

M.Sc. – BOTANY

Course code	Course title	C/E/S	Credit
Semester – I			
BOT-101	Viruses, Bacteria and Fungi.	C	4
BOT-102	Algae, Bryophytes, Pteridophytes and Gymnosperms.	C	4
BOT-103	Taxonomy of Angiosperms.	C	4
BOT-104	Plant Development and Reproduction.	C	4
Practical			
BOT-105	Viruses, Bacteria and Fungi and Algae, Bryophytes, Pteridophytes and Gymnosperms	C	4
BOT-106	Taxonomy of Angiosperms and Plant Development and Reproduction.	C	4
Semester – II			
BOT-201	Plant Bio-Chemistry and Techniques in Biology.	C	4
BOT-202	Cell and Molecular Biology.	C	4
BOT-203	Genetics, Plant Breeding and Evolution.	C	4
BOT-204	Plant Diversity and Human Welfare-1	EE	3
*****	Soft Skills-1	S	2
Practical			
BOT-205	Plant Bio-Chemistry and Techniques in Biology and Cell and Molecular Biology.	C	4
BOT-206	Genetics, Plant Breeding and Evolution.	C	4
Semester – III			
BOT-301	Plant Physiology	C	4
BOT-302	Plant Ecology	C	4
Internal Electives			
BOT-303 (A)	Ethnobotany and Hebal Medicine	IE	4
BOT-303 (B)	Plant Propagation	IE	4
BOT-304	Medicinal Botany-2	EE	3
*****	Soft Skills-2		
Practical			
BOT-305	Plant Physiology and Plant Ecology	C	4
BOT-306	(A) Ethnobotany and Herbal Medicine (B) Plant Propagation.	IE	4
Semester –IV			
BOT-401	Biodiversity, Conservation and Management	C	4
BOT-402	Plant Pathology	C	4
BOT-403	Project Work	C	4
BOT-404 (A)	Plant Biotechnology	IE	4
BOT-404 (B)	Plant Resources and Utilization.	IE	4
Practical			
BOT-405	Biodiversity, Conservation and Management	C	4
BOT-406	Plant Pathology	C	4
BOT-407	Seminar Presentation	C	3

C-Core, EE-External Elective, IE-Internal Elective, S-Soft Skills.

BOT 101. VIRUSES, BACTERIA AND FUNGI

UNIT I: VIRUSES

General account of viruses. Classification of viruses, Ultrastructure of viruses, Isolation and purification of viruses. Chemical nature, replication, transmission and economic importance of viruses. Cultivation of viruses. Viroids and Prions.

UNIT-II: BACTERIA

General account of Bacteria, Classification of bacteria, archaebacteria and eubacteria- rickettsias, mycoplasma and actinomycetes Ultrastructure of bacterial cell. Nutrition, reproduction and economic importance of bacteria. Biology and economic importance of Cyanobacteria. Phytoplasmata: General characteristics, ultrastructure and reproduction and their role in causing diseases.

UNIT III: FUNGI-I

General characteristics of fungi; Nutrition in Fungi (Saprobic, Biotrophic, symbiotic and Parasitic). Reproduction in fungi-sexual compatibility mechanisms, parasexuality. Fruiting body diversity in fungi. Classification of fungi-diagnostic features and classification of myxomycotina, zygomycotina, ascomycotina, basidiomycotina and deuteromycotina.

UNIT IV: FUNGI ECOLOGY AND ECONOMIC IMPORTANCE

Habitats of fungi.- Occurrence and distribution of terrestrial, aquatic, thermophilic, psychrophilic and air-borne fungi. Special features of Myxomycetes. Lichens-Morphology, Reproduction and classification. Mycorrhiza-general characters and classification. Economic importance of fungi-industry, agriculture, medicine and food. Mushroom cultivation.

PRACTICALS

1. Sterilization methods.
2. Study of gram negative and gram positive bacteria.
3. Study of Lichens and Mycorrhizae.
4. Morphological study of fungi belonging to groups' myxomycotina, zygomycotina, ascomycotina, basidiomycotina and deuteromycotina
5. Study of symptomology of locally available diseased specimens (bacterial, viral and fungal).

REFERENCES:

- Ainsworth G.C., E.K.Sparrow & A.S.Sussman, 1973. *The Fungi-An advanced treatise*. Academic Press.
- Allen T. Bull. 2004. *Microbial diversity and Bioprospecting*. ASM Press, Washington.
- Alexopoulos, C.J., C.W.Mims & M. Blackwell 1996. *Introductory Mycology*. John Wiley & Sons.
- Brock, T.D. & Madigan. 1991. *Biology of Microorganisms*. Prentice-Hall Englewood Cliffs.
- Dube, R.C. & D.K.Maheswari 2005. *Microbiology*. S.Chand & Co. Ltd., New Delhi.
- Gilbert, O.L. 2000. *Lichens*. Collins New Naturalist.
- Mehrotra R.S. & K.R. Aneja, 1990. *An Introduction to Mycology*. Wiley Eastern Ltd., New Delhi.
- Pandey, B.P. 2005. *Plant Pathology*. S. Chand & Company, New Delhi.
- Pelczar, M.J., E.C.S.Chan & N.R.Krieg. 1986. *Microbiology*. Tata McGraw Hill, New Delhi.
- Vernon Ahmadjian & M.A. Hale, 1973. *The Lichens*. Academic Press. New York.
- Mehrotra, R.S. 1980. *Plant pathology*. Tata McGraw Hill Publ. Co. Ltd., New Delhi.

