginning of the seventh semester. A report should be submitted by the end of Eighth Semester.

Suggested topics include: Studies on mangroves / Sacred groves / Campus flora; Cultivation of RET / Fruit / Vegetable / Medicinal plants / Mushroom; Topics related to Social responsibility- River restoration, PBR (People Biodiversity Register) preparation, Herbarium arrangement, VFC (Village Forest Committee), VNRC (Village Natural Resource Committee) formation, Landscaping and Green Auditing.

Field Study / Study Tour:

The plant diversity studies should be carried out with the support of Field Study / Study Tour. During each year there should be a field study of 1-5 days duration, with a minimum of 5 days for the completion of theprogramme.

EVALUATION

External Evaluation:

External assessment by the University level examinations on specified times announced by the University for all the courses, theory, practical and Project/Viva Voce. Each student should go through the evaluation process according to the University Regulations 2021-2022

End Semester Evaluation-Theory:

The components of external evaluation and their unit wise and each theory and practical course and the time of examination will be in accordance with the calendar prepared by

the University for each academic year. At the end of each semester, there will be an examination for theory courses. The duration of examinations for all theory and practical courses in Botany will be three hours, except for the Generic Elective Course papers.

External –Practical:

Practical Courses have external examination for all semester. There will be an external practical examiner and an internal examiner / skilled assistant for every practical examination of three hour duration. The external evaluation should be carried out by the team of examiners.

EXTERNAL – PROJECT / FIELD STUDY / VIVA VOCE

The Project/Field Study/General Viva Voce will be conducted in I/II/III/IV/V/VI/VII/ VIII Semester Practical Examination.

Viva should be based on:

Project work

Experiential Learning (Internships

etc) Field Study

General Learning Activity of four years:

For the external evaluation the components and weightage of Project/Field Study/ Viva Voce can be discussed and determined finally by the Board of Examiners; the suggested components and their weightage is given below. The project viva should be based on the Project and importance should be given to the Scientific method undertaken in that project. The general viva should be on based the changes in the outlook of the student after the learning activity of the 4 year programme, field study and Experiential Learning (Internships etc**.**). Time taken for each practical batch should be 3 hrs, by giving nearly 10-15 minutes for each student. The project/field study/viva voce evaluation should be conducted by external examiners and internal examiner.

ELIGIBILITY TO APPEAR FOR PRACTICAL EXAMINATION

1. 80% Attendance (All Sem.)

2. Certified Bona-fide Record (All Sem.)

3. Herbarium and Field Book (Respective Sem.)

4. Field Study Reports (Respective Sem.)

5. Certified Bona-fide Project Report (Eighth Sem.)

6. Report on Experiential Learning (Internships etc**.**) (EighthSem.)

CONTINUOUS INTERNAL EVALUATION

Internal evaluation is a continuous evaluation in all types of courses- theory**/** practical / Project / Field study. The teacher has flexibility in deciding the components and their weightage in accordance with the University Regulations, 2021-22. Internal evaluation should be verytransparent to the students and the components and relative weightage should be announced at the beginning of each learning activity by the concerned teacher. Internal evaluation should be published in the notice board, one week before the closure of each semester.

INTERNAL –THEORY

The percentile system can be adopted for calculating the internal component, test paper.

Sl. No.	COMPONENTS	WEIGHTAGE
1	Attendance	10
	Test Papers	40
2	Assignment	20
	Seminar	20
	Viva	10

INTERNAL – PRACTICAL

The internal evaluation may be regular internal assessment on hourly basis or unit wise,

whichever is communicated with the student.

Sl. No.	COMPONENTS	WEIGHTAGE
1	Regularity	25
2	Practical Skill- (Sectioning, Drawing, Labeling, Record Keeping Etc)	50
3	Regular Viva/Model Examination	25

INTERNAL - PROJECT/FIELD STUDY/VIVA VOCE

Internal evaluation of the project should start with the beginning of the project and can

be finalized by the project viva.

Sl. No.	COMPONENTS	WEIGHTAGE
1	Participation	50
2	Viva	25
3	Field Study and other Assignment Reports	25

Curriculum Structure for the Undergraduate Degree

Program B.Sc. BOTANY

Total Credits for the Program: 176

Starting year of implementation:

2021-22 Name of the Degree Program: B.Sc.

Discipline/Subject: BOTANY

Program Articulation Matrix:

This matrix lists only the core courses. Core courses are essential to earn the degree in that discipline/subject. They include courses such as theory, laboratory, project, internships etc. Elective courses may be listed separately.

Semester	Title / Name Of the course	Program outcomes that the course addresses (not more than 3 per course)	Pre-requisite course(s)	Pedagogy	Assessments
1	BOT A1 Microbial Diversity and Technology	PO1	---	Ex. MOOC	Quiz
2	BOT A2 Diversity of Non flowering Plants	PO2, PO3	BOT A1	Desk Work	Debate
3	BOT A3 Plant Anatomy and	PO4, PO5	BOT A1 and A2	Problem solving,	

				Book Chapter	
	Developmental Biology				Class work
4	BOT A4 Ecology and Conservation Biology	PO4, PO5	BOT A1 A2 A3	Seminar,	
5.	BOT A5 Plant Taxonomy and Resource Botany	PO6, PO7	BOT A1 A2 A3	Project based learning,	Class work
	BOT A6 Cell Biology and Genetics	PO6, PO7	BOT A6 A1 A2 A3 A4 A5		Seminar
6.	BOT A7 Plant Physiology and Biochemistry	PO6, PO7, PO9	BOT A5	Term paper Assignment,	Project writing
	BOT A8 Plant Biotechnology	PO8. PO9	BOT A5	Group Discussion	Articles writing,
7.	BOT A9 Molecular Biology	PO8, PO9	BOT A6 A8	Research Project Instrumentation	Interpretation of results
	BOT A10 Seed Biology and Seed Technology	PO9, PO10	BOT A5 A8 A9		
	BOT A11 Plant Health Technology	PO9, PO10	BOT A5 A4 A8		

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8.	BOT A12 Medicinal Plants and Phytochemistry	PO9, PO10	BOT A4 A5 A7 A8		
	BOT A13 Bioinformatics and Computational Biology	PO9, PO10	BOT A5 A8 A9		
	BOT A14 Research Methodology	PO9, PO10	BOT A13		

- Pedagogy for student engagement is predominantly lectures. However, other pedagogies enhancing better student engagement to be recommended for each course. The list includes active learning/ course projects/ problem or project based learning/ case studies/self-study like seminar, term paper or MOOC

- Every course needs to include assessment for higher order thinking skills (Applying/ Analyzing/ Evaluating/ Creating). However, this column may contain alternate assessment methods that help formative assessment (i.e. assessment for learning).

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IIA. Model Program Structures for the Under-Graduate Programs in Universities and Colleges in Karnataka Bachelor of Science (Basic/ Hons.) (Botany as Major)

Sem.	Discipline Core (DSC) (L+T+P)	Discipline Elective (DSE) / Open Elective (OE)	Ability Enhancement Compulsory Courses (AECC), Languages (L+T+P)		Skill Enhancement Courses (SEC)		Total Credits
					Skill based (L+T+P)	Value based (L+T+P)	
I	Discipline A 1(6) **Microbial Diversity and Technology** Discipline B 1(5)	OE-1 (3)	L1-1 (3), L2-1(3) (3+1+0 each)		SEC-1: Digital Fluency (2) (1+0+2)	Health and Wellness/ Social & Emotional Learning (2) (1+0+2)	24
II	Discipline A 2(5) **Diversity of non flowering plants** Discipline B 2(6)	OE-2 (3)	L1-2(3), L2-2 (3) (3+1+0 each)	Environmental Studies (2)		Sports/NCC/NSS etc. (2) (1+0+2)	24
Exit option with Certificate (48 credits)						
III	Discipline A 3(6) **Plant Anatomy and Developmental Biology** Discipline B 3(5)	OE-3 (3)	L1-3 (3), L2-3(3) (3+1+0 each)	Constitution of India (2)	SEC-2: Artificial Intelligence (2)(1+0+2)		24
IV	Discipline A 4(5) **Ecology and conservation biology** Discipline B 4(6)	OE-4 (3)	L1-4 (3), L2-4(3) (3+1+0 each)		SEC-3: Cyber Security (2) (1+0+2)	Sports/NCC/NSS etc. (2) (1+0+2)	24
Exit option with Diploma (96 credits)						
Choose any one Discipline as Major, the other as the Minor						
V	Discipline A 5(5) **Plant Taxonomy and resource botany** Discipline A 6(5) **Cell biology and Genetics** Discipline B 5(5)	DSE A-1 (3) **Algal and Fungal Biotechnology**			SEC-3: (2) (2+0+2)	Ethics & Self Aware-ness (2) (1+0+2)	20
VI	Discipline A 7(5) **Plant Physiology and biochemistry** Discipline A 8(5) **Plant Biotechnology** Discipline B 6(5)	DSE A-2 (3) **Herbal Technology**			SEC-4: Professional/ Societal Communication (2)		20
Exit option with Bachelor of Science, B. Sc. Basic Degree (136 credits)						
VII	Discipline A-9(5) **Molecular Biology** Discipline A-10(5) **Seed biology and seed Technology** Discipline A-11(4) **Plant Health Technology.**	DSE A-3 (3) **Plant Propagation and Tissue Culture (3)**					20
VIII	Discipline A-12(4) **Medicinal Plants and Phytochemistry** Discipline A-13(4) **Bioinformatics and Computational Biology** Discipline A-14(3) **Research Methodology**	DSE A-4 (3) **Landscaping, Gardening and Green House Technology**					20
Award of Bachelor of Bachelor of Science Honours, B.Sc. (Hons) degree in a discipline etc. (176 credits)						

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DISCIPLINE CORE PAPERS (DSC)

Sl. No.	Semester Details	Subject	Paper No
1	Semester I	Microbial Diversity and Technology	**A-1**
2	Semester II	Diversity of Non Flowering Plants	**A-2**
3	Semester III	Plant Anatomy and Development Biology	**A-3**
4	Semester IV	Ecology and Conservation Biology	**A-4**
5	Semester V	Plant taxonomy and Resource Botany	**A-5**
		Genetics and Cell Biology	**A-6**
6	Semester VI	Plant Physiology and Biochemistry	**A-7**
		Plant Biotechnology	**A-8**
7	Semester VII	Molecular Biology	**A-9**
		Seed Biology and Seed Technology	**A-10**
		Plant Health Technology	**A-11**
8	Semester VIII	Medicinal Plants and Phytochemistry	**A-12**
		Bioinformatics and Computational Biology	**A-13**
		Research Methodology	**A-14**

CORESPECIFIC ELECTIVE PAPERS (DSE)

Sl No.	Semester Details	Subject: Botany	Credits	Paper No
1	Semester V	**DSE 1:** Algal and Fungal Biotechnology	03	E-1
2	Semester VI	**DSE 2:** Herbal Technology	03	E-2
3	Semester VII	**DSE 3:** Plant Propagation and Tissue Culture	03	E-3
4	Semester VIII	**DSE 4:** Landscaping, Gardening and Green House Technology	03	E-4

BOTANY COURSE OUTCOMES (COs):

At the end of the course the student should be able to:

(Write 3-7 course outcomes. Course outcomes are statements of observable student actions that serve as evidence of knowledge, skills and values acquired in this course)

Semester I (A-1): Microbial Diversity and Technology

1. Understand the fascinating diversity, evolution, and significance of microorganisms.
2. Comprehend the systematic position, structure, physiology and life cycles ofmicrobes and their impact on humans and environment.
3. Gain laboratory skills such as microscopy, microbial cultures, staining, identification, preservation of microbes for their applications in research and industry.

