

SRI VENKATESWARA UNIVERSITY::TIRUPATI

S.V.U.COLLEGE OF SCIENCES

CHOICE BASED CREDIT SYSTEM

(for regular students those who study in S.V.U.College (Campus), Tirupati)

(from the batch of students to be admitted during the academic year 2015-16)

M.Sc. BOTANY

SCHEME OF INSTRUCTION AND EXAMINATION

Sl. No	SEME STER	PAPER CODE	NAME OF THE PAPER	MARKS		
				Extern-al	Internal (Avg.1&2 tests)	
1	I	BOT-101:	General and Applied Microbiology	70	30(1+2)	
2.		BOT-102:	Biology and Diversity of Algae, Bryophytes Pteridophytes and Gymnosperms	70	30 (1+2)	
3.		BOT-103:	Cell Biology and Techniques	70	30	
4.		BOT-104	Taxonomy of Angiosperms	70	30	
5.		BOT-105 PI:	Theory Papers BOT 101 & 102	100	-	
6.		BOT-106 PII	Theory Papers BOT 103 & 104	100	-	
7	II	BOT-201:	Biosystematics	70	30	
8.		BOT-202:	Genetics and Plant Breeding	70	30	
9.		BOT-203:	Plant Ecology	70	30	
10.		BOT-204	Plant Biochemistry and Physiology	70	30	
11.		BOT-205 PI:	Theory Papers BOT 201 & 202	100	-	
12.		BOT-206 PII BOT-207	Theory Papers BOT 203 & 204 Human Valued and Professional Ethics-I	100 70	- 30	
13	III	BOT-301:	Plant Molecular Biology	70	30	
14.		BOT-302:	Biodiversity and Conservation	70	30	
15.		BOT-303 & 304 (A)	Plant development and Reproduction	70	30	
16.		BOT-303 & 304 (B)	Ethnobotany and Phytomedicine	70	30	
17.		BOT-303 & 304 (C)	Computer Applications and Bioinformatics	70	30	
18.		BOT-305 PI:	Theory Papers BOT 307 & 308	100	-	
19.		BOT-306 PII	Theory Papers BOT 303 & 304	100	-	
			External Electives			
20.		BOT-307(IE)	Plant resource and Utilization	70*	30*	
21.		BOT-308(IE)	Gardening and Herbal Drugs	70*	30*	
22.	BOT-309 PI	Theory Papers BOT 307 & 308	100*	-		
23	IV	BOT-401:	Plant Biotechnology	70	30	
24.		BOT-402:	Plant Genomics and Proteomics	70	30	
25.		BOT-403 & 404 (A)	Molecular Plant Physiology	70	30	
26.		BOT-403 & 404 (B)	Molecular Plant Pathology	70	30	
27.		BOT-403 & 404 (C)	Horticulture and Agriculture Biology	70	30	
28.		BOT-405 PI:	Theory Papers BOT 401 & 402	100	-	
29.		BOT-406 PII BOT-407	Theory Papers BOT 403 & 404 Human Valued and Professional Ethics-II	100 70	- 30	

* As per University rules.

IA: Internal Assessment for Non-CBCS Students 20 80 100

Semester-I

BOT-101: General and Applied Microbiology
BOT-102: Biology and Diversity of Algae, Bryophytes, Pteridophytes and Gymnosperms
BOT-103: Cell Biology and Techniques
BOT-104: Taxonomy of Angiosperms.
BOT-105 P I: Theory Papers BOT 101 & 102
BOT-106 PII: Theory Papers BOT 103 & 104

Semester-II

BOT-201: Biosystematics
BOT-202: Genetics and Plant Breeding
BOT-203: Plant Ecology
BOT-204: Plant Biochemistry and Physiology
BOT-205 P I: Theory Papers BOT 201 & 202
BOT-206 PII: Theory Papers BOT 203 & 204
BOT-207 : Human Values and Professional Ethics-I

Semester-III

BOT-301: Plant Molecular Biology
BOT-302: Biodiversity and Conservation
BOT-303 & 304 (A): Plant development and Reproduction
BOT-303 & 304 (B): Ethnobotany and Phytomedicine
BOT-303 & 304 (C): Computer Applications and Bioinformatics
BOT-305 P I: Theory Papers BOT 301 & 302
BOT-306 PII: Theory Papers BOT 303 & 304

External Electives

BOT-307(IE): Plant resource and Utilization
BOT-308(IE): Gardening and Herbal Drugs
BOT-309 PI: Theory Papers BOT 307 & 308

Semester-IV

BOT-401: Plant Biotechnology
BOT-402: Plant Genomics and Proteomics
BOT-403 & 404 (A): Molecular Plant Physiology
BOT-403 & 404 (B): Molecular Plant Pathology
BOT-403 & 404 (C): Horticulture and Agriculture Biology
BOT-405 P I: Theory Papers BOT 401 & 402
BOT-406 PII: Theory Papers BOT 403 & 404
BOT-407 : Human Values and Professional Ethics-II

I – SEMESTER

BOT-101: General and Applied Microbiology

Unit-I

Viruses: general account of Viruses: Definition, occurrence, discovery, prokaryotic & eukaryotic viruses, chemistry, symmetry, ultra structure of bacteriophage, plant and animal viruses, purification of viruses, replication-lytic and lysogenic cascades, transmission and economic importance of viruses.

Principles of immunology: immunity, types, antigen, general characteristics, antibody, types, antigen & antibody interactions.

Unit-II

Bacteria: General characters and classification of Archaea and Eubacteria, Ultra structure, Nutrition and reproduction and economic importance of Eubacteria. Salient features, biological importance, Biology and Economic importance of Cyanobacteria.

UNIT-III

Mycology: General characters of Fungi, Cell structure, Unicellular and Multicellular organization. Cell wall composition, Nutrition (Saprobic, Biotropic and Symbiotic):

Reproduction, (Vegetative, Asexual, and Sexual); Heterothalms: Heterocaryosis and Para sexuality. Economic importance of Fungi (Food, Industry and Medicine); fungal diseases in plants and humans, Fungi as biocontrol agents. Mycorrhizae and Mushroom cultivation.

UNIT- IV

Classification of Fungi: Recent trends in Classification, Phylogeny of Fungi; General account of Myxomycota; Eumycota: general account of Mastigomycotina, Zygomycotina, Ascomycotina, Basidiomycotina, and Deutoromycotina.

General principles of plant pathology: infection, disease development, Symptomology and Epidemiology of plant diseases incited by Fungi, Bacteria, Viruses, Viroids and Phytoplasmas. Principles of plant disease control.

Suggested Readings

1. Alexopoulos, C.J., Mims, C.W. and Blackwel, M. 1996. Introductory mycology. John Wiley & Sons Inc.
2. Mandahar, C.L. 1978. Introduction to Plant viruses. Chand & Co., Ltd., Delhi.
3. Mehrotra, R.S. and Aneja, K.R. 1998. An introduction to mycology. New Age International Press.
4. Mehrotra, R.S. 1980. Plant Pathology. Tata Mcgraw hill, India.
5. Rangaswamy, G. and Madhavan, A. 1999. Diseases of Crop Plants in India (4th Ed.) Prentice hall of India Pvt. Ltd., New Delhi.
6. Sharma, P.D. 2000. Plant Pathology. Narosa Publishing House, India.
7. Susila, S.B. and Shantharam, S. 2000. General Microbiology. Oxford & IBH Publ., New Delhi.
8. Webster, J 1985. Introduction to Fungi. Cambridge Univ. Press.

BOT-102: Biology and Diversity of Algae, Bryophytes, Pteridophytes and Gymnosperms

UNIT- I

Phycology: Classification of Algae; Cell ultra structure; general characters; Algae in diverse habitats (Terrestrial, Fresh water, Marine water And In Association); Thallus organization (Range of thallus structure and interactions in evolution of different groups: Cyanophyceae, Xanthophyceae, Bacillariophyceae, Phaeophyceae & Rhodophyceae); Pigmentation and Reserve food; Reproduction (Vegetative, Asexual & Sexual); Economic importance of Algae (Algal blooms, Algal Biofertilisers, Algae as food, Feed and Medicines; Algae in Industry; Algae as Biodiesel; Single cell protein.

UNIT- II

Bryophytes: Origin, Distribution, Morphology, Structure, Reproduction and Evolution of Sporophyte; Life History, Classification. Fossil Bryophytes. General account of Marchantiales, Jungermaniales and Polytrichales; Economic and Ecological importance.
Lichens: Types of Lichens, Anatomy, Biology and Ecological importance.

UNIT- III

Pteridophytes: Origin, Morphology, Anatomy and Reproduction; Classification and Evolution of Stele. Heterospory and Origin of Seed habit; Apogamy and Apospory; Ecological importance, chemical factors controlling Gametophyte; Antheridia, Archegonia. Strobilus and Evolution of Sorus.

Fossil Pteridophytes: Introduction to Psilophytopsida, Psilopsida, Lycopsida, Sphanopsida and Pteropsida.

UNIT- IV

Gymnosperms: Gymnosperms: Introduction, Classification and Distribution of Gymnosperms. Structure and Reproduction in Cycadales, Ginkgoales, Coniferales, Ephedrales, Welwitschiales, and Gnetales. Evolution of Gymnosperms.

Fossil Gymnosperms : Brief account of families Pteridospermales (Lyginopteridaceae, Medulloaceae, Caytoniaceae and Glossopteridaceae) General account of Cycadeodiales and Cordaitales.

Suggested Readings:

1. Kumar H. D. 1988. Introductory Phycology. Affiliated East-West Press Ltd., New Delhi.
2. Morries, I. 1986. An Introduction to the Algae. Cambridge University Press, U.K
3. Parihar, N.S. 1991. Bryophyta. Central Book Depot, Allahabad.
4. Parihar, N.S. 1996. Bilogy and Morphology of Pteridophytes Central Book Depot, Allahabad.
5. Puri, P. 1980. Bryophytes. Atma Ram & Sons, Delhi.
6. Round, F.E.1986. The Biology of Algae, Cambridge University Press, Cambridge.
7. Sporne, K.R.1991. The Morphology of Pteridophytes, B.I. Publishing Pvt. Ltd., Bombay.
8. Stewart, W. N. and Rathwell, G. W. 1993. Paleobotany and the evolution of Plants. Cambridge University Press.
9. Bhatnagar, S.P. and Mitra, A. 1996. Gymnosperms, new Algae International Pvt. Ltd., New Delhi.
10. Sporne, R. K. 1997(2nd Ed). The Morphology of Gymnosperms. Hutchinson University Library.

BOT-103: Cell Biology and Techniques

UNIT I

Structural Organization of Plant Cells: Cell wall Structure and Function, Plasmodesmata Structure and Function; Structural Organization and Functions of Plasma Membrane; Cytoskeleton and Cell mobility, Structure and Functions of Endoplasmic Reticulum, Golgi Apparatus, Lysosomes and Peroxisomes; Structural organization of Chloroplast, Mitochondria and Ribosomes.

UNIT II

Nucleus: Interphase Nucleus, Chromatin Organization, Nucleosome organization, Molecular organization of Centromere and Telomere. Structural organization of Chromosomes; Special types of Chromosomes – Polytene and Lampbrush Chromosomes. Cell cycle and its Regulation.

UNIT III

Optical and Electron Microscopy: Basic principles, Types and Applications;

Chromatography- Basic Principles, Types- Paper, Thin layer and Column Chromatography technique and their applications.

Tracer techniques: Principles and Applications of Radio isotopes in Biology.

UNIT IV

Spectroscopy: Lambert and Beer's Law, Absorbance and Transmittance: Extinction Co-efficient.

Centrifugation- Basic principles, Types and Applications- Differential & Density Gradient, Sedimentation co-efficient.

Electrophoresis: Different types, Principles and applications; SDS-PAGE technique.

Suggested Readings:

1. Alberts, B., Bray, D., Lewis, J. Raff, M., Roberts, K., and Watson. J.D. 1999. Molecular Biology of the cell. Garland Publishing Inc., New York.
2. Buchanan, B.B., Gruissem, W. and Jones, R.L. 2000. Biochemistry and Molecular Biology of Plants. American Soc. of pl. physiologist, Maryland, USA.
3. Deepesh narayan, De.2000. plant cell vacuoles: An introduction. CSIRO publication, Collingwood, Australia.
4. De Robertis, E. D. P. and De Robertis, E.M.F. Jr. 2001. Essentials of cell and Molecular Biology, Holt lea and Febiger, New York.
5. Krishnamurthy, K.V. 2000. Methods in cell wall Cytochemistry. CRC Press, Florida, USA.
6. Kleinsmith, L.J. and Kish, V.M. 1995. Principles of cell and Molecular Biology (2nd Ed). Harper Collins College Publishers, New York, USA.
7. Lewin, B. 2000. Genes VII. Oxford Univ. Press, New York.
8. Lodish, H, Berk, A. Zipursky, S.L., Matsudaira, P. Baltimore, D. and Darnell, J. 2000. Molecular cell Biology (4th Ed.), W. H. Freeman and Co., New York, USA.
9. Rost, T. et al 1998. Plant Biology. Wadsworth Publishing Co., California, USA.
10. Upadyaya, A., Upadyaya, K., and Nath, N. Biophysical Chemistry-Principle and Techniques, Himalya Publishing House, New Delhi.
11. Wolfe, S. L, 1993. Molecular and Cell Biology, Wadsworth Publishing Co., California, USA.

