

**JSS COLLEGE OF ARTS, COMMERCE AND
SCIENCE
(AUTONOMOUS)
Ooty road, Mysore - 570025.**



DEPARTMENT OF BOTANY

**SCHEMATIC SYLLABUS UNDER
CHOICE BASED CREDIT SYSTEM
(CBCS)**

w.e.f.

2017-2018

Semester	Title of the paper	Duration for teaching hours / week		No. of credits			Total credit	Total Hours/ sem		Continuous assessment						Duration for exam	
		T	P	L	T	P		C ₁ (15)		C ₂ (15)		C ₃ (70%)		T	P		
								T	P	T	P	T	P			T	P
I	BIODIVERSITY OF MICROBES AND ARCHEGONIATE	04	04	4	-	2	06	60	60	10	05	10	05	70	70	3	4
II	PLANT ECOLOGY MORPHOLOGY AND TAXONOMY	04	04	4	-	2	06	60	60	10	05	10	05	70	70	3	4
III	PLANT ANATOMY AND EMBRYOLOGY	04	04	4	-	2	06	60	60	10	05	10	05	70	70	3	4
IV	PLANT PHYSIOLOGY AND METABOLISM	04	04	4	-	2	06	60	60	10	05	10	05	70	70	3	4
V	Discipline specific elective																
	CELL AND MOLECULAR BIOLOGY OR ECONOMIC BOTANY AND BIOTECHNOLOGY	04	03	4	-	1.5	5.5	60	60	10	05	10	05	70	70	3	4
	Skill enhancement course																
	ETHNOBOTANY OR FLORICULTURE	02	-	2	-	-	02	30	-	15	-	15	-	50	-	2	-
VI	Discipline specific elective																
	GENETICS PLANT BREEDING OR ANALYTICAL TECHNIQUES AND PLANT SCIENCES	04	03	4	-	1.5	5.5	60	60	10	05	10	05	70	70	3	4

TOTAL CREDITS = 37

Practical=70 marks(50marks For Practical Exam Proper,10marks For Record,10marks for submission of specimens /photographs)

DEPARTMENT OF BOTANY
JSS COLLEGE, OOTY ROAD, MYSORE-25
(AUTONOMOUS)
PROCEEDINGS –BOS MEETING
SUBJECT: BOTANY

The Board of studies meeting in Botany was held on 24.02.2018 at 11.00 am in the Department of Botany, JSS College, Ooty Road, Mysore-25.

The chairman of the BOS welcomed all the esteemed members of the board.

As per the instructions given by the Principal, the BOS meeting was conducted and the following matters were thoroughly discussed.

Agenda

1. Review of syllabus and thorough revision of Horticulture syllabus
2. Additional reference books if any
3. Approval of panel of examiners
4. Any other subject relevant to academics

Resolutions

1. The board has reviewed and suggested the amendments and minor changes to be incorporated in the syllabi of Botany and add on course in Horticulture, effective from 2018-2019 onwards. Horticulture syllabus has been thoroughly revised to make it more relevant and to cater the needs of students. The board suggested minimum of 10- 12 practicals are to be conducted without omitting essential ones.
2. The board approved the books for references.
3. Approved the panel of examiners and incorporated eligible examiners.
4. The BOS members highly appreciated the efforts of faculty members of Botany and Horticulture for having taken the pain staking efforts in the preparation of manuals of both Botany and Horticulture and catered the student needs.

BOS MEMBERS: 2015-17
DEPARTMENT OF BOTANY

Sl. NO	Names of Experts	Remarks
1	Dr. S. Prathibha Chairperson HOD, Department of Botany JSS college of Arts, commerce and science, Ooty Road Mysuru-570025 Phone :92437 07241	Chairperson
2	Dr. Syed Fasihuddin Associate professor of Botany Govt. Science College Bengaluru- 560001	AC Nominee
3	Dr. V. N. Muralidhar Associate professor of Botany Govt. first grade College Sira- 572137 Tumkur District	AC Nominee
4	Dr. SOWMYA, R. Assistant Professor, Department of Botany Yuvaraja's college, Mysuru	VC Nominee

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.	Dr.V.Beligiri ranga Jss College, Ooty Road, Mysore	Hon.Prof.	20/06/2016
External Examiners			
3.	Kambe Gowda Sri Adichunchanagiri FGC, C R Patna	Asso. Prof. 03/01/1985	01/07/1982
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 Maharani`s Science college For Women, Mysore	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.	Shankaregowda Govt College for Women, Mandya	Asso. Prof. 22/01/1959	01/01/1993
11.	Shivalingaiah Maharani`s Science College for Women, Mysore	Asst. Prof. 01/06/1968	08/01/1996
12.	Purushotham S P Maharani`s Science College for Women, Mysore	Asst. Prof. 15/05/1967	02/08/1996
13.	Lingaraju D P AVK College for Women, Hassan	Asst. Prof. 26/02/1965	23/10/2002
14.	Basavaraju G L Govt College for Women, Mandya	Asst. Prof. 21/07/1976	30/01/2004
15.	Devika M Saradavilas College, Mysore	Asst. Prof. 14/03/1970	14/12/2005
16.	Suresh N S Maharani`s Science College for Women, Mysore	Asst. Prof. 25/02/1975	02/05/2006
17.	Jayalakshmi B Maharani`s Science College for Women, Mysore	Asst. Prof. 18/11/1974	14/07/2006
18.	Sowmya H K Govt Science College,Hassan	Asst. Prof. 18/06/1970	22/12/2007
19.	Narayana Hosamai Maharani`s Science College for Women, Mysore	Asst. Prof. 01/07/1975	24/12/2007
20.	Thoyajaksha Govt Science College, Hassan	Asst. Prof. 20/07/1970	24/12/2007
21.	Sandhya Rani D Maharani`s Science College for Women, Mysore	Asst. Prof. 24/08/1972	24/12/2007
22.	Pushpalatha H G Maharani`s Science College for Women, Mysore	Asst. Prof. 23/12/1979	26/12/2007