Semester II (A-2): Diversity of Non- Flowering Plants

1. Understand the diversity and affinities among Algae, Bryophytes, Pteridophytes and Gymnosperms.
2. Understand the morphology, anatomy, reproduction and life cycle across Algae, Bryophytes, Pteridophytes and Gymnosperms, and their ecological and evolutionary significance.
3. Obtain laboratory skills/explore non-flowering plants for their commercial applications.

Semester III (A-3): Plant Anatomy and Developmental Biology

1. Observation of variations that exist in internal structure of various parts of a plant and as well as among different plant groups in support for the evolutionary concept.
2. Skill development for the proper description of internal structure using botanical terms, their identification and further classification.
3. Understanding the basic concepts in plant morphogenesis, embryology and organ development.

Semester IV (A-4): Ecology & Conservation Biology

1. Understanding the fundamental concepts in ecology, environmental science and phyto geography.

2. Concept development in conservation, global ecological crisis, Sustainable development and pros and cons of human intervention.

3. Enable the student to appreciate bio diversity and the importance of various conservation strategies, laws and regulatory authorities and global issues related to climate change and sustainable development.

Semester V (A-5): Plant Taxonomy &Resource Botany

1. Ability to identify, classify and describe the plants in scientific terms. Identification of plants using dichotomous keys.

2. Recognition, processing and utilization of economically important plants.

3. Skill development in processing of biomass and plant products as source of food, healthcare, energy and natural products.

Semester V (A-6): Cell Biology & Genetics

1. Identify the basic principles and current trends in classical genetics and Cell biology.

2. Recognize the historical process of the evolution of molecular genetics from classical genetics.

3. Develop theoretical background on molecular genetics to provide a strong support for the student for future research and employability.

Semester VI (A-7): Plant Physiology & Biochemistry

1. Preliminary understanding of the basic functions and intermediary metabolism in a plant body.

2. Awareness on the interdisciplinary nature of botany, chemistry and physics by studying the principles of plant life, growth and reproduction.

3. Recognizing the wonderful mechanism of transport and the Interrelationships existing between metabolic pathways thereby gaining and idea about the importance of plants in the dynamicity of nature.

Semester VI (A-8): PlantBiotechnology

1. Learning of knowledge & skill in plant tissue culture, plant molecular biology and transgenic.

2. Application of plant biotechnology in plant genomics, phylogenetic studies and metabolic engineering.

3. Understanding of new molecular techniques in cell and metabolic manipulations.

Semester VII (A-9): Molecular Biology

1. Understanding the mechanism and concepts of life process at molecular level through central dogma concept.

2. Skill acquiring in the basic molecular biology techniques & characterization of micro- molecules.

3. Acquiring the emerging technology skills in plant genetic engineering & proteomics.

Semester VII (A-10): Seed Biology & Seed Technology

1. Understanding the seed structure and related functions, seed health and productivity.

2. Technology for assessing the seed pathology, purity, and preservation.

3. Learning the field and laboratory protocols ofseed production, certification and quality.

Semester VII (A-11): Plant Health Technology

1. Understanding & learning common diseases & control measures ofplant diseases.

2. Acquiring skills in plant disease diagnosis, control & management through IPM.

3. Learning of new skills in health clinic through biological methods.

Semester VIII (A-13): Medicinal Plants & Phytochemistry

1. Knowledge of Indian system of medicine with regard to medicinal plants.

2. Acquiring skills in identification, cultivation and preservation of medicinalplants.

3. Isolation, identification, characteristics ofactive principles in medicinal plants & drug formulations.

Semester VIII (A-14): Bioinformatics & Computational Biology

1. Learning of basic principles of application, ICT Technology in biological studies & research.

2. Acquiring skill to utilize the computational apps, active data basis and tools in analysis in genetics & proteomics.

3. Learning skills and software used for biological research & process understanding.

Semester VIII (A-15): Research Methodology

1. Understanding the working of science for further application in free, independent, individual needs and in designing scientific experimentation.

2. Acquire knowledge on the principles, components and applications of various scientific equipment inbiology.

3. Foundation knowledge in the basic concepts, components and functions of informatics and the importance of statistical principles in biological research.

Job opportunities in Botany

Exit after ONE Year: Certificate Course

I Sem. -   **A1: Microbial Diversity and Technology**

II Sem. –   **A2: Diversity and Conservation of Non- Flowering plants**

Job opportunities in Botany
Preparation of algal, fungal microbial, bryophyte, pteridophyte, and gymnosperm slides for educational institutions and other line departments (Entrepreneurship).   - Providing algal, fungal microbial, bryophyte, pteridophyte, and gymnosperm materials for educational institutions and other line departments (Entrepreneurship).   - Developing Nursery (Entrepreneurship).   - Nursery supervisor/manager   - Mushroom cultivation (Entrepreneurship).   - Cyanobaterial, algal and microbial culture (Entrepreneurship).   - Fermentation industries. Dairy farming industries. Dairy products industries. Spice Industries (Lichens)   - Quarantine dept., Quality control/analyst, packaging, Lab. assistant

Job opportunities in Botany

Exit After **TWO** Year: **Diploma Course**

I Semester-A3: Plant Anatomy and Developmental Biology

IV Semester-A4: Ecology and Conservation Biology

Job opportunities in Botany
In Addition to one year certificate   • Preparation of Anatomy embryology and Ecological slides for educational institutions and other line departments (Entrepreneurship).   • Providing Anatomy embryology and Ecological materials for educational institutions and other line departments (Entrepreneurship).   • Lab technician   • Garden / nursery supervisor   • Developing his/her own nursery (Entrepreneurship).   • Forest guard, Wild life watch guard.   • Forest nursery (Entrepreneurship).

Job opportunities in Botany

Exit After **THREE** Year: **Degree Course**

    V Semester-A5: Plant Taxonomy and Resource Botany

    V Semester-A6: Genetics and Cell Biology

    VISemester-A7: Plant Physiology and Biochemistry

    VI Semester-A8: Plant Biotechnology

Job opportunities in Botany
In Addition to two year diploma   • Supplying the angiosperm plants and cytological slides to the educational institutions and other line departments (Entrepreneurship).   • Advisor for Health department   • Marketing NTFPs species (Entrepreneurship).   • RFO/ forest officers   • Biochemical Laboratory (Soil, Water, Air testing etc). (Entrepreneurship).   • Adviser to grow advanced crop (Biotech crop).   • Farmer friendly liaison officer.   • Advisor for crop improvement programme.

Job opportunities in Botany

Exit After FOUR Year: Degree Course (Honors)

VII Semester-A9: Molecular Biology

VII Semester-A10: Seed Biology and Seed Technology

VII Semester-A11: Plant Health Technology

VIII Semester-A12: Medicinal Plants and Phytochemistry

VIII Semester-A13: Bioinformatics & Computational Biology

VIII Semester-A14: Research Methodology

Jobs opportunities in Botany
In Addition to three year degree
• Assisting for Ayurvedic doctors.   • Medicinal plants Marketing (Entrepreneurship).   • R & D Botany, Biotechnology, Ayurvedic and Pharmaceutical Lab.   • Laboratory on checking food adulteration (Entrepreneurship).   • Soil and water assessment laboratory (Entrepreneurship).   • Biological material analysis Laboratory(Entrepreneurship).   • Teacher in primary and High Schools.   • Prepare for joining Research institution for Ph.D. programmes.   • Wild life photographer   • Separation and Analyzing phytochemical compounds.   • Seed technician.   • Plant health manager

SUGGESTED DISCIPLINE SPECIFIC ELECTIVE PAPERS (DSE): UG - BOTANY

Srl No	Subject
1.	Aquatic Botany
2.	Bio-analytical techniques.
3.	Stress Biology
4.	Introduction to plant breeding
5.	Biostatistics
6.	Biofuels & Technology
7.	Horticulture post-harvest practices
8.	Reproductive biology of Angiosperms.
9.	Agroforestry
10.	Food Science
11.	Plant Microbe interaction
12.	IPR
13.	Good laboratory practices
14.	Forensic Botany
15.	Botanical garden, landscaping & Greenhouse technology
16.	Herbal Technology
17.	Plant tissue culture
18.	Genetic Engineering in plants and biosafety
19.	Fermentation Technology
20.	Palynology
21.	Organic Farming
22.	Plant Genomics and proteomics
23	Mushroom Cultivation
24	Global Climate Change
25	Dendrology and Arboriculture

I B.Sc., I- Semester DSC-1

Microbial Diversity and Technology

Number of Theory Credits	Number of lecture hours/semester	Number of practical Credits	Number of practical hours / semester
4	56	2	56

Content of Theory Course 1	56 Hrs
Unit –1	15
Chapter No. 1: Microbial diversity-Introduction to microbial diversity; Methods of estimation; Hierarchical organization and positions of microbes in the living world. Whittaker's five-kingdom system and Carl Richard Woese's three-domain system. Distribution of microbes in soil, air, food and water. Significance of microbial diversity in nature	5
Chapter No. 2 History and developments of microbiology-Microbiologists and their contributions (Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Dmitri Iwanowski, Sergius Winogradsky and M W Beijerinck and Paul Ehrlich)	5
Chapter No. 3 Microscopy-Working principle and applications of light, dark field, phase contrast and electron microscopes (SEM and TEM). Microbiological stains (acidic, basic and special) and Principles of staining. Simple, Gram's and differential staining.	5

Unit – 2	15
Chapter No. 4. Culture media for Microbes-Natural and synthetic media, Routine media -basal media, enriched media, selective media, indicator media, transport media, and storage media.	5
Chapter No. 5. Sterilization methods -Principle of disinfection, antiseptic, tyndallisation and Pasteurization, **Sterilization-**Sterilization by dry heat, moist heat, UV light, ionization radiation, filtration. Chemical methods of sterilization- phenolic compounds, anionic and cationic detergents.	5
Chapter No. 6. Microbial Growth-Microbial growth and measurement. Nutritional types of Microbes- autotrophs and heterotrophs, phototrophs and chemotrophs; lithotrophs and organotrophs.	5
Unit – 3	11
Chapter No. 7 Microbial cultures and preservation-Microbial cultures. Pure culture and axenic cultures, subculturing, Preservation methods-overlaying cultures with mineral oils, lyophilisation. Microbial culture collections and their importance. A brief account on ITCC, MTCC and ATCC.	5
Chapter No. 8. Viruses- General structure and classification of Viruses; ICTV system of classification. Structure and multiplication of TMV, SARS-COV-2, and Bacteriophage (T2). Cultivation of viruses. Vaccines and types.	4
Chapter No. 9. Viroids- general characteristics and structure of Potato Spindle Tuber Viroid (PSTVd); Prions - general characters and Prion diseases**.** Economic importance of viruses.	2

Unit – 4	15
Chapter No. 10. Bacteria- General characteristics and classification. Archaebacteria and Eubacteria. Ultrastructure of Bacteria; Bacterial growth and nutrition. Reproduction in bacteria- asexual and sexual methods. Study of *Rhizobium* and its applications. A brief account of Actinomycetes and Cyanobacteria. Mycoplasmas and Phytoplasmas- Generalcharacteristics and diseases. Economic importance of Bacteria.	5
Chapter No. 11. Fungi-General characteristics and classification. Thallus organization and nutrition in fungi. Reproduction in fungi (asexual and sexual). Heterothallism and parasexuality. Type study of *Phytophthora, Rhizopus, Neurospora, Puccinia, Penicillium and Trichoderma***.** Economic importance of Fungi.	6
Chapter No. 12. Lichens – Structure and reproduction. **VAM Fungi** and their significance. **Plant diseases**-Late Blight of Potato, Black stem rust of wheat; Downy Mildew of Bajra, Grain smut of Sorghum, Sandal Spike, Citrus Canker, Root Knot Disease of Mulberry.	4

Text Books
1. Ananthnarayan R and Panikar JCK. 1986. Text book of Microbiology. Orient Longman ltd. New Delhi.
2. Arora DR. 2004. Textbook of Microbiology, CBS, NewDelhi.
3. William CG.1989. Understanding microbes. A laboratory text book for Microbiology. W.H. Freeman and Company. New York.
4. Dubey RC and Maheshwari DK. 2007. A textbook of Microbiology, S. Chand and Company, NewDelhi.
5. Dubey RC and Maheshwari DK. 2002. A Text book of Microbiology, S.C.Chand and Company, Ltd. Ramnagar, New Delhi.
6. Sharma R. 2006. Text book of Microbiology. Mittal Publications. New Delhi. 305pp.
7. Sharma PD. 1999. Microbiology and Plant Pathology. Rastogi publications. Meerut, India.
8. Vasanthkumari R. 2007. A textbook of Microbiology, BI Publications Pvt. Ltd., New Delhi.