BOT-104: Taxonomy of Angiosperms

UNIT-I

Systems of Angiosperm classification: Historical development of phenetic versus Phylogenetic systems of classification. Merits and demerits of Bentham and Hooker (Natural system), Engler and Prantle, Bessey, Hutchinson, Cronquist, Thorne, Dahlgren, and APG classification (Phylogenetic) systems.

UNIT II

Taxonomic hierarchy: Groups, Categories and Ranks; Species, Genus, Family and other categories; Principles used in assessing relationships; Delimitations of taxa and attribution of Rank. Plant identification and Taxonomic keys; Herbarium methodology, Important Herbaria, Botanical gardens and arboreta in India and World.

Variation and Speciation: Types of variation, isolating mechanisms, gradual or phyletic speciation and additive speciation.

UNIT III

Origin and Phylogeny of Angiosperms: Origin and Evolution of Angiosperms; Angiosperms Phylogeny; Age and Place of Origin, Biphyletic Origin, Theories of Origin; Origin of Monocots and Evolutionary lines of Angiosperms.

International code of Botanical Nomenclature: Salient features of Binomial Nomenclature, Codes of Nomenclature, Rules of ICBN: Ranks of taxa; generic names; species epithet; Typification, Nyms, Rule of Priority, Effective and Valid publication; Author citation; Retention, choice and Rejection of names. Nomen-nudum and Nomen-novo. Hortus malabaricus; General taxonomic Indices; Floras and Manuals; Monographs and revisions.

UNIT IV

Systematic study: Attribution of different systems of classification; orders: Magnoniales, Centrospermae, Tubiflorae, Amentiferae, Helobiales and Glumiflorae.

Suggested Readings:

1. Battacharya, B and Johri, B. M.1998. Flowering Plant taxonomy and Phylogeny. Narosa Publishing House, New Delhi.
2. Cronquist, A. 1981. An integrated system of classification of Flowering Plants. Columbia University Press, New York.
3. Davis, P.H. and Heywood, V.H. 1963. Principles of Angiosperm Taxonomy, Oliver and Boyd.
4. Gifford, E.M. and Foster, A.S. 1998. Morphology and Evolution of Vascular Plants. W.H.freeman & Co., New York.
5. Gurucharan Singh, 1989. Plant Systematics-Theory and Practice. Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi.
6. Heywood, V.H. and Moore, D.M. (Eds.).1984. Current Concepts in Plant taxonomy. Acad. Press, London.
7. Hutchinson, J. 1973. Families of Flowering Plants (3rd Ed.) oxford Univ. Press, New York.
8. Jeffrey, E. 1982. An introduction to plant Taxonomy. Cambridge.
9. Jones, S.B. Jr. and Luchsinger, A.E. 1986. Plant systematics (2nd Ed.). Mc Graw Hill. Book Co., New York.
10. Mayr, E. 1942. Systematic and Origin of Species. Columbia Univ. Press, New York.
11. Pullaiah, T. 1997. Taxonomy of Angiosperms. Regency Publications, New Delhi.
12. Rad Ford, A.E. 1986. Fundamentals of Plant Taxonomy. W. H. Freeman and Company, San Francisco.
13. Sokal, R.R. and Sneath, P.H.A. 1963. Principles of Numerical Taxonomy. W.H. Freeman and Company, San Francisco.
14. Stebbins, G. L. 1974. Flowring plants Evolution above the Species level. Academic Press London.

PRACTICAL PAPER: BOT-105P I

Suggested Laboratory Exercise related to BOT-101

1. Symptomology of some Diseased specimens: White rust, Downy mildew, powdery mildew, Rusts, Smuts, Ergot, Ground nut leaf spot, Red rot of Sugarcane, Wilts, Paddy Blast, Citrus canker, Bacterial blight of paddy, Angular leaf spot of Cotton, Tobacco mosaic little leaf of Brinjal, Sesame Phyllody, Mango malformation, Canker.
2. Section cutting of infected materials of *Albugo*, *Peronospora*, *Plasmospora*, *Scerospora*, *Taphrina*, *Phyllochora*, *Claviceps*, *Xylaria*, *Peziza*, *Puccinia*, *Uromyces*, *Ravanelia*, *Ustilago*, *Tolyposporium*, *Macrophoma*, *Colletotrichum*, *Fusarium*, *Rhizoctonia*.
3. Sterilization methods, Preparation of media and stains, Isolation and Maintenance of cultures. Gram staining of Bacteria.

Suggested Laboratory Exercise related to BOT-102

1. Micro preparations, culture identification, section cuttings of the members of Cyanophyceae, Chlorophyceae, Xanthophyceae, Bacillariophyceae, Phaeophyceae and Rhodophyceae. Raising and maintenance of algal cultures.
2. External and internal morphology and identification of the members in Marchantiales, Jungermaniales, Anthocrotales, Sphagnales, Funariales and Polytrichales.
3. External and internal morphology, reproductive organs, anatomy of stem, root and fructifications of Lycopsidea, Sphenopsida and Pteropsida.
4. Examination of Fossils.
5. Comparative study of the anatomy of vegetative and reproductive organs of *Cycas*, *Thuja*, *Cedrus*, *Cupressus*, *Araucaria*, *Cryptomaria*, *Taxodium*, *Podocarpus* and *Gnetum*.
6. Study of important fossil Gymnosperms from prepared slides and specimens.

PRACTICAL PAPER: BOT-106P II

Suggested Laboratory Exercise related to BOT-103

1. Determination of mitotic index.
2. Study of Chromosomal Behavior during Mitosis in root tips of Onion.
3. Study of chromosomal behavior during meiosis with special emphasis on Prophase-I using flower buds of Onion.
4. Study on the effect of Colchicine on Mitosis.
5. Study of Polytene chromosomes using *Chironomus* larvae.
6. Study on Structural hybrids in *Rhoeo discolor*.

Suggested Laboratory Exercise related to BOT-104

1. Preparation of floral diagrams, floral formulae and determination of taxonomic positions of 30 local plants up to family level.
2. Identification of genus and species following dichotomous keys (Flora of Madras Presidency by Gamble and Fischer)
3. Construction of keys for Families, Genera and Species based on morphological characters.
4. Nomenclature Exercises: Synonyms, Tautonyms, Basynyms.
5. Numerical Taxonomic Methods.
6. Botanical Study Tours, Preparation of Herbaria, Field Note Books & Tour Reports.

Suggested Readings for Laboratory exercises to BOT-104

1. Bailey, L.H. 1949. Manual of Cultivated Plants Macmillan, New York.
2. Bentham, G. & Hooker, J.D. Genera Plantarum, London, 3 Volumes.
3. Gamble, J.S. & Fischer. 1957. Flora of presidency of Madras. BSI, Calcutta.
4. Lawrence, G.H.M. 1951, taxonomy of vascular plants, Macmillan, New York.
5. Matew, K.M. 1983. The Flora of Tamilnadu Carnatic. Vol.1 Part 1 & 2. Tiruchirapalli.
6. Pullaiah, T. & Suryaprakash Babu, P. 1998. Flora of Andhra Pradesh. Vol. 1- 4, Scientific Publishers, New Delhi.
7. Willies, J. C. 1973. Dictionary of Flowering Plants and Ferns. 8th Ed. Cambridge Univ. Press, U. K.

SEMESTER-II

BOT-201: Biosystematics

UNIT I: Biosystematic Categories:

Biosystematics: Introduction, history, scope, importance and objectives; Ecotype: nature, origin and their significance, different types of ecotypes, ecospecies, coenospecies, comparium; phenotype, genotype, biotype; deme concept. Infra specific and Inter specific variations. Genecotypes and phenecotypes. Plasticity of phenotypes; factors affecting phenotype variations and their significance, role of biosystematics in evolution.

UNIT II: Concept of Character And Breeding Systems

Character- definition, different types of characters - analytic Vs synthetic, qualitative Vs quantitative, homology Vs analogy, consistent Vs variable, etc; Heterobathmy, Character weighting, Character state transitions, Correlation of characters, role of selection pressures on character. Methods of sampling and processing of data.

breeding systems and their role in sexual and asexual populations; Ideal species.

UNIT III: Source of Characters and Evaluation (Omega Taxonomy):

External morphology, Comparative Anatomy, Embryology, Palynology-pollen apertural morphoforms, exine stratification and ornamentation. Cytology: Chromosome morphology and behavior, banding patterns. Biochemical and molecular systematics: Secondary metabolites, chemical markers, Chemotypes, Semantides, Isozymes, Allozymes and Immunosystematics.

UNIT IV: Taximetrics and Concept of Species:

Adansonian principles. Phenitics and Phyletics. Apomorphies and Plesiomorphies, summerizing the data and analysis of relationship and distance among the taxa, Merits and demerits of numerical taxonomy. Cladistics: Phenograms, Cladograms and Dendrograms, construction of taxonomic groups. Concept of species; Classification of species (taxonomic, biological, semispecies, successional species, cryptic and semi-cryptic). Mechanism of speciation-allopatry, sympatry and parapatry.

Suggested Readings:

1. Crawford, DJ. 1990. Plant molecular systematics: Macromolecular approach, John Wiley, New York
2. Davis, PH. & VM.Heywood.1963. Principles of Angiosperm Taxonomy Oliver & Boyd. Edinburgh.
3. Gibbs, RD. 1974. Chemotaxonomy of flowering plants. Montreal. & London.
4. Gurucharan Singh, 2000, Plant Systematics. Theory and Practice. Oxford & IBH Publishing Co.PVT.LTD., New Delhi.
5. Heywood, VH. (ed) 1968. Modern methods in Plant Taxonomy. Academic press. London.
6. Hollis, DM. 1996. Molecular Systematics (2nd Ed). Freeman & Co.
7. Judd, W.S, Christopher S. Campbell, Elizabeth A. Kellogg, Peter F. Stevens, and Michael J. Donoghue. 2007. Plant Systematics: A Phylogenetic Approach, 3rd ed. Sinauer.
8. Lawrence, GHM. 1951. Taxonomy of vascular plants. McMillan, New York.
9. Naik, VN. 1992. Taxonomy of Angiosperms. (2nd Ed). Tata Mc. Graw Hill
10. Pullaih.T.2013 Text Book of Biosystemaitcs. Theory and Practicals, Regency Publications, New Delhi.
11. Pullaih, T.1998. Taxonomy of Angiosperms. Regency Publications, New Delhi.
12. Radford. AE.et al., 1974. Vascular Plant systematics. Harper & Row. New York.
13. Radhakrishnaiah, M. 1996. Essentials of Plant Taxonomy. Hyderabad

BOT-202: Genetics and Plant Breeding

UNIT I

Eukaryotic Genetics: Mendelian principles, Multiple Alleles, Epistatic gene interactions; Linkage and Linkage groups, Recombination (Crossing over), Gene mapping. Pedigree analysis and Somatic cell hybrids, Cytoplasmic Inheritance. Genetics of Sex and its Determination Mechanisms in Plants.

UNIT II

Genetics of Microbes: Phage phenotypes and gene mapping. Analysis of r II locus. Transmission, Conjugation, Transduction and Gene Mapping in Bacteria. Tetrad Analysis in Fungi. Mutations: Gene mutations, types, Physical and Chemical mutagens, molecular basis of gene mutations, transposable elements in Prokaryotes and Eukaryotes. Mechanism of transposition and Consequences.

UNIT III

Structural and Numerical alterations in Chromosomes: Origin, Meiotic behavior of Duplication, Deficiency, Inversion and Translocation; Structural Heterozygote's. Origin, Production and Meiotic Behavior of Haploids, Autopolyploids, and Allopolyploids. Genome analysis of Allopolyploids. Production, Meiosis and significance of Trisomics and Monosomics.

UNIT IV

Evolution and Plant Breeding: Origin of Life, Theories of Organic Evolution, Synthetic theory, Natural selection, Mechanisms of Speciation. Hardy-Weinberg Law., factors influencing equilibrium and gene frequencies.

Centre of Diversity; Origin and Evolution of Wheat & Maize. Methods of Breeding and selection of Self, Cross pollinated and Vegetatively propagated plants. Inbreeding Depression and Heterosis.