23.	Ashok N Pyati Maharani`s Science College for Women, Mysore	Asst. Prof. 22/04/1970	28/12/2007
24.	Indushree PES College, Mandya	Asst. Prof.	
25.	Lalitha V Maharani`s Science College for Women, Mysore	Asst. Prof.	
26.	Gayathrri Devi N Jss College for women Chamarajanagar	Asst. Prof.	
27.	Revanamaba B Maharani`s Science College for Women, Mysore	Asst. Prof.	
28.	Dr.M.K. Mahesh Yuvarajas college, Mysore.	Asso. Prof.	
29.	Shravani, K.A Yuvarajas college, Mysore.	Asst. Prof.	
30.	Dr.krishna Yuvarajas college, Mysore.	Asst. Prof.	
31.	Dr.krishnamurthy Yuvarajas college, Mysore.	Asst. Prof.	
32.	Kalpashree Yuvarajas college, Mysore	Asst. Prof.	
33.	Lizzy Joseph St.Philomena`s college, Mysore	Asso. Prof.	

Revised

Semester I

Core Course: Botany Paper I

Biodiversity of Microbes and Archegoniate

(Credits: Theory-4, Practicals-2 credits of 4 hours)

THEORY

Lectures: 60

- Unit 1: Microbial diversity:** (34 Lectures)
- A. Virus** (5 Lectures)
General structure, replication (general account), DNA virus (T-phage); Lytic and lysogenic cycle, RNA virus (TMV); Economic importance.
- B. Bacteria** (5 Lectures)
General characteristics and cell structure; Reproduction – vegetative, asexual and recombination (Conjugation, Transformation and Transduction); Economic importance.
- C. Algae** (12 Lectures)
General characteristics; Classification, Reproduction and Economic importance of algae.
Life-cycles of *Nostoc*, *Spirogyra*, *Sargassum*.
- D. Fungi** (12 Lectures)
General characteristics, classification (Smith), nutrition and reproduction
Study of Life cycle of *Rhizopus*, *Penicillium*, *Puccinia*, Lichens: General account, reproduction and significance.
- Unit 2: Archegoniate:** (26 Lectures)
- A. Bryophytes** (10 Lectures)
General characteristics, Classification, Study of Life cycles of *Marchantia* and *Polytrichum* (Developmental details not to be included). Economic importance of bryophytes.
- B. Pteridophytes** (8 Lectures)
General characteristics and classification, Study of Life cycles of *Selaginella*, *Equisetum* and *Marsilia* (Developmental details not to be included). Stellar evolution and Economical importance of Pteridophytes.
- C. Gymnosperms** (8 Lectures)
General characteristics and classification. Study of Life cycles of *Cycas* and *Pinus*. (Developmental details not to be included). Economical importance.

Practical

1. Microphotographs of **T- Phage, TMV** and types of Bacteria
2. **Gram staining of Bacteria.**
3. Study of *Nostoc, Spirogyra and Sargassum* (Specimen and permanent slides)
4. Study of *Rhizopus and Penicillium*
5. Study of *Puccinia*
6. Study of **Lichens**
7. Study of *Marchantia and Polytrichum*
8. Study of *Equisetum and Marsilea*
9. Study of *Cycas*
10. 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.

BOTANY THEORY
I B.Sc. SEMESTER I: PAPER I
SCHEME OF THEORY QUESTION PAPER

Time: 3.00 Hours

Max. Marks: 70

Blue print:

Units	No. of questions from each category			Total marks
	2 marks (5/8)	5marks (4/6)	10marks (4/6)	
Unit I :Microbial Diversity				
A&B.Virus and Bacteria (10hrs)	2X1=2	5X1=5	10X1=10	17
C. Algae (12 hrs)	2X1=2	5X2=10	10X1=10	22
D. Fungi (12hrs)	2X1=2	5X2=10	10X1=10	22
Unit II: Archegoniate				
A. Bryophytes (12hrs)	2X1=2	5X1=5	10X1=10	17
B. Pteridophytes (08hrs)	2X2=4	-	10X1=10	14
C. Gymnosperms (06hrs)	2X2=4	-	10X1=10	14
Total	8X2=16	4X6=30	6X6=60	106

BOTANY PRACTICALS
I B.Sc. SEMESTER I -PAPER 1
SCHEME OF QUESTION PAPER
Biodiversity of Microbes and Archegoniate

Time: 4 Hours

Max. Marks: 70
(50+10+10)

I. Identify the specimens 'A' and 'B' with reasons and labelled sketches

5x2=10 marks

(A-Algae and B-fungi)

Identification	– 1 mark
Classification	– 1 mark
Reasons with labelled sketch	– 3 marks

II. Prepare a stained temporary slide of 'C'. Sketch, label and Identify with reasons.

Leave the preparation for evaluation.

5 marks

(C-Cyanobacteria)

Identification	– 1 marks
Preparation/staining and mounting	– 2 marks
Reasons with labelled sketch	– 2 marks

III. Write critical notes on 'D', 'E' and 'F'
marks

5x3=15

(D-Algae/Fungi, E-Lichens/Bryophytes, F- Pteridophytes /Gymnosperms)

Identification	– 1 mark
Classification	– 1 mark
Reasons with labelled sketch	– 3 marks

IV. Identify the Microslides 'G', 'H', 'I' and 'J' and with reasons and labeled Sketches

5x4=20 marks

(G-Algae,H-Fungi,I-lichens /Bryophytes,J-pteridophytes/gymnosperms)

Identification	– 1 mark
Classification	– 1 mark
Reasons with labelled sketch	– 3 marks

V. Practical record
10marks

VI. Submissions

10marks

Note: Each student should submit the **duly valued and certified practical record and Assigned submissions** at the time of practical examination.

