MADHYANCHAL
PROFESSIONAL UNIVERSITY

Draft Rules & Syllabus
for the

Master of Science in Botany

(M.Sc. Bot.) Course

Scheme for M.Sc. Botany CBCS Course

SEMESTER I

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted								Hours per week.			Total Credits	Remarks
			Theory				Practical								
			End Sem	Mid Sem. MST	Quiz, Assignment	Total Marks	Lab Work	Assignment /Quiz/Term paper	End Sem	Total Marks	L	T	P		One credit refers to one hour teaching in theory, Tutorial
1	MSc101	Plant Morphology and Taxonomy- I	60	20	20	100	-	-	-	-	3	1	-	4	
2	MSc 102	Plant Biochemistry	60	20	20	100	-	-	-	-	3	1	-	4	
3	MSc 103	Microbiology	60	20	20	100	-	-	-	-	3	1	-	4	
4	MSc 104	Anatomy & Histochemistry	60	20	20	100	-	-	-	-	3	1	-	4	
5	MSc 105	Plant Morphology and Taxonomy- I and Microbiology (Lab)	-	-	-	-	40	20	40	100	-	-	4	2	
6	MSc 106	Plant Biochemistry (Lab) and Anatomy & Histochemistry (Lab)	-	-	-	-	40	20	40	100	-	-	4	2	
	Total		240	80	80	400	80	40	80	200	12	4	8	20	600

SEMESTER II

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted								Hours per week.			Total Credits	Remarks
			Theory				Practical								
			End Sem	Mid Sem. MST	Quiz, Assignment	Total Marks	Lab Work	Assignment /Quiz/Term paper	End Sem	Total Marks	L	T	P		
1	MSc 201	Plant Morphology and Taxonomy- II	60	20	20	100	-	-	-	-	3	1	-	4	One credit refers to one hour teaching in theory, Tutorial
2	MSc 202	Plant Physiology	60	20	20	100	-	-	-	-	3	1	-	4	
3	MSc 203	Reproductive biology of Angiosperms and Plant Morphogensis	60	20	20	100	-	-	-	-	3	1	-	4	
4	MSc 204	Medicinal Plants	60	20	20	100	-	-	-	-	3	1	-	4	
5	MSc 205	Plant Morphology and Taxonomy- II and Plant Physiology (Lab)	-	-	-	-	80	20	20	100	-	-	4	2	
6	MSc 206	Reproductive biology of Angiosperms and Plant Morphogensis (Lab) and Medicinal Plants (Lab)	-	-	-	-	80	20	20	100	-	-	4	2	
	Total		240	80	80	400	160	40	40	200	12	4	8	20	600

Chapter II Syllabus

101 - PLANT MORPHOLOGY AND TAXONOMY – I

Unit I:

- Algae: Study of different kinds of classifications - thallus organisation, Life cycle pattern and general reproductive biology of Cyanophyceae, Chlorophyceae, Phaeophyceae, Xanthophyceae, and Rhodophyceae; Fossil algal records; economic importance.

Unit II:

- Bryophyta: Study of different kinds of classifications, Life cycle patterns and reproductive biology of Hepaticae, Anthocerotae and Musci. Ecological and economic use of Bryophytes. Evolution of land plants and significance of bryophytes.

Unit III:

- Brief history of development of plant taxonomy: Brief history of taxonomic studies in India. Contributions of Van Rheede, William Roxburgh, Natithaniel Wallich, Robert Wight, J.D. Hooker, R.H. Beddome and George Watt. Organisation and functioning of the Botanical Survey of India of pre and post independent India. Taxonomic tools - Herbarium:methodology and its significance; Floras, Revisionary studies and Monographs: Keys - indented and bracketed keys.