Suggested Readings:

1. Allard, R.W. 1960. Principles of Plant Breeding, John Wiley & Sons.
2. Burnham, C.R. 1962. Discussions in cytogenetics, Burgess Publishing Co, Minnesota, USA.
3. Chaudhary, R. C. 1997. Introduction to plant Breeding. Oxford & IBH New Delhi.
4. Elrod, S. and Stansfield, W. 2002. Genetics, Schaum's Outlines. Tata Mc Graw Hill, New Delhi.
5. Griffiths, A.J.F., Miller, J.H., Suzuki, D. T., Lewontin, R.C., and Galbert, W.M.2000. An introduction to Genetic Analysis, W.H. Freeman Publishers, New York.
6. Khush, G.S. 1973. Cytogenetics of aneuploids, Academic Press, New York.
7. Poehlman, J.M. and Borthakur, D. 1972. Breeding Asian Field Crops, Oxford and IBH Publishing Co., New Delhi.
8. Rastogi, V. B. 1997. Organic Evolution. Pitambar Publishing, India.
9. Russel, P.J.1998. Genetics (5th Ed), the Benjamin/ Cummings Publishing Co., Inc.,
10. Singh, B.D., 2000. Plant breeding Principles and Methods. Kalyani Publishers, Ludhiana.
11. Snustad, D.P. and Simmons, M.J. 2000. Principle of Genetics (2nd Ed.). John Wiley & Sons Inc., USA.
12. Stebbins, G.L. 1971. Chromosomal Evolution in Higher Plants. Edward Arnold Ltd., London.
13. Stickberger, M. W. 1990. Genetics. Macmillan Company, New York.
14. Tamarin, R.H. 1999. Principle of Genetics. Mc Graw Hill, New Delhi.

BOT-203: Plant Ecology

UNIT I

Soil, Climate and Vegetation patterns: Soil profile, Types, Texture, Physical and Chemical properties, Organic matter and Micro flora- microbe interactions-Mutualism, Commensalism and parasitism.

Biome: Concept, types, distribution of Tropical, Temperate, Alpine, Grass land, Aquatic and Desert Biomes.

UNIT II

a) Concept of Ecosystem: Earth Atmosphere system; ecosystem components; Physical and chemical sub system; Ecosystem dynamics, Energy flow, cycling nutrients, food webs, community dynamics substratum.

b) Community Development: Succession process, quality establishment, dominance, dynamic equilibrium, climax succession, types of succession, hydrarch, xerarch, secondary succession convergence, modification, species diversity, selection process, bioenergetics in ecological succession.

c) Community organization and Stratification: Fresh water, horizontal, terrestrial, mountains, marine stratification, trophic structure, food chains, ecological pyramids, niche segregation, third level of organization, niche overlap, characters of niche, microclimate, niche phenology.

d) Association and interaction among organisms: Intra and inter specific association, Association, competition, predation, mutualism, insect-plant interactions, figs-fig wasps. Impact of Biota on the environment, microclimate, temperature, light intensity, and quality, moisture wind flow, gases and nutrient substratum.

UNIT III

a) Ecosystem Dynamics: Biogeochemical cycles; Water, Carbon, Nitrogen, Phosphorous and Oxygen cycles. Elements and distribution, cycling process, interaction of biotic and abiotic components. Basic types of BGC Cycles, role of decomposers; Man's interferences on the BGC Cycles.

b) Evaporation-Precipitation and Water Cycle: Parameters controlling water cycle, Hydrological cascade system; local cycling, global evaporation, precipitation and water budget, Impact of water cycle on environment, biota, impact of man on hydrological cycle.

c) Ecosystem energetic: Productivity in ecosystem; Primary productivity, secondary productivity, factors affecting primary and secondary production.

d) Energy flow and ecosystem budgets: Light energy laws of thermodynamics, energy fixation and production, flow through food chain, energy flow-models, energetic relations of ecosystem detritus food chain, trophic interaction with microbial food web, loss of energy of different trophic levels, community food web, scale and structure of natural food webs, energetic and decomposition.

UNIT IV

Environmental Hazards and Management: Pollutants kinds Air, Water, Soil, Sound, Radiation, Heavy Metals and Atomic Pollution, Effects on Plants and Ecosystems strategies for pollution waste water treatment.

Climatic Changes: Green House Gases and Global Warming; Ozone hole, Impact on Plant and Ecosystem, Restoration.

Waste management and bio-energy: Conventional, Non conventional energy resources, Environmental impacts, biogas digester, design and methanogenesis.

Suggested Readings:

1. Begon, M. Harper, J.L. and Townsend, C.R. 1996. Ecology, Blackwell Science, Cambridge, U.S.A.
2. Brady, N.C. 1990. The Nature and Properties of Soils. MacMillan.
3. Chapman, J.L. and Reiss, M.J. 1988. Ecology Principles and Application. Cambridge University Press. Cambridge, U.K.
4. Heywood, V.H and Watson, R.T. 1995 Global Biodiversity Assessment. Cambridge University Press.
5. Hill, M.K. 1997. Understanding environmental Pollution. Cambridge University press.
6. Kormondy, E.J. 1996. Concepts of Ecology, Prentice-Hall of India Pvt. Ltd., New Delhi
7. Kumar, H. D. 1998. Modern Concepts of Ecology, Vikas Publishing, New Delhi.
8. Ludwig. J. and Reynolds, J. F. 1988. Statistical Ecology. A Primer on Methods and Computing. John Wiley & sons.
9. Mason, C.F. 1991. Biology of Freshwater Pollution Longman.
10. Moldan, B. and Billharz, S. 1997. Sustainability Indications, John Wiley & Sons New York.
11. Mukherjee, B. 1997. Environmental Biology, Mc. Graw Hill, New Delhi.
12. Muller-dombois, D. and Ellenberg, H. 1974. Aims and Methods of Vegetation Ecology, Wiley, New York.
13. Odum, E.P. 1971 Fundamentals of Ecology, Saunders, Philadelphia.
14. Odum, E.P. 1953 Basic Ecology. Saunders, Philadelphia.
15. Smith R.L. 1996 Ecology and Field Biology. Harper Collins, New York.
16. Treshow, M. 1985. Air Pollution and Plant Life. Wiley Interscience.

BOT-204: Plant Biochemistry and Physiology

UNIT I

Biochemistry of Carbohydrates and Proteins:

Carbohydrates: Classification, D and L designation, open chain and cyclic structures, epimers and anomers, maturation, reactions of carbohydrates (due to functional groups-hydroxyl, aldehyde and ketone), amino sugars, glycolysis, mono, di, tri and polysaccharides, glycosaminoglycons, glycolproteins.

Amino acids: Classification, structure stereochemistry, chemical reactions of amino acids(due to carbonyl and amino groups), pk value, peptide bond-nature and conformation.

Proteins: General properties, denaturation and renaturation, structural organization of proteins primary, secondary, tertiary and quaternary structures.

UNIT II

Respiration and Lipid Metabolism: Over view of plant respiration, Glycolysis, TCA cycle, Electron transport and ATP synthesis, Pentose Phosphate Pathway. Regulation and significance of Photo

respiration. Structure and functions of Lipids, Glyoxylate cycle, Fatty acid biosynthesis; Synthesis of Membrane, Structural and storage lipids; Catabolism of lipids.

Nitrogen and Sulphur metabolism: Biological Nitrogen Fixation, Mechanism of Nitrate uptake and reduction, Ammonia assimilation; Sulphate uptake and assimilation.

Unit – III

Thermodynamic Concepts: Free energy, Chemical potential, Redox potential.

Translocation of Water and Solutes: Plant cell water relations, Mechanism of water uptake and transport in plants; SPAC concept; Stomatal movements, Phloem transport of organic substances Phloem loading and unloading; Passive and active solute transport; Membrane transport proteins.

Fundamentals of Enzymology: General concepts, Allosteric mechanism, Mode of Enzyme action, Regulator and Active sites, Isozymes.

UNIT IV

Plant growth regulators and elicitors: Physiological effects and mechanism of action of Auxins, Gibberellins, cytokinins, Ethylene, Abscisic acid, Brassinosteroids, Polyamines, Jasmonic acid and Salicylic acid.

Suggested Readings:

1. Buchanan, B.B. Grussem, W. and Jones, RL. 2000. Biochemistry and Molecular Biology of Plants. American Society of Plant Physiologists, Maryland, USA.
2. Dennis, D.T. Turpin, D.H., Lefebvre, D.D. and Layzell, D.B. (Eds.) 1997. Plant Metabolism (2nd Ed.) Longman, Essex, England.
3. Galston, A.W. 1989. Life Processes in Plants. Scientific American Library, Springer-Verlag. New York, USA.
4. Hooykaas, P.J.J., Hall, M.A. and Libbeng, K.R. (Eds.). 1999 Biochemistry and Molecular biology of plant Hormones. Elsevier, Amsterdam, The Netherlands.
5. Hopkins, W.G. 1995. Introduction to Plant Physiology. John Wiley & Sons, New York, USA.
6. Lodish, H., Berk, A., Zipursky, SL., Matsudaira, P., Baltimore, D. and Darnell, J. 2000. Molecular Cell Biology (4th Ed.). W.H. Freeman and Company, New York, USA.
7. Moore, T.C. 1989. Biochemistry and Physiology of plant Hormones (2nd Ed.). Springer-Verlag, New York, USA.
8. Nobel, P.S. 1999. Physicochemical and Environmental Plant Physiology (2 Ed.). Academic Press, San diego, USA.
9. Salisbury, F.B. and Ross, C.W. 1992. Plant Physiology (4th Ed.). Wadsworth Publishing Co., California, USA.
10. Singhal, G.S., Renger, G., Sopory, S.K. Irrgang K.D. and Govindjee 1999. Concepts in Photobiology: Photosynthesis and Photomorphogenesis. Narosa Publishing Houses, New Delhi.
11. Taiz, L. and Zeigler, E. 1998. Plant Physiology (2nd Ed.). Sinauer Associates, Inc., Publishers, Massachusetts, USA.

12. Thomas, B. and Vince-Prue, D. 1997. Photoperiodism in plants (2nd Ed.). Academic Press, San Diego, USA
13. Westhoff, P. Jeske, H. Jurgens, G. Kloppstech, K. Link, G. 1998. Molecular Plant Development: From Gene to Plant. Oxford University Press, Oxford, UK.

PRACTICAL BOT- 205P I

Suggested Laboratory Exercises related to BOT- 201

1. All the students taken admission into this course are to go on local field trips minimum 1-2 days each at least thrice in a semester covering local forests, plains and wastelands for collection of the selected group of plants for taxonomic assessment.
2. Description of a minimum of five species of any genus with the help of different characters.
3. Construction of keys (Bracketed and Indented) for the selected groups.
4. Study of different ecotypic variations in selected group of plants.
5. Study of not less than 75 characters using external morphology, leaf architecture, epidermal and trichome complex, Palynology, Phytochemistry, Cytology etc., in the selected taxa.
6. Construction of similarity matrix and cladistic analysis to indicate the taxonomic relationship among the members of study.

Suggested Laboratory Exercises related to BOT- 201

Genetics:

1. Study of problems with specific examples in Genetics.
2. Study of Genetic variability.
3. Foliar spray of mutagens.
4. Genetic spotters.
5. Emasculation Techniques.
6. Pollination and Hybridization Experiments in Corn and Pennisetum

Suggested Readings for Laboratory exercises BOT- 202

1. Elrod, S. and Stansfield, W. 2002. Genetics, Schaum's Outlines. Tata Mc Graw Hill, New Delhi.
2. Griffiths, A. J. F., Miller, J.H., Suzuki, D. T., Lewontin, R. C., and Galbert, 'N. 2000. An Introduction to Genetic Analysis. W. H. Freeman Publishers, New York.
3. Russel, P.J. 1998. Genetics (5th Ed.) The Benjamin / Cummings Publishing Co., Inc., USA

PRACTICAL BOT- 206 PII

Suggested Laboratory Exercises related to BOT- 203

1. To determine Minimum size and Number of Quadrants required for Reliable estimate of Biomass in Grasslands.
2. Vegetation Analysis: Frequency, Density, Abundancy, IVI, Grasslands and Forests.
3. To determine Soil Moisture content, Porosity and Bulk density of Soils collected from varying depths at different locations.
4. To determine the Water Holding Capacity of Soils collected from different locations.
5. To determine Percent Organic Carbon and Organic Matter in the Soils of Crop land, Grassland and Forest.
6. To estimate the Dissolved Oxygen content in Eutrophic and Oligotrophic water samples by Azide modification of Winklers method.

7. To estimate chlorophyll content in SO₂ fumigated and Un-fumigated plant leaves.
8. To Estimate Rate of Carbon Dioxide Evolution from different soils using soda lime or alkali absorption method.

Suggested Readings for Laboratory Exercises to BOT- 203

1. Trivedy R.K.Goel, P.K.91987), Practical Methods in Ecology and Environmental Science, Environmental Publications, India.

Suggested Laboratory Exercises related to BOT- 204

1. Effect of Enzyme concentration on the rate of Enzyme reaction.
2. Effect of Substrate concentration on the Activity of an Enzyme and Determination of its K_m value.
3. Effect of Salutes and Temperature on Membrane Permeability.
4. Determination of Osmotic Potential of Plant Cell Sap.
5. Determination of Plant Tissue water Potential.
6. Determination of the Rate of Relative Transpiration.
7. Estimation of Chloride Content and its Accumulation Ratio in an Aquatic plant.
8. Effect of Promoters and Inhibitors on Stomatal Opening.
9. Determination of the activity of Succinate Dehydrogenase and its sensitivity to inhibitors.
10. Extraction, Separation and Determination of Absorption Spectra of Chloroplast Pigments.
11. Assay of Chloroplast activity -Hill reaction.
12. Estimation of Titrable acidity of plant material.