BOTANY PRACTICALS
I B.Sc. SEMESTER I -PAPER 1
SCHEME OF QUESTION PAPER
Biodiversity of Microbes and Archegoniate

Time: 4 Hour

Max. Marks: 70 (50+10+10)

- I. Identify the specimens 'A' and 'B' with reasons and labeled sketches** **5x2=10**
marks
- II. Prepare a stained temporary slide of 'C'. Sketch, label and Identify with**
Reasons leave the preparation for evaluation. **5x1=5 marks**
- III. Write critical notes on 'D', 'E' and 'F'** **5x3=15**
marks
- IV. Identify the Microslides 'G', 'H', 'I' and 'J' and with reasons and labeled**
Sketches **5x4=20 marks**
- V. Practical record** **10marks**
- VI. Submissions** **10marks**

Revised
Semester II
Core Course Botany –Paper II
Plant Ecology, Morphology and Taxonomy
(Credits: Theory-4, Practicals- 4 hours of 2 credits)

THEORY

Lectures: 60

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 Adaptation of hydrophytes and xerophytes. **Plant** Succession, **Hydrosere and Xerosere.**

Unit 2: Leaf and Floral Morphology (08 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 fruits

Unit 3: Taxonomy

A. Introduction to plant taxonomy (10 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 (6 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), Apiaceae Apocynaceae and Asteraceae.

Practical

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*
 - c. Stem parasite Eg: *Cuscuta.*
 - d. Epiphytes, Eg: *Vanda*
3. Study of root and stem modifications
4. Study of leaf, types, phyllotaxy and its modifications.
5. Parts of a typical flower (*Tribulus terrestris / Muntingia calabura*), Variation in floral morphology.
6. Types of inflorescence and types of fruits
7. Floral organs in detail with their variations.
8. Study of families included under theory.
9. Mounting of a properly dried and pressed specimen of any wild plant with herbarium label (to be submitted in the record book).

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. 3rd

BOTANY THEORY
I B.Sc SEMESTER II: PAPER II
SCHEME OF THEORY QUESTION PAPER

Time: 3.00 Hours

Max. Marks: 70

Units	No. of questions from each category			Total marks
	2 marks (5/8)	5marks (4/6)	10marks (4/6)	
Unit 1: A. Plant Ecology (6hrs)	2x1=2	-	10x1=10	12
B. Ecosystem (6hrs)	-	5x2=10	-	10
C. Plant communities (6hrs)	2x1=2	-	10x1=10	12
Unit II: Leaf and Floral Morphology (8hrs)	2x2=4	5x2=10	-	14
Unit III: Taxonomy A. Introduction to plant taxonomy (10hrs)	2x2=4	5x1=5	10x1=10	19
C. Herbarium technique (6hrs)	2x1=2		10x1=10	12
D. Angiosperm families (14hrs)	2x1=2	5x1=5	10x2=20	27
Total	8x2=16	5x6=30	10x6=60	106

BOTANY PRACTICALS
I B.Sc SEMESTER II : PAPER II
SCHEME OF PRACTICAL QUESTION PAPER
Plant Ecology, Morphology and Taxonomy

Time: 4 Hour

Max. Marks: 70 (50+10+10)

- I. Write critical notes on 'A' 'B' and 'C' with reasons and labeled sketches 5x3=15 marks**
- II. Assign the plants 'D', 'E' and 'F' to their respective families giving reasons. 5x3=15marks**
- III. Describe the plant 'G' in technical terms. 5x1=5 marks**
- IV. Draw the floral diagram and write the floral formula of the give plant 'H'**
5x1=5m
arks
- V. Identify the slide 'I'. (Placentation) 5x1=5**
marks
- VI. Identify the specimen 'J' and 'H' 2.5x2=5marks**
- VII. Practical record 10marks**
- VIII. Submissions 10marks**

Revised
Semester III
Core Course Botany –Paper III
Plant Anatomy and Embryology

(Credits: Theory-4, Practicals- 4 hours of 2 credits)

THEORY

Lectures: 60

Unit 1: Histology and Anatomy (12 Lectures)

Meristem- structure, classification, based on origin, position and function. Study of Simple and complex tissues.

Structure of dicot and monocot root stem and leaf.

Unit 2: Secondary Growth (8 Lectures)

Process of secondary growth in dicot stem.

Unit 3: Adaptive and protective systems (8 Lectures)

An account of anatomical adaptations in xerophytes and hydrophytes.

Unit 4: Embryology (8 Lectures)

Structure of T.S of mature anther, microsporogenesis, structure of pollen grains, megasporogenesis- types of ovules, L.S of anatropous ovule, structure of mature embryo sac.

Unit 5: Pollination and fertilization (8 Lectures)

Definition, types, mechanism, contrivances and adaptations for pollinations; process of Double fertilization, post fertilization techniques; Seed structure.

Unit 6: Embryo and endosperm (8 Lectures)

Structure and development of Dicot and monocot embryo. Endosperm- nucellar, cellular, helobial and ruminant.

Unit 7: Experimental Embryology (8 Lectures)

Brief account of apomixis (recurrent and non-recurrent), apospory, polyembryony, parthenocarpy and control of fertilization.