References

1. Alexepoulos CJ and Mims CW. 1989. Introductory Mycology, Wiley Eastern Ltd., NewDelhi.
2. Allas RM. 1988. Microbiology: Fundamentals and Applications, Macmillan publishing co. New York.
3. Brook TD, Smith DW and Madigan MT. 1984. Biology of Microorganisms, 4th ed. Eaglewood Cliffts. N.J.Prentice- Hall. New Delhi.
4. Burnell JH and Trinci APJ. 1979. Fungal walls and hyphal growth, Cambridge UniversityPress. Cambridge.
5. Jayaraman J. 1985. Laboratory Manual of Biochemistry, Wiley Eastern Limited. New Delhi.
6. Ketchum PA. 1988. Microbiology, concepts and applications. John Wiley and Sons. New York.
7. Michel J, Pelczar Jr.EC and Krieg CR. 2005. Microbiology, Mc.Graw-Hill, NewDelhi.

8. Powar CB and Daginawala. 1991. General Microbiology, Vol – I and Vol – II Himalaya publishing house,Bombay.
9. Reddy S and Ram. 2007. Microbial Physiology. Scientific Publishers, Jodhpur, 385pp.
10. Sullia SB and Shantharam S. 1998. General Microbiology. Oxford and IBH publishing Co.Pvt.Ltd. New Delhi.
11. Schlegel HG. 1986. General Microbiology. Cambridge. University Press. London, 587pp.
12. Roger S, Ingrahan Y, Wheelis JL, Mark L and Page PR. 1990. Microbial World 5th edition. Prentice-Hall India, Pvt. Ltd. New Delhi.
13. Sullia SB. and Shantharam S. 2005. General Microbiology, Oxford and IBH, NewDelhi.

I B.Sc., I- Semester DSC-1

MICROBIAL DIVERSITY AND TECHNOLOGY

PRACTICALS   Lectures: 56 Hours
                                          (4 Hours/week)

Practical 1: Safety measures in microbiology laboratory and study of equipment/appliances used for microbiological studies (Microscopes, Hot air oven, Autoclave/Pressure Cooker, Inoculation needles/loop, Petri plates, Incubator, LAF, Colony counter, Haemo cytometer, Micrometer etc.).

Practical 2: Enumeration of soil/food /seed microorganisms by serial dilution technique.

Practical 3: Preparation of culture media (NA/PDA) sterilization, inoculation, incubation of *E coli / B. subtilis/* Fungi and study of cultural characteristics.

Practical 4: Determination of cell count by using Haemocytometer and determination of microbial cell dimension by using Micrometer.

Practical 5: Simple staining of bacteria (Crystal violet /Nigrosine blue) / Gram's staining of bacteria.

Practical 6: Isolation and study of morphology of *Rhizobium* from root nodules of legumes

Practical 7: Preparation of spawn and cultivation of paddy straw (Oyster) mushroom.

Practical 8: Study of vegetative structures and reproductive structures - *Albugo, Phytophthora, Rhizopus, Saccharomyces, Puccinia, Agaricus, Lycoperdon, Penicillium,(Depending on local availability)*

Practical 9: Preparation of agar slants, inoculation, incubation, pure culturing and preservation of microbes by oil overlaying.

Practical 10: Study of late blight of Potato, Downy mildew of Bajra, Citrus canker, Tobacco mosaic disease, Sandal spike disease.

Practical 11: Study of well-known microbiologists and their contributions through charts and photographs (As mentioned in theory).

Practical-12: Visit to water purification units/Composting/ microbiology labs/dairy and farms to understand role of microbes in day today life.

(**Note:** Botanical study tour to a floristic rich area for 1-2 days and submission of study report is compulsory)

Time: 2.5 Hours   **Max Marks-** 60

Instructions: Draw neat labelled diagrams wherever necessary

I. Define/Explain any Four of the following: **2X4=8 Marks**

1.
2.
3.
4.
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6.

II. Answer any Four of the following: **5X4=20 Marks**

7.
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III. Answer any Four of the following: **8X4=32 Marks**

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BLUE PRINT OF BOTANY THEORY EXAMINATION
I SEMESTER-BLUE PRINT
MICROBIAL DIVERSITY AND TECHNOLOGY

Time: 2.5 Hours   **Max Marks- 60**

Weightage of Marks				
Units	**2 marks**	**5 marks**	**8 marks**	**Total Mks.**
I	2X2=4	5X2=10	8X1=08	22
II	2X1=2	5X1=05	8X2=16	23
III	2X2=4	5X1=05	8X1=08	17
IV	2X1=2	5X2=10	8X2=16	28
	12 Marks	**30Marks**	**48 Marks**	**90 Marks**

SCHEME OF PRACTICAL QUESTION PAPER

MICROBIAL DIVERSITY AND TECHNOLOGY

Time: 3 Hours   **Max Marks**- 25

I. **Write critical notes on A, B & C**   **3X2=6**
   Marks
   A and B- Microbial Instruments (As mentioned in the syllabus)
   C- Microbiologists (As mentioned in the Syllabus)
   (Identification- 1 mark, Application/Contribution- 1Mark)

II. **Bacterial staining D -Simple / Gram's staining**   **5 Marks**
   (Preparation- 3 Marks Flow chart- 2 Marks)

III. **Prepare a temporary stained slide E of the given material and leave the
        preparation for evaluation.**   **5
                                                                        Marks**

   (Rhizobium, Rhizopus, Saccharomyces, Penicillium)
   (Identification- 1 Mark, Mounting- 2 Marks, Diagram with reasons- 2 Marks)

IV. **Identify the Specimens F & G**   **2X3=6**
   Marks
   (F- Albugo, Phytophthora, Agaricus, Lycoperdon)
   (G - Plant Diseases (As Mentioned in the Syllabus)
    (Identification with Diagram - 2 Marks, Reason – 1Mark

V. **Identify the Permanent Slide J**   **3 Marks**
   (Fungi/Pathology)
   (Identification & Diagram- 2 Marks, reasons- 1 Marks)

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I SEMESTER: PAPER A-1
PRACTICAL QUESTION PAPER
MICROBIAL DIVERSITY AND TECHNOLOGY

Time: 3 Hours   **Max Marks**- 25

I.   Write critical notes on **A, B** & **C**   **6 Marks**

II.   Bacterial staining **D -**Simple / Gram's staining   **5 Marks**

III.   Prepare a temporary stained slide **E** of the given material and leave the preparation for evaluation.   **5 Marks**

IV.   Identify the Specimens **F & G**   **2X3=6 Marks**

V.   Identify the Permanent Slide **J**   **3 Marks**

NOTE: Duly valued, Certified practical record & Submissions/ Assignments/ Tour or field visit reports are compulsorily to be submitted by the student.

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B.Sc. BOTANY: Open Elective Course (OE-1.1)

Semester I
OE-1.1: PLANTS AND HUMAN WELFARE

Course Outcome:

On completion of this course, the students will be able to

1. To make the students familiar with economic importance of diverse plants that offer resources to human life.
2. To make the students known about the plants used as-food, medicinal value and also plant source of different economic value.
3. To generate interest amongst the students on plants importance in day today life, conservation, ecosystem and sustainability.

Number of Theory Credits	Number of lecture hours/semester	Number of practical Credits	Number of practical hours / semester
3	39	0	00

Content of Theory Course OE-1.1: PLANTS AND HUMAN WELFARE	39 Hrs
Unit I	13
Origin of Cultivated Plants. Concept of Centres of Origin, their importance with reference to Vavilov's work. Examples of major plant introductions. Crop domestication and loss of genetic diversity (Only conventional plant breeding methods). Importance of plant bio- diversity and conservation. **Cereals**: Wheat and Rice (origin, evolution, morphology, post-harvest processing & uses).Green revolution. Brief account of millets and their nutritional importance. **Legumes:** General account (including chief pulses grown in Karnataka- red gram, green gram, chick pea, soybean). Importance to man and ecosystem.	
Unit II	13
Cash crops: Morphology, new varieties and processing of sugarcane, products and by-products of sugarcane industry. Natural Rubber –cultivation, tapping and processing. **Spices:** Listing of important spices, their family and parts used, economic importance with special reference to Karnataka. Study of fennel, clove, black pepper and cardamom. **Fruits:** Mango, grapes and Citrus (Origin, morphology, cultivation ,processing and uses) **Beverages:** Tea, Coffee (morphology, processing&uses)	.
Unit III	13
Oils and fats: General description, classification, extraction, their uses and health implications; groundnut, coconut, sunflower and mustered (Botanical name, family & uses). Non edible oil yielding trees and importance as biofuel. Neem oil and applications.	

Essential Oils: General account. Extraction methods of sandal wood oil, rosa oil and eucalyptus oil. Economic importance as medicine, perfumes and insect repellents.
Drug-yielding plants: Therapeutic and habit-forming drugs with special reference to Cinchona, Digitalis, Aloe vera and Cannabis.
Fibers: Classification based on the origin of fibers; Cotton and jute (origin morphology, processing and uses).

Text Books and References

1. Kochhar, S.L. (2012). Economic Botany in Tropics. MacMillan & Co. New Delhi.
2. Wickens, G.E. (2001). Economic Botany: Principles & Practices. The Netherlands: Kluwer Academic Publishers. Netherland.
3. Chrispeels, M.J. and Sadava, D.E. (1994) Plants, Genes and Agriculture. Jones & Bartlett - Publishers. Lincoln, United Kingdom

Pedagogy:

Lectures, Practicals, Field and laboratory visits, Participatory Learning, Seminars, Assignments, specimen submission etc

B.Sc. BOTANY: Open Elective Course (OE-1.2)

Semester I
OE 1.2: BOTANY FOR THE BEGINNERS

Course Outcome:

On completion of this course, the students will be able to

1. To make the students familiar with importance of Botany: plants as natural resources.
2. To make the students known about the plants used as-food, medicinal value and economic value for sustainable development.
3. To generate interest amongst the students to know the importance of plants in day today life, ecosystem restoration.