BOT 102. ALGAE, BRYOPHYTES, PTERIDOPHYTES AND GYMNOSPERMS

UNIT I: ALGAE

General characters of algae - thallus diversity, pigmentation and life cycles. Recent trends in classification of algae. Salient features and classification of Cyanophyta, Rhodophyta, Heterokontophyta (brown algae and diatoms) and Chlorophyta. Economic importance of algae-algae as food, biofertilizers, industrial products, biofuels. Algae as pollution indicators. Algal blooms.

UNIT II: BRYOPHYTES

General characters and classification of Marchantiophyta, Anthocerotophyta and Bryophyta. Salient features of typical representatives - Marchantiales (*Marchantia*), Jungermanniales (*Porella*), Anthoceratales (*Anthoceros*) and Polytrichales (*Polytrichum*). Diversity and evolution of sporophyte. Water conducting systems in bryophytes. Ecology of bryophytes.

UNIT III: PTERIDOPHYTES

General characters and classification of Pteridophytes. Salient features and classification of Psilophytosida (*Rhynia*), Psilotopsida (*Psilotum*), Lycopsidea, (*Lycopodium*) Sphenopsida (*Equisetum*) and Pteropsida (*Pteris*). Origin and phylogeny of pteridophytes - telome theory, stelar theory, heterospory and seed habit.

UNIT IV: GYMNOSPERMS AND PLANT FOSSILS

General characters and classification of divisions; Salient features of representatives: Cycadophyta (*Cycas*), Pinophyta (*Pinus*), Ginkgophyta (*Ginkgo*) and Gnetophyta (*Gnetum*); economic importance of gymnosperms. Principles of Paleobotany-geological time scale; process of fossilization; types of fossils. Brief account on fossil algae, bryophytes and pteridophytes. General characters and evolutionary significance of fossil gymnosperms-Pteridospermales and Bennettitales.

PRACTICALS

- Observation of representatives of all groups in natural habitat.
- Morphological study of representative members of all groups using whole mount preparations and sections.
- Study of morphology and anatomy of vegetative structures of Algae, Bryophytes, Pteridophytes and Gymnosperms.
- Each student has to submit herbarium specimens and a report on field study.

REFERENCES:

- Agashe, S.N. 1995. *Palaeobotany*. Oxford & IBH, New Delhi.
- Bernard Goffinet & A. Jonathan Shaw. 2008. *Bryophyte Biology*. 2nd ed. Cambridge.
- Bhatnagar, S.P. & Alok Mitra 1997. *Gymnosperms*. New Age Int. (P) Ltd.
- Fritsch, F.E. 1935. *The structure and reproduction of Algae*. 2 vols. Cambridge University Press.
- Graham, J.E, Lee W. Wilcox & L.E.Graham 2008. *Algae*. 2nd ed. Benjamin Cummings.
- Johri, B. 1999. *Gymnosperms*. Narosa Pub., New Delhi.
- Kumar, H.D. 2000. *Introductory Phycology*. East West Press. New Delhi
- Sambamurty, A.V.S. 2005. *A Textbook of Bryophytes, Pteridophytes, Gymnosperms and Paleobotany*. Ik International Pvt Ltd.
- Sporne K.R. 1965. *Morphology of Gymnosperms*. HUP, London.
- Sporne K.R. 1976. *Morphology of Pteridophytes*. HUP, London.
- Van den Hoek, Christian, D.Mann & H.M.Jahns *et al.* 1995. *Algae, An introduction to phycology*. Cambridge University Press.

BOT 103: TAXONOMY OF ANGIOSPERMS

UNIT I: ANGIOSPERM CLASSIFICATIONS AND PHYLOGENY

Plant taxonomy-scope and significance. History of plant classifications: artificial, natural and phylogenetic. Natural system-Bentham and Hookers classification. Principles of phylogenetic classifications: monophyly and polyphyly, phylogenetic trees. Angiosperm Phylogeny Group classification (APG-III)-a general account. A comprehensive account on origin, phylogeny and diversification of angiosperms.

UNIT II: HERBARIUM METHODS, IDENTIFICATION AND NOMENCLATURE

Herbarium methodology-methods of collection, processing and preservation of plant specimens. Significant herbaria of the world and India. Process of identification- preparation of taxonomic keys. Taxonomic literature-floras, journals and databases. International Code of Nomenclature-Principles, Rules and Recommendations; taxonomic hierarchy-species, genera and families; typification, rule of priority; concept of names and author citation; effective and valid publication. Describing a new species.

