

M.Sc. Botany Syllabus

For University and Affiliated Colleges

With effect from 2016 – 2017



**Mahatma Gandhi University
Nalgonda - 508254
Telangana, India.**

M.Sc. BOTANY, Mahatma Gandhi University
(Effective from Academic Year 2016-2017)

SEMESTER - I

Subject Code	Subject / Paper	Theory / Practical	Instruction Hrs /Week	Credits	Evaluation		Duration of External Examination
			Th./ Pr.		Internal	External	
MBOT.CC.T.1.101	Phycology	Theory (Paper-I)	4	4	20	80	3
MBOT.CC.T.1.102	Bryophyta & Pteridophyta	Theory (Paper-II)	4	4	20	80	3
MBOT.CC.T.1.103	Taxonomy of Angiosperms and Medicinal Botany	Theory (Paper-III)	4	4	20	80	3
MBOT.CC.T.1.104	Plant Biochemistry	Theory (Paper-IV)	4	4	20	80	3
MBOT.CC.P.1.105	Practical Lab - I	Practical (Paper-I)	4	2	-	50	4
MBOT.CC.P.1.106	Practical Lab - II	Practical (Paper-II)	4	2	-	50	4
MBOT.CC.P.1.107	Practical Lab -III	Practical (Paper-III)	4	2	-	50	4
MBOT.CC.P.1.108	Practical Lab -IV	Practical (Paper-IV)	4	2	-	50	4
		Seminar	2	1		25	
			34	25		625	

SEMESTER - II

Subject Code	Subject / Paper	Theory / Practical	Instruction Hrs /Week	Credits	Evaluation		Duration of External Examination
			Th./ Pr.		Internal	External	
MBOT.CC.T.1.201	Mycology	Theory (Paper-I)	4	4	20	80	3
MBOT.CC.T.1.202	Gymnosperms and Embryology	Theory (Paper-II)	4	4	20	80	3
MBOT.CC.T.1.203	Plant Anatomy and Palynology	Theory (Paper-III)	4	4	20	80	3
MBOT.CC.T.1.204	Plant Physiology	Theory (Paper-IV)	4	4	20	80	3
MBOT.CC.P.1.205	Practical Lab - I	Practical (Paper-I)	4	2	–	50	4
MBOT.CC.P.1.206	Practical Lab - II	Practical (Paper-II)	4	2	–	50	4
MBOT.CC.P.1.207	Practical Lab - III	Practical (Paper-III)	4	2	–	50	4
MBOT.CC.P.1.208	Practical Lab - IV	Practical (Paper-IV)	4	2	–	50	4
		Seminar	2	1		25	
			34	25		625	

SEMESTER – III

Subject Code	Subject / Paper	Theory / Practical	Instruction Hrs /Week	Credits	Evaluation		Duration of External Examination
			Th./ Pr.		Internal	External	
MBOT.CC.T.2.301	Cell Biology, Genetics and Biostatistics	Theory (Paper-I)	4	4	20	80	3
MBOT.CC.T.2.302	Environmental Pollution & Protection	Theory (Paper-II)	4	4	20	80	3
MBOT.CC.T.2.303	Specialization	Theory (Paper-III)	4	4	20	80	3
MBOT.CC.T.2.304	Specialization	Theory (Paper-IV)	4	4	20	80	3
MBOT.CC.P.2.305	Practical Lab - I	Practical (Paper-I)	4	2	–	50	4
MBOT.CC.P.2.106	Practical Lab - II	Practical (Paper-II)	4	2	–	50	4
MBOT.CC.P.2.307	Practical Lab - III	Practical (Paper-III)	4	2	–	50	4
MBOT.CC.P.2.308	Practical Lab - IV	Practical (Paper-IV)	4	2	–	50	4
		Seminar	2	1		25	
			34	25		625	

SEMESTER - IV

Subject Code	Subject / Paper	Theory / Practical	Instruction Hrs /Week	Credits	Evaluation		Duration of External Examination
			Th./ Pr.		Internal	External	
MBOT.CC.T.2.401	Ecology and Phytogeography	Theory (Paper-I)	4	4	20	80	3
MBOT.CC.T.2.402	Plant Molecular biology	Theory (Paper-II)	4	4	20	80	3
MBOT.CC.T.2.403	Specialization	Theory (Paper-III)	4	4	20	80	3
MBOT.CC.T.2.404	Specialization	Theory (Paper-IV)	4	4	20	80	3
MBOT.CC.P.2.405	Practical Lab - I	Practical (Paper-I)	4	2	–	50	4
MBOT.CC.P.2.406	Practical Lab - II	Practical (Paper-II)	4	2	–	50	4
MBOT.CC.P.2.407	Practical Lab - III	Practical (Paper-III)	4	2	–	50	4
MBOT.CC.P.2.408	Practical Lab - IV	Practical (Paper-IV)	4	2	–	50	4
		Seminar	2	1		25	
			34	25		625	

Total number of credits for the 2-year M.Sc. Botany Programme: 100

M.Sc Botany- I Semester

MBOT.CC.T.1.101

(CORE)

4 Hrs/week 4 Credits

Paper I: Phycology

UNIT - I

1. General characters and comparative study of important systems of classification of 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 e) Gross cell structure.
3. Algae of diverse habitats – a) Terrestrial b) Freshwater algae and c) Marine algae
4. Reproduction of algae – a) Vegetative b) Asexual – Different types of spores. Sexual – Zygotic, Sporic and Gametic with suitable examples.