207- HUMAN VALUES AND PROFESSIONAL ETHICS – I

- I. Definition and Nature of Ethics- Its relation to Religion, Politics, Business, Law, Medicine and Environment. Need and Importance of Professional Ethics- Goals – Ethical Values in various Professions.
- II. Nature of Values- Good and Bad, Ends and Means, Actual and potential Values, Objective and Subjective Values, Analysis of basic moral concepts- right, ought, duty, obligation, justice, responsibility and freedom, Good behavior and respect for elders, Character and Conduct.
- III. Individual and society:
Ahimsa (Non-Violence), Satya (Truth), Brahmacharya (Celibacy), Asteya (Non possession) and Aparigraha (Non-stealing). Purusharthas (Cardinal virtues)- Dharma (Righteousness), Artha (Wealth), Kama (Fulfillment Bodily Desires), Moksha (Liberation).
- IV. Bhagavad Gita – (a) Niskama karma. (b) Buddhism – The Four Noble Truths – Arya astanga marga, (c) Jainism – mahavratas and anuvratas. Values Embedded in Various Religions, Religious Tolerance, Gandhian Ethics.
- V. Crime and Theories of punishment – (a) Reformatory, Retributive and Deterrent. (b) Views on manu and Yajnavalkya.

Books for study:

1. John S Mackenjie: A manual of ethics.
2. “The Ethics of Management” by Larue Tone Hosmer, Richard D. Irwin Inc.
3. “Management Ethics – integrity at work” by Joseph A. Petrick and John F. Quinn, Response Books: New Delhi.
4. “Ethics in Management” by S.A. Sherlekar, Himalaya Publishing House.
5. Harold H. Titus: Ethics for Today

6. Maitra, S.K: Hindu Ethics
7. William Lilly: Introduction to Ethics
8. Sinha: A Manual of Ethics
9. Manu: Manu Dharma Sastra or the Institute of Manu: Comprising the Indian System of Duties: Religious and Civil(ed.) G.C. Haughton.
10. Susruta Samhita: Tr. Kaviraj Kunjanlal, Kunjalal Brishagratha, Chowkamba Sanskrit series, Vol. I, II and III, Varnasi, Vol I OO, 16-20, 21-32 and 74-77 only.
11. Caraka Samhita: Tr. Dr. Ram Karan Sarma and Vaidya Bhagavan Dash, Chowkamba Sanskrit Series office, Varanasi I,II,III Vol I PP 183-191.
12. Ethics, Theory and Contemporary Issues, Barbara Mackinnon, Wadsworth/Thomson Learning, 2001.
13. Analyzing Moral Issues, Judith A. Boss, Mayfield Publishing Company, 1999.
14. An Introduction to Applied Ethics (Ed.) John H. Piet and Ayodhya Prasad, Cosmo Publications.
15. Text book for Intermediate logic, Ethics and Human Values, board of Intermediate Education & Telugu Academic Hyderabad.
16. I.C. Sharma Ethical Philosophy of India. Nagin & co Julundhar.

SEMESTER III

BOT-301: Plant Molecular Biology

UNIT I

Structure and Replication of DNA: Structure of DNA and Polymorphism A, B, and Z DNA, biochemical and physical properties of DNA. DNA replication in prokaryotes and eukaryotes. Enzymes and accessory proteins involved in replication. D-loop and Rolling circle models for DNA replication, replication at telomeres. DNA damage and repair mechanisms, Mechanism of Recombination.

UNIT-II

Organization of genomes and genes: Nuclear genome content and C & G-value paradox. DNA kinetics and Cot curves, satellite DNA and repetitive sequences.

Organization of chloroplast and mitochondrial genomes. Bacterial nucleoid organization. Operon-concept fine structure of prokaryotic, eukaryotic genes, promoters. Types of genes; split genes, housekeeping genes, structural and regulatory genes, polyprotein and nested genes. R- RNA and t-RNA genes, Multigene families and gene amplification.

UNIT III

Gene expression: Transcription: RNA Polymerase and plant transcription factors, Mechanisms of transcription in prokaryotes and eukaryotes. RNA splicing and post transcriptional modification. RNA transport and stability .

Translation: Elucidation of Genetic code. Role of rRNA and tRNA in translation. Mechanism of Translation in Prokaryotes and Eukaryotes. Post Translational Modifications and Protein Folding. Protein Targeting.

Unit – IV

Gene Regulation: Principles of Regulation. Prokaryotes - Organization of Lac and Tryptophan operons; Negative and Positive Control and Attenuation mechanisms.

Eukaryotes: *cis*-acting elements – Enhancers, Silencers, Insulators, Locus Control regions, MAR's. Transacting factors, Activators, Co-activators, Suppressors and Co-suppressors and other Regulatory proteins. DNA Methylation and Gene Regulation; Chromatin Remodeling and histone code. Environmental and Developmental gene regulation. RNAi and Gene Silencing.

Suggested Readings:

1. Adams, R. L. P., Knowler, J. T. and Leader, D. P. 1994. The Biochemistry of the nucleic acids. Chapman & Hall.
2. Alberts, B., Bray, D., Lewis, J., Raff, M., Roberts, K., and Watson, J. D. 1999. Molecular Biology of the Cell. Garland Publishing Inc., New York.
3. Brown, T. A. 1999. Genomes 3. John Wiley & Sons, New York, USA.
4. James D., Watson et al; 2004 Molecular Biology of the gene (5th Ed.) Pearson publications.
5. Robert F. Weaver. 2008. Molecular Biology. Mc Graw Hill Higher Education.
6. Buchanan, B. B., Gruissem, W. and Jones, R.L. 2000. Biochemistry and Molecular Biology of Plants. Am. Society of Plant Physiologists, Maryland, USA.
7. David Freifelder Molecular Biology. 1976. W. H. Freeman and Company, San Francisco, USA.
8. Kleinsmith, L. J. and Kish, V. M. 1995. Principles of Cell and Molecular Biology (2nd Ed.). Harper Collins College Publishers, New York, USA.
9. Lewin, B. 2006. Genes VIII. Oxford University Press, New York.

BOT-302: Biodiversity and Conservation

UNIT I

Concept and Importance of Biodiversity: Status in India, World Centers of Primary Diversity, Types of Biodiversity, Causes for Rarity, loss of Species Extinction Red data book, Exploration, Invasions, Introduction of species, Status species-based on IUCN; and Genetic Diversity in crops, Sustainable Agriculture in Biodiversity; Arborescens, Palmata; Global Warming and its effect on Biodiversity.

UNIT II

Status and Analysis of Species Diversity: Remote sensing-Concept, Principles, Applications and Role in study and Identification of Phyto Diversity and Natural Resources. GIS, Application of Microwaves and Radiation.

UNIT III

Principles of Diversity: Concepts of Phytogeography, generic cycles, theories of Phytogeography, Phytogeographical areas in India and Plant Diversity. Continental drift, plate tectonics of World and India, Endemism, Hotspots, Species rarity and Extinction,

Unit – IV

Strategies for Conservation of Diversity: *In situ* Conservation – Sanctuaries, National Parks, Biosphere Reserves, MPCA, MPDA, Mangroves, Coral Reefs, Sacred Groves, *Ex-situ* Conservation – Botanical Gardens. Arborata and Palmata; Herbaria, Gene Banks, Seed Banks, Traditional Role of National and International Organizations – WWF, IPGN, IUCN, NBPGR, BSI, ICAR, CSIR, DBT, DST, NGOs and Role of Indigenous people in Biodiversity conservation.

Suggested Readings:

1. Chandel, K. P. S., Shukla, G. and Sharma, N: 1996. Biodiversity in Medicinal and Aromatic Plants in India: Conservation and Utilization. National Bureau of Plant Genetic Resources, New Delhi.
2. Chaudhuri, A. B. & Sarkar, D. D. 2002. Biodiversity Endangered. Scientific Publishers, New Delhi.
3. Clive Hambler, 2004. Conservation. Cambridge University Press, Cambridge, UK.
4. Chuvieco, E. and Uete, A.H. 2010. Fundamentals of Satellite Remote sensing.
5. Frankel, O.H., Brown, A.H.D. & Burdon, J.J. 1995. The Conservation of Plant Diversity. Cambridge University Press, Cambridge, U.K.
6. Gabriel Melchias. 2001. Biodiversity and Conservation. Oxford IBH Publishers, New Delhi.
7. Christopher, D., Cook, K. 1996. Aquatic and Wet Land Plants of India Oxford University Press, New Delhi, India.
8. Mehra, K. L., Arora, R. K. 1982. Plant Genetic Resources of India -Their Diversity & Conservation, Vol III, Chapman Hall ,U. K.
9. Manilal, K. S. 1988. Flora of Silent Valley, Mathrubhumi Press, Calicut.
10. Nayar, M. P. 1996. Hot Spots of Endemic Medicinal Plants of India, Nepal & Bhutan, Tropical Botanical Garden & Research institute, Palode, Tiruvananthapuram, Kerala.
11. Negi, S. S. 2005. Biodiversity & Its Conservation in India. Indus Publishing Company. New Delhi.
12. Prasad, B. N. 2000. Biotechnology & biodiversity in Agriculture / Forestry. Oxford University Press.
13. Pullaiah, T. 2002 — 2005. Biodiversity in India. Vol. I -IV. Regency Publications, New Delhi.
14. Rajiv K. Sinha. 1996. Global Biodiversity, INA, Shree Publications, Jaipur, India.
15. Santapau, H. 1970. Endangered Plant Species and their Habitat Status. IUCN Publications, Switzerland.
16. Sinha, R. K. Biodiversity -Global Concerns.1996. Commonwealth Publishers, New Delhi.
17. Supriya Chakraborty. 2004. Biodiversity Pointer Publishers, Jaipur.
18. Walter, K.S. and Gillett, H.J. 1998. 1997 IUCN Red List of Threatened Plants. IUCN, the World conservation Union. IUCN, Gland, Switzerland, and Cambridge, U.K.

BOT-303 & 303(A): Plant Development and Reproduction

UNIT I

Tissue types and Tissue systems in Plants: Root growth and Development: Root apical meristem; Cell division, Cell expansion and elongation. Differentiation of root; vascular tissue, root hair and Lateral roots formation.

Stem growth and development: organization of the shoot apex; cytological and molecular analysis of shoot apical meristems. Tissue differentiation in the shoot; xylem regeneration and Phloem differentiation.

UNIT II

Leaf and flower development: Development of leaf, History, Specialized cells and tissue differentiation.

Development and Anatomy of flower, including transition to Flowering and reproductive shoot apex.

UNIT III

Reproduction and Flower: Vegetative options and reproduction; Genes controlling Floral Organ Differentiation.

Male gametophyte: Structure of anther; Microsporogenesis, Role of Tapetum; Pollen development, Pollen germination, Pollen tube growth and Guidance; Pollen storage.

Female Gametophyte: Ovule- Structure and development; Megasporogenesis; Development and Organization of the mature Embryo sac; Structure of the Embryo sac cells; Embryo sac haustoria.

UNIT IV

Fertilization, Seed and Fruit Development: Pollination mechanisms and Vectors; Structure of the Pistil; Pollen- Stigma Interactions, Sporophytic and Gametophytic Self-Incompatibility; Double Fertilization.

Endosperm development during early maturation and Desiccation stages; Embryogenesis-Dicot types; Monocot embryo; Polyembryony; Apomixis; Parthenocarpy. Dynamics of Fruit growth and Seed Development.

Suggested readings:

1. Atwell, B.J. Kriedermann, P. E. and Jumbull, C.G.N. (Ed.) 1999. Plants in Action. Adaptation in Nature, performance in cultivation. MacMilan Education, Sydney, Australia.
2. Burgess, J. 1985. An introduction to Plant Cell development. Cambridge Univ. Press, Cambridge.
3. Fahn, A. 1982. Plant Anatomy (^{3rd}Ed.), Pergamon Press, Oxford.
4. Fosket, D.E. 1994. Plant growth and Development. A molecular approach, Academic Press, San Diego, USA.
5. Howell, S.H. 1998. Molecular Genetics of Plant Development, Cambridge Univ. Press, Cambridge.
6. Jane, F.W. 1970. The structure of wood. Black, London.
7. Lyndon, R.F. 1990. Plant Development. The Cellular Basis, Unnin Hyman, London.
8. Murphy, T.M. and Thompson, W.F. 1988. Molecular Plant Development, Prentice Hall, New Jersey.
9. Pullaih, T., Naidu, K. C., Lakshminarayana, K. & Hanumantha Rao, B. 2007. Plant Development. Regency Publications, New Delhi.