UNIT III: BIOSYSTEMATICS

Biosystematics-scope, importance and objectives; Intra specific and Inter specific variations. Genecotypes and phenecotypes. Character-different types of characters; sources of data-external morphology, anatomy, embryology, palynology, cytology. Biochemical and molecular systematics: Secondary metabolites. Adansonian principles. Phenetics and Phyletics. Apomorphies and Plesiomorphies. Numerical taxonomy.

UNIT IV: STUDY OF SELECTED ANGIOSPERM CLADES-ORDERS

Salient features, diversity, phytogeography, phylogeny of the following groups (based on APG-III): Magnoliids (Magnoliales); Monocots (Asparagales); Commelinids (Poales); Fabids (Fabales); Malvids (Malvales, Caryophyllales); Lamiids (Gentianales, Solanales, Lamiales); Campanulids (Asterales).

PRACTICALS

- Study of about 25 wild taxa representing different families and identification to species level.
- Study of flora of the college campus.
- As a part of botanical tour, student should observe and record the flora and vegetation types of the study area and submit a report at the time of practical examination.
- Part of practical student should submit 50 herbarium specimens of common wild plant taxa.
- Construction of taxonomic keys and Nomenclatural exercise.
- Experiments in Biosystematics.

REFERENCES:

- Gamble & Fischer 1915-1935. *Flora of Presidency of Madras*. 3 vols. BSMS, Dehradun.
- 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.
- Lawrence, G.H.M 1951. *Taxonomy of vascular plants*. McMillan, New York.
- Naik, V.N. 1992. *Taxonomy of Angiosperms*. 2nd Edn. Tata Mc.Graw Hill.
- Pullaiah, T. 2005. *Taxonomy of Angiosperms*. Regency publications, New Delhi.
- Pullaiah, T. et al 1997. *Flora of Andhra Pradesh*. 4 vols. Scientific Publishers, Jodhpur.
- Radford. A.E.et.al., 1974. *Vascular plant systematics*. Harper & Row. New York.
- Ravi Prasad Rao, B. 2010. *The Plant Directory*. ABCD, Amrutha Printers. Hyderabad.
- Simpson, Michael G. 2006. *Plant Systematics*. Elseiver& Academic Press.
- Singh, Gurucharan. 2005. *Plant Systematics*. Oxford & IBH. New Delhi.
- Sivarajan, V.V.1991. *Introduction to principles of Plant Taxonomy*. Oxford & IBH.

BOT 104: PLANT DEVELOPMENT AND REPRODUCTION

UNIT I: MERISTEMS TISSUE SYSTEMS AND SHOOT DEVELOPMENT:

Meristems, classification and types. Organisation of shoot apical meristem. Simple and Complex Tissues. Structure and development of xylem and phloem. Epidermal, ground and vascular tissue systems-cambium, laticifers, periderm, lenticels. Stem-anatomy of node, primary structure and secondary growth; annual rings, heart and sap wood, hard and soft wood, reaction wood. Anomalous secondary growth.

UNIT II: ROOT, LEAF AND FLOWER DEVELOPMENT:

Root- Organization of Root Apical Meristem (RAM), quiescent centre, vascular tissue differentiation. Primary structure and Secondary growth in roots. Leaf growth and differentiation-histology and development of angiosperm leaf. Floral meristems-, development of flower with reference to *Arabidopsis* and *Antirrhinum*. Programmed cell death, ageing and senescence.

UNIT III: PLANT REPRODUCTION- MALE AND FEMALE GAMETOPHYTES:

Microsporangium, microsporogenesis and male gametophyte. Anthers-structure and development of anther wall- anther tapetum- secretory and periplasmodial, role of tapetum. Male gametophyte development. Pollen wall-structure and development. Type of ovules, megasporogenesis. Embryo sac-ultrastructure, development and types: monosporic, bisporic and tetrasporic; nutrition of the embryo sac. Pollination and fertilization- pollen-pistil interactions, double fertilization.

UNIT IV ENDOSPERM, EMBRYO, POLYEMBRYONY AND APOMIXIS:

Development of Endosperm-nuclear, cellular and helobial types; endosperm haustoria, composite and ruminant endosperm. Development of embryo in dicots- onagrad, asterad, chenopodiad, Caryophyllad and solanad types; suspensor. Polyembryony-nucellar, integumentary, synergid, zygotic, suspensor and multiple types; twins and triplets; causes of polyembryony and applications. Apomixis- apospory, diplospory, pseudogamy, semigamy, parthenogenesis.

PRACTICALS :

- Examination of meristems.
- Study of tissues and tissue systems.
- Study of internal organization of different types of stems and roots.
- Study of internal organization of plants showing anomalous secondary growth.
- Study epidermal peels of leaves to study the development and structure of stomata and prepare stomatal index.
- 8. Study of microsporogenesis and gametogenesis in anther sections.
- 9. Examinations of anthers dehiscence and collection of pollen grains for microscopic examination (maize, grasses, brinjal, *Crotalaria*, *Tadescantia*, *Brassica*, *Petunia*, etc.)
- 10. Study of pollen grains by acetolysis
- 11. Dissection and mounting of endosperm and embryo showing developmental stages and haustoria.