UNIT – II

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

UNIT-III

6. General characters and morphology, life history of the following groups of algae.
 - a) Bacillariophyceae – *Cyclotella, Cymbella, Gomphonema*.
 - b) Euglenophyceae - *Euglena, Phacus*
 - c) Phaeophyceae - *Laminaria , Padina*
 - d) Rhodophyceae - *Porphyra, Gracillaria, Corallina*.

UNIT-IV

7. Algal blooms and Toxic algae
8. Algal biofertilizers
9. Algae as Food and Feed.
10. Role of algae in industry (Alginic acid, Agar, Carrageenan)
11. Fossil Algae (A brief account only).

Practical lab - I

1. Identification of the genera mentioned in Cyanophyceae and Chlorophyceae.
2. Collecton and identification of algae occurring in and around university college/campus.
3. Identification of the genera mentioned in Bacillariophyceae, Euglenophyceae, Phaeophyceae and Rhodophyceae.
4. Identification of bloom forming algae.
5. Identification of Algal biofertilizers.
6. Identification of toxic algae.

Reference books

1. Fritsch, F.E. The structure and reproduction of algae volume I and II
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.

M.Sc. BOTANY- I SEMESTER

MBOT.CC.T.1.102

(CORE)

4 Hrs/week 4 Credits

PAPER – II: Bryophyta and Pteridophyta

UNIT - I

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

UNIT - II

3. Structure and evolution of gametophyte in Bryophytes
4. Structure and evolution of sporophytes in Bryophytes
5. Economic importance of Bryophytes
6. Fossil & Fossilization, types of plant fossils
7. Fossil Bryophytes.

UNIT - III

8. Classification systems of Pteridophytes
9. Distribution, structure and reproduction of the following groups:
 - Psilotales- *Psilotum*
 - Filicales – *Ophioglossum*, *Adiantum*, *Salvinia*, *Azolla*
 - Lycopodiales- *Lycopodium*, *Phylloglossum*
 - Selaginellales-*Selagenella*
 - Isoetales- *Isoetes*,
 - Equisetales-*Equisetum*
- Stelar evolution in Pteridophytes.

UNIT- IV

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

Practical Lab –II

1. Bryophytes: Morphological and structural study using whole mount
 - a) *Plagiochasma / Fimbraria*
 - 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*, *Adiantum*, *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.

M.Sc. BOTANY - I SEMESTER

MBOT.CC.T.1.103

(CORE)

4 Hrs/week 4 Credits

Paper-III: Taxonomy of Angiosperms and Medicinal Botany

UNIT -I

1. Systems of classification: Phenetic and Phylogenetic 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:
 - a) Magnoliaceae & Winteraceae
 - b) Malvaceae & Sterculiaceae
 - c) Rutaceae & Meliaceae
 - d) Apocynaceae & Asclepiadaceae
 - e) Verbenaceae & Lamiaceae
 - f) Amaranthaceae & Chenopodiaceae
 - g) Cyperaceae & Poaceae
6. Origin of angiosperms, with reference to recent findings.

UNIT -IV

7. Medicinal Botany:
 - a) Role of plants in medicine, its origin and development
 - b) Morphology, active principles and medicinal value of the following:
 - i. *Andrographis paniculata*
 - ii. *Asparagus racemosus*
 - iii. *Clitoria ternata*
 - iv. *Phyllanthus emblica*
 - v. *Gymnema sylvestre*
8. Flora of Telangana: Salient features of vegetational aspects.

Practical Lab-III

1. Study of the locally available plants and recording of the intraspecific variation.
2. Description and identification at family, genus and species levels using Floras.
3. Identification of key characters in a group of species of a genus and construction of keys.
4. Construction of indented keys for the given material
5. Simple Nomenclatural problems
6. Identification of families studied based on flowers or essential parts of the flowers
7. Knowledge of Herbarium techniques
8. Record and Herbarium

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. Takhtajan, K. Outline of classification of flowering plants. Botanical Rev. 46:225-359), 1980
8. Flowering plants. Origin and Dispersal (Trans. By Jeffrey), 1969

M.Sc. BOTANY- I SEMESTER

MBOT.CC.T.1.104

(CORE)

4 Hrs/week 4 Credits

Paper-IV: Plant Biochemistry

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, glycoproteins.
4. **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.

UNIT -III

5. **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.
6. **Proteins:** a) Classification of proteins, b) Structure of proteins and Ramachandran plot
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.

Practical Lab-IV

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

References

1. Plant Physiology, biochemistry and molecular biology. David, T: Dennis and Davis Turnip. Longman. Scientific and technical U.K. 1990.
2. Plant Biochemistry Voet, D and Voet J.G. International
3. Outlines of biochemistry. 5th edition Con E.E. and Stump P.K. 1995. Willey
4. Principles of biochemistry, Lehninger, A.L. 1982 CBS Publication
5. Biochemistry, Strayer W.H. 1976. Foreman Company.
6. Introduction to Plant Physiology. Willium G. Hopkins and Norman P. A. Huner
7. Plant Physiology. Lincoln Taiz and Eduardo Zeiger. International Edition
8. Plant Biochemistry. P.M. Dey and J.B. Harborne
9. Plant Biochemistry. Hans-Walter Heldt
10. Physicochemical and Environmental Plant Physiology. Park S. Nobel

M.Sc Botany - II Semester

MBOT.CC.T.1.201

(CORE)

4 Hrs/week 4 Credits

Paper I: Mycology

UNIT - I

1. Introduction to Mycology - General characters of true fungi and fungi-like organisms; Hyphal ultrastructure; fungal wall and septa; main growth forms of fungi; mode of nutrition in fungi.
2. General characteristics of fungal spores; asexual and sexual reproduction in different groups of fungi.
3. Fungal cytology and genetics: Heterokaryosis, Parasexual cycle; Sex Pheromones (hormones) in fungi; Mechanism of nuclear inheritance; Mechanism of extra-nuclear inheritance.
4. Outlines of nomenclature, ICN, phylogeny and recent taxonomic criteria; Classification of Fungi (Alexopoulos and Mims, 1996 and Hibbett et. al., 2007).