Unit IV:

- Botanical nomenclature: Principles; typification (type method); priority; ranks of taxa and nomenclature of taxa; effective and valid publication; citation; retention, choice and rejection of names and epithets; conservation of names (nomina conservanda).
- Systems of classification:Concept of Artificial, Natural and phylogenetic systems of classification - study of Bentham & Hooker's system and Hutchinson's system of classification. (Reference to other systems of classification may be made whenever relevant while treating the families). Brief account of APG system.

Unit V:

- The study of the following families with their phylogeny as per Bentham & Hooker's system:Magnoliaceae, Annonaceae, Menispermaceae, Nymphaeaceae, Capparidaceae,Caryophyllaceae,Clusiaceae,Dipterocarpaceae,Oxalidaceae,Balsaminaceae,Meliaceae,Rhamnaceae,Vitaceae,Leeaceae,Sapindaceae, Leguminosae,Rosaceae,Droseraceae,Rhizophoraceae,Combretaceae, Melastomataceae, Lythraceae, Passifloraceae, Cucurbitaceae, Cactaceae.

References:

- Armen Takhtajan. 1969. Flowering plants - Origin and Dispersal. Oliver and Boyd Ltd. Tweeddale Court, Edinburgh, pp. 310.
- Bennet,S.S.R.1979.An Introduction to Plant nomenclature. International Book Distributors.9/3. Rajpur Road, Dehra Dun 248001. India.
- Bhargava M., 2003. Algae 1st Ed, Dominant Publisher, New Delhi.
- Davis, P.H., V.H.Heywood. 1963. Principles of Angiosperm Taxonomy. Oliver and Boyd Ltd., Tweeddale Court,Edinburgh.
- HeywoodV.H.,1976.Botanical Systematics, Academic Press London.
- Hock. C.V.D., D.G.Mann & H.M.Jalms.1993.Algae - an introduction to phycology,Cambridge University Press.
- Hutchinson. J. 1973. The Families of Flowering Plants. Oxford University Press, Elky House, London. W.I., pp. 968.
- Lawrence, H.M.1966. Taxonomy of Vascular Plants. The MacMillon Company. New York, pp. 823.
- Robert Edward Lee 1989. Phycology II End.Cambridge University Press.

102 - PLANT BIOCHEMISTRY

Unit I

- Membranes : structure, chemical composition,models,transport processes - passive, active, bulk transport.
- Plant enzymes-classification,kinetics and mechanism of action.

Unit II

- Respiration: mitochondrial structures,Carbohydrate bio synthesis, classification, structure and metabolism, glycolysis, HMP pathway, uronic acid pathway, T.C.A. Cycle, E.T.S.& oxidative phosphrylation; factors affecting respiration.

Unit III

- Proteins and aminoacids: classification, structure - primary, secondary, tertiary and quarternary; biosynthesis and separation (aminoacid sequence, C-terminal, N-terminal, disulfide bonds).
- Lipids:classification,structure, function and biosynthesis of fatty acids; Beta oxidation.
- Nucleicacids:classification,structure,biosynthesis, functions and metabolism.

Unit IV

- Vitamins - classification, distribution, structure, production, function.Secondary plant products:Structure, Biosynthesis and distribution of Terpenes, Phenolics and Nitrogen containing compounds

Unit V

- Nitrogen fixation and metabolism:Nitrogenase, nitrogen fixation, storage and transport.
- Signaltransduction:Receptors,proteins,phospholipid signaling,roleof cyclic nucleotides,calcium-calmodulincascade,proteinkinasesandphosphatases. Specificsignalling mechanisms in Bacteria and Plants.

References:

- Buchanan, B.B., Gruissem, W. and Jones, R.L. 2007. Biochemistry and Molecular Biology of Plants. American Society of Plant Physiologists, Maryland, USA.
- Dennis,D.T.,Turpin, D.H., Lefebvre, D.D.andLayzell,
- D.B. (eds) 1997.Plant Metabolism.Longman, Essex, England.
- Heldt H.W. and Heldt. F., 2005. Plant Biochemistry, Academic press, California.
- Lea, P.J.and R.C.Leegood, 1993.Plant Biochemistry and Molecular Biology, John Wiley and Sons. USA
- Madigan M.T., Martinko T. M and Parker J., 2000. Brock Biology of Microorganisms 9th Ed, Prentice Hall international, IncUSA.
- Moore, T.C. 1989. Biochemistry and Physiology of Plant Hormones. Springer-Verlag, New York, USA.
- Nelson D.L. and Cox M.M., 2008. Lehninger: Principles of Biochemistry 5th Ed, W.H Freeman and Company, New York.