Number of Theory Credits	Number of lecture hours/semester	Number of practical Credits	Number of practical hours / semester
3	39	0	00

Content of Theory OE 1.2: BOTANY FOR THE BEGINNERS	**39 hrs**
UNIT I: Living World	**13 hrs**.
Origin of Cultivated Plants. Concept of Centres of Origin, their importance with reference to Vavilov's work. Examples of major plant introductions. Crop domestication and loss of genetic diversity (Only conventional plant breeding methods). Importance of plant bio- diversity and conservation. Concept of Living and Non Living: Viruses, Bacteria, Fungi, Plants and Animals; Five kingdom Classification- Classification of plants- Eichler's system – general characters of groups- An introduction to the Life cycle of plants. Cell Structure-Prokaryote and eukaryote	
UNIT II: Morphology of Angiosperms, Origin and Evolution of Life	**13 hrs**
Typical angiosperm plant: Functions of each organ viz. Root, Stem, leaves, inflorescence, flowers, fruit and seed. Flower: Basic structure - essential and non essential whorls. Definition, Ancient Concepts and Modern Concepts. Origin of Life – Geological Time scale – Variation in Hydrosphere, Lithosphere, Atmosphere and Biosphere from Pre Cambrian to Coenozoic era. Darwin's Natural Selection theory and Modern evidences at molecular and organismic level in support of Darwin's theroy	
UNIT III: Interaction between plants and animals	**13 hrs**
General concept on Interaction between plants, microbes and animals. Ecological Significance of Plants – Solar energy fixing Producers, Nitrogen fixation, biofertilisers, biopesticides, Symbiotic relationships-Mutualism, Commensalism, Protoco-operation, Parasitism.	

Plants and Animals for pollination and seed/fruit dispersal- Pollination- Entomophily, Chiropterophily, Myrmecophily Seed Dispersal: Zoochory, Specific case studies on examples for co evolution- Dodo and Calvaria, Butterflies and plants; Wasps and Ficus, mimicking for pollinators.

Medicinal uses of plants – traditional knowledge and scientific knowledge – a brief account

Text Books and References

1. Agarwal, S. K. (2009), Foundation Course in Biology, Ane Books Pvt. Ltd., New Delhi.
2. Datta, A C Class Book of Botany. New Delhi.
3. Mamatha Rao, Microbes and Non flowering plants-impacts and applications, Ane Books, Pvt Ltd, New Delhi.
4. Pandey, B. P. 2001.College Botany, Vol. I: Algae, Fungi, Lichens, Bacteria, Viruses, Plant Pathology, Industrial Microbiology and Bryophyta. S. Chand & Company Ltd, New Delhi.
5. Prithipal Singh (2007), An introduction to Biodiversity. Ane Books India, New Delhi
6. Raven, P.H; Johnson, G.B; Losos, J.B; Singer, S.R (2005), Biology, seventh edition, Tata McGraw Hill, New Delhi
7. Robert A Wallace. Biology: The world of life. Harper Collins Publishers

Pedagogy:

Lectures, Practicals, Field and laboratory visits, Participatory Learning, Seminars, Assignments, specimen submission etc

B.Sc. BOTANY: Open Elective Course (OE-1.3)

Semester I

OE 1.3: MUSHROOM CULTIVATION

Course Outcome:

On completion of this course, the students will be able to

1. To make the students familiar with mushroom cultivation for commercial exploitation.
2. To make the students known about the *Agaricus* (mushroom) used as-food, medicine and economic value for sustainable development.
3. To generate interest amongst the students to know the importance of mushroom in day today life.

Number of Theory Credits	Number of lecture hours/semester	Number of practical Credits	Number of practical hours / semester
3	39	0	00

Content of Theory Course OE 1.3: MUSHROOM CULTIVATION	39 hrs
UNIT-I . Mycology and Mushroom Biology	**13 hrs**.
Five kingdom classification of organisms. Kingdom fungi. General characters of form, function, reproduction and relationship with other organisms. Importance of fungi in human welfare. Morphology (range of form, macro-morphology, micro-morphology), life cycle of a typical mushroom and biological function. Edible, non-edible and poisonous species. Domestication of mushroom. Importance of mushroom in human nutrition, sustainable livelihood, ecosystem function and quality of the environment.	
UNIT II. Applied Mushroom Biology	**13 hrs**
Mushroom cultivation and production. Lab scale, pilot plant and large scale cultivation of commercial species. Crop cycle- spawn, substrate, substrate processing, spawning, spawn run, cropping, harvesting, environment requirement, post harvest practices, shelf life, preservation, storage, transport and marketing. Value-added products of mushroom. Constraints and environment management. Economics of mushroom cultivation. Designs of mushroom facility. Economics of mushroom cultivation and marketing.	
UNIT IV. Mushroom Biotechnology.	**13 hrs**
Concept. Preparation of flavours, appetizers, neutraceuticals, dietary supplements and cosmetics. Mushroom bioremediation. Cleaning of polluted sites. Utilization of mushroom mycelium or enzymes in recycling biological materials. Mycofiltration and applications of the process. Mycorrhiza applications. Biopulping, biobleaching and biotransformations. Biodetergents.	

References.

1. Harandar Singh 1991. Mushrooms: the art of Cultivation. Sterling Publishers.
2. Kaul, T.N.2001. Biology and conservation of Mushrooms. Oxford and IBH
Publishing Company. New Delhi.
3.Tripathi, M. Mushroom Cultivation. Oxford and IBH Publishing Company. New Delhi.
4. Suman B.C. and Sharma V P.2007. Mushroom Cultivation in India. Eastern Book
Corporation. New Delhi.
5. Singh R. and U.C.Singh 2005. Modern Mushroom Cultivation. Agrobios. New Delhi.

Pedagogy:

Lectures, Practicals, Field and laboratory visits, Participatory Learning, Seminars, Assignments, specimen submission etc

Time: 2.5 Hours   **Max Marks**- 60

Instructions: Draw neat labelled diagrams wherever necessary

   I. Define/Explain any Four of the following   **2X4=8 Marks**

1.
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   II. Answer any Four of the following   **5X4=20 Marks**

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   III. Answer any Four of the following   **8X4=32 Marks**

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Time: 2.5 Hours   **Max Marks- 60**

Weightage of Marks				
Units	2 marks	5 marks	8 marks	Total Mks.
I	2X2=4	5X2=10	8X2=16	30
II	2X2=4	5X2=10	8X2=16	30
III	2X2=4	5X2=10	8X2=16	30
	12 Marks	30Marks	48 Marks	90 Marks

I B.Sc., II- Semester DSC-2

Diversity of Non- Flowering Plants

Number of Theory Credits	Number of lecture hours/semester	Number of practical Credits	Number of practical hours/semester
4	56	2	56

Content of Theory Course 2	56Hrs
Unit –1	15
Chapter No. 1 Algae –Introduction and historical development in algology. General characteristics and classification of algae, Diversity- habitat, thallus organization, pigments, reserve food, flagella types, life-cycle and alternation of generation in Algae. Distribution of Algae.	5
Chapter No. 2 Morphology and reproduction and life-cycles of Nostoc, *Oedogonium, Chara, Sargassum and Batrachospermum*. Diatoms and their importance. Blue-green algae-A general account. Algal blooms and toxins.	5
Chapter No. 3 Algal cultivation- Cultivation of microalgae-*Spirulina* and *Dunaliella;* Algal cultivation methods in India. Algal products- Food and Nutraceuticals, Feed stocks, food colorants; fertilizers, aquaculture feed; therapeutics and cosmetics; medicines; dietary fibres from algae and uses.	5

Unit – 2	15
Chapter No. 4. Bryophytes – General characteristics and classification of Bryophytes, Diversity-habitat, thallus structure, Gametophytes and sporophytes.	5
Chapter No. 5 Distribution, morphology, anatomy, reproduction and life-cycles of *Riccia, Anthoceros*, and *Funaria.* Ecological and economic importance of Bryophytes. Fossil Bryophytes.	5
Chapter No. 6. . Pteridophytes- General characteristics and classification; Structure of sporophytes and life-cycles. Distribution, morphology, anatomy, reproduction and life-cycles in *Selaginella*, *Equisetum*, *Pteris* and *Salvinia*.	5
Unit – 3	15
Chapter No. 7 A brief account of heterospory and seed habit. Stelar evolution in Pteridophytes. Affinities and evolutionary significance of Pteridophytes. Ecological and economic importance.	5
Chapter No. 8. Gymnosperms- General characteristics. Distribution and classification of Gymnosperms. Study of the habitat, distribution, habit, anatomy, reproduction and life-cycles in Cycas, Pinus and Gnetum.	5
Chapter No. 9. Affinities and evolutionary significance of Gymnosperms. Economic importance of Gymnosperms - food, timber, industrial uses and medicines.	5

Unit – 4	11
Chapter No. 10. Origin and evolution of Plants: Origin and evolution of plants through Geological Time scale.	2
Chapter No. 11. Paleobotany- Paleobotanical records, plant fossils, Preservation of plant fossils - impressions, compressions, petrification's, moulds and casts, pith casts. Radiocarbon dating.	5
Chapter No. 12. Fossil taxa- *Rhynia, Lepidodendron, Lepidocarpon,Lyginopteris and Cycadeoidea*. Exploration of fossil fuels. Birbal Sahni Institute of Paleosciences.	4

Text Books

1) Chopra, G.L. A text book of Algae. Rastogi & Co., Meerut, Co., New Delhi, Depot.Allahabad.
2) Johri, Lata anf Tyagi, 2012, A Text Book of, Vedam e Books, New Delhi.
3) Sharma, O.P. 1990. Text Book of Pteridophyta. McMillan India Ltd. New Delhi.
4) Sharma, O.P. 1992. Text Book of Thallophytes. McGraw Hill Publishing Co. New Delhi.
5) Sharma, O.P., 2017, Algae Singh-Pande-Jain 2004-05. A Text Book of Botany.Rastogi Publication, Meerut.

References

1. Sambamurty, A.V.S.S.. A Text Book of Algae. I.K. International Private Ltd., New Delhi.
2. Agashe, S.N. 1995. Paleobotany. Plants of the past, their evolution, paleoenvironment and Allied plants. Hutchinson & Co., Ltd., London.
3. Anderson R.A. 2005, Algal cultural Techniques, Elsievier, London.
4. Publication, Application in exploration of fossil fuels. Oxford & IBH., New Delhi.

5. Eams, A.J., (1974) Morphology of vascular plants - Lower groups. Tata Mc Grew- Hill Publishing Co. New Delhi, Freeman & Co., New York.

6. Fritze, R.E. 1977. Structure and reproduction of Algae. Cambridge University Press.

7. Goffinet B and Shaw A.J. 2009, Bryophyte Biology, 2nd ed. Cambridge Unversity Press, Cambridge.Gymnosperms.

8. Srivastava, H N, 2003. Algae Pradeep Publication, Jalandhar, India.

9. Kakkar, R.K. and B.R.Kakkar (1995) The Gymnosperms (Fossils and Living) Central Publishing House, Allahabad.

10. Kumar H. D., 1999, Introductory Phycology, Affiliated East-West Press, Delhi.

11. Lee, R.E., 2008, Phycology, Cambridge Unversity Press, Cambridge. 4th edition.McGraw Hill Publishing Co., New Delhi.

12. Parihar, N.S. 1970. An Introduction to Embryophyta. Vol. I. Bryophyta. Central Book, Allhabad.

13. Parihar, N.S. (1976) An Introduction to Pteridophytes, Central Book Depot, Allhabad.

14. Parihar, N.S. 1977. The Morphology of Pteridophytes. Central Book Depot., Allahabad.Press, Cambridge.

15. Rashid, A. 1998. An Introduction to Pteridophyta. II ed., Vikas Publishing House, New Delhi.

16. Smith, G.M. 1971. Cryptogamic Botany. Vol. II. Bryophytes & Pteridophytes. Tata Tata McGraw Hill Publishing, New Delhi.

17. Smith, G.M. 1971. Cryptogamic Botny. Vol.I Algae & Fungi. Tata McGraw Hill Publishing. New Delhi.

18. Sporne, K.R. 1965. The Morphology of Gymnosperms. Hutchinson & Co., Ltd., London.

19. Stewart, W.M. 1983. Paleobotany and the Evolution of Plants, Cambridge University Cambridge.

20. Sundarajan, S. 1997. College Botany Vol. I. S Chand & Co. Ltd., New Delhi.

21. Vanderpoorten, A. and Goffinet, B. 2009, Introduction to Bryophytes, Cambridge Unversity Press, Cambridge.

22. Vashista, B.R. 1978. Bryophytes. S Chand & Co. Ltd., New Delhi.

Diversity of Non- Flowering Plants

PRACTICALS   **Lectures: 56 Hours**

(4 Hours/week)

Practical-1: Study of morphology, classification, reproduction and lifecycle of

Nostoc.

