Approved Syllabus

for

M.Sc. Botany

(2025-27 under CBCS)

for

University, Constituent and Affiliated Colleges

Department of Botany

University College of Science

Satavahana University, Karimnagar

Board of Studies meeting held on 15.10.2025, Satavahana University, Karimnagar-505 001

Titles of M.Sc. Botany, Satavahana University, Karimnagar-505 001

SEMESTER-I

Paper-1	: Phycology
Paper-2	: Mycology and Microbiology
Paper-3	: Bryophyta & Pteridophyta
Paper-4	: Taxonomy of Angiosperms and Medicinal plants

SEMESTER-II

Paper-1	: Gymnosperms and Embryology of Angiosperms
Paper-2	: Plant Anatomy & Palynology
Paper-3	: Plant Biochemistry
Paper-4	: Ecology and Phytogeography

SEMESTER-III

Paper-1	: Cell Biology, Cytogenetics & Bio Statistics
Paper-2	: Plant Physiology
Paper-3(Elective)	: (i) Ethnobotany
	(ii) Tissue culture & Plant Biotechnology
Paper-4(Elective)	: (i) Environmental Pollution
	(ii) Plant pathology

SEMESTER-IV

Paper-1	: Biodiversity and Conservation
Paper-2	: Plant Molecular Biology
Paper-3(Elective)	: (i) Applied Phycology
	(ii) Plant Breeding
Paper-4(Elective)	: (i) Biofertilizers in Agriculture
	(ii) Pharmacognosy

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Faculty of Science

SATAVAHANA UNIVERSITY - KARIMNAGAR

Department of Botany (2025-2027)

Under Choice Based Credit System

M. Sc (Botany) I SEMESTER

Paper Code	Title	Workload Per Week hrs		Marks			Credits	Duration of the Exams.
		Theory	Practical	Internal	University	Total		
MBOT.CC.T.1.101	**Phycology**	4	--	20	80	100	4	3 Hrs
MBOT.CC.T.1.102	**Mycology and Microbiology**	4	--	20	80	100	4	3 Hrs
MBOT.CC.T.1.103	**Bryophyta & Pteridophyta**	4	--	20	80	100	4	3 Hrs
MBOT.CC.T.1.104	**Taxonomy of Angiosperms and Medicinal plants**	4	--	20	80	100	4	3 Hrs
MBOT.CC.P.1.105	Practical Lab – I (Paper-1 & 2)	--	8	-	100	100	4	3 Hrs
MBOT.CC.P.1.106	Practical Lab – II (Paper-3 & 4)	--	8	-	100	100	4	3 Hrs
TOTAL		16	16	80	520	600	24	-

CPT: Core Paper Theory **CPP: Core Paper Practical**

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II SEMESTER

M. Sc (Botany) II SEMESTER

Paper Code	Title	Workload Per Week hrs		Marks			Credits	Duration of the Exams.
		Theory	Practical	Internal	University	Total		
MBOT.CC. T.1.2 01	**Gymnosperms and Embryology**	4	--	20	80	100	4	3 Hrs
MBOT.CC. T.1.2 02	**Plant Anatomy & Palynology**	4	--	20	80	100	4	3 Hrs
MBOT.CC. T.1.2 03	**Plant Biochemistry**	4	--	20	80	100	4	3 Hrs
MBOT.CC. T.1.2 04	**Ecology and Phytogeography**	4	--	20	80	100	4	3 Hrs
MBOT.CC. P.1.205	Practical Lab – I (Paper-1 & 2)	--	8	-	100	100	4	3 Hrs
MBOT.CC. P.1.206	Practical Lab – II (Paper-3 & 4)	--	8	-	100	100	4	3 Hrs
TOTAL		16	16	80	520	600	24	

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III SEMESTER

M. Sc (Botany) III SEMESTER

Paper Code	Title	Workload Per Week hrs		Marks			Credits	Duration of the Exams.
		Theory	Practical	Internal	University	Total		
MBOT.C C.T.2.301	**Cell Biology, Cyotogenetics & Biostatistics**	4	--	20	80	100	4	3 Hrs
MBOT.C C.T.2.302	**Plant Physiology**	4	--	20	80	100	4	3 Hrs
MBOT.E C.T.2.303	**Electives-I (A/B)**	4	--	20	80	100	4	3 Hrs
MBOT.C C.T.2.304	**Electives-II (A/B)**	4	--	20	80	100	4	3 Hrs
MBOT.C C.P.2.305	Practical Lab – I (Core Paper-I + Elective –I)	--	8	-	100	100	4	3Hrs
MBOT.C C.P.2.306	Practical Lab – II (Core Paper-II + Elective –II)	--	8	-	100	100	4	3 Hrs
TOTAL		16	16	80	520	600	24	-

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IV SEMESTER

M. Sc (Botany) IV SEMESTER

Paper Code	Title	Workload Per Week hrs		Marks			Credits	Duration of the Exams.
		Theory	Practical	Internal	University	Total		
MBOT.CC. T.2.401	**Biodiversity and Conservation**	4	--	20	80	100	4	3 Hrs
MBOT.CC. T.2.402	**Plant Molecular Biology**	4	--	20	80	100	4	3 Hrs
MBOT.EC. T.2.403	**Electives- I (A/B)**	4	--	20	80	100	4	3 Hrs
MBOT.EC. T.2.404	**Electives-II (A/B)**	4	--	20	80	100	4	3 Hrs
MBOT.CC. P.2.405	Practical Lab – I (Core Paper-I + Elective –I)	--	8	-	100	100	4	3Hrs
MBOT.CC. P.2.406	Practical Lab – II (Core Paper-II + Elective –II)	--	8	-	100	100	4	3 Hrs
TOTAL		16	16	80	520	600	24	-

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M. Sc Botany - I Semester

Paper - I: Phycology

MBOT.CC.T.1.101 **4 Hrs/week 4 Credits**

Course objectives:

- The objective of this course is to make students up to date level of understanding of Phycology.
- The content in Phycology provides information on the overview of algae, their recent taxonomic status and economic significance as well

Course outcome: After completion of these courses students will be able to understand:

- A brief account on Algae classification, occurrence, habit, cell structure and reproduction.
- Know economic importance of Algae.

UNIT - I

1. General characters and comparative study of important systems of classification in algae – Fritsch and Parker systems of classifications.
2. Criteria used in the primary classification of algae: a). Pigments b). Reserve food materials c). flagella d). cell wall
3. Algae of diverse habitats – a). Terrestrial. b). freshwater algae and c). Marine algae
4. Reproduction of algae – a). Vegetative b). Asexual – c) Sexual reproduction

UNIT – II

5. General characters, morphology, life history and classification of the following groups of algae:
   a. Cyanophyceae - *Microcystis, Lyngbya*
   b. Chlorophyceae - *Pediastrum, Hydrodictyon, Ulva, Draparnaldiopsis, Cosmarium , Closterium and Bryopsis*
   c. Charophyceae – *Nitella*

UNIT-III

6. General characters, morphology,life history and classification of the following groups of algae
   a) Bacillariophyceae- *Cyclotella,Cymbella.*
   b) Phaeophyceae-*Sargassum, Laminaria*
   c) Rhodophyceae- *Porphyra* and *Gracilaria.*
7. Commercial importance of Phaeophyceae and Rhodophyceae

UNIT-IV

8. Algae as human food.
9. Algae as Biofertilizers
10. Algae in Pharmacy
11. Algal blooms & Toxic Algae
12. Role of Algae in Industry (Alginic acid, Agar – Agar and Carrageenan)

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Paper - I: Phycology Lab

MBOT.CC.P.1.105 Practical Lab **8 Hrs/ week 4 Credits**

1. Identification of the genera mentioned in Cyanophyceae , Chlorophyceae, Phaeophyceae and Rhodophyceae
2. Collection and identification of algae occurring in and around university college/campus/local surrounding water bodies.
3. Introduction to basic algal collections and Preservation techniques and Lab. Safety; Methods of sterilization, media preparation and culturing.

Reference books

1. Fritsch, F.E. The structure and reproduction of algae volume 1 and 2
2. Robin South,G and Alan Whittick: Introduction to Phycology
3. Morris,I: An Introduction to Algae
4. Bold, H.C. and Wynne, M.D.: Introduction to the Algae structure and reproduction
5. H.D.Kumar: Introductory Phycology

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M. Sc Botany - I Semester

Paper - II: Mycology and Microbiology

MBOT.CC.T.1.102 **4 Hrs/week 4 Credits**

Course objectives:

- To acquaint the student about the morphology, characters and importance of different microorganisms.
- To provide a basic understanding of the biology, taxonomy and phylogeny of fungi.

Course outcome: After completion of these courses students will be able to understand:

- A brief account on fungal classification, occurrence, habit, cell structure and reproduction.
- The course will enable students to know about different types of microorganisms viz. fungi, bacteria, virus and mollicutes.

UNIT-I

1. Introduction to Mycology - General characters of fungi; Hyphal ultrastructure and septa; main growth forms of fungi; mode of nutrition in fungi. Asexual and sexual reproductions in different groups of fungi.
2. Fungal cytology and genetics: Heterokaryosis, Parasexual cycle; Sex Pheromones (hormones) in fungi; Mechanisms of nuclear and extra-nuclear inheritance.
3. Outlines of nomenclature, ICN, origin and phylogeny; Recent taxonomic criteria; Classification of Fungi (Hibbett *et. al*., 2007 and Aftol, 2014)

UNIT-II

4. Systematic position, life cycle and brief account of the following types. Fungi like organisms- *Stemonitis;* Microsporidia- General account; Chytridiomycota-*Synchytrium;* Blastocladiomycota- *Pilobolus;* Neocallimastigomycota-General account; Glomeromycota-*Glomus.*
5. Oomycota-*Perenospora;* Ascomycota- *Neurospora;* Basidiomycota- *Melampsora ;* Deuteromycotina- *Cercospora.*
6. **Lichens:** Thallus organization, reproduction, ecology and economic importance

UNIT-III

7. Introduction: A brief account of microbial diversity; Whittaker's classification.
8. General account of Archaebacteria and Eubacteria; General characters of plant pathogenic bacteria -Ultra structure of bacterial cell, biochemistry of cell wall, nutritional and growth factors of bacteria.
9. Plasmids - significance of plasmids; molecular events in genetic transfer (conjugation, transformation and transduction) in bacteria.