Practical

1. Study of Meristems through permanent slides and photographs.
2. Study of simple Tissues (parenchyma, collenchyma and sclerenchyma) through (Permanent slides, photographs).
3. Study of complex Tissue, Macerated xylary elements, Phloem (Permanent slides, photographs).
4. Stem: Monocot: *Zea mays*; Dicot: *Helianthus*.
5. Study of Dicot stem Secondary growth: *Helianthus* (only Permanent slides).
6. Root: Monocot: *Zea mays*; Dicot: *Helianthus*; Secondary: *Helianthus* (only Permanent slides).
7. Leaf: Dicot and Monocot leaf (only Permanent slides).
8. Adaptive anatomy: Xerophyte (*Nerium* leaf); Hydrophyte (*Hydrilla* stem).
9. Structure of anther (young and mature), tapetum (amoeboid and secretory) (Permanent slides).
10. Types of ovules: Anatropous, Orthotropous, Circinotropous, Amphitropous/ Campylotropous.
11. Female gametophyte: *Polygonum* (monosporic) type of Embryo sac Development (Permanent slides/photographs).
12. Ultra structure of mature egg apparatus cells through electron micrographs.
13. Pollination types and seed dispersal mechanisms (including appendages, aril, caruncle) (Photographs and specimens).
14. Dissection of embryo/endosperm from developing seeds.
15. Calculation of percentage of germinated pollen in a given medium.

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.

BOTANY THEORY
II B.Sc. SEMESTER III: PAPER III
SCHEME OF THEORY QUESTION PAPER

Time: 3.00 Hours

Max. Marks: 70

Blue print:

Units	No. of questions from each category			Total marks
	2 marks (5/8)	5marks (4/6)	10marks (4/6)	
Unit 1: Histology and Anatomy (8hrs)	2X1=2	5X2=10	10X1=10	22
Unit 2: Secondary Growth (8hrs)	-	-	10X1=10	10
Unit 3: Adaptive and protective systems (8hrs)	2X1=2	-	10X1=10	12
Unit 4: Embryology (8hrs)	2X2=4	5X1=5	10X1=10	19
Unit 5: Pollination and fertilization	2X1=2	5X1=5	10X1=10	17
Unit 6: Embryo and endosperm (8hrs)	2X1=2	-	10X1=10	12
Unit 7: Experimental Embryology (8hrs)	2X2=4	5X2=10	-	14
Total	8X2=16	5X6=30	10X6=60	106

BOTANY PRACTICALS
II B. Sc SEMESTER III: PAPER III
SCHEME OF PRACTICAL QUESTION PAPER
Plant Anatomy and Embryology

Time: 4 Hour

Max. Marks: 70 (50+10+10)

I. Write critical notes on 'A' 'B' and 'C' with reasons and labeled sketches 5x3=15 marks
(A-Meristem- Apical, intercalary and lateral, B-Simple tissues, C-Complex tissues)

Identification – 1 mark
Labeled sketch with reasons – 4marks

II. Prepare a stained temporary slide of 'D. Sketch, label and identify with reasons.
Leave the preparation for evaluation 05marks

Dicot stem/ Monocot stem

Identification – 1 mark
Labeled sketch with reasons – 4marks

III. Identify the microslides/ photographs 'E' 'F' 'G' & 'H', sketch, label with reasons
5x4=20 marks

(E-root/ leaf, F-Xerophytes/ Hydrophytes, G-T.S of anther/ types of ovule, H- female gamete/ egg apparatus)

Identification – 1 mark
Labeled sketch with reasons – 4marks

IV. Comment on 'I' 'J', with labeled diagrams
(I- Pollination types, J- seed dispersal mechanism)

V. Dissect 'K', sketch label with reasons/ calculate the percentage of germinated pollen

10x1=10 marks

Embryo/ Endosperm

Identification – 1 mark
Labeled sketch with reasons – 4marks

VI. Practical record 10marks

VII. Submissions 10marks

Note: Each student should submit the **duly valued and certified practical record and Assigned Submissions**, at the time of practical examination.

BOTANY PRACTICALS
II B. Sc SEMESTER III: PAPER III
SCHEME OF PRACTICAL QUESTION PAPER
Plant Anatomy and Embryology

Time: 4 Hour

Max. Marks: 70 (50+10+10)

I. Write critical notes on 'A' 'B' and 'C' with reasons and labeled sketches 5x3=15 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' & 'H', sketch, label with reasons 5x4=20 marks

IV. Comment on 'I' 'J', with labeled diagrams

V. Dissect 'K', sketch label with reasons/ Calculate the percentage of germinated pollen

10 marks

VI. Practical record

10marks

VII. Submissions

10marks

Semester IV

Core Course Botany –Paper IV

Plant Physiology and Metabolism

(Credits: Theory-4, Practicals- 4 hours of 2 credits)

THEORY

Lectures: 60

Unit 1: Plant-water relations (8 Lectures)

Importance of water, water potential and its components; Transpiration and its significance; Factors affecting transpiration; Root pressure and guttation.

Unit 2: Mineral nutrition (8 Lectures)

Essential elements, macro and micronutrients; Role and deficiency symptoms of essential elements; Transport of ions across cell membrane, active and passive transport, carriers, channels and pumps.

Unit 3: Translocation in phloem (6 Lectures)

Composition of phloem sap, girdling experiment; Pressure flow model; Phloem loading and unloading.

Unit 4: Photosynthesis (12 Lectures)

Photosynthetic Pigments (Chl_a, b, xanthophylls, carotene); Photosystem I and II, reaction center, antenna molecules; Electron transport and mechanism of ATP synthesis; C₃, C₄ and CAM pathways of carbon fixation; Photorespiration.