- Purich D.L, and Allison R.D., 2002 .The Enzymes reference: Academic Press, New York.
- Plummer, D.T. 1988.An Introduction to PracticalBiochemistry. Tata McGraw-Hill Publishing Co. Ltd., New Delhi.
- Stryer L., Tymoczko L.J and Berg J.M., 2006. Biochemistry 6th Ed, W.H. Freeman and Company, New York.
- Taiz,L.andZeiger,E.2003.Plant Physiology.Sinauer Associates, Inc., Publishers, Massachusetts.USA.
- Voet D. Voet J. G. and Pratt C.W., 2006. Fundamentals of Biochemistry 2nd Ed, John Wiley and Sons Inc.
- Wilson, K. and Walker, J. 1994. Practical Biochemistry: Principles and Techniques. Cambridge University Press, Cambridge,UK.
- Wilson, K. and Goulding, K.H. (Eds), 1996. A Biologists Guide to Principles and Techniques of Practical Biochemistry. Edward Arnold, London, U.K.

103 - MICROBIOLOGY

Unit I:

Introduction:Microbes inrelation to the organisms; Microorganisms, their special characters and habitat. History: Historical development of various fields of microbiology; contributions of early microbiologists like Antony Van Leeuwenhoek, Louis Pasteur, Robert Koch, Edward Jenner, Alexander Flemming, Ivanowski, Lord Lister, Lazzaro Spallanzani, Paul Ehrlich, Emil Christian Hansen and A.E. Mayer. Microscopy - Its principles and applications, Simple - Compound, Dark field, phase contrast, Fluorescent and Electron Microscopes - SEM, TEM, Principles.

Unit II:

Morphology and taxonomy: Major groups of microorganisms and their Classification, Nature, structure, reproduction and life- cycle of Bacteria, actinomycetes, Rickettsiae, Mycoplasma.

Unit III:

Protozoa, Nature, structure, replication and classification of viruses, classification of fungi, life-cycle of major groups of fungi; heterokaryosis and parasexual cycle.

Unit IV:

Bacterial metabolism: sources of energy and nutritional classification of microorganisms-Photolithotrophs,photoorganotrophs,chemolithotrops, Chemoorganotrophs. Aerobic and anaerobic respiration, Fermentation in yeast and bacteria.

Unit V:

Bacterial genetics: Mutation, Genetic recombination- Conjugation, transformation, transduction, genemapping.

References:

- Alexopoulus,C.J.,Mims,C.W.andBlackwel,M.1996. Introductory Mycology. John Wiley & Sons Inc.
- Costa,M.S.DaEdMicrobiologyofextremeenvironment&its potential for biotechnology – 1989.
- Collee J.G., Applied Medical Microbiology - 2 edit – 1981. Freifelder David - 1987. Microbial genetics.
- Jacquelyn G. Black, Microbiology (Principles & Explanations) - 4th edition - 1999.
- LarryMcKane/Judy Kandel -1996.Microbiology (Essential& Appliances) - 2nd Edition.
- Narendra, Microbes & Environment – 1994.
- Powar&Daginawater.GeneralMicrobiology-Vol-I-eight edition - 1992 (Reprint - 2000).
- Purohit S.S., Microbiology; fundamentals & applications (1991)
- 4 ed.
- Stanier Roger Y. - 1993. General Microbiology - 5th ed.
- ThomasD.Brock,MichaelT.Madigan,2000.Biology of Microorganisms - 6th edition.
- Volk, Wesley. A. - 1984 Basic microbiology - 5 ed.
- Dubey RC and Maheswari DK (2005). A text book of Microbiology, Revised Multicolour edition, S Chand Publishers, New Delhi