UNIT-IV

10. **Viruses:** Characteristics and ultrastructure of virions; isolation, purification, detection and characterization of viruses;
11. Classification (ICTV) of viruses; Symptomatology and Transmission of plant viruses; Importance of the viruses.
12. **Mollicutes:** General characters, transmission and diseases caused by Spiroplasma and Phytoplasma.

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Paper II: Mycology and Microbiology Lab

MBOT.CC.P.1.106 Lab-II **8 Hrs/ week 4 Credits**

Major and Minor experiments:

1. Introduction to basic Mycological Techniques and Lab. Safety; Methods of sterilization, media preparation and culturing.
2. Identification of fungal cultures, slides and specimens of *Synchytrium, Allomyces, Glomus, Neurospora, Melampsora* and *Stemonitis.*
3. Study of Symptomology of the following fungal diseases by taking sections and slide preparation: Downy mildews, Tikka disease, Melampsora rust, Wheat rust and White rust.
4. Study of Mushroom specimens
5. Staining of Gram + ve and Gram - ve Bacteria
6. Herbarium of diseased plants (fungal, bacterial, viral & mycoplasma diseases available locally - at least 2-3 specimens of each to be submitted).

References Books

1. John Webster and Roland W.S. Weber - Introduction to Fungi
2. Alexopoulos C.J., C.W. Mims and M. Blackwell – Introductory Mycology
3. Mehrotra R.S. and K.R. Aneja – An Introduction to Mycology
4. Smith, J.E. - The Filamentous Fungi
5. Change. S.T. and P.G. Miles - Edible mushrooms and their cultivation
6. Mosses, B.V.A. - Mycorrhizae
7. Berry, R. - Industrial mycology (Vol. I)
8. Dubey, S.C. - Biotechnology.
9. Jeffrey C. Pommerville - Alcamo's Fundamentals of Microbiology
10. Arora D.R. and B. Arora - Text book of Microbiology

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M. Sc Botany - I Semester

PAPER – III: Bryophyta and Pteridophyta

MBOT.CC.T.1.103 **4 Hrs/week 4 Credits**

Course objectives:

- To study general characteristics, classification, trends in classification, phylogeny and inter-relationships of Bryophyta and Pteridophyta.

Course outcome: After completion of these courses students will be able to understand:

- Study of morphology, structure, reproduction and life history of Bryophytes.
- Understand morphology, structure, reproduction and life history of Pteridophytes.

UNIT - I

1. General characters and Classification of Bryophytes
2. Distribution, structure and reproduction of the following groups:
   a) Marchantiales; - *Targionia*
   b) Jugarmanniales- *Porella*
   c) Anthocerotales- *Notothyllas*
   d) Sphagnales – *Sphagnum*
   e) Polytrichales- *Polytrichum.*

UNIT – II

3. Structure and evolution of gametophyte in Bryophytes
4. Structure and evolution of sporophyte in Bryophytes
5. Economic importance of Bryophytes
6. Fossil & Fossilization, types of plant fossils
7. Techniques employed in the types of fossils: Fossil Bryophytes.

UNIT – III

8. General characters and Classification of Pteridophytes
9. Distribution, structure and reproduction of the following groups:
   a) Psilotales- *Psilotum*
   b) Filicales – *Azolla*
   c) Lycopodiales- *Phylloglosum*
   d) *Selaginellales- Selagenella*
   e) Isoetales- *Isoetes,*
   f) Equisetales-*Equisetum*
   g) Stelar evolution in Pteridophytes.

UNIT- IV

10. Telome theory & its application
11. Heterospory & seed habit
12. Geological time scale
13. Origin & evolution of early vascular plants
14. General characters of Lepidodendrales, Calamitales and Sphenophyllales.

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Paper- III: Bryophyta & Pteridophyta Lab

MBOT.CC.P.1.107 Practicals (Labs) **8 Hrs/ week 4 Credit**

Major and Minor experiments:

1. Bryophytes: Morphologiocal and structural study using whole mount
   a) *Plagiochasma / Fimbirania*
   b) *Targionia*
   c) *Notothylas*
   d) *Sphagnum / Fumaria.*
2. Pteridophyta, Morphology and anatomy of vegetative and reproductive organs using cleared whole mount sections. Macerations and permanent preparation of *Psilotum*, *Isoetes*, *Ophioglossum*, *Adianthum*, *Salvinia*, *Azolla*.

Reference books

1. Smith, G.M. Cryptogomic Botany. Vol.II
2. Parihar, N.S.: Bryophyta
3. Parihar, N.S.1976: Biology and Morphology of Pteridophytes
4. Sporne, K.R. Pteridophyta
5. Rashid: Introduction to Pteridophyta
6. Cavers, F. Inter-relations of Bryophytes.

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M. Sc Botany I Semester

Paper-IV- Taxonomy of Angiosperms and Medicinal Plants

MBOT.CC.T.1.104 **4 Hrs/week 4 Credits**

Course objectives:

- The ultimate aim of taxonomy is to understand the evolution at work. Angiosperms being the dominant as well as most evolved plant group.
- It is also being practiced at various levels, from morphology to phylogenomics. This course aims to give comprehensive understanding in angiosperm taxonomy as well as its practice and application.

Course outcome: After completion of these courses students will be able to understand:

- Know the methods of morphological characterization of different families and field collection and documentation. Know commercial cultivation of medicinal plants conservation of medicinal plants
- Know the techniques of herbaria preparation.

UNIT -I

1. Systems of classification: Phenetic and Phylognetic systems. Critical account of the systems of classifications of a) Hutchinson b) Cronquist and c) Takhtajan.
2. Taxonomic evidence and techniques used therein a) Morphology b) Micromorphology c) Epidermology d) Cytology e) Phytochemistry f) Nucleic acid hybridization.

UNIT -II

3. Nomenclature: a) Concept of ICBN b) Salient features of Botanical Nomenclature c) Ranks and Nomenclature of taxa d) Typification e) Rules of Priority f) Effective and valid publication g) Author citations.
4. Biosystematics: a) Concept b) Categories c) Species concept

UNIT -III

5. A comparative study of the following pairs of families and their treatment in recent systems:
   I. Rutaceae & Meliaceae
   II. Verbenaceae &Lamiaceae
   III. Amaranthaceae & Chenopodiaceae
   IV. Cyperaceae & Poaceae
6. Origin of angiosperms, with reference to recent findings.

UNIT -IV

7. **Medicinal Botany:**
   I. Role of plants in medicine, its origin and development
   II. Morphology, active principles and medicinal value of the following:
   a)Andrographis paniculata b) Asparagus racemosus c)Clitoria ternatea d) Hygrophila spinosa e)Gymnema sylvestre
8. Flora of Telangana: Salient features of vegetation aspects.

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Paper-IV- Taxonomy of Angiosperms and Medicinal Plants Lab

MBOT.CC.P.1.108 Practicals (Labs) **8 Hrs/ week 4 Credits**

Major and Minor experiments:

1. Field work/ study tour for familiarizing the local flora under the supervision of teachers recording of the intraspecific variation and documentation of proceedings in the field note book (to be submitted during the practical examination).
2. Study tour should be conducted to any one of the biodiversity rich areas of Telangana state for familiarizing with floristic wealth of our Telangana state and Deccan plateau.
3. Description and identification of plants at family, genus and species levels using floras
4. Identification of key characters in a group of species of a genus and construction of keys
5. Construction of indented keys for the given material
6. Identification of families studied based on flowers or essential parts of the flowers
7. Knowledge of Herbarium techniques
8. A minimum of 50 herbarium specimens
9. A minimum of 10 abbreviations of authors' names to be presented in the record.
10. Record

References:

1. Lawrence: Taxonomy of Vascular Plants
2. Sivarajan, V.V. (Ed. Robson). Introduction to Principles of Plant Taxonomy
3. Heywood, V.H. Plant Taxonomy
4. Naik, V.N. Taxonomy of Angiosperms (1988)
5. Stace, C.R. Plant Taxonomy and biosystematics (2nd Ed.)
6. Hutchinson, J. The families of flowering plants (3rd Ed.),1973
7. Cronquist, R. The Evolution and classification of flowering plants (1988)
8. Cronquist 1981. An integerated system of classification of flowering plants
9. Takhtajan, K. Outline of classification of flowering plants. Botanical Rev. 46:225-359),1980
10. Flowering plants. Origin and Dispersal (Trans. By Jeffry),1969

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M.Sc. BOTANY - II- SEMESTER

Paper – I: Gymnosperms and Embryology of Angiosperms

MBOT.CC.T.1.201 **4 Hrs/week 4 Credits**

Course objectives:

- This course aims to impart an insight into the internal structure and reproduction of the most evolved group of plants.
- Understand the morphology, structure, reproduction and life history of Gymnosperms.

Course outcome: After completion of these courses students will be able to understand:

- Understand the plant anatomy and embryology of angiospermic plant.
- Understand the development of pollen and ovule.
- Understand the process of Embryology

UNIT – I

1. Distribution of Gymnosperms - Past and present.
2. Classification of Gymnosperms – Proposed by Sporne and Pant.
3. Economic importance of Gymnoperms
4. Wood anatomy of Conifers

UNIT – II

5. A general account of Gymnosperms with reference to their vegetative morphology anatomy and reproductive structures of the following taxa

   i. Cycadales (*Zamia*)
   ii. Ginkgoales (*Ginkgo*)
   iii. Coniferal.es (*Araucaria*)
   iv. Taxales (*Taxus)*
   v. Gnetales (*Ephedra*)
   vi. General Account of Pteridospermales, Pantoxylales and Cordaitales

UNIT – III

6. **Microsporangium:** Structure, Micro sporogenesis and development of male gametophyte

7. **Megasporangium:** Structure of Ovule, types of ovule, Mega sporogenesis and development of female gametophyte and types of embryosacs

UNIT IV

8. **Fertilization:** Double fertilization, self-incompatibility, barriers of fertilization.
9. **Endosperm:** Development and types of endosperms. Embryogeny of dicots and monocots. Polyembryony: A general account on Apomixes and Parthenocarpy.
10. Embryology in relation to Taxonomy.