Unit 5: Respiration (6 Lectures)

Glycolysis, TCA cycle; Oxidative phosphorylation, Glyoxylate, Oxidative Pentose Phosphate Pathway, anaerobic respiration

Unit 6: Enzymes (4 Lectures)

Structure and properties; Mechanism of enzyme catalysis and enzyme inhibition.

Unit 7: Nitrogen metabolism (4 Lectures)

Biological nitrogen fixation; Nitrate and ammonia assimilation.

Unit 8: Plant growth regulators (6 Lectures)

Discovery and physiological roles of auxins, gibberellins, cytokinins, ABA, ethylene.

Unit 9: Plant response to light and temperature (6 Lectures)

Photoperiodism (SDP, LDP, Day neutral plants); Phytochrome (discovery and structure), red and far red light responses on photomorphogenesis; Vernalization.

Practical

1. Determination of osmotic potential of plant cell sap by plasmolytic method. Study of plasmolysis and deplasmolysis on Rhoeo leaf.
2. To study the effect of two environmental factors (light and wind) on transpiration by excised twig, using Ganong's potometer.
3. Calculation of stomatal index and stomatal frequency of a mesophyte and a xerophyte.
4. Experiments pertaining to growth- i. Phototropism, ii. Geotropism.
5. Experiments pertaining to growth- Arc Auxanometer experiment.
6. To study the effect of light intensity and bicarbonate concentration on O₂ evolution in photosynthesis.
7. Comparison of the rate of respiration in any two parts of a plant using Ganong's respiroscope
8. Separation of photosynthetic pigments by paper chromatography.
9. Qualitative biochemical tests for carbohydrates, fats and proteins

Demonstration experiments (any four)

1. Bolting.
2. Effect of auxins on rooting.
3. Suction due to transpiration.
4. Relation between absorption and transpiration.
5. Kuhne's experiment.

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.

BOTANY THEORY

II B.Sc. SEMESTER IV: PAPER IV SCHEME OF THEORY QUESTION PAPER

Time: 3.00 Hours

Max. Marks: 70

Blue print:

Units	No. of questions from each category			Total marks
	2 marks (5/8)	5marks (4/6)	10marks (4/6)	
Unit 1: Plant-water relations (8hrs)	2X2=4	5X2=10	-	14
Unit 2: Mineral nutrition (8hrs)	2X1=2	-	10X1=10	12
Unit 3: Translocation in phloem (6hrs)	-	-	10X1=10	10
Unit 4: Photosynthesis (12hrs)	2X2=4	-	10X2=20	24
Unit 5: Respiration (6hrs)	-	-	10X1=10	10
Unit 6: Enzymes (4hrs)	2X1=2	5X1=5	-	7
Unit 7: Nitrogen metabolism (4hrs)	2X1=2	5X1=5	-	7
Unit 8: Plant growth regulators (6hrs)	2X1=2	5X1=5	-	7
Unit 9: Plant response to light and temperature (6hrs)	-	5X1=5	10X1=10	15
Total	8X2=16	5X6=30	10X6=60	106

BOTANY PRACTICALS
II B. Sc SEMESTER IV: PAPER IV
SCHEME OF PRACTICAL QUESTION PAPER
Plant Physiology and Metabolism

Time: 4 Hour

MaxMarks: 70
(50+10+10)

I. Perform the major experiment 'A' write the principle, Requirements, Procedure and record the result with inference and leave the setup for evaluation **15x1 =15 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

Comparison of the rate of respiration in any two parts of a plant using Ganong's respiroscope

OR

Separation of photosynthetic pigments by paper chromatography)

Principle	-2 marks	Procedure	-3 marks
Requirements	-2 mark	Result and inference	-3 marks
Setting	-5 marks		

II. Comment on 'B', 'C' & 'D. (Minor experiments) **7x3 =21 marks**

(To study the effect of two environmental factors (light and wind) on transpiration by excised twig, using Ganong's photometer)

OR

Experiments pertaining to growth- i. Phototropism, ii. Geotropism

OR

Experiments pertaining to growth-Arc Auxanometer experiment

OR

To study the effect of light intensity and bicarbonate concentration on O₂ evolution in photosynthesis)

Identification	-1 marks
Critical notes	-4 marks
Labeled sketch	-2 marks

III. Demonstrate 'E' & 'F'

5x2=10 marks

(Bolting **OR** Effect of auxins on rooting **OR** Suction due to transpiration **OR** Relation between absorption and transpiration **OR** Kuhne's experiment)

Setting-2 marks Labeled sketch with reasons-3 marks

IV. Perform the biochemical test of the given sample 'G' & 'H'

7x2=14 marks

Procedure -5marks Result -2 marks

VI. Practical record

10marks

BOTANY PRACTICALS
II B. Sc SEMESTER IV: PAPER IV
SCHEME OF PRACTICAL QUESTION PAPER
Plant Physiology and Metabolism

Time: 4 Hour

Max. Marks: 70 (50+10+10)

I. Perform the major experiment 'A' write the principle, Requirements, Procedure and record the result with inference and leave the setup for evaluation **15x1 =15 marks**

II. Comment on 'B', 'C' & 'D. (Minor experiments) **7x3 =21 marks**

III. Demonstrate 'E' & 'F' **5x2=10 marks**

IV. Perform the biochemical test of the given sample 'G' & 'H' **7x2=14 marks**

VI. Practical record **10marks**

Discipline Centric Elective Courses

Two (2) be selected from each of the three disciplines

Discipline Centric Elective Botany

Semester V

DSE-1: Cell and Molecular Biology

(Credits: Theory-4, Practicals- 4 hours of 2 credits)

THEORY

Lectures: 60

Unit 1: Techniques in Biology (8 Lectures)

Principles of microscopy; Light Microscopy; Phase contrast microscopy; Fluorescence microscopy; Sample Preparation for light microscopy; Electron microscopy (EM)- Scanning EM and Scanning Transmission EM (STEM); Sample Preparation for electron microscopy; X-ray diffraction analysis.