10. Raghavan, V. 1999. Developmental Biology of Flowering Plants, Springer-Verlag, New York.
11. Steeves, T.A. and Sussex, T.M. 1989. Patterns in Plant Development (2ndEd.). Cambridge Univ Press, Cambridge.
12. Waisel, Y., Esnel, A, and Kafkaki U. (Eds.). 1996. Plant Roots. The Hidden Hall (2nd Ed.), New York, USA.
13. Bhojwani, S. S. and Bhatnagar, S.P. 2000. The embryology of Angiosperms (4th Revised and Enlarged Ed.). Vikas Publishing House, New Delhi.
14. The plant cell. Special issue on Reproductive Biology of Plants, Vol. 5. 1993. The American Society of plant physiologist, Rockville, Maryland, USA.
15. Howell, S. H. 1998. Molecular genetics of Plant Development. Cambridge Univ. Press, Cambridge.
16. Murphy, T .M. and Thompson, W. F. 1988. Molecular plant development, prentice Hall, New Jersey.
17. Pullaiah, T .Lakshiminarayana, K. & Hanumantha rao, B. 2008.plant reproduction. Scientific publishers, Jodhpur.
18. Raghavan, V. 1997. Molecular embryology of Flowering plants, Cambridge Univ. Press, Cambridge.
19. Raghavan, V. 1999. Developmental Biology of Flowering plants. Springer- Verlag, New York.
20. Sedgely, M.. and Griffin, A. R. 1989. Sexual reproduction of Tree crops. Academic Press, London.
21. Shivanna, K.R. and Sawhney, V.K. (Eds). 1997. Pollen Biotechnology for Crop Production and Improvement. Cambridge Univ. Press, Cambridge.
22. Shivanna, K.R. and Johri, B.M. 1985. The Angiosperm pollen: the Structure and function. Wiley Eastern Ltd., New York.

BOT-303 & 304 (B): Ethnobotany and Phytomedicine

UNIT I

Ethnobotany: Scope and importance, inter disciplinary approaches in Ethnobotany, tribals of Andhra Pradesh and their traditional usage of plants in medicine, food and other purposes. Applications of Ethnobotany.

UNIT II

Cultivation, Multiplication, Collection, Processing and Marketing: Macro and Micro Propagation and cultivation of medicinal plants; Multiplication of Medicinal Plants and Production of Specific Biologically Active Molecules through Tissue culture; Methods of collection, Processing, Storage, Market Potential and Trade of Plant Medicines. Adoption of GATT and TRIP Intellectual Patent Rights (IPR) & Intellectual Property Protection (IPP) for the plant medicines.

UNIT III

Phytomedicine: Systems of medicine, brief history, origin and scope of plant medicines, identification of locally available medicinal plants. Vitamins, Various secondary metabolites and Biosynthesis; Adulteration and Alternations of the Drugs.

UNIT IV

Formulations, Diagnostic features and Biological activity of Plant Medicines: Formulations and dosage forms of plant medicines; Pharmacology and Pharmacognosy; Study of the important Diagnostic Features of Active Constituents, Quality, Purity; and Pharmaceutical uses of important Plant Medicines. Biological Active Principles of Established Herbal Medicines. Herbal Cosmetics and Dietetics.

Suggested Readings:

1. Jain, S.K. 1968. Medicinal Plants National Book Trust of India, New Delhi.
2. Jain, S.K. 1981. Glimpses of Indian Ethnobotany, Oxford and IBH Publishing Co., New Delhi.
3. Rao, P.S. Venkaiah, K. & Padmaja, R. 1999. Field guide on Medicinal Plants. A. P. Forest Department.
4. Sinha, R.K. 1997. Global Biodiversity, INA Shree Publications, Jaipur, India.
5. Trivedi, P.C. 2002. Ethnobotany, Avishkar Publishers, Jaipur, India.
6. Arber, A. 2008. Herbal Plants & Drugs. Agro Science Book Centre, New Delhi.
7. Cutler. S.J. & Cutler. H.G. 1999. Biologically Active Natural Products – Pharmaceuticals, Agro Science Book Centre, New Delhi.
8. Harborne, J.B. 1948. phytochemical methods . Chapman and Hall, London.
9. Kokate, C.K. Purohit, A.P. Gauchely, S.B. 1990. Pharmacognosy, (Narial Prakashan).
10. Khare, C.P. 2000. Indian herbal therapies. Delhi Book Co., Connaught, Circle, New Delhi.
11. Mukherjee, B. 1998. The Wealth Of Indian Alchemy & its Medicinal Uses.
12. Nadkarni, K. M. 2004. Indian plants & Drugs with their Medicinal Properties. Agro Sci. Publ. Centre, New Delhi.
13. Panda, H. 2003. Medicinal Herbs & Their Uses with Formulations. Daya Publi. House, New Delhi.
14. Sharma, R. 2003. Medicinal plants of India – An Encyclopedia
15. Trease, G.E. and Evans, W.C. 1983. Pharmacognosy. (12th Ed.), Bailine, London.
16. Wallis, T.E. 1999. Text Book of Pharmacognosy, (5th Ed.) CBS Publishers & Distributions, New Delhi.

BOT-303 & 304 (C): Computer Applications and Bioinformatics

UNIT I

Computer Operating systems. Types of Operating Systems, MS Office

UNIT II

Bioinformatics –definition, introduction, applications and scope. Databanks – Gen Bank, PDB, NCBI, OMIM, EMBL. Literature Databanks - Pubmed, Med line. Plant Biology Specific Engines.

UNIT III

Sequence Alignment based on Matrices (BLOSUM and PAM), Algorithm

(Needleman Wunsch & Smith Waterman). Tools for sequence alignment – BLAST, FASTA. Pair wise. Multiple sequence alignment and phylogenetic analysis

UNIT IV

The biological databases & Types; Types of biological databases; Sequence databases; Structural databases; Prediction of genes and gene function. Translation of gene into protein; Protein secondary structure prediction; Prediction of domains, motifs and profiles of proteins.

Suggested Readings:

1. Bioinformatics. A practical guide to analysis of genes and proteins. 1998. Baxevanis and Quellerie.
2. Bioinformatics: A biologist's guide to biocomputing and the internet. 2000. Stuart M. Brown.
3. Bioinformatics: Sequence and genome analysis. 2001. David W. Mount.
4. Bioinformatics. David H Mount. 2005. Second Edn. CBS Publishers, New Delhi.
5. Bioinformatics- Methods and applications. S.C.Rastogi, N.Mendiratta and P.Rsatogi. Third edition. PHI Learning Pvt. Ltd, New Delhi.

Practical-305P I

Suggested Laboratory Exercises related to BOT- 301

1. Determination of Absorption Spectrum.
2. Determination of A max of DNA and RNA and Protein.
3. DNA denaturation and Preparation of Cot curves; Hyperchromic effect.
4. Isolation of plant DNA and its quantitation by a Diphenylamine method.
5. Protein estimation methods, Isolation of RNA and quantitation by a Orcenol method.
6. Assignments on DNA structure, Replication, Transcription, Genetic code and Translation.

Suggested Readings for Laboratory exercises (BOT- 301)

1. Becker, J. M., Caldwell, Zachgo. 1996. Biotechnology, A Laboratory Course, Academic press, California, USA.
2. Glick, B.R. and Thompson, J.E. 1993. Methods in Plant Molecular Biology Biotechnology. CRC Press, Boca Raton, Florida.
3. Glover. D.M. and Hames, B.D. (Eds.). 1995. DNA cloning 1: A Practical Approach; Core Techniques, (2nd Ed.) PAS, IRL Press at Oxford University Press, Oxford.
4. Gunning, B.E.S., and Steer, M.W. 1996. Plant Cell Biology: Structure and Function. Boston, Jones and Bartlett Publishers. MA, USA.
5. Hackett, P.B., Fuchs, J.A. and Messing, J.W. 1988. An Introduction Recombinant DNA Techniques: Basic Experiments in Gene Manipulation.' The Benjamin / Cummings Publishing Co., California, USA.
6. Hall, J.L. and Moore, A.L. 1983. Isolation of membranes and organelles from Plant cells. Academic Press, London, UK.
7. Harris, N. and Oparka, K.J. 1994. Plant Cell Biology: A Practical Approach, IRL Press and Oxford University Press, Oxford, U.K.
8. Sadasivam, S. & Manikam, A. 1992. Biochemical methods. Wiley Eastern Ltd.
9. Sawhney, S. K. and Ranbir Singh(Eds).2000.Introductory Practical Biochemistry, Narosa Publishers, New Delhi.
10. Shaw, C.H. (Ed.). 1988. Plant Molecular Biology: A Practical Approach, IRL Press, Oxford.

Suggested Laboratory Exercises related to BOT- 302

1. Study of the Species Diversity in Fields and Forests.
2. Study of Bio-diversity of identical areas.
3. Study of Mangroves and Sacred groves.
4. Study of Endemic, Rare, Extinct species of Seshachalam hill range.
5. Genetic Diversity of species / varieties of *Vinca*, *Oscimum*, *Gomphrena*, *Portulaca*, *Plumbago*, *Amaranthus* etc.

6. Screening of Plant species for Secondary metabolites.
7. Extraction of Plant Dyes from various parts.
8. Saponification and Iodine Number of Different Plant oils.
9. Study and Distribution of Genera and Species of Indigenous (Endemic) and World.
10. Endemic plant diversity and Distribution in India.
11. Study on Forest types of India.
12. Identification of Hotspots, National parks and Sanctuaries of India and World.
13. Study of FCC and TCC related to remote sensing.

Suggested Readings for Laboratory Exercises (BOT- 302)

1. Bajracharya, D. 1999. Experiments in Plant Physiology: A laboratory manual. Narosa Publishing House, New Delhi.
2. Cooper, T.G. 1977, Tools in Biochemistry. John Wiley, New York, USA.
3. Copeland, R,A. 1996. Enzymes : A practical introduction to Structure, Mechanism, and Data analysis. VCH Publishers, New York.
4. Dennison, C. 1999. A guide to protein isolation. Kluwer Academic Publishers, Dordrecht, The Netherlands.
5. Devi, P. 2000. Principles and methods of plant molecular biology, Biochemistry and Genetics, Agrobios, Jodhpur. India.

6. Dryer, R.L. and Lata, G.G. 1989. Experimental Biochemistry, Oxford University Press, New York.
7. Hames, B.D. (Ed). 1998. Gel Electrophoresis of proteins: A Practical approach. (3rd Ed.). RA,S Oxford University Press. Oxford UK
8. Harborne, J. B. 1981. Phytochemical methods: A guide to modern techniques of plant analysis. Chapman & Hall, London.
9. Meidner, H. 1984. Class experiments in Plant physiology, George Allen & Unwin Publishers, Boston, USA.
10. Moore, T.C. 1974. Research Experiences in Plant Physiology: A Laboratory manual. Springer Verlag, Berlin.
11. Ninfa A.J. and Ballou, D.P. 1998. Fundamental Laboratory Approaches for Biochemistry and Biotechnology, Fitzgerald Science Press, Inc., Maryland, USA.
12. Plummer,D.T. 1988. An Introduction to Practical Biochemistry. Tata McGraw Hill Publisf,iriCo. Ltd., New'Delhi.
13. Scott R.P.W. 1995. Techniques and Practice of Chromatography. Marcel Dekker, Inc., New York.
14. Wilson, K. and Goulding, K.H. (Eds.). 1986. A Biologists guide to principles and ltechniques of practical biochemistry. Edward Arnold, London, UK.
15. Wilson, K. and Walker, J. 1994. Practical Biochemistry: Principles and Techniques, (4th Ed.). Cambridge University Press, Cambridge, UK.

Practical-306P II

Suggested Laboratory Exercises related to BOT- 303 & 304 (A)Plant Development

1. Representative types of roots -Diarch, Triarch, polyarch types — transverse sections with double staining, ex. *Vicia*, *Ficus*, *Tinospora* (aerial root), vanda (velamen root).
2. Types of Stems: for transverse sections with double staining methods — showing Primary and Abnormal Secondary Growth. Ex. *Aristolochia*, *Citrullus*, *Cucurbita*, *Polyanthus*, *Sorghum*, *Strychnos*, *Cocculus*, *Bignonia*, *Amaranthus*, *Achyranthus*, *Piper*, *Peperomia*, *Bouganvilla*, *Boerhaavia*, *Dracaena*.
3. Maceration of wood: For observation of Individual Xylem elements with single staining.
4. Leaf types: Dorsiventral leaf, Isobilateral leaf, Xeromorphic leaves -*Muehlenbeckia*, *Nerium*, *Casuarina*, *Peperomia*, and *Ficus* leaves, *Nymphaea*, *Typha* leaves. *Sorghum* and *Saccharum* leaves for C4 anatomy.
5. Nodal anatomy — types.

Plant Reproduction

6. Study of Microsporogenesis and Gametogenesis in sections of Anthers.
7. Examination of Modes of Anther Dehiscence and collection of Pollen grains for microscopic examination (Maize, Grasses, *Cannabis sativa*, *Crotalaria*, *Tradescantia*, *Brassica*, *Petunia*, *Solanum melongena* etc.
8. Tests for Pollen Viability using stains and in vitro Germination. Pollen Germination using Hanging drop and Sitting drop cultures, Suspension culture and Surface culture.
9. Estimation of Percentage and Average Pollen tube Growth *in vitro*.