UNIT -II

5. Systematic position, lifecycle (Hibbett et. al., 2007) and brief account of the following types:
 - Microsporidia - General account
 - Chytridiomycota – Synchytrium
 - Blastocladiomycota - Allomyces, Pilobolus
 - Neocallimastigomycota - General account
 - Glomeromycota – Glomus
 - Ascomycota - Taphrina, Emericella, Neurospora, Gibberella, Glomerella, Morchella
 - Basidiomycota - Melampsora, Phallus, Ustilago
 - Oomycota – Peronospora
 - Fungi-like organisms - Stemonitis

UNIT-III

6. Fungi in Industry: Production of alcohol and organic acids.
7. Fungi in Medicine: Types of metabolites used in medicine and production of antibiotics.
8. Fungi in Agriculture and Forestry:
 - a) Fungi as plant parasites (Wilts, Leafspots, Root rots, Smuts and Rusts).
 - b) Fungi as bio-fertilizers: Ecto and Endomycorrhizae.
 - c) Fungi as biopesticides: mycofungicides, weedicides, and insecticides.
9. Fungi as human and animal parasites (medical mycology)
10. Fungi as food: Mushrooms: Types of mushrooms, biology and growth of mushrooms, nutritional and medicinal value of edible mushrooms; fungal protein (*Yeast* and *Fusarium*).

UNIT-IV

11. General account of Archaeobacteria and Eubacteria; General characters of Plant Pathogenic Bacteria -Ultra structure of bacterial cell, biochemistry of cell wall, nutritional and growth factors of bacteria.
Plasmids - significance of plasmids; molecular events in genetic transfer (conjugation, transformation and transduction) in bacteria.
12. Viruses: Characteristics and ultrastructure of virions; isolation, purification, detection and characterization of viruses; Classification (ICTV) of viruses; Symptomatology and Transmission of plant viruses; Importance of the viruses.
13. Mollicutes: General characters, transmission and diseases caused by Spiroplasmas and Phytoplasmas.

Practical lab –I

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*, *Emericella*, *Neurospora*, *Morchella*, *Fusarium*, *Colletotrichum*, *Melampsora*, *Phallus*, *Ustilago*, *Peronospora*, 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. Identification of fungal cultures, slides and specimens of *Rhizopus/Mucor*, *Aspergillus*, *Penicillium*, Yeast, *Fusarium*, *Alternaria*, *Cercospora*, *Pythium*, *Sphaecelotheca*, VAM fungi, *Trichoderma*, *Beauveria*.
5. Study of Mycorrhizal colonization in roots of *Parthenium* and *Tagetes*.
6. Study of Mushroom specimens
7. Staining of Gram + ve and Gram - ve Bacteria
8. Herbarium of diseased plants (fungal, bacterial, viral & mycoplasma diseases available locally - at least 2-3specimens of each to be submitted).

Reference 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. Powel, C and D. J. Bagyaraj - V.A. Mycorrhizae
8. Berry, R. - Industrial mycology (Vol. I)
9. Dubey, S.C. - Biotechnology.
10. Jeffrey C. Pommerville - Alcamo's Fundamentals of Microbiology
11. Arora D.R. and B. Arora - Text book of Microbiology.

M.Sc. BOTANY- II SEMESTER

MBOT.CC.T.1.202

(CORE)

4Hrs/week 4 Credits

Paper – II Gymnosperms and Embryology

UNIT – I

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

UNIT – II

5. A general account of Gymnosperms with reference to their vegetative morphology and anatomy and male and female cones of the following taxa
 - a). Cycadales (*Cycas*, *Zamia*)
 - b). Ginkgoales (*Ginkgo*)
 - c). Coniferales (*Araucaria*, *Podocarpus*, *Cupressus* and *Cedrus*)
 - d) Taxales (*Taxus*)
 - e). Gnetales (*Ephedra*, *Welwitschia*)
6. General Account of Pteridospermales, Pantoxylales and Cordaitales.

UNIT – III

7. Microsporangium: Anther, sporogenous tissue, formation of pollen wall, vegetative and generative nucleus.
8. Megasporangium: Ovule, types of ovules, Nucellus, Megasporogenesis, embryosac types, a special account of mature embryosac.

UNIT-IV

9. Fertilization: Double fertilization, self-incompatibility, barriers of fertilization.
10. Endosperm: Development and types of endosperms. Embryogeny of dicots. A general account of Apomixis and Parthenocarpy.
11. Embryology in relation to Taxonomy.