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Paper – I: Gymnosperms and Embryology Lab

MBOT.CC.P.1.205 Practicals (Labs) **8 Hrs/ week 4 Credits**

Major and Minor experiments:

1. Gymnosperms: Comparative study of the vegetative, reproductive parts and Anatomy of the following: *Zamia, Araucaria, Cedrus, Thuja, Ginkgo and Taxus.*
1. Palaeobotany: *Lyginopteris, Medullosa, Ptilophyllum and Glossopteris.*
2. Embryology: Study of embryology by specimens and slides.

a) T.S. of anther.

b) Study of ovules by hand section.

c) Globular embryo

d) Mature embryo

e) Polyembryony

f) Pollen viability.

References

1. Chamberlain, C.J. Gymnosperms: Structure and evolution
2. Sporne K. R: The Morphology of Gymnosperms.
3. Vashistha, P.C. 1978: Gymnosperms.
4. Foster & Gifford. Comparative Morphology of Vascular Plants
5. Delevoryas, T.1963. Morphology and evolution of Fossil Plants
6. Arnold C.W. introduction to Paleobotany
7. Shukla & Mishra: Essentials of Paleobotany
8. Steward, W.N. 1988: Paleobotany & Evolution of plants
9. Sergeiv, Moyen: Fundamentlis of Paleobotany – 1098
10. Taylor, T.N. 1981. Introduction to Fossils

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M.Sc. BOTANY - SEMESTER-II

Paper-III: Plant Biochemistry

MBOT.CC.T.1.203 (CORE) **4 Hrs/week 4 Credits**

Course objectives:

- The aim of this course is to give the students essential knowledge pertaining to plant biochemistry and metabolic activities.

Course outcome: After completion of these courses students will be able to understand:

- Structure and role of amino acids and proteins their biosynthesis
- Will gain knowledge on nucleic acids, their synthesis and regulation, and fatty acids their types and synthesis.

UNIT-I

1. **Bioenergetics**: Conservation of energy, Entropy and disorder, Gibbs free energy, Chemical reactions and equilibrium constants, Redox potential, energy currencies (ATP, NAD, NADP), ATP structure and reactions.
2. **Enzymes**: Properties of enzymes, Co-factors, Isozymes, enzyme kinetics, Michaelis – Menten equation, mechanism of enzyme action, regulation of enzyme action.

UNIT –II

3. **Carbohydrates**: Classification, structure and function of carbohydrates a) monosaccharides b) oligosaccharides c) polysaccharides, storage polysaccharides, structural polysaccharides and glycoproteins.
4. **Amino acids**: a) General properties b) Classification and characteristics c) non protein amino acids d) peptide bonds e) Biosynthesis of amino acids with reference to GS and GOGAT.

UNIT –III

5. **Proteins:** a) Classification of proteins, b) Structure of proteins and Ramachandran plot.
6. **Lipids**: Classification of lipids – simple lipids, compound lipids, sterols and terpenoids, biosynthesis of fatty acids, polyunsaturated fatty acids, lipoproteins, oxidation of fats, α-oxidation, β-oxidation, glyoxylate cycle, gluconeogenesis
7. **Nucleic acids:** a) Structure of DNA and types – B, A and Z forms and DNA, b) Structure of RNA – m-RNA, t-RNA, r-RNA

UNIT –IV

8. **Structure and function of membranes**: a) Chemical composition b) Membrane models c) Functions of Membranes d) Membrane proteins e) Membrane lipids.
9. **Biochemistry of plant cell wall:** cellulose, hemicelluloses, lignin, pectin, suberin and cutin.
10. **Secondary metabolites**: introduction, classification, distribution and functions.

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Paper-III: Plant Biochemistry Lab

MBOT.CC.P.1.207 Practicals (Labs) **8 Hrs/ week 4 Credits**

Major and Minor Experiments

1. Determination of amylase activity
2. Estimation of fructose by resorcinol method
3. Estimation of protein by Biuret method
4. Estimation of reducing sugars in fruits.
5. Determination of iodine number.
6. Extraction and estimation of alkaloids from tea leaves/coffee seeds

Spotters

a. Cellulose
b. Isozymes
c. Lock & Key model
d. Structure of Cholesterol
e. Tertiary structure of protein

References:

1. Plant Physiology, biochemistry and molecular biology. David, T: Dennis and Davis Turnip. Longman. Scientific and technical U.K. 1990.
2. Plant Biochemistry. P.M. Dey and J.B. Harborne
3. Plant Biochemistry. Hans-Walter Heldt
4. Plant Biochemistry Voet, D and Voet J.G. International
5. Outlines of biochemistry. 5th edition Con E.E. and Stump P.K. 1995. Willey
6. Principles of biochemistry, Lehnenger, A.L. 1982 CBS Publication
7. Biochemistry, Strayer W.H. 1976. Foreman Company

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M.Sc. BOTANY- II SEMESTER

Paper-IV: Ecology and Phytogeography

MBOT.CC.T.1.204 **4 Hrs/week 4 Credits**

Course objectives:

- This course aims to introduce the concepts and principles of ecology, biological diversity, conservation, sustainable development, population, community and ecosystem structure and function, application of these concepts to solve environmental problems.

Course outcome: After completion of these courses students will be able to understand:

- Know the biotic and abiotic components of ecosystem.
- Understand plant community & ecological adaptation in plants.

UNIT-I

1. **The Environment:** Physical environment; biotic and abiotic interactions.
2. **Habitat and Niche:** Concept of habitat and niche; Niche width and overlap; Fundamental and realized niche; Resource partitioning; Character displacement- Allopatric and Sympatric.
3. **Ecosystem Ecology**: Ecosystem structure and function; Food Chain, Food Web, Energy flow and Mineral cycling (C,N).
4. Primary production and Methods of measurement of primary productivity

UNIT-II

5. **Population Ecology:** Characteristics of a population(Density ,Natality, Mortality ,Dispersion Population size, Age structure , Life tables); Population growth curves; Population regulation; life history strategies (r and K selection)
6. **Species Interactions:** Types of Interactions, Positive interactions Mutualism, Symbiosis, commensalism, Protocooperation.
7. Negative interactions – Exploitation, Herbivors. Carnivors, antibiosis, competition.

UNIT-III

8. **Community Ecology:** Characteristics of communities Analytical Quantitative – Frequency, density, Abundance, Cover and Basal area. Qualitative – Physiognomy, Phenology,Stratification, sociability, vitality and Life form and Synthetic - Prensence and constance, Fidelity Dominance.); Raunkiaer concept ; Levels of species diversity and its measurement; Ecotones. Biodiversity: Monitoring; Hotspots (with reference to India), Major drivers of biodiversity change;
9. **Ecological Succession:** Types; mechanisms; Changes involved in succession;
10. Concept of climax- Monoclimax and Polyclimax theories.

UNIT –IV

11. **Biogeography:** Plant distribution , Theory on plant distribution(Age and area theory, Theory of tolerance), Major terrestrial biomes; Biogeographical zones and Phytogeographical zones of India of India. Classification of climate – Koppens and Thornthwaites classification.
12. Phytogeography and Flora of Telangana; Salient features of vegetation aspects of Telangana state with reference to its location in Deccan plateau.

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Paper-IV: ECOLOGY AND PHYTOGEOGRAPHY LAB

MBOT.CC.P.1.208 Practicals (Labs) **8 Hrs/ week 4 Credits**

Major and Minor Experiments:

1. Determination of Biochemical oxygen demand (BOD) in sewage water.
2. Determination of chemical oxygen demand (COD) in industrial effluents.
3. Study of plant community by determining the frequency, density and abundance of different species. Based on the collected data construct frequency diagram and compare it with normal frequency diagram.
4. Determination of accumulated soil enzymes (protease and urease) and soil fertility.
5. Estimation of organic matter in agriculture soils.
6. Estimation of phosphates and sulphates in degraded and fertile soils.

Spotters

A. Petrol or coal (Non-renewable energy)
B. Alcohol (bioenergy)
C. Hydrophytes
D. Xerophytes
E. Epiphytes

References:

E.P. Odum 1996

E.J Koromondy .1996 Concept of Ecology

P.D Sharma . 1996

S.P. Misra .S.N. 2010 Pandey Essentail Enviromental studies

N.S Subrahmanyam and Sambamurty 2000 Ecology

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SEMESTER – III

MBOT.CC.T.2.301: Paper-I: Cell Biology and Cytogenetics
MBOT.CC.T.2.302: Paper-II: Plant Physiology

ELECTIVES

MBOT.EC.T.2.303 / A:
Paper-3 (Elective) : (i) Ethnobotany (or)

(ii) Tissue culture & Plant Biotechnology

MBOT.EC.T.2.304 / B:
Paper-4 (Elective) : (i) Environmental Pollution (or)

(ii) Plant pathology

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M.Sc. Botany - III Semester

Paper-I: Cell Biology, Genetics and Biostatistics

MBOT.CC.T.2.301 **4 Hrs/week 4 Credits**

Course objectives:

- The aim of this course is to give the students essential knowledge pertaining to Cell Biology deals with the detailed study of a cell including cell structure, cell composition, cell organelles.

Course outcome: After completion of these courses students will be able to understand:

- Demonstrate an experiential learning and critical thinking of the structure and function of both prokaryotic and eukaryotic cells.
- Acquire knowledge of cell cycle, cell division and cell death mechanisms.