Practical-2: Study of morphology, classification, reproduction and life-cycle of

*Oedogonium & Chara,*Sargassum, *Batrachospermum/ Polysiphonia*.

Practical-3: Study of morphology, classification, reproduction and life-cycle of

Riccia/Marchantia &Anthoceros.

Practical-4: Study of morphology, classification, anatomy, reproduction and life-cycle of

Selaginella and Equisetum.

Practical -5: Study of morphology, classification, anatomy, reproduction and life-cycle of

Pteris, Azolla..

Practical -6: Study of morphology, classification, anatomy and reproduction

in *Cycas*.

Practical -7: Study of morphology, classification & anatomy, reproduction in

Pinus.

Practical -8: Study of morphology, classification & anatomy, reproduction in

Gnetum.

Practical -9: Study of imporratnt blue green algae causing water blooms in

the lakes.

Practical -10: Study of different methods of cultivation of ferns in a nursery.

Practical -11: Preparation of natural media and cultivation of *Azolla* in artificial ponds.

Practical -12: Media preparation and cultivation of *Spirulina*.

Practical -13: Study different algal products and fossils impressions and slides/Photographs.

Practical-14: Visit to algal cultivation units/lakes with algal blooms/Fern house/ Nurseries/Geology museum/lab to study plant fossils.

(**Note**: Botanical study tour to a floristic rich area for 1-2 days and submission of study report is compulsory)

SCHEME OF BOTANY THEORY EXAMINATION
II SEMESTER
MODEL QUESTION PAPER
DIVERSITY OF NON FLOWERING PLANTS

Time: 2.5 Hours   **Max Marks-** 60

Instructions: Draw neat labelled diagrams wherever necessary

I. Define/Explain any Four of the following: **2X4=8 Marks**

1.
2.
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4.
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6.

II. Answer any Four of the following: **5X4=20 Marks**

7.
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III. Answer any Four of the following: **8X4=32 Marks**

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BLUE PRINT OF BOTANY THEORY EXAMINATION II SEMESTER

DIVERSITY OF NON FLOWERING PLANTS

Time: 2.5 Hours   **Max Marks-** 60

Weightage of Marks			
Units	**2 marks**	**5 marks**	**8 marks**	**Total Mks.**
I	2X2=4	5X2=10	8X1=08	22
II	2X1=2	5X2=10	8X2=16	28
III	2X1=2	5X1=05	8X2=16	23
IV	2X2=4	5X1=05	8X1=08	17
	12 Marks	**30Marks**	**48 Marks**	**90 Marks**

SCHEME OF PRACTICAL QUESTION PAPER
DIVERSITY OF NON- FLOWERING PLANTS

Time: 3 Hours   **Max Marks**- 25

I. Prepare a temporary stained slide of the given material A and leave the preparation for evaluation   `5 Marks

Algae (Nostoc, Oedogonium, Chara, Batrachospermum / Polysiphonia)

(Preparation - 2 Mark, Diagram-1 Marks, Identification with Reasons- 2 Marks)

II.   Identify the given specimens B & C   2X3=6 Marks
 B- Bryophytes (Marchantia and Anthoceros)
 C- Pteridophytes (Selaginella, Equisetum, Pteris , Azolla,)

(Identification- 1 Mark, Diagram with reasons- 2 Marks)

III. Identify the Permanent Slides D, E, F & G   4X2=8 Marks

(One each from Algae, Bryophyte, Pteridophyte and Gymnosperms)

(Identification- 1 Mark, Diagram with Reasons-1 Marks)

IV. Comment on H & I   2X3=6 Marks

 H- Gymnosperm
 I – Fossils

(Identification- 1 Mark, Diagram with Reasons- 2 Marks)

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PRACTICAL QUESTION PAPER

DIVERSITY OF NON- FLOWERING PLANTS

Time: 3 Hours   **Max Marks**- 25

I. Prepare a temporary stained slide of the given material **A** and leave the preparation
    for evaluation   `

                                                                                                                    5 Marks

II.   Identify the given specimens **B &C**   **2X3=6 Marks**

III.   Identify the Permanent Slides **D, E, F & G**   **4X2=8 Marks**

IV.   Comment on **H & I**   **2X3=6 Marks**

**NOTE: Duly valued, Certified practical record & Submissions/ Assignments/ Tour or field
    visit reports are compulsorily to be submitted by the student.**

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PLANT PROPAGATION, NURSERY MANAGEMENT AND GARDENING

Paper Outcome:

On completion of this course, the students will be able to

1. To gain knowledge of gardening, cultivation, multiplication, raising of seedlings of garden plants.
2. To get knowledge of new and modern techniques of plant propagation.
3. To develop interest in nature and plant life.

Number of Theory Credits	Number of lecture hours/semester	Number of practical Credits	Number of practical hours / semester
3	39	0	00

Unit I :Nursery and Vegetative propagation	13
Definition, objectives and scope and general practices and building up of infrastructure for nursery, planning and seasonal activities. Planting - direct seeding and transplants, Soil free/soilless/ synthetic growth mediums for pots and nursery. Air-layering, cutting, selection of cutting, collecting season, treatment of cutting, rooting medium and planting of cuttings. Hardening of plants .Green house, mist chamber, shed root, shade house and glass house.	
Unit II :Gardening	13
Definition, objectives and scope. Different types of gardening - landscape and home/terrace gardening, parks and its components. Plant materials and design. Computer applications in landscaping, Gardening operations: soil laying, manuring, watering, management of pests and diseases and harvesting.	
Unit III: Seed, Sowing/raising of seeds and seedlings	13
Structure and types - Seed dormancy; causes and methods of breaking dormancy. Seed storage: Seed banks, factors affecting seed viability, genetic erosion Seed production technology. Seed testing and certification. Transplanting of seedlings - Study of cultivation of different vegetables and flowering plants: cabbage, brinjal, lady's finger, tomatoes, carrots, bougainvillea, roses, geranium, ferns, petunia, orchids etc. Storage and marketing procedures. Developing and maintence of different types of lawns. Bonsai technique.	

Text Books and References

1. Agrawal, P.K. (1993). Hand Book of Seed Technology. Dept. of Agriculture and Cooperation, National Seed Corporation Ltd. New Delhi.
2. Bose T.K., Mukherjee, D. (1972). Gardening in India. Oxford & IBH Publishing Co. New Delhi.
3. Jules, J. (1979). Horticultural Science, 3rd edition. W.H. Freeman and Co. San Francisco, California.
4. Kumar, N. (1997). Introduction to Horticulture. Rajalakshmi Publications. Nagercoil, Tamil Nadu.
5. Musser E., Andres. (2005). Fundamentals of Horticulture. McGraw Hill Book Co. New Delhi
6. Sandhu, M.K. (1989). Plant Propagation. Walle Eastern Ltd. Bangalore.

Pedagogy:
Lectures, Practicals, Field and laboratory visits, Participatory Learning, Seminars, Assignments, specimen submission etc

Open Elective Course (OE-2.2)

I B.Sc., Semester II

BIO-FUELS

Course Outcome:

On completion of this course, the students will be able to

1. To make the students familiar with Bio-fuel plant species cultivation for commercial exploitation.
2. To make the students known about the Bio-fuel used in automobile industries and solving fuel problems in feature.
3. To generate interest amongst the students to know the importance of Bio-fuel in day today life and economic wellbeing.

Number of Theory Credits	Number of lecture hours/semester	Number of practical Credits	Number of practical hours / semester
3	39	0	00

UNIT-I	**10 hrs**.
Introduction, definition, scope and Importance of Bio-fuel with respect to climate change and environmental issues. Public awareness. Biofuels scenario in India and world. History of Biofuels. Advantages and disadvantages of biofuels. Developmental generation of biofuels: first, second, third and fourth generation of biofuels and present status.	
UNIT II	**16 hrs**
Biofuel feed stocks: Agricultural waste, farm waste, forestry waste, organic wastes from the residential, institutional and industrial waste and its importance.(Biomass-plant, animal and microbial based waste). Algal biofuel. Biodiesel species: *Pongamia pinnata, Simarouba gluca, Jatropha curcas, Azardirachta india, Madhuca indica* and *Callophyllum innophyllum* . Seed harvesting, processing, oil extraction, and characterization.	
UNIT III	**13 hrs**
Introduction to biodiesel, bioethanol, biogas and bio hydrogen. Production technology of biofuels (Biodiesel, ehanol and biogas). Quality analysis of biodiesel, bioethanol and biogas and its comparison with national and international standards. Biofuel sustainability; Biofuel Policy in Karnataka and India. Biofuel production statistics. Fuel against food security concepts.	

Text Books and References

1) The Biodiesel Handbook (2005). Jurgen Krahl, Jon Harlan Van Gerpen.AOCS Press.
2) Bioenergy and Biofuels (2017).Ozcan Konur. CRC Press, Taylor & Franci's group.
3) https://mnre.gov.in/biofuels

Pedagogy:
Lectures, Practicals, Field and laboratory visits, Participatory Learning, Seminars, Assignments, specimen submission etc

Open Elective Course (OE-2.3)

I B.Sc., Semester II

BIOFERTILISERS

Course Outcome:

On completion of this course, the students will be able to

1. To make the students familiar with bio-fertilizer plant species cultivation for commercial exploitation.
2. To make the students known about the bio-fertilizer used in agriculture forming and industries and solving problems erupted by synthetic fertilizer.
3. To generate interest amongst the students to know the importance of bio-fertilizer in day today agricultural practices and economic wellbeing.

Number of Theory Credits	Number of lecture hours/semester	Number of practical Credits	Number of practical hours / semester
3	39	0	00

Content of Theory Course 2.3: BIOFERTILISERS	39 hrs
UNIT-I . General account, isolation and mass multiplication	**13 hrs**.
General account about the microbes used as biofertilizer – Rhizobium – isolation, identification, mass multiplication, carrier based inoculants, Actinorrhizal symbiosis. *Azospirillum:* isolation and mass multiplication – carrier based inoculants, associative effect of different microorganisms. *Azotobacter*: classification, characteristics – crop response to *Azotobacter* inoculum, maintenance and mass multiplication	
UNIT II. Association of Cyanobacteria and Fungi	**13hrs**
Cyanobacteria (blue green algae), *Azolla* and *Anabaena Azollae* association, nitrogen fixation, factors affecting growth, blue green algae and *Azolla* in rice cultivation Mycorrhizal association, types of mycorrhizal association, taxonomy, occurrence and distribution, phosphorus nutrition, growth and yield – colonization of VAM –its influence on growth and yield of crop plants	
UNIT III. Applications of Cyanobacteria and Fungi	**13 hrs**
Organic farming – Green manuring and organic fertilizers, Recycling of biodegradable municipal, agricultural and Industrial wastes – bio-compost making methods, types and method of vermin-composting – field Application.	

Suggested Readings

1. Dubey, R.C., 2005 A Text book of Biotechnology S. Chand & Co, New Delhi.
2. Kumaresan, V. 2005, Biotechnology, Saras Publications, New Delhi.
3. John Jothi Prakash, E. 2004. Outlines of Plant Biotechnology. Emkay Publication, New Delhi.
4. Sathe, T.V. 2004 Vermiculture and Organic Farming. Daya Publishers. New Delhi.
5. Subha Rao, N.S. 2000, Soil Microbiology, Oxford & IBH Publishers, New Delhi.
6. Vayas, S.C, Vayas, S. and Modi, H.A. 1998 Bio-fertilizers and organic Farming Akta Prakashan, Nadiad

PEDAGOGY:

Lectures, Practicals, Field and laboratory visits, Participatory Learning, Seminars, Assignments, specimen submission etc

Time: 2.5 Hours   **Max Marks**- 60

Instructions: Draw neat labelled diagrams wherever necessary

I. Define/Explain any Four of the following   2X4=8 Marks

1.
2.
3.
4.
5.
6.