Practical Lab-II

1. Gymnosperms: Comparative study of the vegetative, reproductive parts and Anatomy of the following: Zamia, Araucaria, Cedrus, Thuja, Ginkgo and Taxus.
2. Palaeobotany: Lyginopteris, Medullosa, Ptilophyllum and Glossopteris.
3. 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

M.Sc. BOTANY- II SEMESTER

MBOT.CC.T.1.203

(CORE)

4 Hrs/week 4 Credits

Paper: III Plant Anatomy and Palynology

UNIT -I

1. Introduction, importance and relationships of Plant Anatomy
2. Shoot Development:
 - a) Recent views on organization of shoot Apical Meristem and types of vegetative shoot apex in Gymnosperms and Angiosperms.
 - b) Cytological zonation – Anneun initial and Meristem : c) d' attente
 - d) Sub-apical differentiation of tissues.
3. Root Development:
 - a) Organization of root apex and significance of Quiscent center
 - b) Recent experimental studies on differentiation of tissues.
4. Leaf: Structure with reference to C3 and C4 plants – Kranz and CAM Syndrome.

UNIT -II

5. Epidermology:
 - a) Structural composition of Epidermal cells, stomata and trichomes
 - b). Epidermal cell complex – Structure, orientation and arrangement
 - c). Stomatal complex–Basic structure with reference to subsidiaries and ultrastructure of guard cells. Ontogeny of Paracyctic, diacytic, and anisocytic stomata. Classification of trichomes.
6. Transfer cells: Structure, distribution, ontogeny and function.

UNIT -III

7. a) Secondary growth with reference to Dicot stem:
 - b) Significance of Dicots wood anatomy.
 - c). Morphology and arrangement of Vessels, Axial Parenchyma Fibres and Ray parenchyma and their value in wood identification.
8. Salient features of the following woods.
 - a) *Tectona grandis*
 - b) *Terminalia tomentosa*
 - c) *Shorea robusta*
 - d) *Pongamia pinnata*

UNIT – IV

9. Palynology:
 - a) Introduction and scope of palynological science.
 - b) Morphology of pollen – Polarity, symmetry, size and shape, apertural pattern, exine stratification and ornamentation of pollen wall.
10. Aeropalynology – principles, dissemination, distribution of aerospora and meteorological factors. Pollen and spore allergy and clinical treatment.
11. Importance of melittopalynology.
12. Role of Palynology in Taxonomy

Practical Lab - III

1. Study of angiosperm leaf epidermis in the following taxa: Crotalaria, Portulaca or Talinum, Tridax, Petunia or Datura, Barleria, Rheodiscolor or Commelina, Brassica, Cyperus and Grass.
2. Estimation of stomatal frequency and stomatal index in the materials studied.
3. Maceration of wood and identification of various elements in Michelia, Bombax, Tectona, Terminalia and Azadirachta
4. Study of wood structure with the help of T.S., R.L.S. in the following: Tectona, Bombax, Michelia, Pongamia and Azadirachta
5. Histochemical tests for identification of the following: a) Callose b) Lignin c) Pectin d) Starch e) Suberin f) Silica bodies in the leaf of grasses and sedges.
6. Study of shoot apex in suitable locally available materials to understand cyto histological zonation (Coleus, Kalanchoe)
7. Study of roots in Monocots and Dicots. Examination of L.S. of root from a permanent preparation to understand the organization of root apical meristem and its derivatives (maize, aerial roots of banyan, Pistia, Jussiaea)
8. Study of the pollen grains of Hibiscus, Tribulus, Ocimum and Grass.
9. Acetolysis

Reference books

1. Fahn, A. Plant Anatomy (4th Ed.), 1990.
2. Easwari, K. Anatomy of Seed Plants.
3. Easwari, K. Plant Anatomy, 2nd Ed. Wiley N.Y. 1965.
4. Cutter, E.G. Plant Anatomy, Part I and II Edward Arnold; London, 1971 and 1978
5. Metcalf and Chalk. Anatomy of dicots (2nd Edition) (1983). Clarendon Press, Oxford.
6. Metcalf (1982-87) Anatomy of Dicots Vol. I to III
7. P.K.K. Nair. Pollen Morphology of angiosperms.
8. P.K.K. Nair: Essentials of Palynology
9. Moor & Moor: Pollen analysis
10. R.B. Knox, Pollen allergy

M.Sc. BOTANY- II SEMESTER

MBOT.CC.T.1.204

(CORE)

4 Hrs/week 4 Credits

Paper-IV: Plant Physiology

UNIT –I

1. Water relations:

- a. Water potential
- b. SPAC concept

2. Mineral nutrition: Mechanism of ion uptake

- a. Electrochemical potential
- b. Uptake of solutes and macromolecules from soil
- c. Ion channels
- d. ATPase carrier
- e. Aquaporins

3. Assimilation of Nutrients:

- a. Physiology and biochemistry of nitrogen fixation
- b. Sulphate reduction and assimilation

UNIT –II

4. Photosynthesis:

- a. Properties of light and absorption of light by photosynthetic pigments
- b. Composition and characterization of photo systems I and II
- c. Photophosphorylation
- d. Path of carbon
 - Differences between C3 and C4 photosynthesis
 - CAM pathway and its regulation
- e. Photorespiration, biosynthesis of glycolate and regulation of photorespiration.

UNIT –III

5. Respiration:

- a. Glycolysis, fermentation, tricarboxylic acid cycle, Regulation of TCA cycle.
- b. electron transport and oxidative phosphorylation, coupling oxidative phosphorylation to electron transport, chemiosmotic hypothesis.
- c. Hexose monophosphate shunt and its significance, Cyanide – resistant respiration.