- PurohitS.S.,(2005)Microbiology-fundamentalsand Applications.Student Edition Publishers, Jodhpur.
- Pelezar & Kreig (2006). Microbiology 5th edition. Tata McGraw Hill, New Delhi
- Powar & daginawala (2005), General Microbiology Vol.I & II 8th Edition, Himalaya Publishing House, Mumbai
- Salle, AJ (2001). Fundamentals & Principles of Bacteriology, 7th edition. Tata McGraw-Hill, Davis.

104: Plant Anatomy and Histochemistry

Unit I:

Primary vegetative body of the plant:Stem: Arrangement of tissues, epidermis, cortical bundles, medullary bundles, steles of various types: Leaf-Structure of foliage leaves, petiole and node of dicot leaves, vascular system of moncot leaves, stem-leaf junction of monocots, structure of fern and gymnosperm leaves: Structure of modified leaves-Kranz anatomy and C4 photosynthesis. Xerophytic and submerged foliage leaves, cataphylls, hypsophylls: Root-Structure of primary root, mucigel, epidermis, exodermis, dimorphic roots, root nodules.

Unit II:

Ultra structure of the cell wall and differentiation. Ultra structure and differentiation of xylem and phloem: tracheary elements and their differentiation, sieve elements and their differentiation. Meristems: Apical meristems, shoot apex of Pteridophytes, gymnosperms and angiosperms, root apex and intercalary meristems. Secondary growth of the plant body: Periderm, variations in wood structure. Anomalous secondary growth in climbers and monocots.

Unit III:

Floral anatomy: Flower, flower parts and their arrangement, vascular system, floral meristem, origin and development of floral parts. Pathological Anatomy.

Unit IV:

Plant Histochemistry: Minerals, Carbohydrates, Lignins, Polyphenols, Proteins, Nucleic acids and Histones, Lipids, Cutin, Suberin and Waxes, Ascorbic acid.Study ofthe instruments, their principles and uses (a) Camera lucida, (b) Micrometry (c) Microtomes –sledge Rocking, Rotary (D) Fluorescence microscope (e) Electron Microscope.

Unit V:

Staining technique –Principles of histochemical stains, Killing, fixing & staining of plant tissues;Important reagents & chemicals needed in the fixatives; FAA, Carnoy's fluid, Navashins solution, fleminge; Dehydrating agents, mounting media, Double staining, Saffranin, Fast green, Embedding: TBA method, embedding for electron microscope, Sectioning, Whole mounts maceration. Histochemical-PAS Test, Sudan black lipids, Feulgen reaction –N acids.

(A) PLANT MORPHOLOGY AND TAXONOMY - LAB - I

- Algae and Bryophytes: Study of morphology, anatomy and reproductive structures of the types represented by the groups mentioned in the syllabus.
- Study of fossils.
- Taxonomy : Study of local flora. Study of the families listed in the theory part of the syllabus. Identification of plant specimens level using Gamble's flora.
- Validating the Botanical names using latest literature; herbarium methodologies;
- Field work, specimen collection, processing and identification.
- Study Tour.

(B) - PLANT BIOCHEMISTRY -LAB

- Reactions of carbohydrates. Reactions of proteins & amino acids.
- Precipitation reactions of proteins.
- Reactions of non protein nitrogenous substances (NPN). Reactions of vitamins.
- Identification of unknown proteins.
  Identification of unknown carbohydrates.
- General scheme for identification of unknown carbohydrates, proteins and Non Protein Nitrogenous(NPN) substances.
- Estimation of total sugar.
- Effect of time and enzyme concentration on the rate of reaction of an enzyme.
- Effect of substrate concentration on the activity of an enzyme.
- Demonstration of the substrate inducibility of the enzyme nitrate reductase.