II. Answer any Four of the following   5X4=20 Marks

7.
8.
9.
10.
11.
12.

III. Answer any Four of the following   8X4=32 Marks

13.
14.
15.
16.
17.
18.

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Time: 2.5 Hours   **Max Marks- 60**

Weightage of Marks				
Units	**2 marks**	**5 marks**	**8 marks**	**Total Mks.**
I	**2X2=4**	**5X2=10**	**8X2=16**	**30**
II	**2X2=4**	**5X2=10**	**8X2=16**	**30**
III	**2X2=4**	**5X2=10**	**8X2=16**	**30**
	12 Marks	**30Marks**	**48 Marks**	**90 Marks**

II B.Sc. III-Semester- DSCC

PLANT ANATOMY AND DEVELOPMENT BIOLOGY

Number of Theory Credits	Number of lecture hours/semester	Number of practical Credits	Number of practical hours / semester
04	56 hours	02	52 hours

Unit	PLANT ANATOMY	Teaching hours
I	**ANGIOSPERM ANATOMY, PLANT CELL STRUCTURE AND TISSUES**	14
	Introduction, objective and scope of Plant Anatomy, Plant cell structure- nature of plant cell wall. *Tissue and tissue systems* - meristematic tissue, permanent tissue and secretary cells. **Classification of meristem:** (apical, intercalary and lateral), primary and secondary meristem. *Apical meristem:* Theories on organization of meristem (apical cell theory, Tunica-Corpus theory, Histogen theory and Korper-Kappe theory). Types of vascular bundles and Vascular cambium, Origin, development, arrangement and diversity in size and shape of leaves.	
II	**ANGIOSPERM ANATOMY**	14
	Structure of Dicot root: primary structure and secondary growth (Sunflower), Structure of monocot root (Maize). **Structure of Dicot stem**: Primary structure and secondary growth (Helianthus annuus), Structure of Monocot stem (Zea mays). **Structure of Dicot leaf:** Primary structure (Helianthus annuus), primary structure of Monocot leaf (Zea mays), Stomatal types. **Anomalous secondary growth:** Boerhaavia (dicot stem) Dracaena (monocot stem) Applications in Systematics, and Pharmacognosy. Forensicbotany.	

III	DEVELOPMENTAL BIOLOGY MORPHOGENESIS AND DIFFERENTIATION	14
	Morphogenesis in plants - Differentiation and cell polarity in acellular (Dictyostelium), Unicellular (Acetabularia) and multicellular system (root hair and stomata formation) **Organogenesis:** Differentiation of root, stem, leaf and axillary bud. Mechanism of leaf primordium initiation, development and Phyllotaxis (Diversity in size and shape of leaves) Root cap, quiescent centre and origin of lateral roots. Transition from vegetative apex into reproductive Developmental patterns at flowering apex: ABC model specification of floral organs. Modification of gene action by growth hormones and cellular differences between floral organs. Senescence - a general account.	
IV	**REPRODUCTIVE BIOLOGY** Introduction, Scope and contributions of Indian embryologists: P. Maheswari, B G L Swamy, B.M Johri, M.S. Swaminathan and K.C. Mehta. **Microsporangium:** Development and structure of mature anther, Anther wall layers, Tapetum -types, structure and functions and sporogenous tissue. **Microsporogenesis**- Microspore mother cells, microspore tetrads, Pollinia. **Microgametogenesis-** Formation of vegetative and generative cells, structure of male gametophyte. Pollen embryosac (Nemec phenomenon). **Megasporangium** - Structure of typical Angiosperm ovule. Types of ovule (Anatropous, Orthotropous, Amphitropous, Hemianatropous, Campylotropous, Circinotropous). **Megagametogenesis-** Types and development of Female gametophyte/embryosac- monosporic- *Polygonum* type, bisporic - *Allium* type, tetrasporic - *Fritillaria* type. Structure of mature embryosac. **Pollination and Fertilization**: Structural and functional aspects of pollen, stigma and style. Post pollination events; Current aspects of fertilization and Significance of double fertilization, Post fertilization changes. **Endosperm** - Types and its biological importance. Free nuclear (*Cocos nucifera*) cellular (*Cucumis),* helobial types. Ruminate endosperm. Study of non-endospermic plants from Podostemaceae, Orchidaceae, Trapaceae. **Embryogenesis** - Structure and development of Dicot (*Capsella bursa* pastoris) and Monocot (Najas), embryo. Polyembryony, Apomixis and Parthenocarpy.	20

Text Books for Reference:

1. Bhojwani and Bhatnagar & Dantu , The Embryology of Angiosperms, 6 Edition 2022-Oxford & IBH, Delhi

2. Bhojwani Sant Saran, 2014.Current Trends in the Embryology of Angiosperms, Woong-Young Soh, Springer Netherlands,

3. Coulter E. G. , 1969. Plant Anatomy - Part I Cells and Tissues - Edward Arnold, London.

4. Dickison, W.C. (2000). Integrative Plant Anatomy, Harcourt Academic Press, USA

5. Eames A. J. - Morphology of Angiosperms - Mc Graw Hill, New York.

6. Esau, K. 1990. Plant Anatomy, Wiley Eastern Pvt Ltd New Delhi

7. Evert, R.F. (2006) Esau's Plant Anatomy: Meristem, Cells, and Tissues of the Plant Body: Their Structure, Function and Development. John Wiley and Sons, Inc

8. Fahn, A.1992. Plant Anatomy, Pergamon Press, USA

9. Johri, B.M. l., 1984.Embryology of Angiosperms, Springer-Verlag, Netherlands.

10.Karp G., 1985. Cell Biology; Mc.Graw Hill Company

11.Maheshwari,P 1950. An introduction to the embryology of angiosperms.
    New York: McGraw-Hill

12.Mauseth, J.D. (1988). Plant Anatomy, the Benjammin/Cummings Publisher, USA.

13. Nair P .K .K - Pollen Morphology of Angiosperms - Scholar Publishing House, Lucknow

14.Pandey, B. P., 1997. Plant Anatomy, S.Chand and Co. New Delhi

15.Raghavan, V., 2000. Developmental Biology of Flowering plants, Springer, Netherlands.

16.Saxena M. R. - Palynology - A treatise - Oxford & I. B .H., New Delhi.

17. Shivanna, K.R., 2003. Pollen Biology and Biotechnology. Oxford and IBH Publishing Co. Pvt.Ltd. Delhi.

18.Vashishta .P.C .,1984. Plant Anatomy - Pradeep Publications – Jalandhar

II B.Sc. III-Semester- DSCC
PLANT ANATOMY AND DEVELOPMENT BIOLOGY
PRACTICALS

LIST OF EXPERIMENTS TO BE CONDUCTED

Practical No. 1

i) Study of meristems (Permanent slides/ Photographs).

ii) Study of Simple Tissues (Parenchyma, Collenchyma and Sclerenchyma) and Complex Tissues (xylem and phloem).

Practical No.2, 3 & 4

Maceration technique to study elements of xylem and phloem, Study of primary structure of dicot root (Cicer), stem (Tridax) and leaf (Datura/Zinnia)) and monocot root (Maize), stem (Grass) and leaf (Grass).

Practical No.5

Anomalous secondary growth: *Boerhaavia* (dicot stem) *Dracaena* (monocot stem)

Practical No. 6

Study of trichomes (any three types) and stomata (any three types) with the help of locally available plant materials

Practical No. 7

Permanent slides of Microsporogenesis and male gametophyte, Mounting of Pollen grains of Grass and Hibiscus and Pollinia of Calotropis

Practical No. 8

Pollen germination by hanging drop method

Practical No. 9

Permanent slides: T.S of Tricarpellary and pentacarpellary ovary, Matured ovule, Placentation types: Axile, Marginal and Parietal types.

Practical No. 10

Mounting of embryo: Tridax /Cyamopsis/Crotolaria, Mounting of endosperm: Cucumis

Practical No. 11 & 12

Mini project work in groups of 3-5 students, from the following list
a) Study of pollen morphology of different flowers with respect to shape, colour, aperture etc.
 b) Pollen germination of different pollen grains and calculate percentage of germination.
c) Calculate the percentage of germination of one particular type of pollen grain collected from different localities/ under different conditions.
d) Study of placentation of different flowers.
e) Any other relevant study related to Anatomy / Embryology

PLANT ANATOMY AND DEVELOPMENTAL BIOLOGY

Time: 3 Hours   **Max Marks- 25**

I. Prepare a temporary stained slide of the given material A. Leave the

    Preparation for evaluation   **5 Marks**

  (Root, Stem, Leaf)

  (Preparation -2 Marks, Identification -1, Diagram with Reasons- 2Marks)

II. Identify the given slides B, C & D   **3X3=9 Marks**

  (**B** from Tissues, **C** from Anatomy, **D** from Embryology)

  (Identification-1 Mark, Diagram with reasons - 2 Marks)

III. Mount the material E   **3 Marks**

  (Pollen grain/Stomata/Trichomes)

  (Mounting - 2 Mark, Diagram with Reasons-1 Marks)

IV. Pollen germination of F by hanging drop method.   **5 Marks**

  (Preparation - 3 Marks, Procedure-2 Marks)

V. Mount the material of G   **3 Marks**

  (Endosperm / Embryo)

Time: 2 Hours   **Max Marks- 60**

Instructions: Draw neat labelled diagrams wherever necessary

I. Define/Explain any Four of the following: **2X4=8 Marks**

 1.

 2.

 3.

 4.

 5.

 6.

II. Answer any Four of the following: **5X4=20 Marks**

 7.

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 11.

 12.

I1I Answer any Four of the following: **8X4=32 Marks**

 13.

 14.

 15.

 16.

 17.

 18.

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BLUE PRINT OF BOTANY THEORY EXAMINATION

III SEMESTER

PLANT ANATOMY AND DEVELOPMENTAL BIOLOGY

Time: 2.5 Hours   **Max Marks-** 60

UNITS	2 marks	5 marks	8 marks	Total Marks
I	2X1=2	5X2=10	8X1=08	**20**
II	2X1=2	5X1=5	8X2=16	**23**
III	2X2=4	5X1=5	8X1=08	**17**
IV	2X2=4	5X2=10	8X2=16	**30**
	12 Marks	**30Marks**	**48 Marks**	**90**

Open Elective Course (OEC - 3)

Community Forestry

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures / Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
OEC-3.1	OEC	Theory	03	03	42 hrs	2 hrs	40	60	100

Learning outcomes:

After completion of the course, the students will be able to;

- Understand community forestry and its conservation

- Examine the use of trees and community forestry

- Interpret the role of indigenous / tribal people in conservation of forest

- Examine the role of various community forestry conservation programs

- Measure the different properties of trees such as wood volume, age, height, volume etc.

Keywords:
Community forestry, Commercial forestry, Conservation Land uses, Timber harvesting

Unit I   **14 lectures**

Defining community forestry and conservation, Indigenous community-based forestry systems and their changes, Case studies of indigenous forest management systems: India., History of commercial forestry in India, Diseases of commercial forestry, maintenance of forests, Protection form fire, illicit felling, Measurement of Trees- Height, girth, wood density, wood quality, clear and selective felling.