UNIT –IV

6. Hormonal control of growth and development

- a. General role of auxins, Gibberellins, Cytokinins, ethylene and Abscisic acid
- b. Mechanism of hormonal regulation-hormone receptors, secondary messengers,
- c. amplification of kinases.

d. Structure and functions of Calmodulin

8. Physiology of flowering

- a. Photoperiodism
- b. Phytochrome – structure and function

9. Physiology and biochemistry of seed dormancy and germination:

- a. Causes of dormancy and methods of breaking dormancy
- b. Biochemical changes accompanying seed germination.

Practical Lab – IV

1. Determination of water potential by Shardolo's methods.
2. Determination of total and titrable acidity.
3. Separation of chloroplast pigments by solvent method
4. Determination of chlorophyll a, chlorophyll b and total chlorophylls in C3 and C4 plants.
5. Estimation of reducing sugars in fruits.
6. Determination of iodine number.

References

1. Mineral nutrition of crop plants. H. Marshener academic Press 1986.
2. Plant Physiology by F.B. Salisbury and C.W. Ross. Wordsworth biology series.
3. Growth and differentiation in plants by Wareing and Phillips, Pergamon press.
4. Plants Cell structure and metabolism. J.L. Hall, Flower and Roberts, ELBS, Longman.
5. Advanced Plant Physiology by M.B. Wilkinson, ELBS, Longman
6. Introduction to Plant Physiology by G.R. Noggle and G.J. Fritz, Printice Hall Press
7. Cell Biology by C.B. Powar, Himalaya Publishing
8. Plant Physiology by R.N. Devlin and F.H. Witham, CBS 1986
9. Introduction to plant physiology W.G. Hopkins and Norman P.A. Huner
10. Plant Physiology. Lincoln Taiz and Eduardo Zeiger

M.Sc. Botany - III Semester CBCS

Common paper

MBOT.CC.T.2.301

(CORE)

4 Hrs/week 4 Credits

Paper-I: Cell Biology, Genetics and Biostatistics

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

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

UNIT -III

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

UNIT -IV

15. Basic concepts of gene sequencing, genomics, proteomics and Bioinformatics.
16. Mean, Variance, Standard deviation and Standard error.
17. Chi-square and Student's "t" test. Probability distribution (Binomial, Poisson and Normal).
18. Introduction to computers. Use of Word and PowerPoint in the preparation and presentation of documents. Use of Internet and World Wide Web in research.

Practical Paper-I (Common)

1. Cytological Squash preparation of onion root tips to study mitosis.
2. Problems in Genetics:
 - Mendelian inheritance and gene interaction.
 - Chromosome mapping in eukaryotes
 - Population Genetics
3. Problems in Restriction mapping of plasmids.
4. Problems in Biostatistics:
 - Graphic representation of data: Histogram.
 - Mean Variance, Standard Deviation and Standard Error.
 - Chi-square and Student's "t" test.
 - Problems on Probability.
5. Demonstration of Isolation of DNA from plants/Chicken spleen.
6. Demonstration of plant tissue culture methods.
7. Maintenance of Practical Record.

Reference books

1. A. K. Sharma and A. Sharma. 1990. Chromosome techniques. Butterworths. 1990 Ed.
2. G. M. Cooper. 1997. The Cell and Molecular approach. ASM Press. Ed.
3. Strickberger. Genetics. 3rd Ed. 1990. Ed.
4. Snustad and Simmons. 1997. Principles of Genetics. Ed.
5. Benjamin Lewis. 1999. Genes VII.
6. Daniel Hartl. 1994. Basic Genetics. Ed.
7. Griffiths, Miller, Suzuki, Lewontin & Gelbert 1999 An introduction to Genetic analysis
8. A.V.S.S. Sambamurthy. 1999. Genetics.
9. P.K. Gupta. 1990. Genetics.
10. K. K. De. 1992. Plant tissue culture.
11. Narayanaswamy. 1994. Plant cell & tissue culture.
12. Prathibha Devi. Principles & Methods in Plant Molecular Biology, Genetics & Biochemistry, Agrobios.
13. Stansfield. 1996. Theory & Problems in Genetics. Schaum's Series. McGraw & Hill.
14. Khan, I. A. and A. Khanum. 1994 Fundamentals of Biostatistics
15. B. N. Mishra and K. K. Mishra. Naya Prakash. 1983. Introductory practical Biostatistics
16. Cynthia Gibas. O'Reilly & Assoc. 2000. Developing Bioinformatics Computer skills.
17. Balasubramanian. Ed. Concepts in Biotechnology. Universities Press. 1996.

M.Sc. BOTANY- III SEMESTER

Common paper

MBOT.CC.T.2.302

(CORE)

4 Hrs/week 4 Credits

Paper-II: Environmental pollution and protection

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. Primary treatment (Industrial wastewater) - Segregation, equalization, neutralization, sedimentation, flotation and oil separation.
9. Secondary treatment (Biological treatment)- Principles of biological treatment
10. Waste stabilization ponds, Aerated lagoons-Activated sludge process, Trickling filters.

UNIT III

11. Soil pollution – Sources, effects and control measures.
12. Bioremediation- In-situ 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 Municipal waste
17. Hazardous and Biomedical waste
18. Environmental (protection) Act-1986.

Practicals common paper

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, McGraw Hill 1993 – Air pollution
2. C.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

M.Sc. BOTANY- III SEMESTER

Specialization: Biodiversity of Angiosperms and Pharmacognosy of Medicinal Plants

MBOT.EC.T.2.303 /C

4 Hrs/week 4 Credits

Paper-III: Biodiversity of Angiosperms

UNIT –I

1. Concept of Biodiversity, its origin and development
 - a) Definition b) Past history c) Ranks recognized in Biodiversity studies, taxonomy and others d) Keystone taxa.
2. Aims and objectives of Biodiversity
3. Characterization of Biodiversity
 - a) Levels of Biodiversity b) Measurement of Genetic diversity, species diversity and community diversity.