(C) - MICROBIOLOGY -LAB

- Introduction - good laboratory practices, sterilization methods, instrumentation.
- Staining methods - Gram staining, staining of endospores
  Determination of bacterial motility
- Preparation of Media, Bacterial and Fungal cultures Micrometry
- Study of AM fungi
- Mushroom - Spawn production and cultivation

(1C) - Anatomy & Histochemistry -Lab

- Staining of xylem and phloem elements.
- Anatomy of roots in: Ficus, Musa, Dieffenbachia, Orchid.
- Anamalous secondary growth in the following examples: Stems of Aristolochia,
- Nyctanthes, Pyrostegia, Peperomia, Tinospora, Achyranthes. Ecological anatomy.
- Pathological anatomy.
  Vasculature in floral organs.
  Double staining technique.
- Embedding: TBA method, embedding for electron microscope,
  Sectioning, Microtomes,Whole mounts maceration.
- Histochemical-PAS Test, Sudan black lipids, Feulgen reaction –N acids

References:

- Abraham F. 1982. Plant Anatomy. 3rdedn. Pergaon Press. Oxford.
- Cariquist S, 1967. Comparative Plant Anatomy-Holt Reinert and Winston, NY.
- Cutter D G, 1971. Plant Anatomy- Part 1, Cell and Tissues Edward Arnold London.
- Cutter D G, 1971. Plant Anatomy-Part 1, Cell and Tissues Edward Arnold London. Part-II.
- Eames and McDaniel 1947, II edn., " Plant Anatomy" McGraw Hill, N.Y.
- Esau K 1965, Plant Anatomy, Joh Wiley and Sons, N.Y.
- James D Mauseth, 1998. Plant anatomy The Benzamin/ Cummins Publishing Co.Inc.
- Katherine Esau, 1979, Anatomy of seed plants-first Wiley eastern reprint. New Delhi.
- Krishnamurthy K. V. 1988. Methods in Plant Histochemistry. S. Viswanathan (Printers and Publishers) Pvt. Ltd. Madras.

SEMESTER II

201 - PLANT MORPHOLOGY AND TAXONOMY - II

Unit I:

Pteridophyta - Distribution and classification of pteridophytes. Evolution of steles; fossil pteridophytes; Heterospory and the origin of seed habit; Economic importance.

Unit II:

Gymnosperms:Distribution and classification of gymnosperms. Brief account of the families of Pteridospermales Lygenopteridaceae, Medullosaceae, Caytoniaceae, Glossopteridaceae; General account of Cyacadeoidales and Cordaitales; Structure and reproduction in Cycadales, Ginkgoales, Coniferales, Epherdrales, Welwitchiales and Gnetales. Economic importance.

Unit III:

Angiosperm taxonomy:Taxonomic evidence: Anatomy, Palynology, Chemotaxonomy, Cytotaxonomy, Numerical taxonomy.

Unit IV:

Study of following families with their phylogeny as per Bentham & Hookers system Rubiaceae, Asteraceae, Sapotaceae, Ebenaceae, Oleaceae, Asclepiadaceae, Loganiaceae, Gentianaceae, Boraginaceae, Scrophulariaceae, Lentibulariaceae, Bignoniaceae, Acanthaceae, Verbenaceae, Amaranthaceae, Podostemaceae, Piperaceae, Myristicaceae, Lauraceae, Loranthaceae, Santalaceae, Moraceae, Urticaceae.

Unit V:

Hydrocharitaceae, Orchidaceae, Musaceae, Zingiberaceae, Liliaceae, Amaryllidaceae, Dioscoreaceae, Commelinaceae, Araceae, Cyperaceae, Poaceae.