UNIT -I

1. Brief account of DNA replication and transcription. Introns and exons.
2. Brief study of regulation of gene expression in prokaryotes (Lac-operon) and eukaryotes (promoters, transcription factors and enhancers).
3. Overview of cell cycle. Control mechanisms: role of cyclins and cyclin- dependent kinases. Apoptosis and Programmed cell death.

UNIT -II

3. Mutations: Gene mutations (substitutions and frame-shift mutations), Chromosomal aberrations (structural), Transposon-induced mutations; Site-directed mutagenesis.
4. Brief study of DNA damage and repair mechanisms
5. Inherited human diseases: Haemophilia and Sickle cell Anaemia. Gene therapy
6. Brief account of Proto-oncogenes, oncogenes and tumor suppressor genes.
7. Mendelian inheritance. Gene interaction (12:3:1; 9:3:4; 9:7 ratios).
8. Linkage and chromosome mapping in eukaryotes

UNIT -III

9. Extra nuclear inheritance: Cytoplasmic male sterility
10. Hardy-Weinberg Law. Gene pool, Gene frequency and genotype frequency
11. Brief account of plant tissue culture, micropropagation and transgenic plants. Overview of recombinant DNA technology. Gene cloning, genomic / cDNA libraries, Restriction mapping blotting methods, polymerase chain reaction and DNA finger printing.
12. Brief overview of plant breeding methods: Conventional, mutation breeding, QTLs and MAS.

UNIT -IV

13. Basic concepts of gene sequencing, genomics, proteomics and Bioinformatics.
14. Mean, Variance, Standard deviation and Standard error.
15. Chi-square and Student's "t" test. Probability distribution (Binomial, Poisson and Normal).

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Paper-I: Cell Biology, Genetics and Biostatistics Lab

MBOT.CC.P.2.305 Practicals (Labs) **8 Hrs/ week 4 Credits**

Major and Minor Experiment:

1. Cytological Squash preparation of onion root tips to study mitosis.
2. Problems in Genetics
3. Mendelian inheritance and gene interaction.
4. Chromosome mapping in eukaryotes
5. Population Genetics
6. Problems in Restriction mapping of plasmids.
7. Problems in Biostatistics:
8. Graphic representation of data: Histogram.
9. Mean Variance, Standard Deviation and Standard Error.
10. Chi-square and Student's "t" test.
11. Problems on Probability.
12. Maintenance of Practical Record.

List of books recommended

1. A. K. Sharma and A. Sharma. 1990. Chromosome techniques. Butterworths. 1990 Ed.
2. E.D.P. De Robertis and E. M. F. De Robertis. 1987. Cell and Molecular biology8th Ed(Indian Ed
3. G. M. Cooper. 1997. The Cell and Molecular approach. ASM Press. Ed.
4. Strickberger. Genetics. 3rd Ed. 1990. Ed.
5. Snustad and Simmons. 1997. Principles of Genetics. Ed.
6. Benjamin Lewis. 1999. Genes VII.
7. Daniel Hartl. 1994. Basic Genetics. Ed.
8. Griffiths, Miller,Suzuki, Lewontin & Gelbert1999 An introduction to Genetic analysis
9. Winter, Hicky and Fletcher. 1999. Instant notes in Genetics. Ed.
10. A.V.S.S. Sambamurthy. 1999. Genetics.
11. Ahluwalia. 1993Genetics.
12. P.K. Gupta. 1990. Genetics.
13. U. Sinha and S. Sinha. 1994. Cytogenetics, Plant Breeding & Evolution. Ed.
14. K. K. De. 1992. Plant tissue culture.

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M. Sc. BOTANY III Semester

Paper-II: Plant Physiology

MBOT.CC.T.2.302 **4 Hrs/week 4 Credits**

Course objectives:

- The aim of this course is to give the students essential knowledge pertaining to plant physiology especially the water transport, absorption, photosynthesis, respiration and nitrogen metabolism.

Course outcome: After completion of these courses students will be able to understand:

- Know scope and importance of plant physiology
- Understand process of photosynthesis, C3, C4, CAM pathways
- Understand the Physiology of Floral Induction
- Understand the Plant Growth Regulators

Unit-I: PLANT WATER RELATION AND MINERAL NUTRITION

1. Water relation – water potential, SPAC concept, stomatal relation of transpiration- energy and hormonal development hypothesis.
2. Mineral nutrition: Role of micronutrients in plant nutrition, mechanism of ion uptake, role of ATPase as carries ion channels.

Unit- II: PHOTOSYNTHESIS AND RESPIRATION

3. Photosynthesis; photosynthesis apparatus, photosynthetic pigments and light harvesting complexes. Photo-oxidation of water, mechanism of electron transport, carbon assimilation; the Calvin cycle, and C_4 cycle; CAM, Photorespiration
4. Respiration; overview of plant respiration, Glycolysis, TCA cycle, Electron transport and ATP synthesis, Pentose Phosphate Pathway, Glyoxylate cycle, Cynide-Resistant Respiration.

Unit- III: NITROGEN AND SULPHUR METABOLISM AND PLANTGROWTH REGULATIONS.

5. Nitrogen fixation, nitrogen and sulphur metabolism; overview, biological nitrogen fixation, nodule formation and nod factors, mechanism of nitrate uptake and reduction, ammonium assimilation, sulphate uptake, transport and assimilation.
6. Structure and regulation of Nif genes, transfer of nif gene into higher plants. Plant growth regulators; physiological effects and mechanism of action of auxines, Gibberellines, Cytokinins, Ethylene, Abscisic acid.

Unit-IV: THE FLOWERING PLANTS &STRESS PHYSIOLOGY.

7. The flowering process; Photoperiodism and its significance, endogenous clock and its regulation. Floral induction and development- genetic and molecular analysis, role of vernalization.
8. Stress physiology; plant response to abiotic stress, mechanism of abiotic stress, tolerance (water stress, salt stress, temperature stress, heavy metal stress)

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Paper-II: Plant Physiology Lab

MBOT.CC.P.2.306 Practicals (Labs) **8 Hrs/ week 4 Credits**

(A) Major Experiments:

1. Estimation of Reducing Sugars
2. Separation of Chloroplast pigments by Solvent Extraction method
3. Determination of Iodine Number of Oils.

(B) Minor Experiments:

4 Extraction and estimation of Chlorophyll- a and Chlorophyll- b.
5 Estimation of IAA.
6 Estimation of Ascorbic Acid

Spotters:

1. Plasma membrane
2. ATP
3. Root Nodules
4. Nitrogenase
5. Rubisco
6. C_3 Plants
7. C_4 Plants
8. CAM Plants
9. IAA
10. IBA
11. GA_3
12. Phytochrome
13. Kranz Anatomy
14. Florigen.

References:

1. Plant Physiology, biochemistry and molecular biology. David, T: Dennis and Davis Turnip. Longman.Scientific and technical U.K. 1990.
2. Physicochemical and Environmental Plant Physiology. Park S. Nobel

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M.Sc. BOTANY III SEMESTER

Paper III (i) - EHNOBOTANY

MBOT.EC.T.2.303 / A (i) Theory Syllabus **4 Hrs/week** **4 Credits**

Course objectives:

- This course would provide students the economic importance, ethano agriculture, ethano medicine and role of employment opportunities.

Course outcome: After completion of these courses students will be able to understand:

- Increase the awareness and appreciation of plants & plant products encountered in everyday life Appreciate the diversity of plants and the plant products in human use
- Understand the concept of Ethanobotany

UNIT-I

1. Ethnobotany: Introduction, scope and relevance and interdisciplinary science.
2. The ethnic groups of India: Major ethnic groups of Andhra Pradesh, and their life styles.
3. The dependence of ethnic groups on the forests.
4. The ethnobotanical data documentation: role of Indigenous Traditional Botanical Knowledge(TBK) .

UNIT-II

5. The centers of ethnobotanical studies in the world.
6. Ethnobiology research in Telangana/Andhra Pradesh. Plants of Magico-religious beliefs, social customs and taboos.
7. The history of plant-human interactions: Paleobotanical evidence.
8. Archaeo-ethnobotany: A brief account.

UNIT-III

9. Ethnomedicine: Introduction and scope.
10. Ethnoveteirnary medicine and its significance.
11. The important Indian ethnobotanical drugs.
12. WHO and Ethno-directed drug discovery.

UNIT-IV

13. Ethnoagriculture: Podu/Jhum/Shifting cultivation and its impact on the surrounding environment.
14. The minor (non-timber) forest products collected by the ethnic tribes (Chenchus, Gonds, Koyas, Konda Reddi and Yanadi) of Telangana/Andhra Pradesh.
15. Role of ethnobotany in the conservation of native plant genetic resources.
16. Applied Ethnobotany. Ethnobotany and Employment opportunities.

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Ethnobotany: Reference Books and Journals:

Balick, M.J. & Cox, P.A. Plants, 1996. People and Culture –The Science of Ethnobotany. Scientific American Library, New York.

Ciran 1993. 1993-2003, Indigenous Knowledge and Development Monitor.

Cotton, C.M. 1966. Ethnobotany: Principles and Applications. John Wiley & Sons, New York.

Haimendorf, C.V.F.1943. The Chenchus. Mac Millan & Co, London.

Haimendorf, C.V.F.1945. The Reddis of Bisson Hills. Mac Millan & Co, London.

Haimendorf, C.V.F.1979. The Gonds of Andhra Pradesh. Vikas Publishing House, New Delhi.

Harsberger, J.W.1986. The purpose of ethnobotany. Botanical Gazette 21: 146-154.

Hasian, N. 1995. *Bharateeya Girijanulu* (in Telugu). Orient Longman, Hyderabad.

Hemadri, K. 1994. *Shastravettalanu Akarshisisstlunna Girijana Vaidyam*. TCRTI, Hyderabad (in telugu).

Jain, S.K. (Edited) 1981. Glimpses of Indian Ethnobotany. Oxford & IBH, New Delhi.