REFERENCES:

- Bhojwani, S. S and S.P. Bhatnagar 2002. *The embryology of Angiosperms* (4th ed.) Vikas Publication House, New Delhi
- Eames, A.J. and E.M. McDaniels. 1947. *An Introduction to Plant Anatomy*. McGraw Hill Book Company, New York.
- Esau, K. 1979. *Anatomy of seeds plants*. John Willy & Sons
- Fahn, A. 1992. *Plant Anatomy* 3rd Ed. Pergamon press, Oxford.
- Johri, B.M 1984. *Embryology of Angiosperms*. Springer-Verlag. Berlin
- Maheshwari, P. 1980. *An introduction to the Embryology of Angiosperms*, Tata,mcgrawin
- Pullaiah, K. C. Naidu., K. Lakshmi narayana and B. Hanumantha Rao 2007. *Plant Development*, Regency Publications, New Delhi
- Pullaiah, T., K. Lakshminarayana and B. Hanumantha Rao 2008. *Plant Reproduction*. Scientific Publishers, Jodhpur.
- Raghavan, V 1999. *Developmental biology of Flowering Plants*. Springer Verlag,

BOT 201: PLANT BIOCHEMISTRY AND TECHNIQUES IN BIOLOGY

UNIT I: BIOENERGETICS AND ENZYMES

Energy transformation in living systems; Laws of thermodynamics. Free energy and standard free energy changes; Phosphate group transfer and ATP, free energy of hydrolysis of ATP. Biological oxidation-reduction reactions and their half reactions. Nomenclature and classification of enzymes. Mode of action of enzymes; enzyme substrate complex, Inhibition; Competitive, Non competitive and Feedback. Regulation of enzyme activity. Enzyme kinetics: Michaelis-Menten equation.

UNIT II: CARBOHYDRATES, PROTEINS, NITROGEN AND LIPID METABOLISM

Classification and properties of carbohydrates (Mono, Oligo, and Polysaccharides; Homo and Heteropolysaccharides). Gluconeogenesis. Amino acids: Non standard protein and amino acids, peptides structure and reactions. Proteins: Primary, Secondary, Tertiary and quaternary structures. Biological nitrogen fixation. legume rhizobium symbiosis; mechanism of nitrogen fixation; mechanism of nitrate uptake, reduction and ammonia assimilation. Lipid Metabolism: Chemical composition of plant lipids, α -Oxidation and β -Oxidation of fatty acids, Biosynthesis of fatty acids-malonyl CoA.

UNIT III : pH, MICROSCOPY,CENTRIFUGATION AND CHROMATOGRAPHY

pH – Measurement of pH, biochemical buffers. Principles and applications of Microscopy – Light, Phase contrast and Electron microscopy. Fixation and staining methods. Centrifugation-basic principles of sedimentation, types of centrifuges and rotors. Applications of centrifugation. General principles and applications of chromatography-paper, thin-layer, gas-liquid chromatography. Principle of Gel filtration. Affinity chromatography, High-performance liquid chromatography, Ion-exchange chromatography.

UNIT IV: ELECTROPHORESIS, SPECTROSCOPY AND RADIO ISOTOPE TECHNIQUES

Principles and applications of Electrophoresis. Native-PAGE, SDS-PAGE, Isoelectric-focussing, 2D electrophoresis. Agarose gel electrophoresis. Laws of light absorption, Instrumentation and applications of UV- visible spectrophotometer. Radioisotope Techniques-types of isotopes, radioactive decay. Detection and measurement of radioactivity. autoradiography. isotopes used in biology.

PRACTICALS

- Estimation of proteins in plant samples by Biuret or Lowry's method.
- Estimation of reducing sugars in plant samples by Nelson's method.
- Determination of amylase activity in germinating seeds.
- Estimation of Amino acids by ninhydrin method.
- Determination of Catalase activity in germinating seeds.
- Reaction of amino acids and sugars.
- Separation and identification of amino acids by paper chromatography.
- Separation and identification of sugars and lipids by TLC.
- Separation of proteins by PAGE
- Separation of pigments by paper chromatography
- Isolation and spectrophotometric characterization of plant pigments

REFERENCES:

- Buchnan Gruissen & Jones. 2001. *Biochemistry and Molecular Biology of Plants*.
- Dennis, D.T., D.B. Layzell, D.D. Lefebvre & D. Turpin. 1997. *Plant Metabolism*. 2nd ed.. Addison-Wesely Pub. Co. New York.
- Dey and Horborne. 1998 *Plant Biochemistry*, Academic Press.
- Heldt, H.W.. 1997. *Plant Biochemistry and Molecular Biology*. OUP.
- Horton HR , Moran LA , Ochs RS et al., 2001.*Principles of Biochemistry*, III edn. Prentice Hall.
- Lehninger, A.L. 2001. *Biochemistry*. Kalyani Publishers. Ludhiana.
- Matthews CK, Van Holde KE & Ahem KG 2000. *Biochemistry* III edn. Sanfransisco. Benjamin Cummings.
- Wilkins, M.B.(ed) 1987. *Advanced Plant Physiology*. ELBS & Longman. Essex., England.
- Wilson & Walker 1986. *Practical biochemistry: Principles & Techniques*. Cambridge Univ. Press