Suggested Reading:

- Bhattacharya B. and B.M. Johre. 1998. Flowering plants - Taxonomy and phy
- Bhatnagar, S.P. and Moitra, a. 1997. Gymnosperms. New Age International Pvt. Ltd., New Delhi.
- Biswas. C., and Johri B.M 1997. The Gymnosperms. Narosa Publishing

House, New Delhi.

- Coulter & Chamberlains. 1959. Morphology of gymnosperms. Central Book depot. Hyderabad.
- Gurucharan Singh, 1999. Plant systematics - Theory and practice. Oxford and IBH Publishing Co., Pvt Ltd., New Delhi.
- Heywood, V.H. and Moore, D.M. 1984. Current Concepts in Plant Taxonomy. Academic Press, London.
- Heywood V.H., 1976. Botanical Systematics, Academic Press London.
- Lawrence, H.M., 1966. Taxonomy of vascular plants. The Mac Million Company, New York.
- Stace, C.A. 1989. Plant Taxonomy and Biosystematics (2nd Edition). Edward Arnold Ltd., London.
- Singh G., 1999. Plant Systematics, Oxford and IBH, New Delhi. 202 Plant Physiology

Paper 202 Plant Water Relations

Unit- I

Cell differentiation: Internal factors - cytoplasmic, genetic; environmental.Mechanism of ion uptake, transportation and accumulation; Donnan's equillibrium; translocation of solutes.

Unit- II

Water relations: water requirement, transpiration; factors affecting transpiration, transpiration control and antitranspirants.

Mineral Nutrition: Elements found in plants, essential elements, quantitative requirements and tissue analysis, functions, Nutrient deficiency.

Unit III

Hormones and growth regulators - biosynthesis and mechanisms of action of auxins, gibberellins, cytokinins, ethylene, abscissic acid; application of growth hormones and retardants in agriculture and horticulture; hormone receptors; mechanism of flowering,

Unit- IV

Environmental physiology: Response of plants to environmental radiation; allelochemicals and allelopathy; stress physiology - stressful environments, water stress, chemical stress, temperature stress; stress tolerance Chronobiology:

Circadian and other rhythms, clock mechanisms, biological clock.

Unit- V

Photomorphogenesis: properties of phytochromes, distribution, mode of action, role of phytochromes in seed germinationand seedling establishment Photosynthesis: chloroplasts - structure and function, cyclic and noncyclic photophosporylation, photolysis, electrontransport system; CO_2fixtation; C3 and C4 mechanisms, Photorespiration factors affecting photosynthesis.

Suggested Reading:

- Buchanan, B.B., Gruissem, W. and Jones, R.L. 2007. Biochemistry and Molecular Biologyof Plants. American Society of Plant Physiologists, Maryland, USA.
- Burgess, J. 1989. An introduction to plant cell development. Cambridge University Press, Cambridge.
- Devlin, R. andF.H. Whiteman 1986. Plant physiology. CBS publishers and distributors, New Delhi.
- Hemantaraman A., 2007. Environmental Physiology, Scientific Publisher, India.
- Hale M.G. and D.M. Orcutt 1987. The physiology of Plants under stress. A wiley - interscience publication. New York.
- Hopkins, W.G. 2005.Introduction to Plant Physiology. John Wiley & sons, Inc., New York, USA.
- Khan N.A. and Singh S., 2008. Abiotic Stress and Plant Responses, I.K. International Publishing House Pvt Ltd, New Delhi.
- Moore, T.C. 1989. Biochemistry and Physiology of Plant Hormones Springer-Verlag, New York, USA.
- Moore, T.C. 1974. Research Experiences in Plant Physiology:A Laboratory Manual: Springer-Verlag, Berlin, New York.
- Noggle,G.R. and G.J. Fritz 1986. Introductory plant physiology. CBS Publishers and distributors, New Delhi.

PLANT MORPHOLOGY AND TAXONOMY - LAB - II

- Pteridophytes and Gymnosperms: Study of morphology, anatomy and reproductive structures of representative types of the groups. Study of fossils.
- Angiosperm Taxonomy: Identification of plants pertaining to the families mentioned in the syllabus. Construction of dichotmous keys forfamily,genus,and species. Preparation of ten herbarium specimens of common plants.
- Field work / study tour.