Jain, S.K. (Edited) 1985. Ethnobiology in Human Welfare. Deep Publications. New Delhi.

Jain, S.K. 1987. A Manual of Ethnobotany. Scientific Publishers , Jodhpur.

Jain, S.K (Assist. by S. Srivastava) 1998. Dictionary of Ethnobotany Plants. Deep Publications, New Delhi.

Mathias, E., Rangnekar,D.V.& McCorkle, C.M.(Ed.) 1999. Ethnoveterinary Medicines – Alternative for Livestock Development. BAIF Development Research Foundation, Pune.

Ramarao, N. & Henry, A.N. 1996. The Ethnobotany of Eastern Ghats of Andhra Pradesh, India. BSI, Kolkata.

Ravishankar, T. & Henry, A.N. 1992. The Ethnobotany of Adilabad district, Andhra Pradesh, Ethnobotany 4:45-52.

Reddy, C.S., Nagesh, K., Reddy, K.N. & Raju, V.S. 2003. Plants used in ethnoveterinary practices by Gonds of Karimnagar district, Andhra Pradesh, India. J.Econ. Tax. Bot. 27(3): 631-634.

Thurston,E. 1909. Casts and Tribes of Southern India. Govt. Press, Madras.

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Paper III (i) – EHNOBOTANY LAB

MBOT.EC.P.2.307- A Practicals (Labs) **8 Hrs/ week 4 Credits**

Major and Minor Experiments

1. Collection of ethnobotanical data: From a local forest area and from a local forest tribe ethnobotanical data are to be collected. The details of resource persons are documented (photography, video, tape recording etc.)

2. Analysis of ethnobotanical data-disease-wise, plant part wise, habit-wise, tribe-wise and pictorial presentation of these data

3. Calculation of total important value (TIV) index of a species based on ethnobotanical uses; demonstrate the evaluation of two ethnobotanical sites for prioritization or disposal

4. Submission of Ethnomedicinal herbarium/Museum specimens like leaves, barks, tubers, nuts, etc. of economic/medicinal use.

Spotters:

1. **Ethnic food plants:**
   a) *Cajanus cajana* (Kandi); b) *Sorghum bicolor* (jonnalu); c) *Dioscoria* spp. (Nalla gadda, kasi teega)

2. **Ethnomedicinal plants:**
   a) *Andrographis paniculata* (nelavemu); b) *Rauvolfia serpentine* (sarpagandhi); c) *Terminalia bellarica* (tani)

3. **Ethno-veterinary plants:**
   a) *Litsea glutinosa* (narra mamidi); b) *Gymnema sylvestre* (china pala teega); c) *Vitex negundo* (tella vavili)

4. **Magico-religious/ ornamental plants:**
   a) *Abrus precatorius* (gurija); b) *Achyranthus aspera* (uttareni); c) *Cassia glauca* (bhuthankush, nerdi).

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M.Sc. BOTANY III SEMESTER
Paper III (ii) - Tissue culture & Plant Biotechnology

MBOT.EC.T.2.303 / B (ii) **4 Hrs/week 4 Credits**

Course objectives:

- The course aims at the consept, scope, instrumentation, basic requirements and applied aspects of plant tissue culture. It focuses on various types plants cultures.

Course outcome: After completion of these courses students will be able to understand:

- Student will understand the basic properties of plant cell and with apply the their basic knowledge of tissue culture techniques
- Understand the fundamental of recombinant DNA technology.

UNIT-I.

1. Introduction to plant tissue culture, totipotency and cyto differentiation
2. Establishment of tissue culture lab, tissue culture techniques, preparation of culture media. Cell suspension, callus induction, meristem and organ culture.
3. Morphogenesis: *In vitro* regeneration (direct and callus mediated) and plantlet establishment.
4. Somaclonal variation and their applications in crop improvement.

UNIT-II.

5. Micropropagation and its application in horticulture and forestry. Cryopreservation and germplasm storage.
6. Androgenic haploids: Anther and pollen culture and their importance.
7. Isolation, culture and fusion of protoplasts. Somatic hybridization & cybrids.
8. *In vitro* production of secondary metabolites from medicinal plants, hairy root cultures.

UNIT-III.

9. General concept of Recombinant DNA technology, gene cloning principles and techniques
10. Restriction endonucleases: Type I,II&III, DNA ligases, reverse transcriptase, alkaline phospotases, S1 nuclease, role in genetic engineering.
11. Vectors used in gene cloning, Construction of genomic and c-DNA libraries.
12. Blotting techniques: Southern, Northern and Western blotting.

UNIT-IV

13. Genetic engineering, basic concepts, aims and strategies for development of transgenics.
14. Agrobacterium-natural genetic engineer T-DNA transfer mechanism, direct gene transfer techniques – selectable markers and reporter genes.
15. Transgenics – possible risks and benefits. Polymerase chain reaction and its application, DNA finger printing
16. Transgenic plant resistance to agricultural pests (Bt – Cotton & Bt – Brinjal), resistance to herbicides (Roudup ready), Improved nutrional benefits (Golden Rice)

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Paper III - (ii) Tissue culture & Plant Bio technology Lab

MBOT.EC.P.2.307/B (Practical Labs) **8 Hrs/ week 4 Credits**

MAJOR EXPERIMENTS:

1) Isolation of DNA
2) Isolation of plasmid DNA
3) Agrobacterium – mediated genetic transformation.
4) Agarose Gel electrophoresis

MINOR EXPERIMENTS

5) Biolistic method of transformation. (gene gun)
6) Invitro amplification of DNA by PCR
7) Southern blotting

MAJOR EXPERIMENTS:

1) Preparation of tissue culture media (MS and B5 media) sterilization of tissue culture media of inoculation of various explain.
2) Induction of callus from different explants.
3) Micro propagation through induction of multiple shoot by using shoot tips and axillary buds.
4) Organogenesis and somatic embryogenesis using appropriate explants.
5) Enzymatic isolation of protoplast and their fusion employing PEG.

MINOR EXPRIMENTS:

6) Demonstration of anther culture experiment in culture
7) Encapsulation of somatic embryos.

SPOTTERS:

a. Callus
b. Autoclave
c. Laminar Air Flow Chamber
d. Synthetic seeds
e. Multiple shoots
f. Hot Air Oven
g. Plasmids
h. PCR
i. Restriction Enzymes
j. RAPD

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M.Sc. BOTANY III SEMESTER

Paper-II: Environmental pollution

MBOT.CC.T.2.304/A : **8 Hrs/week 4 Credits**

Course objectives:

- The course deals with air, water, and soil pollution, solid wastes disposal techniques, pesticide pollution, and their impacts on environment, ecosystems and human health and other living organisms

Course outcome: After completion of these courses students will be able to understand:

- Students will learn how to assess pollution sources and fate.
- Assess environmental related risk.
- Develop controls to reduce or eliminate risk.
- Plan measurement and monitoring of air pollutants.

UNIT I

1. Kinds of pollution, Air pollution-Sources of air pollution,
2. Major air pollutants, Primary and Secondary Pollutants stationary and mobile sources.
3. Effects of air pollutants on plants, human beings and materials, control of air pollution.
4. Noise pollution- sources, effects and control measures.
5. Acid rain- causes and effects on terrestrial and aquatic systems.

UNIT II

6. Water pollution- Sources, Effects and control of water pollution.
7. BOD, COD, Hardness of water, criteria of water quality.
8. Primarytreatment (Industrial wastewater) - Segregation, equalization, neutralization, sedimentation, flotation and oil separation.
9. Secondary treatment (Biological treatment)- Principlesofbiologicaltreatment
10. Waste stabilization ponds, Aerated lagoons-Activated sludge process, Trickling filters.

UNIT III

11. Soil pollution – Sources, effects and control measures.
12. Bioremediation- Insitu and Ex-situ bioremediation
13. Bioremediation of toxic metals.
14. Concept of Phytoremediation

UNIT IV

15. Classification of solid wastes, types and sources. Disposal methods,
16. Management of Muncipal waste,
17. Hazardous and Biomedical waste.
18. Environmental (protection) Act-1986

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Paper-II: Environmental pollution Lab

MBOT.CC.P.2.308/A (Practical Labs) **8 Hrs/ week 4 Credits**

Major and Minor Experiments:

1. Estimation of the following in water:
   a. Total hardness
   b. Calcium
   c. Organic matter
   d. BOD

2. Estimation of noise.

3. Qualitative estimation of the following:
   a. Solid waste
   b. Coal
   c. Fly ash
   d. Sugarcane bagasse
   e. Wood
   f. Cow dung

REFERENCE BOOKS

1. MN Rao, McGrace Hill 1993 – Air pollution
2. Ç.S.Rao- Environmental Engineering and technology
3. S.P. Misra and Pandey- Essential Environmental Studies
4. Y.Anjaneyulu- Introduction to Environmental Science.
5. P.D.Sharma- Ecology and Environment
6. P.C.Santra- Environmental Science

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M.Sc. BOTANY III SEMESTER

Paper –IV (ii) PLANT PATHOLOGY

MBOT.EC.T.2.304 /B **4 Hrs/week 4 Credits**

Course objectives:

- To acquaint the students with the science of phytopathology; its objectives, general concepts and classification of plant diseases.

Course outcome: After completion of these courses students will be able to understand:

- Understand causes of disease development.
- Know the prevention and control measures of plant diseases.
- Knowledge of Bio-control and Integrated Pest management.

UNIT-I

1. Introduction and History of Plant Pathology
2. Classification of plant diseases: Symptomology of Fungal, Bacterial, Viral and Protoplasma.
3. Parasitism and Disease Development, Host range of pathogens, disease cycle penetration (Chemical and Physical), colonization and dissemination of pathogens.
4. Host pathogen interactions, Chemical Weapon of pathogens,(Enzymes. Toxins and Growth regulators).