Unit 2: Cell as a unit of Life (1 Lectures)

The Cell Theory; Prokaryotic and eukaryotic cells;

Unit 3: Cell Membrane and Cell Wall (6 Lectures)

The functions of membranes; Models of membrane structure; The fluidity of membranes; Membrane proteins and their functions; Carbohydrates in the membrane; Faces of the membranes; Selective permeability of the membranes; Cell wall.

Unit 4: Cell Organelles (20 Lectures)

Ultrastructure, composition and functions of Mitochondria, Chloroplast, ER, Golgi body, Lysosomes, Peroxisomes and Glyoxisomes

Nucleus: Nuclear Envelope- structure of nuclear pore complex; chromatin; molecular organization, DNA packaging in eukaryotes, euchromatin and heterochromatin, nucleolus and ribosome structure (brief).

Unit 5: Cell Cycle (6 Lectures)

Overview of Cell cycle, Mitosis and Meiosis and their significance.

Unit 6: Genetic material (6 Lectures)

DNA: Miescher to Watson and Crick- historic perspective, Griffith's and Avery's transformation experiments, Hershey-Chase bacteriophage experiment, DNA structure, types of DNA, types of genetic material. DNA replication (Prokaryotes and eukaryotes): bidirectional replication, semi-conservative method

Unit 7: Protein synthesis and genetic code (6 Lectures)

Types of structures of RNA (mRNA, tRNA, rRNA), RNA polymerase- various types; Transcription and Translation (Prokaryotes and eukaryotes), genetic code.

Unit 8: Regulation of gene expression (7 Lectures)

Prokaryotes: Lac operon and Tryptophan operon ; Regulation of gene expression in eukaryotes (Britton Davidson model).

Practical

1. Preparation of fixatives and stains: FAA, Carnoy's fixative, safranin, acetocarmine and aceto-orcein.
2. To study prokaryotic cells (bacteria), viruses, eukaryotic cells with the help of light and electron micrographs.
3. Study of the photomicrographs of cell organelles
4. To study the structure of plant cell through temporary mounts.
5. Study of mitosis (temporary mounts and permanent slides).
6. Study of meiosis (temporary mounts and permanent slides).
7. Measure the cell size (either length or breadth/diameter) by micrometry.
8. Study the structure of nuclear pore complex by photograph (from Gerald Karp)
9. Study of special chromosomes (polytene & lampbrush) either by slides or photographs.
10. Study DNA packaging by micrographs.
11. Preparation of the karyotype and ideogram from given photograph of somatic metaphase chromosome.

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.

BOTANY THEORY

III B.Sc. SEMESTER V: PAPER V SCHEME OF THEORY QUESTION PAPER

Time: 3.00 Hours

Max. Marks: 70

Blue print:

Units	No. of questions from each category			Total marks
	2 marks (5/8)	5marks (4/6)	10marks (4/6)	
Unit 1: Techniques in Biology (8hrs)	2X1=2	-	10X1=10	12
Unit 2: Cell as a unit of Life (1hrs)	2X1=2	-	-	02
Unit 3: Cell Membrane and Cell Wall (6hrs)	-	5X1=5	10X1=10	15
Unit 4: Cell Organelles (20hrs)	2X1=2	5X2=10	10X2=20	32
Unit 5: Cell Cycle (6hrs)	2X1=2	5X1=5	-	07
Unit 6: Genetic material (6hrs)	2X2=4	5X1=5	10X1=10	19
Unit 7: Protein synthesis and genetic code (6hrs)	2X1=2	5X1=5	-	07
Unit 8: Regulation of gene expression (7hrs)	2X1=2	-	10X1=10	12
Total	8X2=16	5X6=30	10X6=60	106

BOTANY PRACTICALS
III B. Sc SEMESTER V: PAPER V
SCHEME OF PRACTICAL QUESTION PAPER
Cell and Molecular Biology

Time: 4 Hour

Max. Marks: 70 (50+10+10)

I. Prepare a temporary squash of given material 'A'. Sketch, label and identify with reasons. Leave the preparation for evaluation. 10 marks

(Onion root tip/ flower bud)

Preparation - 5marks

Identification - 1mark

Sketch and label - 2marks

Reasons - 2marks

II. Identify the cytological slide 'B' with labeled diagram and reasons. 05 marks

(Mitosis/ Meiosis)

Identification - 1mark

Sketch and label - 2marks

Reasons - 2marks

III. Comment on 'C' and 'D' (charts/photographs) 5 X 2= 10marks

C- Cell organelle (Identification - 1mark, Sketch and label - 2marks, Reason - 2marks)

D- Fixative/ stain (Identification - 1mark, Sketch and label - 2marks, Reason - 2marks)

IV. Prepare a temporary mount of a plant cell 'E' 05 marks

(Onion peeling/ tomato pulp)

Preparation - 2 marks

Sketch and label of eukaryotic cell - 3marks

OR

Preparation of the karyotype and ideogram from given photograph of somatic metaphase chromosome.