PLANT PHYSIOLOGY - LAB

- Separation of aminoacids by thin layer chromatography (TLC). Separation of Amino acids by paper chromatography.
- Studies on the factors affecting rate of respiration in plants. Effect of phytohormones on plant development.
- Extraction of chloroplast pigments from leaves and preparation of the absorption spectrum of chlorophylls and carotenoids.
- To determine the chlorophyll a/chlorophyll b ratio in C3 and C4 plants.
- Extraction of seed proteins.
- Preparation of standard curve of protein (BSA) and estimation of the protein content of plant materials.
- Physiological adaptations in plants-xerophytes,mesophytes, hydrophytes.
- Determination of water potential using scholander pressure chamber.
- Estimation of vitamin C (Ascorbic acid) in plants.
  Determination of diffusion pressure deficit.

203 Reproductive Biology of Angiosperms and Plant Morphogenesis

Unit I:

Reproductive Biology of Angiosperms: Historical over view, Contributions of P. Maheshwari; BM Johri; BGL Swamy to the development of embryology in India; Microsporogenesis-Male gametophyte development; anther wall layers and functions; Tapetum-types, Concept of male germ unit; Pollen morphological features; Unusual features: pollen development in Cyperaceae, pollen embryosac; Scope of palynology.

Unit II:

Megasporogenesis-Female gametophyte development; Ovular structure & types; Development of monosporic, bisporic, tetrasporic & special types of embryo sacs; Ultrastructure & nutrition of female gametophyte; Fertilization-A general account; double fertilization; single fertilization; heterofertilization & polyspermy; Pollen recognition & rejection reactions-Types; structures; methods to overcome incompatibility reactions; Endosperm-Types; haustorial variations; ruminate & composite endosperm; Embryo-Structure; development of monocot, dicot & grass embryo; significance of embryonal suspensor; Experimental Embryology-Scope & applications.

Unit III:

Plant Morphogenesis:Historical developments; Models of morp hogenesis-Comparison of plant v/s animal morphogenetic pathways: Embryo, Coenorhabditis elegans; Concepts-Cell fate/

fate maps, gradients, stem cells in plants and their significance in development, polarity, symmetry, totipotency of cell types, pleuripotency, plasticity, differentiation, redifferentiation, dedifferentiation and regeneration in Acetabularia

Unit IV:

Plant growth and development; types, Shoot apical meristems, root meristems; control of cell division in meristems; Quiescent center & Meresteme de attente; Arabidopsis-vascular patterning and leaf development, abnormal growth; Cellular basis ofgrowth -Maintenance of cell shape; cytoskeletal elements; Photomorphogenesis-

Definition, history, Hartmann's technique; Photoreceptors & photo morphogenesis,Localization
and properties; effect of bluelight-mediated photomorphogenesis with suitable examples.

203 - Reproductive Biology of Angiosperms and Plant Morphogenesis - Lab

Reproductive Biology of Angiosperms:

- Microsporangium: Slides: Wall layers; tapetal types; two - celled & three-celled pollen; pollen tetrads
- Pollen germination: *Balsam, Delonix, Hibiscus* and *Peltaphorum*
- Megasporangium: Slides Female gametophyte development in Penstemon, Xyris pauciflora;2, 4, 8-nucleate stages; mature embryo sac
- Endosperm mounting : *Cucumis sativus, Grevellia robusta* & *Croton sparsiflorus*
- Embryo: Slides: Monocot, dicot & grass embryo Embryo mounting : *Crotalaria*

Plant Morphogenesis:

- Study of stem cells in plants: SAM, RM
- Regeneration abilities of shoot apical meristems of dicots on media with combinations of growth regulators
- Study of totipotency in cell types: stomata, epidermal cells, stem and leaf explants on a tissue culture media
- Polarity in stem cuttings: *Pothos* spp.
- Study of regeneration in succulents *Kalanchoe, Byrophyllum*
- Study of leaf galls of plants: *Pongamia pinnata* & *Achyranthes aspera*: Morphological observations and histology.