10. Study of ovules in cleared preparations; Study of Monosporic, Bisporic and Tetrasporic types of Embryo Sac development through examination of permanent stained serial sections.
11. Field study of several types of flowers with different pollination mechanisms (Wind Pollination, Thrips pollination, Bee / Butterfly Pollination, Bird Pollination).
12. Study of Nuclear and Cellular endosperm through dissections and staining.
13. Isolation of Zygotic Globular, Heart-shaped, Torpedo stage and mature embryos from suitable seeds.
14. Polyembryony in Citrus, Jamun (*Syzygium cumini*) etc. by Dissections.

Suggested Readings for laboratory exercises

1. Chopra, V.L. 2001. Plant breeding: Theory and Practice. Oxford IBH Pvt. Ltd. New Delhi.
2. Chopra, V.L. 2001. Plant breeding: Field Crops, Oxford IBH Pvt. Ltd., New Delhi.
3. Shivanna, K.R. and Rangaswamy, N.S. 1992. Pollen Biology: A laboratory Manual. Springer verlag, Berlin Heidelberg.
4. Shivanna, K.R. and Sawhney, V.K. (Eds.) 1997. Pollen Biotechnology for Crop Production and Improvement. Cambridge University Press, Cambridge.

Suggested Laboratory Exercises BOT- 303 & 304 (B) Ethnobotany

1. Visits to tribal habitats and field Study of medicinal plants used by tribal people.
2. Recording medicinal practices and herbal formulations of tribal medicine.
3. Collection and identification of herbal medicinal plants.
4. Preservation and submission of herbal medicinal samples.
5. Preparation and submission of herbal practice centre tour report.
6. Development of medicinal plant nurseries in botanical garden.

Suggested Laboratory Exercise related to BOT-103

1. Jain, S.K. 1968. Medicinal plants. National book trust of India, New Delhi.
2. Rao, P.S. Venkaiah, K. & Padmaja, R. 1999. Field guide on medicinal plants. A. P. Forest department.
3. Trivedi, P.C. 2002. Ethnobotany. Avishkar Publishers, Jaipur, India.

Phytomedicine:

1. Identification of important Medicinal plants and study of Morphological features of the Medicinal plant parts.
2. Field trip to study and identify locally occurring Medicinal plants.
3. Practical Methods of Cultivation, Propagation, Conservation and Protection of important Medicinal plants to develop familiarity.
4. Micro-propagation of Medicinal plants and Production of Callus from different Explants for Specific Biologically active Ingredients.
5. Practical demonstration of collection, processing and storage of Plant Medicines.
6. Microscopic study of locally available Medicinal plant parts such as leaves, stems, underground parts, flowers, fruits and seeds (Senna, Datura, Cinnamon, Cinchona, Ginger, Clove, Fennel, Nux-vomica & Ipecacuanha).
7. Demonstration of drug adulteration, identification of locally available Plant Medicines.
8. Antibiotic sensitive test of crude drugs.
9. Demonstration of drug Formulation and Herbal cosmetics.
10. Organoleptic examination and physical and chemical properties.

11. Visit to nearest Pharmaceutical Industry.

Suggested Laboratory Exercise related to BOT-303 & 304 (C)

1. Document files creation using MS word. Creating document style.
2. Internet – E-mail and mail attachment
 - i. Downloading webpage; Saving a web page; Printing the web page; Document
 - ii. Search engine; Image
3. Visit to genebank database; NCBI; EMBL
4. Visit to protein database; Swis prot ;PDb
5. Use of literature database
 - i. Virtual library; Agricola; Pub med
6. Use of similarity search tools: NBLAST; PBLAST

BOT- 307 (EE): Plant Resources and Utilization

UNIT I

Importance of Plants to Mankind: Origin and Development of Agriculture and Food crops: Cereals-Major and Minor Millets; Pulse crops, Oil seed crops, Fruits and Vegetables.

UNIT II

Non Wood Forest Products: Rubber, Latex, Gums, Resins, Dyes, Tannins, Fibers, Apiculture, Bio-vitamins and Aromatic plants.

UNIT III

Commercial Crops: Spices and Condiments, Flavoring Products, Beverages, Fumigators and Mastigatories, Narcotics, Orchids, Ornamentals and Cut flowers.

UNIT IV

Silviculture: Timber yielding plants, Conventional and Non Conventional Energy Resource Development. Bamboos, Ratoons, Generation of Paper Industry Raw material.

Suggested Readings:

1. Baker, H.G. 1978. Plants and Civilization (3 Ed.). C. A. Wadsworth, Belmont
2. Council of Scientific & Industrial Research 1986. The Useful Plants of India. Publications and Information Directorate, CSIR, New Delhi.
3. Fransworth, N. R. 1988. Screening Plants for New Medicines. National Acad. Press. USA
4. Harborne, J. B. 1973. Phytochemical Mthod. A guide to Modern Techniques of Plant Analysis: Chapman & Hill, London.
5. Kocchar, S.L. 1998. Economic Botany of the Tropics, (2' Ed.). Macmillan India Ltd., Delhi.
6. Negi, S. S. 1996. Biodivrsity & Conservation, Indus Publishing, New Delhi.
7. Plant Wealth of India, 1997. Special Issue of Proceedings Indian National Science Academy B-63.
8. Singh, M. P. Soma Dey.2004. Natural Resources & Renewable Energy. Daya Publications, New Delhi.
9. Sharma, O.P. 1996 Hill's Economic Botany, Tata McGraw-Hill: New Delhi.
10. Thomas, P. 2000. Trees: Their National History Cambridge University Press, Cambridge.

11. Wagner, H., Hikino, H. and Farnsworth, N. 1989 Economic and Medicinal Plant Research. Vols. 1-3. Academic Press, London.

BOT-308(EE) HERBAL DRUGS & COSMETICS

Unit - I

Ethno Botany: Its scope and importance; Inter disciplinary approaches in Ethno botany; study of Medicinal, Edible and Miscellaneous plants used by the Tribes; Applications of Ethno botany.

Phytomedicine: Systems of Medicine (Brief); Brief history, Origin and Scope of Plant Medicines; Identification of locally available Medicinal plants.

Unit - II

Propagation and Cultivation of Medicinal Plants: Methods of Collection, Processing and Storage of Plant Medicines; Plant Medicines, and their Trade, Patent Rights and Marketing.

UNIT III

Herbal origin like fixed oils, waxes, gums, hydrophilic colloids, colours, perfumes, protective agents, bleaching agents, preservatives, antioxidants and other ancillary agents used in the cosmetic formulations. Herbal Cosmetic Preparations & Formulation care creams: Soaps, dyes, shampoos, anti aging creams, toothpaste, mouthwash, deodorants, antiperspirants, hair preparations, lotions, nail polishes, lipsticks and toiletries etc. and their analysis.

UNIT IV

Formulation & standardization of various herbal cosmetic products, physicochemical characterization in whole form, separation and identification of active principles, excipients and their estimation in various cosmetic preparations using different modern techniques.

Suggested Readings:

1. Harborne, J. B. 1948. Phytochemical Methods (Ed.) Chapman and Hall, London.
2. Khare, C. P. 2000. Indian Herbal Therapies. Delhi Book Co., M-Connaught, Circus, New Delhi.
3. Kokate, C. K. Purohit, A.P. Gauchely, S.B. 1990. Pharmacognosy, Narial Prakashan, India.
4. Trease, G. E. and Evans, W.C. 1983. Pharmacognosy. (12th Ed.), Bailine, Londong.
5. Wallis, T. E. 1999. Text Book of Pharmacognosy, (5th Ed.) CBS Publishers & Distributions, New Delhi.
6. Singh, M. P. and Panda, Himadri 2005. Medicinal herbs with their formulations. Volume 1 & 2. Daya Publishing House, Delhi.
7. Herbal cosmetics, hand book By H. Panda
8. Cosmetic analysis- selective methods and techniques by P. Borc
9. Cosmetics formulation, manufacturing and their quality control by P.P. Sharma

PRACTICAL 309 P I

Suggested Laboratory Exercises Related to Plant Resource Utilization (BOT307 EE)

1. Food crops: Morphology and anatomy of parts of Wheat, Rice, Maize, Chickpea (Bengal gram), Potato, Tapioca, Sweet potato, Sugarcane used as food materials.
2. Forage / Fodder crops: Study of any five important crops of the locality (for example fodder Sorghum, Bajra, Clover gram bean, Ficus sp.).

3. Plant fibres: Textile fibres: Cotton, Jute, Linen, Sunn hemp, Cannabis. Cordage fibres: Coir, Fibers for stuffing: Silk cotton or Kapok. Morphology, Anatomy, Microscopic study of whole fibres using appropriate staining procedures.
4. Medicinal and Aromatic plants: Screening for secondary metabolites of *Papaver somniferum*, *Atropa belladonna*, *Catharanthus roseus*, *Adhatoda zeylanica* (Syn. *A. vasica*). *Allium sativum*, *Rauwolfia serpentina*, *Withania somnifera*, *Phyllanthus amarus* (*P. Fraternus*). *Andrographis paniculata*, *Aloe barbadense*, *Mentha arvensis*, *Rosa* sp., *Pogostemon cablin*, *Origanum vulgare*, *Veitveria zizanioides*, *Jasminum grandiflorum*, *Cymbopogon* sp. *Pandanus odoratissimus*.
5. Study of live or herbarium specimens or other visual materials to become familiar with these above resources.
6. Vegetable oils: Mustard, Groundnut, Soybean, Coconut, Sunflower, Castor. Morphology, microscopic structure of the oil yielding tissues, tests for oil and Iodine number.
7. Gums, Resins, Tannins, Dyes: Perform simple tests for gums and resins. Prepare a water extract of vegetable tannins (*Acacia*, *Terminalia*, mangroves, tea *Cassia* sp. myrobalans) and dyes (Turmeric, *Bixa orellana*, Indigo, *Butea monosperma*, *Lawsonia inermis*) and perform tests to understand their chemical nature.

Suggested laboratory exercises (BOT308 EE)

Fertilizers: Establishment of nursery, different containers, soil transplantation techniques.

Methods of raising a lawn. Plant propagation – layering, cutting, grafting. Visit to nursery

Layout of garden, plan of a rock garden, glass house, kitchen garden, artificial pond.

SEMESTER-IV

BOT-401: Plant Biotechnology

UNIT I

Basic concept of regeneration: Concept of Cellular Totipotency and Differentiation. Fundamental aspects of Morphogenesis. Organogenesis-direct & indirect. Role of plant growth regulators and factors governing *in vitro* behavior of cultures.

Propagation and variation

Modes, stages and Application of Micropropagation. Production of Pathogen free plants and their application.. Somatic embryogenesis, role of physical and chemical factors in the induction; synthetic seeds-production and uses. Origin, Molecular basis and application of Somaclonal variation.

UNIT II

Applications of Plant Tissue culture: Production of Haploids and its significance in Crop improvement. Secondary metabolite production through Cell and Organ cultures-Hairy roots. Shikonin production. Cryo preservation, methods and *in vitro* conservation of Germplasm.

Somatic hybridization: Protoplast isolation, Fusion and culture, Hybrid selection and characterization of hybrids. Symmetric and Asymmetric hybrids, Cybrids, significant achievements and limitations of Protoplast research, production of test tube plants.

UNIT III

Principles of Gene Cloning and Analysis: Enzymology of r DNA technology. Cloning vectors- Plasmids, Phages, Cosmids, Phagemids and strategies of cloning, expression vectors. Bacterial

transformation and transfection. Genomic and c DNA libraries construction. Selection and analysis of cloned genes and its products.

UNIT IV

Genetic engineering of plants: Plant Gene Isolation-Transposons and t DNA tagging and map based cloning. Ti and Ri plasmid-mechanism of t DNA transfer; Viral and other vectors. Physical methods of gene transfer; PEG mediated gene transfer, Electroporation, Biolistics, Micro injection and other techniques. Chloroplast transformation, regulations of release and concerns of genetically modified crops; intellectual property rights. Production and application of transgenic plants (Drought tolerance, Golden rice, Edible Vaccines).

Suggested Readings: BOT-401

1. Bhojvani, S.S. and Razdan, M.K. 1996. Plant tissue Culture: theory and Practice. Elsevier, New York, USA.
2. Bhojvani, S.S. 1990. Plant Tissue Culture: Applications and Limitations. Elsevier, New York, USA.
3. George, E.F., Vol-I (1986) and Vol II (1993) Plant propagation by Tissue culture.
4. Kartha, K.K. 1985. Cryopreservation of plant cells and organs. CRC Press, Boac Raton, Florida, USA.
5. Rajdan, M.K. 1993. An Introduction to Plant Tissue culture. (2nd Ed.). oxford IBH, New Delhi.
6. Reinert, J. Bajaj, YPS (Eds.). 1977. Applied and fundamental aspects of plant cell, tissue, and organ culture. Springer-Verlag, New York.
7. Vasil, I.K. and Thorpe, T.A. 1994. Plant cell and Tissue culture, Kluner Academic Publishers, The Netherlands.
8. Altman, A. 2001. Gene cloning and DNA Analysis- An introduction. (5th Ed.). Blackwell Scientific Publication, Oxford, U.K.
9. Brown, T.A. 1999. Genomes. John Wiley & Sons (Asia) Pvt. Ltd., Singapore.
10. Chrispeels, M.J. and Sadava, D.E. 1994. Plants, Genes and Agriculture. Jones and Bartlett Publishers, Boston, USA.
11. Copping, L.G. and Rodgers, P. (Eds.). 1989. Biotechnology and its application to Agriculture. British Crop Protection Council.
12. Glazer, A.N. and Nikaido, H. 1995. Microbial Biotechnology, W.H. Freeman & Company, New York, USA.
13. Glick, B.R. & Pasternak, J.F. 1994. Molecular Biotechnology. Principles and applications of Recombinant DNA. Panima Publishing Corporation, New Delhi.
14. Old, R.W. and Primose, S.B. 1989. principle of Gene Manipulation Blackwell Scientific Publications, Oxford, UK.
15. Primrose, S.B. & Twyman, R.M. 2003. Principles of Genomic analysis and Genomics.(7thEd.) Blackewll Science.
16. Sandhya Mitra. 1996. Genetic Engineering: principles and Prpractice. Macmillan India Ltd.
17. Santharam, S. and Montgomery, J.F. 1999. Biotechnology, Biosafety, and Bio0diversity, oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
18. Slater, A. Scott, N. W. and Fowler, M.R. 2003. Plant Biotechnology. The Genetic Manipulation of Plants. Oxford University Press.