BOT 202: CELL AND MOLECULAR BIOLOGY

UNIT I: CELL BIOLOGY

Nucleus -Ultrastructure of nucleus and nuclear envelope. Nomenclature of chromosome, C-value paradox, dosage compensation. Organisation of eukaryotic chromosome - structure of nucleosome. Euchromatin and heterochromatin. Nucleolus. Polytene and Lampbrush chromosomes. Cell cycle and its regulation. MPF, cyclins and cyclindependent kinases. Cell differentiation. Cell death and proliferation-Apoptosis. Cell Communication - general principles: Cell surface and intracellular receptors. Cytoskeleton-structure and functions of actin, microfilaments and intermediary filaments.

UNIT I: DNA REPLICATION AND REPAIR: Modes of replication. Experimental evidences for semi-conservative mode of replication - Meselson–Stahl, and Cairns experiments. Replication fork, continuous and discontinuous DNA synthesis. Enzymes and proteins in replication - Single strand DNA binding proteins (SSB), Helicases, Topoisomerases, DNA ligases. Priming by RNA polymerase and primase. DNA polymerases - E.coli DNA polymerase I, II and III, and Eukaryotic DNA polymerases. DNA damage and repair-a general account.

UNIT II: TRANSCRIPTION (RNA BIOSYNTHESIS): RNA polymerases - structure of E. coli RNA polymerase, and nature of eukaryotic RNA polymerases. Promoters and their characterization. Enhancer sequences. Initiation, elongation and termination of RNA synthesis. Monocistronic and polycistronic RNAs. Posttranscriptional modifications of eukaryotic hnRNA-capping, methylation and polyadenylation. RNA splicing and splicing mechanisms. Splicing of nuclear pre-tRNA, group I and group II introns, and pre-mRNA splicing. Excision of multiple introns. Role of catalytic RNA.

UNIT III: TRANSLATION (PROTEIN SYNTHESIS): General features and elucidation of genetic code, codon degeneracy and universality. tRNA role in protein synthesis. Amino acyl-tRNA synthetases, wobble hypothesis. Mechanism of initiation, elongation and termination of protein synthesis. Inhibitors of protein synthesis-antibiotics and others. Post-translational modifications. Regulation of gene expression: regulatory proteins- DNA-binding motif of regulatory proteins. Prokaryotic operons- fine structure of lac operon; negative and positive regulation.

PRACTICALS

- Preparation of cytological slides for mitosis using root tips.
- Preparation of cytological slides for meiosis-I using flower buds; chiasma frequency
- Identification of different stages of mitosis and meiosis.
- Demonstration of chromosomal (structural and numerical) aberrations
- Study of polytene chromosomes.
- Karyotypic study.
- Estimation of DNA by diphenylamine method.
- Isolation of genomic DNA from plant tissue by CTAB/Kit method
- Determination of purity and quantity of DNA by UV absorption method.
- Determination of melting temperature (T_m) of DNA
- Estimation of RNA by orcinol method.
- PAGE electrophoresis of proteins.
- Southern and western blotting.

REFERENCES:

- Alberts, B, D. Bray, J. Lewis, M. Raff, K. Roberts and J.D.Watson. 2004. *Molecular Biology of the Cell* Garland Publishing, New York and London
- Benjamin Lewin.2006. *Genes VIII*. Oxford University Press.
- Cooper Geoffrey,M. 2000. *The Cell-a molecular approach*. 2nd Edn. ASM Press. Washington.
- De Robertis EDP & EMF De Robertis. 2001. *Cell and Molecular biology*. Lippincott Williams & Wilkins. Bombay.
- Des Higgins Willie.2006. *Bioinformatics sequence, structure and data banks*.
- George M. Malacinski & D.Freifeilder 2005. *Essentials of Molecular Biology*.
- Walker, J. and W. Castra. 1992. *Techniques in Molecular Biology*.Goom Helns, London.

BOT 203: GENETICS, PLANT BREEDING AND EVOLUTION

UNIT I: GENETICS

Mendel's Laws of Inheritance; Chromosomal basis of heredity; Theory of probability, Chi square test; extra chromosomal inheritance; Interaction of genes; types with examples. Linkage, crossing over and chromosome mapping; Chromosome pairing, chiasma formation and molecular mechanism of recombination-Holliday model; synaptonemal complex, Recombination nodule.