Unit II   **14 lectures**

Role of community forestry in Environmental conservation, Water shed management, soil management and poverty reduction, Trees as a forest management tool managing vegetation to modify climate, soil conditions & ecological processes, Social considerations on land-uses.

Unit III   **14 lectures**

State-sponsored community forestry and conservation programs, Changing paradigms in forestry and environmental conservation, Community-managed commercial timber harvesting. Community based forestry and collaborative conservation in India, factors contributing to the rise of community forestry, Role of tribes in Forest and management.

Suggested Reading

1. Agrawal, A and C.C. Gibson. (2001). Introduction: The Role of Community in Natural Resource Conservation. In: Agrawal, A and C. C. Gibson (eds).Communities and the Environment. NJ: Rutgers University Press

2. Mosse, D.(2001).'People's knowledge', participation and patronage: operations and representations in rural development. In: Cook, B & Kothari, U (eds), Participation the newtyranny? Zed Press

3. Ong, C.K. & Huxley, P.K. (1996). Tree Crop Interactions–A Physiological Approach. ICRAF.

4. Robinson, D. (2018). The Economic Theory of Community Forestry (Routledge Explorations in Environmental Economics) Routledge.

5. Sagreiya, K.P. (1979). Forests and Forestry. National Book Trust, India, New Delhi, P1-307.

B.Sc. BOTANY – III Semester

Open Elective Course (OEC - 3)

Algal Cultivation and Applications

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures / Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
OEC-3.2	OEC	Theory	03	03	42 hrs	2 hrs	40	60	100

Learning outcomes:

On completion of this course, the students will be able to;
• Understand core concepts and fundamentals of various levels of algal growth
• Translate various algal technologies for benefit of ecosystem
• Demonstrate algal growth in different types of natural water.
• Analyze emerging areas of Algal Biotechnology for identifying commercial potentials of algal products & their uses.

Keywords:
Culture techniques, Algal growth, Algal blooms, Eutrophication, Algal immobilization, Biofertilizers, Pollution indicators

Unit I   **14 lectures**
A brief account of culture techniques and media for algal research. Measurement of algal growth: lag phase, log phase, stationary phase and death phase using biomass, chlorophyll content. Limits to algal growth in natural waters. Dynamics and consequences of marine & freshwater algal blooms;

Unit II   **14 lectures**
Causative factors for eutrophication and its impact on algal blooms. Algal immobilization: methods and applications, Algal technologies for the restoration/maintenance of soil fertility; reclamation of usar soils. Restoration of degraded aquatic systems through algae; High rate algal ponds for the treatment of wastewaters for the production of useful biomass & fuels.

Unit III   **14 lectures**

Emerging areas of Algal Biotechnology: Single cell proteins, bio-fertilizers, Algae as food, medicine, feed, Biofuel, industrial products such as phyco-colloid (Agar-agar, Algin, Carrageenan, Diatomite); A brief account of commercial potentials of algal products & theiruses. Algae as indicators of pollution. Biofouling, Sewage disposal.Waste-land reclamation. Use of Algae in experimental studies. Algae in space. Algal toxins.

Suggested Readings

1. Hoek, C. and Van D. (2009) Algae: An Introduction to Phycology. Cambridge University Pres

2. Bast, F. (2014). An Illustrated Reviewon Cultivation and Life History of Agronomically Important Seapl ants. In Seaweed: Mineral Composition, Nutritional and Antioxidant Benefits and Agricultural Uses, Eds. Vitor Hugo Pomin, 39-70. Nova Publishers, New York ISBN:978-1-63117-571-8

3. Kumar, H.D.(1999). Introductory Phycology. Affiliated East-West Press, Delhi

4. Sahoo, D. (2000). Farming the ocean: seaweeds cultivation and utilization. Aravali International, NewDelhi.

5. Bast, F. (2014). Seaweeds: Ancestors of land plants with rich diversity. Resonance,19 (2)1032-1043*ISSN*:0971-8044

B.Sc. BOTANY – III Semester
Open Elective Course (OEC - 3)
Landscaping and Gardening

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures / Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
OEC-3.3	OEC	Theory	03	03	42 hrs	2 hrs	40	60	100

Learning outcomes:

After the completion of this course the learner will be able to:
• Apply the basic principles and components of gardening
• Conceptualize flower arrangement and bio-aesthetic planning
• Design various types of gardens according to the culture and art of bonsai
• Distinguish between formal, informal and free style gardens
• Establish and maintain special types of gardens for outdoor and indoor land scaping

Keywords:
Gardening, Landscaping, Flower arrangement, Vertical gardens, Roof gardens, Computer aided designing

Unit I   **14 lectures**
Principles of gardening, garden components, adornments, lawn making, methods of designing rockery, water garden, etc. Special types of gardens, their walk-paths, bridges, constructed features. Green house. Special types of gardens, trees, their design, values in land scaping, propagation, planting shrubs and herbaceous perennials. Importance, design values, propagation, plating, climbers and creepers, palms, ferns, grasses and cacti succulents.

Unit II   **14 lectures**
Flower arrangement: importance, production details and cultural operations, constraints, post-harvest practices. Bio-aesthetic planning, definition, need, round country planning, urban planning and planting avenues, schools, villages, beautifying railway stations, dam sites, hydroelectric stations, colonies, river banks, planting material for play grounds.

Unit III   **14 lectures**

Vertical gardens, roof gardens. Culture of bonsai, art of making bonsai. Parks and public gardens. Land scape designs, Styles of garden, formal, informal and freestyle gardens, types of gardens, Urban land scaping, Land scaping for specific situations, institutions, industries, residents, hospitals, road sides, traffic islands, dam sites, IT parks, corporate. Establishment and maintenance, special types of gardens, Bio-aesthetic planning, eco-tourism, indoor gardening, therapeutic gardening, non-plant components, water-scaping, xeri-scaping, hardscaping; Computer Aided Designing (CAD) for outdoor and indoor scaping Exposure to CAD (Computer Aided Designing)

Suggested Readings

1. Berry, F. and Kress, J. (1991). Heliconia: An Identification Guide. Smithsonian Books

2. Butts, E. and Stensson, K. (2012). Sheridan Nurseries: One hundred years of People, Plans, and Plants. Dundurn Group Ltd.

3. Russell, T.(2012). Nature Guide: Trees: The world in your hands (Nature Guides).

II B.Sc. IV SEMESTER

Ecology and Conservation Biology

Number of Theory Credits	Total Lecture Hours/Semester	Number of Practical Credits	Total Practical hours/Semester
04	56	02	56

Contents of Theory Course		
Unit	Topics	Teaching Hours
I	**Introduction to Ecology and Conservation Biology:** Definitions, Principles of Ecology, Brief History, Major Indian Contributions, Scope and importance. Ecological levels of organisation. **Ecological factors:**Climatic factors:light, temperature, precipitation and humidity. **Edaphic factors**:Soil and its types, soil texture, soil profile, soil formation; physico-chemical properties of soil - mineral particle, soil pH, soil aeration, organic matter, soil humus and soil microorganisms. Topographic Factors: Altitude **Ecological groups of plants and their adaptations:**Morphological and anatomical adaptations of hydrophytes, xerophytes, epiphytes and halophytes.	15 hrs
II	**Ecosystem Ecology:** Introduction,types of ecosystems with examples -terrestrial and aquatic, natural and artificial. Structure of ecosystem: Biotic and Abiotic components, detailed structure of a pond ecosystem. Ecosystem functions and processes: Food chain-grazing and detritus; Food web. Ecological pyramids -Pyramids of energy, biomass and number. Principles of Energy flow in ecosystem. Bio-geo chemical cycles: Gaseous cycles -carbon and nitrogen, Sedimentary cycle- Phosphorus. Ecological succession: Definition, types- primary and secondary. General stages of succession. Hydrosere and xerosere. **Community Ecology:** Community and its characteristics – frequency, density, Abundance, cover and basal area, phenology, stratifications, life-forms. Concept of Ecotone and Ecotypes. Intra-specific and Inter-specific interactions with examples. **Ecological methods and techniques:** Methods of sampling plant communities – transects and quadrates. Remote sensing as a tool for vegetation analysis, land use – land cover mapping. **Population Ecology:** Population and its characteristics – Population density, natality, mortality, age distribution, population growth curves and dispersal.	15 hrs

III	**Phytogeography and Environmental issues:** Theory of land bridge, theory of continental drift, polar oscillations and glaciations. Centre of origin of plant – Vavilov's concept, types. Phytogeographical regions – concept, phytogeographical regions of India. Vegetation types of Karnataka – Composition and distribution of evergreen, semi-evergreen, deciduous, scrub, mangroves, shoal forests and grasslands. An account of the vegetation of the Western Ghats. Pollution: Water pollution: Causes, effect, types; water quality indicators, water quality standards in India, control of water pollution (Waste water treatment). Water pollution disasters – National mission on clean Ganga ,Minimata, Pacific gyre garbage patch, Exxon valdez oil spill. Air pollution: Causes, effect, air quality standards, acid rain, control. Soil pollution: Causes, effect, solid waste management, control measures of soil pollution.		11hrs
IV	**Biodiversity and its conservation:** Biodiversity: Definition, types of biodiversity - habitat diversity, species diversity and genetic diversity, Global and Indian species diversity. SDG's in biodiversity conservation. Values of Biodiversity – Economic and aesthetic value, Medicinal and timber yielding plants. NTFP. Threats to biodiversity. Concept of Biodiversity Hotspots, Biodiversity hot spots of India. Concept of endemism and endemic species. ICUN plant categories with special reference to Karnataka/ Western Ghats. Biodiversity Conservation- Indian forest conservation act, Biodiversity bill (2002). Conservation methods – *In-situ* and *ex-situ*methods *In-situ*methods –Biosphere reserves, National parks, Sanctuaries, Sacred grooves. *Ex-situ*methods-Botanical gardens, Seed bank, Gene banks, Pollen banks, Culture collections, Cryopreservation.		15 hrs

SUGGESTED REFERENCE BOOKS:

1. Sharma, P.D. 2018. Fundamentals of Ecology. Rastogi Publications.
2. Odum E.P. (1975): Ecology By Holt, Rinert& Winston.
3. Oosting, H.G. (1978): Plants and Ecosystem Wadworth Belmont.
4. Kochhar, P.L. (1975): Plant Ecology. (9th Edn.,) New Delhi, Bombay, Calcutta-226pp.,
5. Kumar, H.D. (1992): Modern Concepts of Ecology (7th Edn.,) Vikas Publishing Co., New Delhi.
6. Kumar H.D. (2000): Biodiversity & Sustainable Conservation. Oxford & IBH Publishing Co Ltd. New Delhi.
7. Newman, E.I. (2000): Applied Ecology, Blackwell Scientific Publisher, U.K.
8. Chapman, J.L&M.J. Reiss (1992): Ecology (Principles & Applications). Cambridge University Press, U.K.
9. Malcolm L. Hunter Jr., James P. Gibbs, Viorel D. Popescu, 2020. Fundamentals of Conservation Biology, 4th Edition. Wiley-Blackwel.