19. Winnacker, E.L. 2003. From Genes to Clones- Introduction to Gene Technology. Panima Publishing Corporation, New Delhi.

BOT-402: Plant Genomics and Proteomics

UNIT I

Structural genomics:

Isolation ,purification of plant DNA. Fragmentation, separation and generation of Mega base libraries. DNA marker systems and construction of melocular genetics maps and Physical maps. Maxim & Gilbert, Sanger and New generation DNA sequencing methods. Whole gene,moe sequence alignment strategies; clone by clone and shot gum sequencing. Contig assembly strategies and finished sequences. DNA sequence data bases.

UNIT II

Genes and Transcriptomics:

Genome annotation, in silico methods for gene identification and prediction of function; pair-wise and multiple sequence alignments, Experiemental techniques for functional identification of fenes: Insertional mutagenesis, Targeted induced local lesions (TILLING), RNA interference (RNAi) and gene knockout.

Functional genomics:Transcript profiling – DNA Micro array, Serial analysis of gene expression (SAGE) and Massively parallel signature sequencing (MPSS)

UNIT III

Proteomics:

Protein structure, ample preparation and separation techniques – 2D-analysis, Multidimensional liquid chromatography. Characterization of proteins by Mass spectrometry, protein sequencing, protein data bases and In silico characterization, protein micro arrays. Methods for protein interaction analysis; yeast hybrid systems, phage display and protein complexes.

UNIT IV

Comparative and evolutionary genomics:

DNA /protein sequence homologies – analogy, orthology and paralogy. Gene duplication and divergence. Evolution of novel genes and proteins, DNA quantities and non-coding sequences in plant genome evaluation. Molecular clocks, Molecular phylogenetics and construction of phylogenetic trees and theor applications Salient features of Arbidopsis and rice genome projects, Applications of plant genomics in agriculture and industry.

Suggested Readings: BOT 402.

1. Genomes, T. A. Brown (3rd Ed.), John Wiley Publications.
2. Principle of Genome analysis and Genomics, 7th edition, Primrose, S. B. Blockwilley.
3. Brown, T.A.2001. gene cloning and DNA Analysis- An introduction (5th Ed.), Blackwell Scientific Publications, Oxford, U.K.
4. Plant functional genomics, Daria Leister.
5. Gustafson, J. P. 2000. Genomes, Kluwer Academic plenum publishers, New York, USA.

6. Jolls, O. and Jornvall, H. (eds.) 2000. Proteomics in Functional Genomics. Birkhauser Verlag, Basel, Switzerland.
7. Introduction to Bioinformatics, 2001 by T. A. Attwood & D. J. Parry-Smith, Pearson Education Asian Publishers.
8. Bioinformatics: methods and Protocols, Edited by Stephen Misener and Stephen A. Krawetz. 2000. Methods in Molecular Biology Series, Human Press.
9. Bioinformatics: A Practical guide to the analysis of genes and proteins 1998, Edited by A. D. Baxevanis and B.F.
10. Computer Applications in Biotechnology, 1998, by T. Yosida
11. Aurthier, M. Lesk. 2002. Introduction to Bioinformatics. Oxford University Press, USA.
12. Durbin, R. Eddy S. R. Krogh, A., Mitchison, G. 1998. Biological Sequence Analysis: Probabilistic models of Proteins and Nucleic acids. Amazon Publications.
13. Gustafson, J. P. 2000. Genomes, Kluwer Academic plenum publishers, New York, USA.
14. Henry, R. J. 1997. Practical application of Plant Molecular Biology. Chapman & Hall, London. U.K.
15. Jolls, O. and Jornvall, H. (eds.) 2000. Proteomics in Functional Genomics. Birkhauser Verlag, Basel, Switzerland.
16. Mount, D., 2004. Bioinformatics: Sequence and Genome Analysis. (2nd Ed.) Cold Spring Harbor Laboratory Press.

BOT-403 & 404 (A): Molecular Plant Physiology

Unit I

Signal transduction: Overview, Receptors and G-Proteins, Phospholipid signaling, Role of cyclic nucleotides, Calcium-Calmodulin Cascade, Protein kinases, MPK and Phosphates. Specific signaling mechanisms- Two component sector regulatory system in plants, sucrose-senesing mechanism. Hormone receptors, signal transduction pathways and gene expression

Unit II

Photosynthesis: Photosynthetic pigments, Photosystems & Light harvesting complexes. Regulation of PS I and PS II activities; Photo-oxidation of Water, Oxygen evolving complex, Water oxidation clock, Mechanism of Photosynthetic electron and Proton transport; Energy spill over mechanisms; ATPase and Photophosphorylation; Rubisco activation and its mechanism of action; Light Activation of Photosynthetic enzymes; Chloroplast Protein Phosphorylation and Enzyme regulation of Photosynthetic carbon Assimilation; Mechanism of C4 cycle and CAM Pathway.

Unit III

Nanotechnology: Nanotechnology in Biology, Chemical synthesis and Bio-synthesis of Nano particles, Diversity of Nano particles; Nano sensors, Nano probes, Nano shells, Nano tubes; Application in Agriculture, Medicine and Industry; Quantam dots (Properties, Synthesis, Solubilization & Bioconjugation, Diversity, Binding specificity and application)

Unit IV

Stress Physiology: Concept of Stress, Plant Molecular Responses and Tolerance Mechanism to Abiotic Stress such as Water, Salt, Heavy Metal and High & low Temperature Stresses. Heat shock proteins, LEA Proteins, mi RNA involved in stress response in plants.

Senescence: Physiological, molecular and genetic changes associated with leaf Senescence.

Molecular Physiology of Flowering: Photoperiodism, Photoinduction and Evocation; Endogenous Clocks and Regulation; Physiological Signals of Floral Induction; Genetic and Molecular analysis, Vernalization.

Suggested Readings:

1. Buchanan, B.B. Grussem, W. and Jones, R.L. 2000. Biochemistry and Molecular Biology of Plants. American Society of Plant Physiologists, Maryland, USA.
2. Dennis, D.T. Turpin, D.H., Lefebvre, D.D. and Layzell, D.B. (Eds.) 1997. Plant Metabolism (2nd Ed.) Longman, Essex, England.
3. Galston, A.W. 1989. Life Processes in Plants. Scientific American Library, Springer-Verlag. New York, USA.
4. Hooykaas, P.J.J., Hall, M.A. and Libbeng, K.R. (Eds.). 1999 Biochemistry and Molecular biology of plant Hormones. Elsevier, Amsterdam, The Netherlands.
5. Hopkins, W.G. 1995. Introduction to Plant Physiology. John Wiley & Sons, New York, USA.
6. Lodish, H., Berk, A., Zipursky, S.L., Matsudaira, P., Baltimore, D. and Darnell, J. 2000. Molecular Cell Biology (4th Ed.). W.H. Freeman and Company, New York, USA.
7. Moore, T.C. 1989. Biochemistry and Physiology of plant Hormones (2nd Ed.). Springer-Verlag, New York, USA.
8. Nobel, P.S. 1999. Physicochemical and Environmental Plant Physiology (2 Ed.). Academic Press, San Diego, USA.
9. Salisbury, F.B. and Ross, C.W. 1992. Plant Physiology (4th Ed.). Wadsworth Publishing Co., California, USA.
10. Singhal, G.S., Renger, G., Sopory, S.K. Irrng K.D. and Govindje 1999. Concepts in Photobiology: Photosynthesis and Photomorphogenesis. Narosa Publishing Houses, New Delhi.
11. Taiz, L. and Zeigler, E. 1998. Plant Physiology (2 Ed.). Sinauer Associate, Inc., Publishers, Massachusetts, USA.
12. Thomas, B. and Vince-Prue, D. 1997. Photoperiodism in plants (2 Ed.). Academic Press, San Diego, USA
13. Westhoff, P. 1998. Molecular Plant Development: From Gene to Plant. Oxford University Press, Oxford, UK.
14. Tuanvo, Dinh Eds. Nanotechnology in Biology and Medicine; CRC Press, USA.
15. Subbaiah balaji, 2010. Nanobiotechnology; MJP Publishers, Chennai.
16. Chandrabhanu, T. K. and Bhatnagar, V. 2009. Nano science and Technology. Published by Campus Books international, New Delhi.
17. Charles P. Poole, Jr. Frank, J. Owens. Introduction to Nanotechnology. John Wiley & Sons Publications.
18. ODED Shoscyov & I Lan Levy. Nano Biotechnology, Bioinspired devices and materials of the future. Humana press, Totowa, New Jersey.
19. Nanobiotechnology: inorganic nanoparticles Vs Organic Nanoparticles. Elsevier.
20. Gerhard wilde. Nano standard materials. Elsevier.
21. M.N.V. Prasad, Salt stress.
22. Paras N. Prasad. Introduction to Nanomedicine and Nano bioengineering. Wiley series in.

23. Harry F. Tiffals. Medical Nanotechnology and Nanomedicine. University of Texas south western medical centre, Dallar, USA, CRC Press.

BOT-403 & 404 (B): Molecular Plant Pathology

Unit – I

Symptoms and Diagnosis of Plant Diseases

Disease development: Concept of plant diseases, Casual agents-Fungi, Eumycota, Protozoa, Bacteria, Phytoplasma and Spiroplasma, Viruses. Historically important diseases. Stages in Disease cycle – Inoculum, Inoculum Potential, Penetration, Infection, Invasion, Reproduction, Spread and Survival of the Pathogens. Susceptibility, Specificity, Toxins, Enzymes and Growth Regulators.

Plant Disease Epidemiology: Stages in diseases cycle, Molecular biology in plant pathology, use of model organisms, transformation techniques, forward and reverse genetics, dissection of signaling pathways, gene expression profiling and metabolite profiling, susceptibility of host and defense mechanisms, plant disease epidemiology; Development of Plant Disease, Epidemics, Modeling, Computer Simulation of Epidemics.

Unit – II

Physiology of the infected plant: Changes in Respiration, Photosynthesis, Carbohydrate metabolism, Nitrogen metabolism, Nucleic acid metabolism and growth characteristics of plants. Concept of plant immunity, PAMPs, PARs, DAMPs, PTI, ETI and HR.

Unit – III

Plant Disease Management: Physical, Chemical and Cultural. Plant fungal and Bacterial Diseases-Control.**Bio-Control:Principles.** (a) Biopesticides- Microbial, Fungal, Bacterial, Viral and Botanicals. (b) Integrated Pest Management- Integrated control in a Perennial crop and Integrated control in Annual crops. **Transgenics:** Insect (pest) Resistant Plants (Bt-cotton), Disease Resistant Plants (Virus Resistance); **Principles of Disease Resistance:** Physical, Chemical (Phytoalexins), HR, Tissue culture methods.

UNIT IV

Specific plant disease: Symptoms, Aetiology, Disease cycle and control of the Following diseases. Club-rot diseases of crucifers, Damping-off Vegetables, Late blight of potato, Green ear disease of Bajra, White rusts of Brassica, Powdery mildew of Cucurbits, Ergot of Bajra, Leaf spot of Turmeric, Groundnut rust, Whip smut of Sugarcane, Leaf spot of Groundnut, Brown spot of Rice, Blast of Rice and Blight of Rice.

Suggested Readings:

1. Agrios, G.N. 1997. Plant Pathology, (4th Ed.), Academic Press, London.
2. Bilgrami, K. S. and Dube, H. C. 2000. A text book of Modern Plant Pathology, Vikas Pub. New Delhi.
3. Mukerji, KG. and Garg, K. L. 1993. Bio-control of plant diseases, Vol. I & II CBS Publishers & Distributors Delhi.
4. Rangaswami, G., 1988(3rd Ed.) Diseases of Crop plants in India. Prentice-Hall of India.

5. Schaad, N.W. 1990. Laboratory Guide for identification of plant pathogenic bacteria (2nd Ed.), APS. (USA)
6. Sharma, P.D. 201. Plant pathology
7. Staples, R.C. and G.H. Toenniessen .1981. Plant disease control resistance and susceptibility John Wiley & sons, New York 339 pp.
8. Wood, R.K.S. 1980. Specificity in Plant diseases.