UNIT II: MUTATIONS AND POPULATION GENETICS

Modern concept of gene. Mutations-types. Chromosomal structural aberrations: deficiencies, duplications, translocations, inversions and their significance in evolution. Numerical changes in chromosomes: aneuploidy and euploidy, polyploidy and their significance in evolution; molecular mechanism of mutagenesis. Theory of probability: Chi-square test, Hardy-Weinberg equilibrium and its significance in population genetics.

UNIT III: PLANT BREEDING

Methods in plant breeding: Heterosis and Hybrid vigour. Inbreeding depression, homozygous and heterozygous balance, genetical and physiological basis of heterosis, Mutation breeding: Mechanism of action of radiation and chemical mutagens. Application of mutations in plant breeding. Resistance breeding – Disease resistance, types of disease resistance; genetics of host and parasitic relationships.

UNIT-IV: EVOLUTION

Origins of evolutionary thought. Charles Darwin: The voyage of the *Beagle*. Biological species concept, sub species, clines and hybrid zones. Mutation, Genetic recombination and reproductive isolating mechanisms; models of population; Natural selection: Stabilizing, directional, and disruptive; the general selection model. Group selection, kin selection, and sociobiology. Variation over geography-the niche concept. Modes of speciation: sympatric, parapatric and allopatric. Macroevolution: the molecular clock.

PRACTICALS

1. Mendelian Mono and Dihybrid ratios with colored marbles and different colored seeds.
2. Study of simple Mendelian inheritance in human beings.
3. Problems in Mendelian genetics, chi square test, Interaction of genes, Sex linked inheritance.
4. Problem in Chromosomal mapping.
5. Study chiasma frequency using permanent slides.
6. Experiments in plant breeding

REFERENCES:

- Allard, R.W. 1960. *Principles of Plant Breeding*. John Wiley and sons Inc. New York.
- Chowdhary H.K. 1971. *Elementary Principles of Plant Breeding* Oxford & IBH, New Delhi.
- Foehlman J.M. & D.N. Borthakur 1969. *Breeding Asian Field Crops with special reference to crops of India*. Oxford & IBH, New Delhi.
- Freifelder D. 1990 *Molecular Biology*. 2nd Ed. Narosa Publ. House, New Delhi.
- Gardner, E.J. & D.P. Snustad 1996. *Principles of Genetics*. John Wiley & Sons, New York.
- Russel, E.G. 1978. *Plant breeding for pest and disease resistance*. Butterworth, London.
- Singh, B.D. 1990. *Plant Breeding*, Kalyani Publ. New Delhi.
- Sinnot E.W., L.C. Dunn, & T. Dobzhansky 1958. *Principles of Genetics* 5th Edn. McGraw Hill, New York.
- Strickberger, M.W. 1996. *Genetics* 3rd Edn, Mc. Millan, New York.
- Winchester, A.M. 1967. *Genetics*. Oxford & IBH., New Delhi.

BOT 204 (EE): PLANT DIVERSITY AND HUMAN WELFARE

UNIT I: PLANT DIVERSITY

Origin and evolution of plants. Plant classification-a modern approach. Salient features and outlines of classifications of bacteria, algae, fungi, bryophytes, pteridophytes, gymnosperms and angiosperms. Origin and evolution of plants-a general account.

UNIT II: PLANTS AND ENVIRONMENTAL VALUES

Plants-Ecosystem services. Direct (extractive) Indirect (ecosystem services), optional (future possibilities of usage) and non-use values. Human civilization and plants-Agriculture, Horticulture, Forestry, Animal Husbandary, Agroforestry. Plants and landscape ecology-gardening. Plants role in soil protection and water conservation. Plants and climate change-carbon sequestration, carbon credits. Plants in combating pollution- as bioremediants. Plants posing problems to humankind - poisonous plants; invasive species.

UNIT III: PLANT RESOURCES

Comprehensive account of the following plant resources: Edible resources-Cereals and Millets; Pulses; Spices and Condiments; Fruits and nuts; Vegetables; Starch and Sugar yielding Plants; Oil yielding plants. Plants yielding essential oils, saponins, fibres and cellulose products; gums, resins, rubber; tannins and dye yielding plants. Plants as sources for timber, biofuels and firewood. Forage plants. Ornamental Plants. Plants with medicinal value-plants used in ayurveda, siddha and unani.

UNIT IV: PLANTS AS MODEL ORGANISMS

Introduction to model organisms. Use of model Organism. Important model organisms- *Escherichia coli*, *Caenorhabditis elegans*, [*Chlamydomonas reinhardtii*](#), *Arabidopsis thaliana*, *Selaginella moellendorffii*, *Zea mays*. Major types of model organisms: **Genetic, Experimental and Genomic model organisms. Genetically Modified Organisms- Transgenic plants.**

REFERENCES:

- Alan beebay & Anne-Maria Brennan. 2008. *First Ecology*. 3rd ed. Oxford University Press.
- Cotton, CM. 1996. *Ethnobotany: principles and applications*.
- Cunningham, W.P. & M.A.Cunningham 2007. *Principles of Environmental Science-Inquiry and applications*. Tata Mc GrawHill Pub.New Delhi.
- Hill, Albert, F.1952. *A text book of useful plants and plant products*. Mc Graw Hill.
- Kokate, CK., AP. Purohit & SB. Gokhale. 2000. *Pharmacognosy*. Nirali Prakashan Publ.
- Krishnamurthy, K.V. 2004. *Advanced Textbook On Biodiversity: Principles And Practice*. Oxford
- Lincol Taiz and Eduardo Zeiger. 2010. Chapter 1- Model organisms in *Plant Physiology*, 5th edition. Sinauer.
- Pooja. 2010. *Economic Botany*. Discovery Publishing House.
- Rao, Ravi Prasad B. 2005. Biodiversity. In Pullaiah,T. (ed.)*Taxonomy of Angiosperms*. Regency Pub. New Delhi. Pp. 287-317.
- Rao, Ravi Prasad B. 2009. *The Plant Directory*. ABCD. Kalanjali. Hyderabad.
- Sambamurthy, A.V.V.S. & N.S. Subramanyam. 2000. *Economic Botany of crop plants*. Asiatech Publishers Inc.

BOT 301: PLANT PHYSIOLOGY

UNIT I: PLANT AND SOIL WATER RELATIONS

Thermodynamic concept of plant cell and water relations. Water potential, Osmotic potential and Pressure potential. Dynamics of soil-plant-atmosphere continuum (SPAC); Active and passive absorption of ions; essential elements-functions and deficiency symptoms. Stomata-structural features; mechanism of stomatal movements and stomatal Index. Stomatal responses to environmental factors, antitranspirants and their importance in drought resistance.

UNIT II: PHOTOSYNTHESIS

Current knowledge on the mechanism of photosynthesis-light harvesting complexes, photochemical reactions, electron transport in chloroplasts. Oxygen evolution and photophosphorylation. Carbon fixation pathways-Reductive Pentose Phosphate pathway and its regulation by light and metabolites; C₄ pathway; CAM pathway; C₃-C₄ intermediates. Photosynthesis versus plant productivity. Photorespiration-Glycolate pathway, significance of photorespiration.

UNIT III: RESPIRATION AND PLANT GROWTH REGULATORS

Significance of Plant Respiration; Glycolysis, TCA cycle, Electron Transport System and ATP synthesis. Pentose Phosphate Pathway. Glyoxylate cycle, alternate oxidase system. Biosynthesis and mechanism of action of plant growth regulators-auxins, gibberellins, cytokinins, brassinosteroids, abscissic acid, jasmonic acid and salicylic acid; role of hormones in agriculture; physiology of flowering-kinetics of phytochrome; photoperiodism.

UNIT IV: STRESS PHYSIOLOGY

Concept of stress and strain. Kinds of stress. Water stress. Salt stress. Temperature stress. Heavy metal stress. Stress avoidance and tolerance mechanisms; structural, physiological, biochemical and molecular responses of plants to environmental stress. Reclamation of saline soils and heavy metal contaminated soils.

PRACTICALS

- Determination of total chlorophyll content and a/b ratio in leaves.
- Separation of chloroplast pigments into two and four groups. Recording of their absorption spectra.
- Determination of cell permeability by using Beet root tissues.
- Determination of stomata index and frequency in leaves.
- Determination of the water potential of the tissue.
- Comparative anatomy of C₃, C₄ and CAM leaves.
- Determination of viability of different seed material.
- Determination titrable acidity (TAN) in leaves of C₃ & CAM plants.
- Estimation of IAA by Solkowski's method.
- Determination of membrane stability and chlorophyll stability index
- Estimation of free Proline in stressed plants sample

REFERENCES:

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- Taiz & E. Zeiger. 1998. *Plant Physiology*. Second Edition. Sinauer Associates Inc, Publishers, Massachusetts, USA.
- Thomas C. Moore.1992. *Biochemistry and Physiology of Hormones*. Narosa.

BOT 302. PLANT ECOLOGY

UNIT I: ECOSYSTEMS AND PLANT COMMUNITIES

Ecology and its domain. Ecosystem-structure and function. Physical environment- light, temperature and soil factors. Energy flow in ecosystems- productivity, food chains. Principles of biogeochemical cycling- gaseous and sedimentary cycles. Characteristics of plant communities- qualitative and quantitative (abundance, density, frequency, basal area) characters. Plant Succession-process and modeling- ecosystem attributes; concept of climax.

UNIT II: POPULATIONS AND INDIVIDUALS

Characteristics of plant populations-density, dispersion, natality, mortality and survival, age structure and biotic potential; population growth curves and population regulation. Life history strategies-*r* and *K* selection. Species interactions: plant-plant (inter-specific competition) and plant-animal (pollination ecology and plant defence against herbivores). Concept of ecological niche.

UNIT III: PHYTOGEOGRAPHY

Principles of Phytogeography. Patterns of plant distribution: past-continental drift theory; concept of endemism; endemic plants of India. Biomes of the world: terrestrial (tropical forests, grasslands, deserts) and aquatic ecosystems (freshwater, marine and estuarine). Biogeographical zones of India- a general account. Flora and vegetation of Andhra Pradesh.