UNIT-II

5. Changes in Host-Physiological function due to pathogenesis:
   a. Photosynthesis b. Respiration c. Translocation of water and nutrients d. Permeability of membrane
6. Nutrition and Physiology of plant pathogenic fungi:
   a) Carbon, Nitrogen, Phosphorous and trace elements
   b) Physiology and dormancy of spore germination.

UNIT-III

7. Host defense mechanisms: Structural defense, hyper sensitivity, Physical barriers. Metabolic or Biochemical defense, phenols, Phyto alexins and induced enzymes.

8. Effect of Environment on Disease Development: Effect of Moisture, temperature, wind, soil, PH and Host plant nutrition.

9. Plant diseases epidemiology: Elements of epidermis, Measurement of plant diseases Patterns of epidemics and pathogens factors, .Computer simulation of epidemics and Diseases Forecasting and Management.

UNIT-IV

10. Principles of plant disease control:
    a: Quarantine b: Cultural practices c: Biological Methods d: Physical Methods e:Chemical Methods: Classification of fungicides, Chemical nature and mode of action, methods of application of fungicides: Sulphur, Copper, Mercurial compounds, Quinones, Heterocyclic compounds. Oxanithis and Benzimidozoles.
    F) Miscellaneous fungicides.

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Paper IV – (ii) PLANT PATHOLOGY LAB

MBOT.EC.P.2.308 / B (Practical Labs) **8 Hrs/ week 4 Credits**

Minor experiments:

1. Micrometry and Standardization of Microscope.
2. Measurement of fungal spores and mycelium and camera Lucida drawings.
3. Disease diagnosis by studying symptoms.
4. Infected plant material eg. Leaf spots, Blight, mildews, rots, wilts and Rusts and Smuts.

Major experiments:

1. Collection, isolation of fungi, Dilution method, soil plate method, agar plate method.
2. Calculation of spore count using hemocytometer.
3. Study of plant diseases (Herbarium) and preparation of semi-permanent slides.
4. Isolation and Identification of VAM fungi and estimation of root colonization.
5. Mushroom Cultivation.

Herbarium

Record

References

1. Agrios, G.N. 1999. Plant Pathology. Academic Press
2. Annual Review of Phytopathology, 1999. Vol. 37, APS Press
3. Chandanwala, K. 1986. Introduction to Plant Pathology. Ammol Publishers and Distributors
4. Horsfall, J.G. & Cowelling. 1978. Plant Diseases – An Advance Treatise Vol. II& IV Acad Press
5. Tarr, S.A.J . 1987. Principles of Plant Pathology. Academic Press

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SEMESTER - IV

MBOT.CC.T.2.401: Paper-I: Biodiversity and Conservation

MBOT.CC.T.2.402: Paper-II: Plant Molecular Biology

Elective I:

MBOT.EC.T.2.403 / A: Paper-III: (i) Applied Phycology

Paper-III: (ii) Plant Breeding

Elective II:

MBOT.EC.T.2.404 /B: Paper-IV: (i) Biofertilizers in Agriculture

Paper-IV: (ii) Pharmacognosy

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M.Sc. BOTANY IV SEMESTER

Paper-I: Biodiversity and Conservation (common paper)

MBOT.CC.T.2.401 **4 Hrs/week 4 Credits**

Course objectives:

- The objective of this course is to provide a critical and conceptually sophisticated understanding of biodiversity and conservation

Course outcome: After completion of these courses students will be able to understand:

- To understand and distribution of biodiversity
- Scope , importance and management of biodiversity

UNIT –I

1. Concept of Biodiversity, its origin and development, Aims & Objectives Magnitude and Distribution.
2. Ranks recognized in Biodiversity studies and taxonomy, Keystone taxa.
3. Characterization of Biodiversity

a) Levels of Biodiversity b) Measurement of Genetic diversity, species diversity and community diversity.

UNIT –II

4. Bio-geographical regions and Hot spots of India
5. Endemism and endemic species of India with special reference to Telangana state.
6. Degeneration Maintenance and Loss of Biodiversity

a) Diversification of species, b) Ecological extinctions and c) Proximate causes

UNIT –III

7. Inventorying, Monitoring and Assessment of resource base for Biodiversity
   a) Monitoring of Biodiversity at different biological levels: Genetics, Population, Species; Species turnover in Ecosystems and Landscape levels.
   b) Monitoring in marine environment and freshwater ecosystems. Long-term monitoring of ecosystems
   c) Inventorying and monitoring for conservation: RAMSAR convention, sites, Red data (books and lists).
8. Assessment and use of molecular DNA data on Biodiversity and Application of Biotechnology for the utilization of Biodiversity

UNIT –IV

9. Economic value and utilization of Biodiversity with reference to the following taking five examples for each: a) Food b) Fibre c) Oils d) Drugs e) Spices f) Gums and Resins g) Insecticides and Pesticides
10. Biodiversity convention: a) Initiative from UN b) Rio Conference c) Recent efforts
13. Conservation of Biodiversity

a) in-situ conservation, b) ex-situ conservation

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Paper-I: Biodiversity and Conservation Lab

MBOT.EC.P.2.405 Practicals (Labs) **8 Hrs/ week 4 Credits**

Major and Minor experiments:

1. Interpretation of Biodiversity and vegetation based on the data provided
2. Comparison of floristic elements of Biodiversity in published Floras:
   a) Comparison of ten dominant families in different Floras
   b) Genetic diversity (number of Genera)
   c) Ten dominant Genera
3. Comparative study of species diversity of different Genera from published Floras (Jaccard index Coefficient). The student should be provided data on specific Genera represented in the relevant Floras. 4. Field study – Record and Field Note Book.

Reference

1. Global Biodiversity assessment Heywood, V.H. and Watson, RT Ed. 1995.
2. Biodiversity measurement and estimtioin.Ed. Hawksworth. Chapman & Hall, 1995.
3. Biodiveirsity and eecosystem function.Ed.B7 Schulze, ED and Mooney, HA Springer Verlag. NY. 1996.
4. Functional roles of Biodidversity: A Global Perspective. Mooney, HA, Cushman, JH, Miduo, E, Sale, OE and Schulze, ED. 1995.
5. Biodiversity prospecting: Using Genetic resources for suitable development. Reid et al. WRI, USA, 1993.
6. Conserving Biodiversity for suitable development. Ramakrishnan, AK.Das and Saxena INSA, N.Delhi. 1995.
7. Biodiversity and Forest Genetic Resources. D.N. Tewari. international Book Distrib. Dehradun
8. Biodiversity and its conservation in India S.S. Negri. 1996.
9. Biodiversity in Managed landscapes. Theory and practice. R.C. Szatro and D.W. Johnston. Oxford University Press. 1996.
10. General Ecology. HD. Kumar. Vikass Publ. House Pvt. Ltd. 1995.
11. Global Biodiversity. Trivedi.
12. Biodiversity. Agarwal – K.C.
13. Kumar, U – Biodiversity
14. Navadanya – The Biodiversity convention to its impact on III World.

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M.Sc. BOTANY-IV SEMESTER

Paper-II: Plant Molecular Biology

MBOT.CC.T.2.402 **4 Hrs/week 4 Credits**

Course objectives:

- The objective of the present course content is to provide a foundation and background in cellular and acellular entities of plants and animals, cell structure in relation to functions, eukaryotic genome structure (including nuclear and organellar), and regulatory mechanisms.

Course outcome: After completion of these courses students will be able to understand:

- Know about molecular cytogenetics, understand scope and objectives of plant breeding.
- They understand the principle mechanisms of genome replication, maintenance, function and regulation of expression.

UNIT -I

1. Overview of Plant Molecular Biology.
2. Plant tissue culture, culture media and culture techniques. Totipotency and cyto- differentiation
3. Micropropagation, Somatic embryos, Synthetic seeds and Somaclonal variation. *In vitro* production of secondary metabolites.
4. Brief account of anther culture and haploidy. Isolation and fusion of protoplasts.

UNIT- II

5. Recombinant DNA technology. Biosafety measures. Intellectual property rights and Patents.
6. Vectors, Restriction endonucleases and DNA ligases. Gene cloning, genomic and Cdna libraries. Detection and isolation of a gene within a library by immuno- detection of proteins and nucleic acid (colony) hybridization.
7. Southern, northern and western blotting. Restriction fragment length polymorphisms (RFLPs) and DNA Fingerprinting. RNAi technology, Gene knockout technology.

UNIT -III

8. Genetic engineering for production of transgenic plants: *Agrobacterium* and microprojectile gun mediated methods of gene transfer, Genetic transformation of chloroplasts. Hairy root cultures.Status of transgenic plants in India.
   Sanger's method of DNA sequencing. Human genome project. Brief account of chemical synthesis of genes.
9. Importance of cryopreservation and germplasm storage.

UNIT -IV

10. Polymerase Chain reaction. Brief account of molecular markers: Randomly Amplified Polymorphic DNA (RAPD), Amplified length fragment polymorphism (AFLP), Simple Sequence Repeats (SSR) and Expressed sequence tags (ESTs).
12. Mapping of quantitative trait loci (QTLs) and marker-assisted selection.
13. Applications of Biofertilizers. Biopesticides. Single cell protein and Biodiesel.
14. Microbial production of vitamins, organic acids and alcohols.

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Paper-II: Plant Molecular Biology Lab

MBOT C.C.P.2. 406 Practicals (Labs) **8 Hrs/ week 4 Credits**

Major and Minor experiments:

1. Preparation of stock solutions and tissue culture medium (MS medium).
2. Plant tissue culture for callus induction, somatic embryogenesis, shoot regeneration and rooting.
3. Preparation of synthetic seeds with somatic embryos.
4. Enzymatic isolation of protoplasts from leaves.
5. Estimation of RNA by Orcinol method.
6. Scoring of RFLP maps.
7. Study of Biofertilizers and Biopesticides
8. Problems on restriction mapping.
9. Maintenance of Practical Record.