BOT-403 & 404 (C): Horticulture and Agriculture Biology

UNIT I:

Introduction and importance of Gardening, Soil types and preparation and treatment, Fertilizers, organic fertilizers and bio fertilizers Gardening, bonsai, Outdoor garden types and arrangements annuals, biennials. Perennials with common examples and culture: influence of environment, training, pruning and transplanting.

UNIT II:

Methods of plant propagation – layering, cutting, grafting, budding and their advantages. Pest and weed management – historical, theoretical, philosophical and biological insect pest suppression. Weed problem and ecological perspective, biological control of weeds growth regulators, growth retarders, sex modification, flower induction, parthenocarpy, harvesting seed storage, preservation of fruits and vegetables.

UNIT III

Bio fertilizers

Importance of biofertilizers in agriculture (Rhizobium, Azatobacter, Mycorrhiza, Actinorhiza) advantages and current status. Vermiculture, Composting, current practices & production of biofertilizers. Nitrogen fixation-diazotrophic microorganisms, genetics of free living and symbiotic diazotrophs (N₂ fixation genes, transfer of nif genes to micro propagation). Blue green algae & Azolla-identification of elite species & mass products for practical application.

UNIT IV

Bio pesticides

Control of pests. Importance of Juvenile Hormone and JH analogues in insect pest control. Insect pheromones and their application. Biological control of pests & diseases of crop plants and weeds, biopesticide predators, parasites, insect virus, antagonistic fungi & bacteria, antifeedents and insecticidal activities of the compounds of botanicals.

Suggested Readings:

1. Al David – A complete guide to gardens.
2. Vishnu Swarup – Garden flowers
3. Readers digest – Complete library of gardens (3 volumes) Kissan world.
4. Reinert and Bajaj 1977 – Plant cell, tissue and organ culture, Narosa publication. New Delhi.

5. Agricultural microbiology, G. Rangaswamy and D.J. Bhagyaraj. Hall of India Private Ltd. New Delhi.
6. Hand book of Agriculture (1987) ICAR Publication. New Delhi.
7. Veena, D.P.S and Hons T. (1984), Plant gene Research, Springer and New York.
8. Vincent J.M. (1982). Nitrogen fixation in Legumes, London.
9. Ericksson Ed. (1998) Biotechnology in the pulp and paper industry, Springer.
10. Larry Anderson and David A. Tilman (1977). Fuels from waste, Academic Press.
11. Subramanian .V. (2001). Text book of environmental Science, Narosa International, New Delhi.

PRACTICAL BOT- 405P I

Suggested Laboratory Exercises related to BOT-401

1. Preparation of Stock solutions and Media.
2. Production of Aseptic seedlings.
3. Isolation and culture of embryos of Maize, *Crotalaria*, *Cyamopsis* etc.
4. Introduction of callus and historical/cytological studies of callus.
5. Direct organogenesis and somatic embryogenesis in Tobacco explants.
6. Androgenesis and production of haploids from *Datura* buds.
7. Establishment of Cell cultures and determination of plating efficiency.
8. Enzymatic isolation and culture of protoplasts.
9. Fusion of protoplasts using PEG.
10. Preparation of synthetic seeds using sodium alginate.
11. Estimation of IAA using Salkowski reagent.
12. Isolation of Genomic DNA.
13. Agarose Gel Electrophoresis of DNA and Southern Blotting.
14. Isolation of Yeast RNA and Quantification by Spectrophotometry.
15. Isolation of Plasmid DNA.
16. Restriction digestion of the plasmid DNA.
17. Ligation of DNA fragments.
18. Bacterial Transformation and Identification of Transformants.
19. Co-cultivation of the plant material (e.g. leaf discs) with *Agrobacterium* and study of GUS activity histochemically.
20. Problems related to R-DNA technology.

Suggested Readings for Laboratory Exercises BOT-401

1. Dixon, R.A. (Ed). 1987. Plant cell culture: A practical approach. IRL. Press, oxford.
2. Gamborg, O. L. & Philips, G.C. (Eds.) 1995. Plant cell, Tissue and Organ culture. Fundamental methods. Narosa publishing house, New Delhi.
3. Hall, R.D. (Ed.) 1999. Plant cell culture protocols, humana press alnl., New Jersey, USA.
4. Reinert, J. and Yoeman, M.M. 1982. Plant cell and Tissue culture: A laboratory manual. Springer-Verlag.
5. Mascarenhas, A.F. 1991. Hand book of plant tissue culture, ICAR publications, New Delhi.
6. Smith, R.H. 2000. Plant tissue culture: techniques and Experiments. Academic press, New York.
7. Becker, J.M. Caldwell, G.A., 1990. Biotechnology- A laboratory course. Academic press, New York, USA.
8. Gelvin, S.B. and Schilperoort, R.A. (Eds.). 1994. Plant molecular biology manual, (2ndEd.), Kluwer Academic Publishers, Dordrecht, The Netherlands.

9. Glover, D.M. and Hames, B.D. (Eds.) 1995. DNA cloning 1: A practical approach; Core techniques, (2nd Ed.), PAS IRL Press, oxford.
10. Mickloss, D.A. and Freyer, G.A. 1990. DNA science. A first course in Recombinant Technology. Cold spring harbor laboratory press, New York.
11. Sambrook, J., Fritsch, EF & Maniatis, T. 1989. Molecular cloning, A laboratory Manual. (2ndEd.), Cold spring harbor laboratory press, New York.
12. Schuler, M.A. & Zielinski, R.E. 1989. Methods in plant molecular biology. Academic press Inc., San Diego, CA, USA.
13. Frank, H. Stephenson. 2008: calculations in molecular biology and Biotechnology-A guide to mathematics in the laboratory, Academic press.

Suggested Laboratory Exercises Related to BOT-402.

1. Isolation of Genomic DNA; Purification and Quantification by spectrophotometry.
2. Fractionation
3. Determination of Genome Size
4. Restriction Digestion of the plant genomic DNA.
5. Agarose Gel Electrophoresis of DNA fragments and Size determination.
6. PCR Amplification of DNA. RAPD Analysis.
7. Isolation of Yeast RNA and Quantification by Spectrophotometry.
8. Estimation of Protein.
9. Determination of Isoelectric point of Proteins.
10. Separation of Proteins by SDS- PAGE and size determination.
11. Problems related to Genomics and Proteomics.

Suggested Readings for Laboratory Exercises BOT-402.

1. Gelvin, S. V. and Schilperoort, R. A. (Eds.) 1994. Plant Molecular Biology Manual, (2nd Ed.), Kluwer Academic Publishers, Dordrecht, The Netherlands.
2. Glover, D. M. and Hames, B. D. (Eds.) 1995. DNA cloning 1: A Practical Approach; Core Technique (2nd Ed.), PAS IRL Press, Oxford.
3. Mickloss, D. A. and Freyer, G. A. 1990. DNA Science a first course in recombinant technology. Cold Spring Harbour Laboratory Press, New York, USA.
4. Sambrook, J., Fritsch, EF & Maniatis, T. 1989. Molecular Cloning, A laboratory manual, (2nd Ed.). Cold Spring Harbour Laboratory Press, New York, USA.
5. Schuler, M. A. & Zielinski, R. E. 1989. Methods in Plant Molecular Biology. Academic Press Inc. San Diego, CA, USA.
6. Frank, H. Stephenson. 2008: Calculations in Molecular Biology and Biotechnology-A Guide to Mathematics in the Laboratory, Academic Press.
7. Douglas J., Futhyma, 1998. Evolutionary biology (3rd Ed.) Sinauar Associates Inc.Publishers.

PRAC11CAL: BOT- 406P II

Suggested laboratory exercises related to Molecular Plant Physiology (BOT-403 & 404(A) :

1. Extraction and Estimation of Chlorophyll pigments.
2. Substrate Inducibility of the enzyme Nitrate Reductase.
3. Preparation of Standard Curve of Proteins and Estimation of Protein content in the Extracts of Plant materials using Lowry's or Brodfords method.
4. Preparation of Standard Curve of Glucose and Estimation of Carbohydrate in the extracts of Plant materials using Anthrone reagent.
5. Studies on hormonal regulation of senescence.
6. Effect of Salt and Water stress on the Accumulation of Proline.
7. Seed viability test using Tetrazolium chloride and Seedling vigour.
8. Temperature, Seed germination and Acid Phosphatase activity.
9. De-repression of Dwarf Characters of plants by Gibberellins.
10. Separation of Isozymes of Peroxidase by native Polyacrylamide Gel Electrophoresis.
11. Extraction and separation of soluble plant proteins by SDS PAGE.

Suggested laboratory exercises related to Applied Plant Pathology (BOT 403 & 404 (B):

1. Isolation of Pathogenic Fungi and Bacteria.
2. Demonstration of Koch's postulates Citrus canker.
3. Estimation of Rhizosphere, Phyllosphere, Spermosphere microorganisms by Serial dilution methods.
4. Screening method of Antagonists against Pathogenic Micro Organisms.
5. Isolation of Hyperparasites form Plant Fungal disease by Serial Dilution Methods.
6. Screening of Antibiotics against Pathogens by Paper Disc Method.
7. Screening of Botanical Pesticides (plant extracts) against Fungal Pathogens by incorporating in the medium.
8. Submission of Plant Pathology Herbarium.

Suggested Laboratory Exercises Related to Horticulture and Agriculture (BOT-403 & 404 C):

1. Isolation, Characterization and Identification of Rhizobium
2. Outdoor cultivation of Bluegreen Algae
3. Preparation of compost pit and Vermicompost production
4. Multiplication of VAM and Staining of Mycorrhizal fungi.
5. Synthesis of various Biofertilizers;
6. Establishment of nursery, different containers, soil transplantation techniques.
7. Methods of raising lawns.
8. Plant propagation – layering, cutting, grafting.
9. Layout of garden, plan of a rock garden, glass house, kitchen garden, artificial pond.
10. Visit to nurseries.

407 - HUMAN VALUES AND PROFESSIONAL ETHICS – II

COMMON SYLLABUS FOR ALL P.G. COURSES (CBCS & NON-CBCS)
(With effect from 2015-16)

- I. Value Education- Definition – relevance to present day - Concept of Human Values – Self introspection – Self esteem. Family values - Components, structure and responsibilities of family Neutralization of anger – Adjustability – Threats of family life – Status of women in family and society – Caring for needy and elderly – Time allotment for sharing ideas and concerns.
- II. Medical ethics- Views of Charaka, Sushruta and Hippocrates on moral responsibility of medical practitioners. Code of ethics for medical and healthcare professionals. Euthanasia, Ethical obligation to animals, Ethical issues in relation to health care professionals and patients. Social justice in health care, human cloning, problems of abortion. Ethical issues in genetic engineering and Ethical issues raised by new biological technology or knowledge.
- III. Business ethics- Ethical standards of business-Immoral and illegal practices and their solutions. Characteristics of ethical problems in management, ethical theories, causes of unethical behavior, ethical abuses and work ethics.
- IV. Environmental ethics- Ethical theory, man and nature – Ecological crisis, Pest control, Pollution and waste, Climate change, Energy and population, Justice and environmental health.
- V. Social ethics- Organ trade, Human trafficking, Human rights violation and social disparities Feminist ethics, surrogacy/pregnancy. Ethics of media- Impact of Newspapers, Television Movies and Internet.

Books for study:

1. John S Mackenjie: A manual of ethics.
2. “The Ethics of Management” by Larue Tone Hosmer, Richard D. Irwin Inc.
3. “Management Ethics – integrity at work’ by Joseph A. Petrick and John F. Quinn, Response Books: New Delhi.
4. “Ethics in management” by S.A. Sherlekar, Himalaya Publishing House.
5. Harold H. Titus: Ethics for Today
6. Maitra, S.K: Hindu Ethics
7. William Lilly: Introduction to Ethics
8. Sinha: A Manual of Ethics
9. Manu: Manu Dharma Sastra or the Institute of Manu: Comprising the Indian system of Duties: Religious and Civil(ed.) G.C. Haughton.
10. Susruta Samhita: Tr. Kaviraj Kunjanlal, Kunjalal Brishagratha, Chowkamba Sanskrit series, Vol. I, II and III, Varnasi, Vol I OO, 16-20, 21-32 and 74-77 only.
11. Caraka Samhita: Tr. Dr. Ram Kraran Sarma and Vaidya Bhagavan Dash, Chowkambha Sanskrit Series office, Varanasi I,II,III Vol I PP 183-191.
12. Ethics, Theory and Contemporary Issues, Barbara Mackinnon, Wadsworth/Thomson Learning, 2001.
13. Analyzing Moral Issues, Judith A. Boss, Mayfield Publishing Company, 1999.
14. An Introduction to Applied Ethics (Ed.) John H. Piet and Ayodhya Prasad, Cosmo Publications.
15. Text book for Intermediate logic, Ethics and Human Values, board of Intermediate Education & Telugu Academic Hyderabad.
16. I.C. Sharma Ethical Philosophy of India. Nagin & co Julundhar.