10. Saha T. K., 2017. Ecology and Environmental Biology. Books and Allied Publishers.

Ecology and Conservation Biology

PRACTICALS

LIST OF EXPERIMENTS TO BE CONDUCTED

Practical No.	Experiments
1	Determination of pH of different types of Soils, Estimation of salinity of soil/water samples.
2	Study of Ecological instruments – Wet and Dry thermometer, Altimeter, Hygrometer, Soil thermometer, Rain Gauge, Barometer, etc
3	Hydrophytes: Morphological adaptations in *Pistia, Eichhornia, Hydrilla, Nymphaea.* Anatomical adaptations in *Hydrilla*(stem) and *Nymphaea* (petiole).
4	Xerophytes: Morphological adaptations in *Asparagus, Casuarina, Acacia, Aloe vera, Euphorbiatirucalli.* Anatomical adaptations in phylloclade of *Casuarina* .
5	Epiphytes: Morphological adaptations in *Acampe, Bulbophyllum, Drynaria.*Anatomical adaptations in epiphytic root of *Acampe/ Vanda.* Halophytes: study of Viviparyin mangroves, Morphology and anatomy of Pneumatophores.
6	Study of a pond/forest ecosystem and recording the different biotic and abiotic components
7	Demonstration of different types of vegetation sampling methods – transects and quadrats. Determination of Density and frequency.
8	Application of remote sensing to vegetation analysis using satellite imageries
9	Field visits to study different types of local vegetations/ecosystems and the report to be written in practical record book.
10	Determination of water holding capacity of soil samples
11	Determination of Biological oxygen demand (BOD)
12	Determination of Chemical oxygen demand (COD)
13	Determination of soil texture of different soil samples.

SCHEME OF BOTANY PRACTICAL EXAMINATION
IV-Semester
ECOLOGY AND CONSERVATION BIOLOGY

Time: 3 Hours   **Max Marks- 25**

I. Conduct the experiment A.   **6 Marks**
 (COD/Water holding capacity of soil/Salinity of soil/Water sample)
(Requirements - 1Mark, Procedure -3 marks, Result - 2Marks)

II. Write the ecological adaptations of B & C   **2X3=6 Marks**
(Hydrophytes, Xerophytes, Epiphyte, Halophyte, Parasite)
(Identification-1 Mark, Diagram with reasons - 2 Marks)

III. Prepare a temporary stained slide of the given material D. Leave the
 preparation for evaluation.   **5 Marks**
(Hydrilla/Nymphaea/Casuarina/Orchid root)
(Mounting -2 Mark, Identification-1,Diagram with Reasons-2 Marks)

IV. Comment on E (Ecological instruments)   **3 Marks**
(Instruments studied in Practicals)

V. Identify the slides/Chart F & G   **2 X 2.5=5 Marks**
(One from adaptations, One from Quadrants/Remote sensing of Satellite image)

ECOLOGY AND CONSERVATION BIOLOGY

Time: 2.5 Hours   **Max Marks- 60**

Units	2 marks	5 marks	8 marks	Total Marks.
I	2X1=2	5X1=05	8X2=16	23
II	2X2=4	5X2=10	8X1=08	22
III	2X2=4	5X2=10	8X1=08	22
IV	2X1=2	5X1=05	8X2=16	23
	12 Marks	**30Marks**	**48 Marks**	**90 Marks**

SCHEME OF BOTANY THEORY EXAMINATION
IV- SEMESTER
ECOLOGY AND CONSERVATION BIOLOGY

Time: 2 Hours   **Max Marks- 60**

Instructions: Draw neat labelled diagrams wherever necessary

I.   Define/Explain any Four of the following: **2X4=8 Marks**

1.

2.

3.

4.

5.

6.

II.   Answer any Four of the following: **5X4=20 Marks**

7.

8.

9.

10.

11.

12.

III. Answer any Four of the following: **8X4=32 Marks**

13.

 14.

15.

16.

17.

18.

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B.Sc. BOTANY – IV Semester

Open Elective Course

Plant Diversity and Human Welfare

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures / Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
OEC - 4.1	OEC	Theory	03	03	42 hrs	2 hrs	40	60	100

Learning outcomes:

After the completion of this course, the learner will be able to:

- Develop understanding of the concept and scope of plant biodiversity

- Identify the causes and implications of loss of biodiversity

- Apply skills to manage plant biodiversity

- Utilize various strategies for the conservation of biodiversity

- Concept ualize the role of plants in human welfare with special reference to India

Keywords:

Biodiversity, Biodiversity loss, Hotspots, Biodiversity management, Conservation strategies, Biodiversity awareness programmes

Unit I: Plant Diversity and its Scope   14 lectures

Levels of biodiversity: Genetic, Species and Ecosystem; Agro-biodiversity and cultivated plant taxa and related wild taxa. Values and uses of Biodiversity, Methodologies for valuation, Ethical and aesthetic values, Uses of plants; Ecosystem services.

Unit II: Loss of Biodiversity and Management of Plant Biodiversity

14 lectures

Loss of biodiversity-causes and implications, Hotspots of biodiversity, extinction of species, projected scenario for biodiversity loss. Organizations associated with biodiversity management, IUCN, UNEP, WWF, UNESCO, NBPGR; Methodology for execution; Biodiversity legislation; Information management and communication.

Unit III: Conservation of Biodiversity, Role of Plants in Relation to Human Welfare
14 lectures

Conservation of genetic, species and ecosystem diversity, *In situ* and *ex situ* conservation strategies, India's biodiversity and its conservation Social approaches to conservation, Biodiversity awareness programmes, Sustainable development. Importance of forestry their utilization and commercial aspects; Avenue trees; Ornamental plants of India; Alcoholic beverages; Fruits and nuts; Wood and its uses; their commercial importal,

Suggested Readings

1. Krishnamurthy, K.V. (2004).An Advanced Text Book of Biodiversity-Principles and Practices. Oxford and IBH Publications Co. Pvt. Ltd. New Delhi.

2. Singh, J. S., Singh, S.P. and Gupta, S.(2006). Ecology Environment and Resource Conservation. Anamaya Publications, New Delhi, India.

3. Reddy, K.V. and Veeraiah, S. (2010). Biodiversity and Plant Resources. Aavishkar publication, New Delhi.

4. Heywood, V.H. and Watson, R.T.(1995). Global biodiversity and Assessment. Cambridge University Press.

Open Elective Course

Medicinal Plants in Health Care

Cours e No.	Type of Cours e	Theory / Practical	Credit s	Instruction hour per week	Total No. of Lectures / Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
OEC-4.2	OEC	Theory	03	03	42 hrs	2 hrs	40	60	100

Learning outcomes:

On completion of this course, the students will be able to:

- Recognize the basic medicinal plants

- Apply techniques of conservation and propagation of medicinal plants.

- Setup process of harvesting, drying and storage of medicinal herbs

- Propose new strategies to enhance growth of medicinal herbs considering the practical issues pertinent to India

Keywords:

Medicinal plants, Traditional systems, endangered medicinal plants, Ethnobotany, Folk medicines, Ethnic communities

Unit I: History and Traditional System of Medicine   14 lectures

History, Scope and Importance of Medicinal Plants; Traditional systems of medicine; Definition and Scope.

Ayurveda: History, origin, panchamahabhutas, saptadhatu and tridosha concepts, 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 II: Conservation, Augmentation and Ethnobotany and
Folk Medicine   14 lectures

Conservation of Eendemic and endangered medicinal plants, Red list criteria; *In situ* conservation: Biosphere reserves, sacred groves, National Parks; *Ex situ* conservation: Botanic Gardens, Ethnomedicinal plant Gardens.

Propagation of Medicinal Plants: Objectives of the nursery, its classification, important components of a nursery, sowing, pricking, use of greenhouse for nursery production, propagation through cuttings, layering, grafting and budding.

Ethnobotany and Folk medicines. Definition; Ethnobotany in India: Methods to study ethnobotany; Applications of Ethnobotany: National interacts, Palaeo-ethno-botany. Folk medicines of ethnobotany, ethnomedicine, ethnoecology, ethnic communities of India.

Unit III Medicinal Plants   **14 lectures**

Brief description of selected plants and derived drugs, namely Guggul (*Commiphora*) for hypercholesterolemia, *Boswellia* for inflammatory disorders, Arjuna (*Terminalia arjuna*) for cardioprotection, turmeric (*Curcuma longa*)f or wound healing, antioxidant and anticancer properties, Kutaki (*Picrorhiza kurroa*) for hepatoprotection, Opium Poppy for analgesic and antitussive, Salix for analgesic, Cincona and Artemisia for Malaria, Rauwolfia as tranquilizer, Belladona as anticholinergic, Digitalis as cardiotonic, Podophyllum as antitumor.

Suggested Readings:

1. Akerele, O., Heywood, V. and Synge, H. (1991). The Conservation of Medicinal Plants. Cambridge University Press.
2. AYUSH (www.indianmedicine.nic.in). About the systems—An overview of Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homeopathy. New Delhi: Department of Ayurveda, Yogaand Naturopathy, Unani, Siddha and Homoeopathy (AYUSH), Ministry and Family Welfare, Government of India.
3. CSIR- Central Institute of Medicinal and Aromatic Plants, Lucknow (2016). *Aush Gyanya*: Handbook of Medicinal and Aromatic Plant Cultivation.
4. Dev, S. (1997). Ethno-therapeutics and modern drug development: The potential of Ayurveda. *Current Science* 73:909–928.
5. Evans, W.C. (2009). Trease and Evans Pharmacognosy, 16[th]edn. Philadelphia, PA: Elsevier Saunders Ltd.
6. Jain, S.K. and Jain, Vartika. (eds.) (2017). Methods and Approaches in Ethnobotany: Concepts, Practices and Prospects. Deep Publications, Delhi
7. Kapoor, L.D. (2001). Handbook of Ayurvedic medicinal plants. Boca Raton, FL: CRC Press.
8. Saroya, A.S. (2017). Ethnobotany. ICAR publication.
9. Sharma, R.(2003). Medicinal Plants of India-An Encyclopaedia. Delhi: Daya Publishing House.
10. Sharma, R. (2013) Agro Techniques of Medicinal Plants. Daya Publishing House, Delhi.
11. Thakur, R.S., H.S. Puri, and Husain, A.(1989). Major medicinal plants of India. Central Institute of Medicinal and Aromatic Plants, Lucknow, India.

B.Sc. BOTANY – IV Semester

Open Elective Course (OEC - 4)

Floriculture

Cour se No.	Type of Cours e	Theory / Practical	Credit s	Instruction hour per week	Total No. of Lectures / Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
OEC - 4.3	OEC	Theory	03	03	42 hrs	2 hrs	40	60	100

Learning outcomes:

After completing this course the learner will be able to;

- Develop conceptual understanding of gardening from historical perspective

- Analyze various nursery management practices with routine garden operations.

- Distinguish among the various Ornamental Plants and their cultivation

- Evaluate garden designs of different countries

- Appraise the landscaping of public and commercial places for floriculture.

- Diagnoses the various diseases and uses of pests for ornamental plants.

Keywords:
Gardening, Transplanting, Mulching, Plant growth regulators, Ornamental plants, Commercial floriculture

Unit I   14 lectures

Introduction: Importance and scope of floriculture and landscape gardening. Nursery Management and Routine Garden Operations: 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 II   14 lectures

Ornamental Plants: Flowering annuals; Herbaceous perennials; Divine vines; Shade and ornamental trees; Ornamental bulbous and foliage plants; Cacti and succulents; Palms and Cycads; Ferns and fern allies; Cultivation of plants in pots; Indoor gardening; Bonsai. Principles of Garden Designs: English, Italian, French, Persian, Mughal and Japanese gardens; Features of a garden (Garden wall, Fencing, Steps, Hedge, Edging, Lawn, Flowerbeds, Shrubbery, Borders, Water-garden. Some Famous gardens of India.

Floriculture and green house technology. Commercial aspects and exporting of flowers and ornamental plants. Quranatine and testing requirements.

Unit III   **14 lectures**
Landscaping Places of Public Importance: Landscaping highways And Educational institutions. Commercial Floriculture: 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, Gladiolus, Marigold, Rose, Lilium, Orchids). Diseases and Pests of Ornamental Plants.

Suggested Readings

1.   Randhawa, G.S. and Mukhopadhyay, A. (1986).Floriculture in India. Allied Publishers.

2.   Adams, C., M. Early and J. Brrok (2011). Principles of Horticulture. Routledge, U.K