References

1. Y.P.S. Bajaj. Biotechnology in Agriculture and Forestry. Vol. 1 to 16. 1986-1990.
2. I. Vasil. Plant tissue culture. Vol. 1 to 4. Ed. I. Vasil. 1993.Ed.
3. Balasubramainan. Concepts in Biotechnology.. Universities Press. 1996. Ed.
4. Prathibha Devi. Principles and methods in Plant Molecular Biology, Genetics and Biochemistry.

Agrobios Publ. 2000. Ed.

5. S.S. Purohit . Agricultural Biotechnology.. 1999.Ed.
6. H. D. Kumar . Biotechnology..1992.Ed.
7. Trehan. Biotechnology. 1994.Ed.
8. K. K. De Plant tissue culture.. 1992.Ed.
9. Narayanaswamy. Plant tissue culture. 1994.Ed.
10. Smith,R.H.2000 Plant Tissue Culture:Techniques & Experiments Acad PressN.Y.

M. A. Hughes Plant Molecular Genetics..

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M.Sc. BOTANY IV SEMESTER

Paper-III: (i) Applied Phycology

MBOT.EC.T.2.403 /A **4 Hrs/week 4 Credits**

Course objectives:

- The content in Applied Phycology provides information on the overview of algae, SCP, algae in agriculture, industrial and economic significance as well.

Course outcome: After completion of these courses students will be able to understand:

- Know economic importance of Algae.
- Mass cultivation of microalgae and macroalgae

UNIT-I.

1. History perspectives and scope of algae
2. Algae as a source of food, and feed
3. Algal culture, types of culture media, isolation of pure culture, preservation, and source of algal culture(Media for chlorophyceae and cyanophyceae – Bolds basal media, Chu 10 media)

UNIT-II

4. Single cell protein studies with reference to *Spirulina, Chlorella* and *Scendesmus*
5. Mass cultivation and commercial value of sea weeds with reference to Porphyra, Laminaria and Enteromorpha.
6. Applications of Algae in agriculture
7. Applications of Algae in aquaculture

UNIT-III

8. Aquatic pollution causes and consequences, Eutrophication and its impact on water quality.
9. Algae as indicators in assessing water quality and pollution.
10. Algae in environmenta health, Microalgae and wastewater treatment.

UNIT-IV

1. Role of Algae in Bio remediation
2. Industrial uses of Algae (Cosmetic. Pharmaceutical. and Biofuel)
3. Algal Blooms & Toxic algae (fresh water and marine algae)

References :

Algae and water pollution - Palmer, C.M
Limnology - Welch, P.S.
Seaweeds and their uses - Chapman, V.J.
Metabolism in Algae - F.E.Fogg
Cultivation of Algae - G.S. Venkatraman
The Blue –Green - Peter Fay
Cyanophyta - Desikchary,T.V.
Algae and human affairs - Carole, A .Lembi et al.,
Micro --algae biotechnology - Michael Borowitzka
Handbook of Phycological method - Stein J.R.

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Paper-IV: (i) Applied Phycology Lab

MBOT.EC.P.2.407/A Practicals (Labs) **8 Hrs/ week 4 Credits**

MAJOR AND MINOR EXPERIMENTS

1. Identification of bioindicators.
2. Preparation of algal beads (sodium alginate)
3. Estimation of Algal pigments
4. Estimation of sugars in Algae.
5. Estimation of proteins in Algae.
6. Identification of nitrogen fixing algae
7. Algal cytology (Chlorophyceae) by acetocarmine squash method
8. Media preparation and isolation of algae
9. Induction and conjugation in Chlorophyceae (Conjugales)
10. Biofuels

SPOTTERS:

11.. Biofertilisers
12. Agar agar media
13. *Spirullina*
14. Commercial sea weeds (*Gracillaria, Gigartina, Gelidium* and *Laminaira*)
15. Toxic Algae (*Gymnodimium, Anabaena, Lyngbya* and *Microcystis*)
16. Algal culture
17. Algal pigments
18. Phyco-colloids
19. Single Cell Protein
20. Nitrogen Fixation (Nitrogenase)

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M.Sc. BOTANY IV SEMESTER

Paper III – PLANT BREEDING

MBOT.EC.T.2.403 /B **4 Hrs/week 4 Credits**

Course objectives:

- To impart theoretical knowledge and practical skills about plant breeding objectives, modes of reproduction and genetic consequences, breeding methods for crop improvement

Course outcome: After completion of these courses students will be able to understand:

- Understand objectives and scope of plant breeding.
- Breeding techniques

UNIT-I

1. Types of reproduction in crop plants; sexually reproducing species
2. Breeding Techniques
3. Hybridization in self pollinated crops
4. Hybridization in vagetatively propagated crops.

UNIT-II

5. Inbreeding, out breeding of heterosis
6. Induced polyploidy of breeding
7. Breeding for disease resistances
8. Breeding for specific traits

UNIT-III

9. Plant variety protection
10. Hybrid seed protection
11. Techniques of artificial Hybridization
12. Genetic basis of plants breeding

UNIT-IV

13. Incompatibility systems in plants
14. Self Incompatibility in plant breeding
15. Plant tissue culture in crop improvement
16. Genetic Engineering in crop improvement

Paper III – PLANT BREEDING LAB

MBOT.EC.P.2.407/B Practicals (Labs) **8 Hrs/ week 4 Credits**

I. Major experiments:

1. Action of alkylating agents (EMS, MMS and NMU) on dividing cells
2. Hybridization techniques
3. Mutagenic effectiveness and efficiency of physical and chemical mutagenesis
4. Induced polygenic variability.

II. Minor experiments:

5. C-mitosis (Induction of tetraploids and polyploids).
6. Pollen sterility.
7. Invitro pollen germination.

III. Spotters:

8. Somatic hybrid
9. Chromosomal aberrations
   (a) Chromosome brides
   (b) Chromosome fragments
   (c) Spindle abnormalities
   (d) Precocious movement of Chromosomes
10. Multiple shoots
11. Fused protoplasts
12. Cybrid
13. Bt-cotton
14. Somaclonal variation
15. Variation in sizes of pollen grains

References

Plant breeding by B D Singh.
U. Sinha and S. Sinha. 1994. Cytogenetics, Plant Breeding & Evolution.
Plant breeding by Allard.
Plant breeding by Randhawan

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M.Sc. BOTANY IV SEMESTER

Paper IV – (i) Biofertilizers in Agriculture

MBOT.EC.T.2.404/ A **4 Hrs/week 4 Credits**

Course objectives:

- This course is aimed at students interested in understanding the basic of Organic farming and use of biofertilizers.

Course outcome: After completion of these courses students will be able to understand:

- Discuss various principles, need and prospect of Organic farming.
- Describe biofertilizers and their significance.

UNIT-I: Introduction to plant nutrition

1. Role of microbes in plant nutrition, plant growth promoting Rhizobacteria (PGPR) and fungi, nitrogen fixers, phosphate solubility, micro organism and VAM, modes of N_2 fixation, symbiosis and free living forms.
2. Bioferlilizer technology, mass cultivation techniques, biofertilizes and soil reclamation, organic farming, organic manure, compost, microbial succession, composting.

UNIT-II: Bacterial Biofertilizers

3. Isolation and mass cultivation of *Rhizobium, Azotobzcter, Azospirillum* and *Frankeia*
4. Phospate solubilizing bacteria, PGPR formulation and applications.

UNIT-III: Cyanobacteria Biofertilizers

5. Utilization BGA in agriculture, Reclamation of saline and alkaline soils, Symbiotic Cyanobacteria, Blue green algae and nitrogen fixation, BGA and rice fields, free living and symbiotic nitrogen biofertilizers.
6. Cultivation of BGA, methods of cultivation-trough method, pit method, *Azolla*, *Anabaena* and is role in rice fields.

UNIT-IV: Fungal Biofertilizers

7. Micorrhizae types and Arbascular micorrhizal fungi: *Glomus*
8. Plant growth promoting fungi and bio control agent (*Trichoderma*) production of fungal bioinoculants and their application methods, advantages and disadvantages of bioinoculants in relation to chemical fertilizer.

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Paper IV – (i) Biofertilizers & Organic farming Lab

MBOT.EC.P.2.408 /A Practicals (Labs) **8 Hrs/ week 4 Credits**

Major and Minor Experiments:

1. Estimation method of biological N2 fixation, acetylene reduction (GC) and total N2 estimation
2. Isolation of bacteria from soil and root nodules and assessment for PGPR characters.
3. Cultivation of biofertilizer bacteria (*Rhizobium/Azatobacteria*) and its GC assessment
4. Nodulation of legume seedlings by *Rhizobium* inoculants
5. Cultivation of BGA (Anabaena/Nostoc) and assessment for N2 fixation
6. Cultivation of *Trichoderma* and testing biocontrol activity (Growth inhibition in plate/chitinase activity)

Spotters:

1. Biofertilizers
2. Root nodules
3. VAM
4. *Rhizobium* culture plate
5. Biopesticide (*Trichoderma)*
6. Compost
7. Nitrogenase
8. Organic fruit
9. Organic vegetable
10. *Azolla*

References:

1. Biology of rice fields-BGA-SC, Santra, 1993
2. Biofertilizers and organic farming. H. Pards and D. Hota, 2007
3. A textbook of biotechnology by N.S. Subbarao
4. Biofertilizers technology by Singh and Purohit.

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M.Sc. BOTANY IV SEMESTER

Paper-IV: (ii) Pharmacognosy

MBOT.EC.T.2.404 /B **4 Hrs/week 4 Credits**

Course Objectives:

- To know and understand the Adulteration and Deterioration that occurs in herbal/natural drugs and methods of detection of the same.

Course Outcome:

- Helps the students to know about common bitters, laxatives and the analytical profiles of some herbal drugs and herbal cosmetics used in everyday life.

UNIT-I

1. Phytochemistry: Introduction, Retrospect and Prospect.
2. Phytochemistry and Human welfare.
3. Phytochemical Methods: Isolation, Chromatography, Electrophoresis and NMR spectra.
4. Phytochemical Diversity.