V. Measure the cell size of the given specimen 'F' by micrometry. 10 marks

Calibration - 5 marks

Description – 5 marks

VI. Write critical notes on 'G' and 'H' 2 X 5 = 10 marks

Nuclear pore complex/ Special chromosome/ DNA packaging/ prokaryotic cell

VI. Practical record 10marks

VII. Submissions 10marks

BOTANY PRACTICALS

III B. Sc SEMESTER V: PAPER V SCHEME OF PRACTICAL QUESTION PAPER Cell and Molecular Biology

Time: 4 Hour

Max. Marks: 70 (50+10+10)

I. Prepare a temporary squash of given material 'A'. Sketch, label and identify with reasons. Leave the preparation for evaluation. 10 marks

II. Identify the cytological slide 'B' with labeled diagram and reasons. 05 marks

III. Comment on 'C' and 'D' (charts/photographs) 5 X 2= 10marks

IV. Prepare a temporary mount of a plant cell 'E' 05 marks

V. Measure the cell size of the given specimen 'F' by micrometry. 10 marks

VI. Write critical notes on 'G' and 'H' 2 X 5 = 10 marks

VI. Practical record 10marks

VII. Submissions 10marks

Semester V

DSE-2: Economic Botany and Biotechnology

(Credits: Theory-4, Practicals- 4 hours of 2 credits)

THEORY

Lectures: 60

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.

Practical

1. Study of economically important plants included in theory.
2. Familiarization with basic equipments in tissue culture.
3. Study through photographs: Anther culture, somatic embryogenesis, endosperm and embryo culture; micropropagation.
4. Study of molecular techniques: PCR, Blotting techniques 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.

BOTANY THEORY

III B.Sc. SEMESTER V: PAPER V SCHEME OF THEORY QUESTION PAPER

Time: 3.00 Hours

Max. Marks: 70

Blue print:

Units	No. of questions from each category			Total marks
	2 marks (5/8)	5marks (4/6)	10marks (4/6)	
Unit 1: Cereals and Millets (4hrs)	2X1=2	5X1=5	-	07
Unit 2: Legumes (6hrs)	2X1=2	-	10X1=10	12
Unit 3: Spices and condiments (8hrs)	-	5X1=5	10X1=10	15
Unit 4: Beverages (4hrs)	-	5X1=5	-	05
Unit 5: Oils and Fats (4hrs)	2X1=2	5X1=5	-	07
Unit 6: Fibre Yielding Plants (4hrs)	2X1=2	-	10X1=10	12
Unit 7: Introduction to biotechnology (2hrs)	2X1=2	-	-	02
Unit 8: Plant tissue culture (10hrs)	2X1=2	5X1=5	10X1=10	17
Unit 9: Recombinant DNA Techniques (18hrs)	2X2=4	5X1=5	10X2=20	29
Total	8X2=16	5X6=30	10X6=60	106

SEMESTER V
SEC-2: Ethnobotany
(Credits 2)

Lectures: 30

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 ethnobotanical practices (along with their habitat and morphology) a) *Azadirachta 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 *Rauwolfia serpentina*, *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.

Suggested Readings

- 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)

Semester VI
DSE-2: Genetics and Plant Breeding
(Credits: Theory-4, Practicals- 4 hours of 2 credits)

THEORY
Lectures: 60

Unit 1: Heredity **(24 Lectures)**

1. Brief life history of Mendel
2. Terminologies
3. Laws of Inheritance
4. Modified Mendelian Ratios: 2:1- lethal Genes; 1:2:1- Co- dominance, incomplete dominance; 9:7; 9:4:3; 13:3; 12:3:1.
5. Multiple allelism,
6. Pleiotropism
7. Pedigree Analysis
8. Cytoplasmic Inheritance: leaf variegation in *Mirabilis jalapa*, Male sterility.
9. Chromosome theory of Inheritance.
10. Quantitative inheritance-Concept, mechanism, examples. Monogenic vs polygenic Inheritance.

Unit 2: Sex-determination and Sex-linked Inheritance **(4 Lectures)**

Unit 3: Linkage and Crossing over **(8 Lectures)**

Linkage: concept & history, complete & incomplete linkage, bridges experiment, coupling & repulsion, recombination frequency, linkage maps based on two and three factor crosses. Crossing over: concept and significance, cytological proof of crossing over.

Unit 4: Mutations and Chromosomal Aberrations **(4 Lectures)**

Types of mutations, effects of physical & chemical mutagens. Numerical chromosomal changes: Euploidy, Polyploidy and Aneuploidy ; Structural chromosomal changes: Deletions, Duplications, Inversions & Translocations.

Unit 5: Plant Breeding **(4 lectures)**

Introduction and objectives. Breeding systems: modes of reproduction in crop plants. Important achievements and undesirable consequences of plant breeding.

Unit 6: Methods of crop improvement **(8 lectures)**

Introduction: Centres of origin and domestication of crop plants, plant genetic resources; Acclimatization; Selection methods: For self pollinated, cross pollinated and vegetatively propagated plants; Hybridization: For self, cross and vegetatively propagated plants – Procedure, advantages and limitations.

Unit 7: Inbreeding depression and heterosis **(4 lectures)**

History, genetic basis of inbreeding depression and heterosis; Applications.

Unit 8: Crop improvement and breeding **(4 lectures)**

Role of mutations; Polyploidy; Distant hybridization and role of biotechnology in crop improvement.

Practical

1. Mendel's laws through seed ratios. Laboratory exercises in probability and chisquare.
2. Chromosome mapping using point test cross data.
3. Pedigree analysis for dominant and recessive autosomal and sex linked traits.
4. Incomplete dominance and gene interaction through seed ratios (9:7, 9:6:1, 13:3, 15:1, 12:3:1, 9:3:4).
5. Study of aneuploidy: Down's, Klinefelter's and Turner's syndromes through photographs.
6. Photographs/Permanent Slides showing Translocation Ring, Laggards and Inversion Bridge.
7. Hybridization techniques - Emasculation, Bagging (For demonstration only).
8. Induction of polyploidy conditions in plants (For demonstration only).

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.