References:

- Johri, B. M. 1984. The embryology of Angiosperms. Springer Verlag
- Johri, B. M. 1982. The experimental embryology of vascular plants. Springer Verlag NY
- Swamy, B.G.L. & Krishnamurthy, K. V. 1982. From flower to fruit: The embryology of angiosperms. Tata McGraw Hill Co.

- Eames 1961. Morphology of Angiosperms. McGraw Hill book Co., Inc., NY
- Maheshwari, P. 1950. An introduction to the embryology of Angiosperms. McGraw Hill book Co., Inc., NY
- Maheshwari, P. 1963. Recent advances in the embryology of angiosperms. Edited by the International Society of Plant Morphologists, New Delhi
- Bhojwani, S. S. & Bhatnagar, S. P. 1978. The embryology of Angiosperms. Vikas Publishing House, New Delhi.
- Turing, A. M. 1952. The chemical basis of morphogenesis. Phil. Trans. R. Soc. Lond. B. 237: 37-72.
- Sinnot, E. W. 1960. Plant Morphogenesis. Mc Graw-Hill Book Co. Inc. New York, USA.
- Steeves, T.A. & Sussex, I. M. 1989. Patterns in Plant development. 2ndedition, Cambridge University Press. Chasan, R. 1994. Tracing tracheary element development. The Plant Cell 6:917-919.
- Lyndon, R. F. 1990. Plant Development : The Cellular basis. Unwin Hyman, London.
- Aloni, R. 1987. Differentiation of vascular tissues. Annu. Rev. Plant Physiol. 38:179-219.
- Raman, A. 2007. Insect induced plant galls of India; unresolved questions. Curr. Sci. 92 (6): 748-757.
- Smith, H. 1975. Phytochrome and Photomorphogenesis-an introduction to the photocontrol of plant development. Mc Graw- Hill Book Co. (UK), Ltd.
- Mohr, H. 1972. Lectures in photomorphogenesis. Springler- Vohrleg, Berlin, Germany

204 Medicinal Plants

Unit I:

Plant classification – Broad outline of major groups and ranks of taxa, Plant Nomenclature- Common names, Bionomial nomenclature, IUBN- brief outline of methods in nomenclature; Typification.

Herbarium- Methods of collection, processing of herbarium specimens; Major herbaria of the world, Botanical Survey of India- brief outline of its organization and its role and significance.

Unit II:

Medicinal plants – system of herbal medicine, threatened medicinal plants- Threats, various approaches to conservation - *in-situ* and *ex- situ;* MPCA, Biosphere reserves, National parks, Sacred grooves, CITES, IUCN categories of plant, Brief account of Biodiversity Act.

Unit III:

Ethnobotany: Basic approaches to study the traditional knowledge on plant use. Collection methods, field methods and studying of Herbarium specimens and folklore; verification of data, Aesthetic value.

Unit IV:

Plants as medicine: Drugs of botanical origin. Medicinal properties of important local plants, Neutraceuticals Bioprospecting, Biopiracy.

Intellectual property Rights: Forms of protection, Patents, Trademarks, Tradesecrets, Designs, Geographicalindications, Plant variety protection.

Unit V:

Cultivation potential of important medicinal plants Agroclimatic requirements, propagation, Transplanting and aftercare of the following medicinal plants.

- *Acorus calamus*
- *Andrographis paniculala*
- *Asparagus*

racemosus

- *Azadirachta indica*
- *Centella asiatica*
- *Piper longum*
- *Rauwolfia serpentina*
- *Zingiber officinale*
- *Vinca rosea*
- *Emblica officinalis*
- *Cinnamomum suphuratum*

Suggested Reading:

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