UNIT-II

5. Micromolecules :Secondary Metabolites :Alkaloids, Flavonoids,Steroids and terpenoids.
6. Phenolic constituents.
7. Macromolecules: Nucleic acids,Proteins, Polysaccharides,Molecular markers.
8. Chemosystematics and phylogeny.

UNIT-III

9. Pharmacognosy: Introduction, Interdesciplenary nature and scope
10. Organised and Unorganised crude plant drugs
11. Analytical pharmacognosy
12. Indian pharmacopoeia

UNIT-IV

13. Organoleptic studies of powders of crude plant drugs.

(a)	Root drug	:	Rauwolfia
(b)	Rhizome drug	:	Curcuma
(c)	Bark drug	:	Cinnamon
(d)	Wood drug	:	Santalum
(e)	Leaf drug	:	Senna
(f)	Flower drug	:	Cloves
(g)	Fruit drug	:	Caraway
(h)	Seed drug	:	Strychnos
(i)	Herb drug	:	Cannabis

14. Therapeutic uses of plant drugs
15. Phytopharmaceuticals :Retrospect and prospect
16. Nutraceutiocals, Cosmeceuticals and Immunomodulators

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Paper-IV: (i) Pharmacognosy Lab

MBOT.EC.P.2.408/B Practicals (Labs) **8 Hrs/ week 4 Credits**

MAJOR AND MINOR EXPERIMENTS:

1. To conduct photochemical methods:

a) Thin layer chromatography,

(b) Paper chromatography and

(c) Electrophoresis, etc.

2. Organoleptic study of crude plant drugs which are mentioned in the syllabus (any two) i). *Rauwolfia*, ii).Senna, iii). Cloves, iv). *Strychnos*, v). Caraway, vi). *Cinnamon*, vii).*Santalum.*

3. Secondary metabolites: following colour tests with extraction of plant drugs (any two): steroids, terpenoids, proteins, polysaccharides, phenolic acids, alkaloids and flavonoids etc.

4. Conduct adulteration tests under analytical pharmacognosy.

5. Active principles of therapeutic uses of plant drugs mentioned in the syllabi (any two)

Spotters:

1. Cloves
2. Caraway
3. Cinnamon
4. Rauwolfia
5. Senna
6. Santalum
7. Strychons.

Reference Books and Journals:

1. Trease, G.E and Evans, W.C. Pharmacognosy,12th Ed. Bailliere Tirdall, Wast bourne, U.K.1983. Kokate, C.K. Purohit,A.P. and S.B.,Practical Pharmacognocy 2nd edition 1996.Nirali Prakashan Publication.Pune.
2. Upadhyay,S.N.Immunomodulation 1997. Navosa Publishing House,New Delhi. Miller, L.P.Phytochemistry, 1-3 volumesd, Van Nostard Reinhold Co., 1973.
3. Phytochemical phylogeny. 1969.Edited by J.B.Harborne,Academic Press,London and New York. Smith, P.M. The chemotaxonomy of plants. Edward Arnold Publishers Ltd. 25 Hill Street,London. Gibbs, R.D. 1974. Chemotaxonomy of Flowering plants McGill. Queens University press, Montreal (1-3 VOL.)
4. Harborne,J.B. 1983. Phytochemical methods.Chapman and Hall, London. Pharmacopoeia of India, Govt. of India, Ministry of Health 1955& 1966. Swain, T. Comparative phytochemistry,Academic Press, London. 1966.

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M.Sc. BOTANY
SCHEME OF EXAMINATIONS
(CBCS 2025–2027)
University Exam (Theory)

Time: 3 Hrs. **Maximum marks: 80**

Section – A (4X 5M = 20 Marks)

I. Answer all the four questions. Each question carries 5 marks.

Q1. a) From Unit 1

b) From Unit 2

c) From Unit 3

d) From Unit 4

Section – B (4 X 15M = 60 Marks)

Answer all the following four questions. Each carries 15 marks.

Q2. (a) or (b) from Unit 1

Q3. (a) or (b) from Unit 2

Q4. (a) or (b) from Unit 3

Q5. (a) or (b) from Unit 4

M.Sc. BOTANY
SCHEME OF EXAMINATIONS
(CBCS 2025–2027)
Internal Assessment (Theory)

Time: 1 Hr. **Maximum marks: 20**

I. Multiple choice questions	**10×½=05Marks**
II. Fill in the blanks.	**10×½=05Marks**
III. One word answers	**05×01=05Marks**
IV. Assignment	**01×05=05Marks**

- Two internal exams (one at the middle of the semester and the other at the end) of one hour duration are to be conducted carrying 20 marks each.
- Average of the scores of two exams should be taken into account.

FACULTY OF SCIENCE
DEPARTMENT OF BOTANY
I – SEMESTER
PRACTICAL MODEL PAPER – I
(Phycology & Mycology and Microbiology)

MAX. MARKS: 100 ***TIME: 4 Hrs***

1. Identify the algal components (A, B, C and D) from the given mixture. Describe their characters with well labeled diagram, Assign them to their taxonomic position& add note on their ecological significance **20M**

2. Take a section of the infected plant material (E) and prepare a temporary mount. Describe its Characters with well labeled diagram. Assign the pathogen to its systematic position **20 M**

3. Stain the given Bacteria (F) and give the reasons **10 M**

4. Identify the given slides (G, H, I & J) (2 – Phycology + 2- Mycology) **4×3 = 12 M**

5. Identify the given specimens (K, L, M & N) (2 – Phycology + 2- Mycology) **4×3 = 12 M**

6. Algal Collections + Pathology Plants collection **5+5 = 10 M**
7. Record + Slides **5+5 = 10 M**
8. Viva- voce **06 M**

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EXTERNAL **INTERNAL**

FACULTY OF SCIENCE
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I - SEMESTER
PRACTICAL MODEL PAPER – II
(Bryophyta and Pteridophyta & Taxonomy of Angiosperms and Medicinal Plants)

MAX. MARKS: 100 ***TIME: 4 Hrs***

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1. Describe the Morphology and Anatomy of the given material (A) (Bryophyta or Pteridophyta) by preparing single stained mount and draw the diagram and identify it. **20 M**

2. Identify the twig and Describe the Characters up to species level with the help of flora (B) **20 M**

3. Assign the given flowers/ floral parts C and D to their respective families giving reasons **10 M**

4. Identify the given Spotters (E, F, G, H, I & J) (3- Bryophyta + 3- Pteridophyta) **6×3 = 18 M**

5. Comment on K & L and add a note on their medicinal importance **2×6 = 12 M**

6. Herbarium **05 M**
7. Records + slides **05+05= 10 M**
8. **Viva- voce** **05 M**

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FACULTY OF SCIENCE
DEPARTMENT OF BOTANY
II - SEMESTER
PRACTICAL MODEL PAPER – I
(Gymnosperms and Embryology of Angiosperms & Plant Anatomy and Palynology)

MAX. MARKS: 100 ***TIME:4 Hrs***

1. Describe the morphology and anatomy of the given material A (Gymnosperms) by preparing double stained mount. Draw diagram and identity giving reasons **20 M**

2. Estimation of stomatal frequency/stomatal index and identify the type of stomata in the given material (B) **20 M**

3. Isolation of ovule from given material (C) **15 M**

4. Spotting (D, E, F, G, H & I)
   (3- Gymnosperms and Embryology) (3- Plant Anatomy and Palynology) **6x5=30M**

5. Records & Slides **5+5+=10M**

6. Viva- voce **05 M**

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II - EMESTERS
PRACTICAL MODEL PAPER – II
(Plant Biochemistry and Ecology & Phytogeography)

MAX. MARKS: 100 ***TIME: 4 Hrs***

1. Plant biochemistry major experiment (A) **20 M**

2. Ecology major experiment (B) **20 M**

3. Explain following minor experiment/ ecosystem (C) **10 M**

4. Plant biochemistry minor experiment (D) **10 M**

5. Spotting (E, F, G, H, I & J) **6x5=30 M**

6. Record & Viva- voce **5+5=10 M**

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FACULTY OF SCIENCE
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III - SEMESTER
PRACTICAL MODEL PAPER – I
(First common paper +First Elective paper)

MAX. MARKS: 100 ***TIME: 4 Hrs***

7. Common paper major experiment **20 M**

8. Common paper minor experiment **15 M**

9. Elective paper major experiment **20 M**

10. Elective paper minor experiment **15 M**

11. Spotting **5X 4 =20 M**

A)
B)
C)
D)
E)

12. Record + Viva voce **5+5=10 M**

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III – SEMESTER
PRACTICAL MODEL PAPER – II
(Second common paper + Second Elective paper)

MAX. MARKS: 100 ***TIME: 4 Hrs***

1. Common paper major experiment **20 M**

2. Common paper minor experiment **15 M**

3. Elective paper major experiment **20 M**

4. Elective paper minor experiment **15 M**

5. Spotting **5X 4 =20 M**
   A)
   B)
   C)
   D)
   E)

6. Record + Viva voce **5+5=10 M**

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FACULTY OF SCIENCE
DEPARTMENT OF BOTANY
IV – SEMESTER
PRACTICAL MODEL PAPER – I
(First common paper +First Elective paper)

MAX. MARKS: 100 ***TIME: 4 Hrs***

13. Common paper major experiment **20 M**

14. Common paper minor experiment **15 M**

15. Elective paper major experiment **20 M**

16. Elective paper minor experiment **15 M**

17. Spotting **5X 4 =20 M**

A)
B)
C)
D)
E)

18. Record + Viva voce **5+5=10 M**

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IV– SEMESTER
PRACTICAL MODEL PAPER – II
(Second common paper + Second Elective paper)

MAX. MARKS: 100 ***TIME: 4 Hrs***

7. Common paper major experiment **20 M**

8. Common paper minor experiment **15 M**

9. Elective paper major experiment **20 M**

10. Elective paper minor experiment **15 M**

11. Spotting **5X 4 =20 M**

A)
B)
C)
D)
E)

12. Record + Viva voce **5+5=10 M**

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