BOTANY THEORY

III B.Sc. SEMESTER V: PAPER V SCHEME OF THEORY QUESTION PAPER

Time: 3.00 Hours

Max. Marks: 70

Blue print:

Units	No. of questions from each category			Total marks
	2 marks (5/8)	5marks (4/6)	10marks (4/6)	
Unit 1: Heredity (24 Lectures)	2X3=6	5X1=5	10X3=30	41
Unit 2: Sex-determination and Sex-linked Inheritance (4 Lectures)	2X1=2	5X1=5	-	7
Unit 3: Linkage and Crossing over (8 Lectures)	2X1=2	-	10X1=10	12
Unit 4: Mutations and Chromosomal Aberrations (4 Lectures)	2X1=2	5X1=5	-	7
Unit 5: Plant Breeding (4 lectures)	2X1=2	5X1=5	-	07
Unit 6: Methods of crop improvement (8 lectures)	-	5X1=5	10X1=10	15
Unit 7: Inbreeding depression and heterosis (4 lectures)	2X1=2	5X1=5	-	02
Unit 8: Crop improvement and breeding (4 lectures)	-	-	10X1=10	10
Total	8X2=16	5X6=30	10X6=60	106

BOTANY PRACTICALS
III B. Sc Semester VI: PAPER VI
SCHEME OF PRACTICAL QUESTION PAPER
Genetics and Plant Breeding

Time: 4 Hour

Max. Marks: 70 (50+10+10)

- I. Perform the experiment 'A'. 10 marks**
(Emasculation and bagging)
- Preparation - 5marks
 - Identification - 1mark
 - Sketch and label - 2marks
 - Reasons - 2marks
- II. Conduct experiment 'B'. 10 marks**
(Induction of polyploidy)
- Principle -2 marks
 - Requirements -2 marks
 - Procedure -4 marks
 - Result and inference -2 marks
- III. Problems on Chromosome mapping using point test cross data 'C'.
10marks**
- IV. Comment on the given specimen 'D'. 05 marks**
(Pedigree analysis)
- Identification - 1mark
 - Reasons - 4marks
- V. Problems on gene interaction 'E' 05
marks**
- VI. Identify the given photographs 'F' & 'G' 5x2=10
marks**
(F- Aneuploidy & G- Translocation)
- Identification - 1mark
 - Reasons - 4marks
- VI. Practical record 10marks**
- VII. Submissions 10marks**

SEMESTER VI

DSE-2: Analytical Techniques in Plant Sciences

(Credits: Theory-4, Practicals-2)

THEORY

Lectures: 60

Unit 1: Imaging and related techniques (15 Lectures)

Principles of microscopy; Light microscopy; Fluorescence microscopy; Confocal microscopy; Use of fluorochromes: (a) Flow cytometry (FACS); (b) Applications of fluorescence microscopy: Chromosome banding, FISH, chromosome painting; Transmission and Scanning electron microscopy – sample preparation for electron microscopy, cryofixation, negative staining, shadow casting, freeze fracture, freeze etching.

Unit 2: Cell fractionation (8 Lectures)

Centrifugation: Differential and density gradient centrifugation, sucrose density gradient, CsCl₂ gradient, analytical centrifugation, ultracentrifugation, marker enzymes.

Unit 3: Radioisotopes (4 Lectures)

Use in biological research, auto-radiography, pulse chase experiment.

Unit 4: Spectrophotometry (4 Lectures)

Principle and its application in biological research.

Unit 5: Chromatography (8 Lectures)

Principle; Paper chromatography; Column chromatography, TLC, GLC, HPLC, Ionexchange chromatography; Molecular sieve chromatography; Affinity chromatography.

Unit 6: Characterization of proteins and nucleic acids (6 Lectures)

Mass spectrometry; X-ray diffraction; X-ray crystallography; Characterization of proteins and nucleic acids; Electrophoresis: AGE, PAGE, SDS-PAGE

Unit 7: Biostatistics (15 Lectures)

Statistics, data, population, samples, parameters; Representation of Data: Tabular, Graphical; Measures of central tendency: Arithmetic mean, mode, median; Measures of dispersion: Range, mean deviation, variation, standard deviation; Chi-square test for goodness of fit.

Practicals

1. Study of Blotting techniques: Southern, Northern and Western, DNA fingerprinting, DNA sequencing, PCR through photographs.
2. Demonstration of ELISA.
3. To separate nitrogenous bases by paper chromatography.
4. To separate sugars by thin layer chromatography.
5. Isolation of chloroplasts by differential centrifugation.
6. To separate chloroplast pigments by column chromatography.
7. To estimate protein concentration through Lowry's methods.
8. To separate proteins using PAGE.
9. To separate DNA (marker) using AGE.
10. Study of different microscopic techniques using photographs/micrographs (freeze fracture, freeze etching, negative staining, positive staining, fluorescence and FISH).
11. Preparation of permanent slides (double staining).

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

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 & Dagainawala	General Microbiology. Vol. I	Himalaya Publishing house, Bombay
Power & Dagainawala	General Microbiology. Vol. II	Himalaya Publishing house, Bombay
Pelzar Michael.J	Text Book of Microbiology	
Prescott, Lansing and Others	Microbiology	
Ananthanarayana .R .	Text Book of Microbiology	Orient and Longman, New Delhi.
Jayaram Panicker a) salle. A. J.	Functional Principles of Bacteriology	Tata Mc graw Hill
Vinita Kale and Kishore Bhusari	Applied Microbiology.	Himalaya Publishing house, Bombay
Frazier William. C.	Food Microbiology	
Cruckishank	Text book of Medical Microbiology	ELBS Publisher , New Delhi
Rangaswamy.G.	Diseases of crop plants in India.	Prentice Hall of India N.Delhi
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