UNIT –II

4. Magnitude and Distribution of Biodiversity
 - a) Current magnitude of Global Biodiversity
 - b) Botanical regions and Hot spots
 - c) Distribution of Biodiversity
 - d) Endemism and Biodiversity
5. Degeneration Maintenance and Loss of Biodiversity
 - a) Diversification of species
 - b) Ecological extinctions
 - c) Proximate causes

UNIT –III

6. Inventorying, Monitoring and Assessment of resource base for Biodiversity
 - a) Inventorying: Definition, purpose, orientation, completeness and intensity. Indicator selection for Biodiversity inventory.
 - Monitoring of Biodiversity at different biological levels: Genetics, Population level and Species level; Species turnover in Ecosystems-Landscape levels.
 - b) Monitoring:
 - Definition, purpose, orientation, completeness and intensity
 - 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).
7. Biotechnology and Biodiversity
 - a) Assessment and use of molecular DNA data on Biodiversity
 - b) Application of Biotechnology for the utilization of Biodiversity

UNIT –IV

8. Economic value and utilization of Biodiversity with reference to the following taking five examples for each: a) Food b) Fodder c) Fibre d) Oils e) Drugs f) Timber g) Rubber h) Spices I) Essential oils j) Gums and Resins k) Insecticides and Pesticides l) Ornamentation
9. A brief account of origin of cultivated plants
10. Biodiversity convention a) Initiative from UN b) Rio Conference c) Recent efforts
11. Conservation of Biodiversity
 - a) In-situ conservation
 - b) Ex-situ conservation

Practical Lab - (Special)

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 books

1. Global Biodiversity assessment Heywood, V.H. and Watson, RT Ed. 1995.
2. Biodiversity measurement and estimation. Ed. Hawksworth. Chapman & Hall, 1995.
3. Biodiversity and ecosystem function. Ed. B7 Schulze, ED and Mooney, HA Springer Verlag. NY. 1996.
4. Functional roles of Biodiversity: 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.

M.Sc. BOTANY - III SEMESTER

Specialization: Biodiversity of Angiosperms and Pharmacognosy of Medicinal Plants

MBOT.EC.T.2. 304/C

4 Hrs/week 4 Credits

Paper-IV: Cultivation and Phytochemistry of Medicinal Plants

UNIT -I

1. Importance of active principles and uses of medicinal plants in different traditional systems of medicine and Allopathy
2. Origin, Historical background. Active principles uses and cultivation practices of the following medicinal plants
 - a) *Andrographis paniculata*
 - b) *Asparagus racemosus*
 - c) *Bacopa monnieri*
 - d) *Coleus forskohlii*
 - e) *Rauwolfia serpentina*
 - f) *Withania somnifera*
3. Origin, Historical background, Active principles uses and cultivation practices (including organic farming) of the following aromatic plants:
 - a) Lemon grass (*Cymbopogon flexuosus*)
 - b) Citronella
 - c) Palmarosa
 - d) *Eucalyptus citriodora*

UNIT -II

6. Distillation of aromatic plants:
 - a) Description of distillation
 - b) Principles of distillation
 - c) Methods of distillation
 - d) Maintenance and precautions for distillation
 - e) Yields and recoveries of different aromatic plants
7. Preparation of Crude drugs in different systems of medicine
8. Value addition grading and processing of plant drugs

UNIT-III

- 9) Major groups of Phytochemicals sources, Pharmaceutical and medicinal importance
 - a) Alkaloids
 - b) Terpenoids
 - c) Coumarins
 - d) Steroids
 - e) Flavonoids
- 10) Techniques involved in the isolation in the biomolecules of medicinal importance- solvent extraction, chemical separation, steam distillation, soxhlet extraction
Chromatography: HPLC, TLC, UV

UNIT -IV

11. Biosynthetic pathways important phytochemicals
 - a) Shikimic acid
 - b) Mevalonic acid pathway
- 12) Biosynthetic pathways of commercially important phytochemicals
 - a) Forskolin
 - b) Taxol
 - c) Vincristin, Vinblastin
13. Threatened and endangered Medicinal Plants
14. Financial aspects of medicinal plants:
 - a) Loans
 - b) Subsidies
15. IPR – Patents

Practical Lab - (Special)

1. Thin layer Chromatography, HPLC
2. Isolation of some natural products: Piperine, Caffeine, Flavone, Coumarin
3. Spectroscopic estimation of some natural products
4. Organoleptic and Microscopic analysis, identification and adulteration check of the following crude drugs.
 - a) Leaf drugs *Cassia augustifolia*
 - b) Root drugs *Rauwolfia serpentina* vs. *R. tetraphyla*
 - c) Bark drugs *Hollahrena pubiscente* vs *Wrightia tinctoria*
 - d) Flower drugs Saffron-vs Safflower
 - e) Whole plant drugs *Catharanthus roseus*
5. Histochemical identification of the following chemical substances: a) Carbohydrates b) Proteins c) Amino acids d) Starch e) Tannins f) Enzymes
6. Estimation of oil content in aromatic crops (Clevenger apparatus) and GSC analysis of oil samples for identification of major compounds.

Reference books

1. Cultivation of medicinal and aromatic crops by Farooqui and Sreeramulu. Univ. Press
2. Textbook of Pharmacognosy by Young Ken – Heber W and Young Ken
3. Pharmacognosy of indigenous drugs by K. Raghunathan and Roma Mitra
4. Pharmacognosy- Kokate et al
5. Pharmacognosy- Mohammed Ali
6. Pharmacognosy- Wallis
7. Pharmacognosy- Trease & Evans-1996
8. Pharmacognosy- Shaw and Quadri
9. Pharmacognosy- Tyler, Brady and Robbins

M.Sc. BOTANY- IV SEMESTER

MBOT.CC.T.2.401

(CORE)

4 Hrs/week 4 Credits

Paper-I: Ecology and Phytogeography (common paper)

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); Primary production and Methods of measurement of primary productivity.

UNIT - II

4. **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).
5. **Species Interactions:** Types of Interactions, Positive interactions- Mutualism, Symbiosis, Commensalism, Protocooperation.
6. Negative interactions – Exploitation, Herbivores, Carnivores, antibiosis, competition.

UNIT - III

7. **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 - Presence 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.
8. **Ecological Succession:** Types; mechanisms; Changes involved in succession.
9. Concept of climax- Monoclimax and Polyclimax theories.

UNIT- IV

10. **Biogeography:** Plant distribution, Theory on plant distribution (Age and area theory, Theory of tolerance), Major terrestrial biomes; Biogeographical zones of India. Classification of climate – Koppens and Thornthwaites classification.
11. **Applied Ecology:** Pollution -Global environmental change -Atmosphere composition and structure, Green house gases, Global warming, Ozone depletion.
12. **Conservation Biology:** Principles of conservation In-situ - Protected areas, National parks, Wildlife sanctuaries, Biosphere reserves and Project tiger. Ex situ - Botanical gardens, Zoological parks and cryopreservation.

Practical Lab - I (Common)

1. Determination of quantitative characters by random quadrat method -Abundance, Density, Frequency, IVI and Dominance: Similarity and Dissimilarity Index
2. Estimation of Carbonates, Bicarbonates, Chlorides and Dissolved Oxygen
3. Morphology and Anatomy of Hydrophytes and Xerophytes and their Adaptations
4. Maintenance of Practical records

Reference books

1. E.P. Odum 1996 Fundamentals of ecology
2. E.J Koromondy .1996 Concept of Ecology
3. P.D Sharma. 1996 Ecology and environment
4. S.P. Misra .S.N. 2010 Pandey Essentail Enviromental studies
5. N.S Subrahmanyam and Sambamurty 2000 Ecology

M.Sc. BOTANY- IV SEMESTER

MBOT.EC.T.2.402

4 Hrs/week4 Credits

Paper-IV. Plant Molecular Biology

UNIT –I

1. Overview of Plant Molecular Biology and Biotechnology.
2. Plant tissue culture, culture media and culture techniques. Totipotency and cyto-differentiation.
3. Micro propagation, 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 end nucleases 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: *Agro bacterium* and micro projectile gun mediated methods of gene transfer, Genetic transformation of chloroplasts. Hairy root cultures. Status of transgenic plants in India.
9. Sanger's method of DNA sequencing. Human genome project. Brief account of chemical synthesis of genes.
10. Importance of cryopreservation and germplasm storage.

UNIT –IV

11. 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.

Practical Lab - (Special)

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.

Reference books

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. Balasubramanian. 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.
11. Snustad and Simmons. 1997. Principles of Genetics. Wiley.
12. Watson, Hopkins, Roberts, Steitz & Weiner1987. Molecular Biology of the gene.

M.Sc. BOTANY- IV SEMESTER

Specialization: Biodiversity of Angiosperms and Pharmacognosy of Medicinal Plants

MBOT.EC.T.2.403 /C

4 Hrs/week 4 Credits

Paper-III: Taxonomy of Angiosperms and Ethno botany

UNIT –I

1. Method to describe a new Taxon with reference to Genus and species
2. Contribution of the following to the growth of Taxonomy a) R.M.T. Dahlgren b) R.F. Thorne c) Kubitzki
3. Plant identification – taxonomic keys

UNIT –II

4. Role of the following institutions in the growth of Taxonomy
a) Botanical Survey of India, India
b) Kew Gardens, London, UK
c) Smithsonian, Institutions, Washington, D.C., USA
5. Floral diversity in a) Annonaceae b) Malvaceae c) Apocynaceae
d) Asclepiadaceae e) Hydrocharitaceae f) Lemnaceae

UNIT –III

6. Taxonomy of the following significant families
a) Nymphaeaceae (*Sensu stricto and Sensu lato*)
b) Euphorbiaceae with emphasis on its role in modern economy
c) Podostemaceae
d) Musaceae
e) Arecaceae
7. Seed Morphology: external features
a) Embryo, Endosperm, Seed coat anatomy
b) Corner's classification and its role in taxonomy

UNIT –IV

8. Ethnobotany: Concept, scope and objectives
9. Ethnobotany as an inter-disciplinary science. The relevance of Ethnobotany in the present context. Methodology of ethnobotanical studies
a) Field work b) Herbarium c) Ancient literature d) Archaeological findings e) Temples and sacred groves
10. Plants Vs. Tribal Life: a) Food plants and Food cycles b) Intoxicants and Beverages c) Ropes and Bindings materials d) Resins and oils e) Poisons as baits
11. Role of ethno botany in modern medicine with special examples.

Practical Lab - (Special)

1. Study of the following locally available taxa (living sand herbarium) belonging to:
a) *Cleome* b) *Cassia* c) *Sida* d) *Indigofera* e) *Euphorbia* f) *Corchorus* g) *Tephrosia*
h) *Phyllanthus* i) *Brachiaria* j) *Ipomoea*
2. Identification of key characters of species of above genera and construction of keys
3. Study of the seed morphology of the following:
a) *Cleome* b) *Gossypium* c) *Calotropis* d) *Annona* e) *Cyperus* f) *Oryza* g) *Castor*/
Croton h) *Portulaca* i) *Tecoma* j) *Glinus* / *Mullugo* k) *Pulses*
4. Identification of selected families based on their Androecium and Gynoecium given in the mixture
a) Malyaceae b) Meliaceae c) Fabaceae d) Umbelliferae e) Cucurbiataceae
f) Compositae g) Euphorbaceae h) Lamiaceae\
5. Students are required to maintain field note book and record of the taxa occurring in the areas visited
6. Students are required to prepare herbarium of plants collected during field trips
7. Record.

Reference books

1. Wills, J.C. Dictionary of Flowering plants, 1971
2. Santapau, H and A.N. Henry. Dictionary of Flowering plants in India, CSIR, 1973
3. D.J. Mabberly, Plant Book (2nd Edi.) 1997. Cambridge Univ. Press
4. Hubbard, C.E. Grasses, 1954. Penguin Books, London
5. Henry and Chandrabose. An Aid to International code of Botanical Nomenclature
6. Hutchinson, J. The families of Flowering plants (3rd Edi.) b1973.
7. Lawrence, G.H. Taxonomy of Vascular plants. 1951
8. Sivarajan, V.V. (Ed. Robson) Introduction to Principles of Plant Taxonomy
9. V.N. Naik. Taxonomy of angiosperms
10. Cronquist. A. The Evolution and classification of flowering plants. 1988
11. Takhtajan. A. Outline of classification of flowering plants. Botanical Rev. 1980.
12. Davis P.H. and Heywood, V.H. Principles of Angiosperm Taxonomy

M.Sc. BOTANY- IV SEMESTER

Specialization: Biodiversity of Angiosperms and Pharmacognosy of Medicinal Plants

MBOT.EC.T.2.404 / C

4 Hrs/week 4 Credits

Paper-IV: Pharmacognosy

UNIT –I

1. Introduction and Scope of Pharmacognosy: Pharmacognosy and modern medicine
2. Crude plant drugs
 - a) Sources: Geographical, Biological, Cell Culture and Sea
 - b) Classification: Morphological (Organized and unorganized), Taxonomical, Chemical, Pharmacological and alphabetical
3. Indigenous traditional drugs and their market adulteration of Punarnava, Shankhapuspi (Clitoria), Indian goose-berry, Tulasi, Commiphora, Kalmegh

UNIT -II

4. Types of Plant drug and their Pharmacognostic study
 - a) Root drugs; *Glycyrrhiza* and *Ipecac*, *Rauwolfia*, *Satavari*, *Colcus*, *Withania*
 - b) Rhizome drugs, Ginger
 - c) Leaf drugs, *Andrographis*, *Clitoria*, *Senna*
 - d) Bark drugs: *Terminalia arjuna*, *Holorrhena*
 - e) Flower drugs: Saffron
 - f) Seed drugs: *Piper longum*, *Mucuna*
 - g) Fruit drugs: Cumin, Amla, Senna pods
 - h) Whole plant drugs: *Catheranthus roseus*

UNIT -III

5. Evaluation of the drugs; Organoleptic, Microscopic, Physical Chemical and Biological methods of evaluation
6. A brief account of various drug constituents: Carbohydrates, Cardiac glycosides, alkaloids, volatile oils, resins, quinines and steroids with particular reference to Accacia gum, amla, Coleus, Satavari, *Rauwolfia*

UNIT -IV

7. Medicinal Principles and powder analysis of *Curcuma*, Cloves, Senna, Fennel and Cinnamon
8. Large scale Industrial preparation of Crude Drugs
 - a) Types of reactors used and extraction methods
 - b) Active principles and non-active principle of drugs
 - c) Import and Export potentials of Crude Drugs
 - d) Preparation of crude drugs in indigenous system of medicine
 - e) Quality control test – contamination, Adulteration

Practical Lab - (Special)

1. Histochemical analysis of the following chemical compounds:
 - a) Alkaloids b) Steroids c) Quinones d) Resins e) Glucosides
 - f) Pigments g) Volatile oils
2. Organoleptic evaluation of the following:
 - a) *Glycyrrhiza* (Root) b) Ginger (Rhizome) c) Eucalyptus (leaf)
 - d) *Terminalia arjuna* (Bark) f) *Strychnos nuxvomica* (seed)
3. Powder analysis. a) Curcuma b) Cloves c) Senna d) Fennel
- e) Cinnamon: Market drugs: a) Turmeric b) Chillies c) Coriander
- d) Wheat and Jowar
4. Qualitative and Quantitative tests for
 - a) Alkaloids b) Carbohydrates c) Anthroquinones d) Tannins
 - e) Steroids f) Terpenoids
5. Growing chosen Medicinal plants in an experimental plot and preparation of Crude Drug for commercial market – Project
6. Collection of crude drugs from the market and studying their characteristics
7. Preparation of exhibits
8. Record

Reference books

1. Cultivation of Medicinal plants - Purohit & Vyas CBS, 2006
2. Introduction to Medicinal Chemistry (12996). Aler Gingauz. Wiley publications.
3. Medicinal Chemistry (2001). Graham L. Patrick. Oxford University Press