UNIT IV: NATURAL RESOURCES AND ENVIRONMENTAL POLLUTION

Classification of natural resources; non-conventional energy resources-solar energy and bioenergy. Atmospheric pollution-types and sources, impacts and control; global warming-green house gases, impacts on global environment and biodiversity; Ozone layer depletion; El Nino Southern Oscillation; Water pollution-sources and control; Chemical pollution-types and effects; Bioremediation.

PRACTICALS

- Determination of texture of different soil samples.
- Determination of organic matter in soil samples.
- Determination of salinity in soil and water samples.
- Estimation of dissolved oxygen in water samples.
- Determination of minimum size and minimum number of quadrates.
- Determination of quantitative characters of plant community.
- Determination of species-wise IVI in plant community.
- Determination of species diversity indices of plant communities.
- Preparation of biological spectrum of plant community.
- Mapping of biogeographic zones of India
- Acquaintance with meteorological instrumentation and preparation of climatic diagrams.

REFERENCES:

- Alan beebay & Anne-Maria Brennan. 2008. *First Ecology. 3rd ed. Oxford University Press.* Dash, M.C. 2009. *Fundamentals of Ecology.* Tata Mc GrawHill Pub. New Delhi. Girard, James. 2005. *Principles of Environmental Chemistry.* Jones & Barlett. Sudbury, MA, USA. Kormondy, E.J. 1996. *Concepts of Ecology.* PHI. New Delhi. Molles, M.C. 2005. *Ecology-concepts and applications.* Mc GrawHill. Boston. Moore, P.D. & S.H. Chapman. 1986. *Methods in Plant Ecology.* Blackwell, Oxford. Odum, E.P. 1971. *Fundamentals of Ecology.* W.B. Saunders, Philadelphia. Odum, E.P. & Gary W. Barrett. 2005. *Ecology.* Tomson Brooks/Cole, gapore. Ricklefs, R.E. & Gary L. Miller. 2000. *Ecology.* 4th ed. W.H. Freeman and Company. New York. Stiling, P. 2002. *Ecology, Theory and applications.* Prentice-Hall of India, New Delhi.

(IE)BOT 303 A: ETHNOBOTANY AND HERBAL MEDICINE

UNIT I: ETHNOBOTANICALS

Ethnobotany-Introduction, history, scope and importance. Tribes of Andhra Pradesh and their relevance in ethnomedicine. Erosion of traditional cultures related to ethno medicine. Wild medicinal plants of Andhra Pradesh-a general account. Different types of crude drugs (based on origin, application and purpose / use). Potential medicinal plants of Andhra Pradesh and their therapeutic values. Importance of Ethnomedicine in the establishment of alternative medicine.

UNIT II: PHYTOMEDICINE AND OTHER SYSTEMS OF MEDICINE

Different systems of indigenous medicine (Traditional Medicine, Ayurveda, Siddha, Unani) Homeopathy and Allopathy. Role of phytomedicine in modern systems of medicine. Phytopharmaceuticals: inventory, taxonomic validation and evaluation of sources.

UNIT III: PHARMACOGNOSTIC STUDIES OF CRUDE DRUGS

Introduction, history, scope and applications of Pharmacognosy. Phytopharmacy: constitution, identification of different constituents; Classification of drugs; analytical methods-drug adulteration, drug evaluation, anatomical and phytochemical analysis of crude drugs: preliminary screening, fractionation and separation of different groups of biodynamic compounds and biological evaluation.

UNIT IV: PHARMACOLOGICAL ANALYSIS AND UTILISATION

Ethnopharmacology, phytopharmacology, dosimetry and administration of drugs; Phytopharmaceuticals: Drugs of alkaloids, coumarins, volatile oils, tannins, resins and gums. Natural pesticides, antibiotics, allergens and poisonous plants. Antimicrobial assay: antibacterial and antifungal screening of crude drugs. Molecular farming, Biotechnological intervention in effective utilisation and sustainable management of drug yielding plants. Potential drug yielding plants and their marketing avenues. Intellectual Property Rights and patenting of active principles.

PRACTICALS

- Analysis of morphological attributes in selected medicinal plants.
- Identification of crude drugs using trichomes
- Identification of crude drugs using physical properties
- Qualitative analysis of crude drugs for different phytochemicals
- Quantitative estimation of secondary metabolites: Phenolic compounds and alkaloids.
- Antimicrobial studies to determine MIC and MBC of different solvent extracts.

REFERENCES:

- Cotton, CM. 1996. *Ethnobotany: principles and applications*.
- Dey, A.C.1988. *Indian Medicinal Plants and Ayurvedic preparations*, Bishen Singh, M. Singh.
- Gibbs, R.D. 1974. *Chemotaxonomy of flowering plants*. Montreal & London.
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- Kokate,CK, Khandelwal, SB Gokhale 1996. *Practical Pharmacognosy*. Nirali Prakashan, Pune.
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- Martin, G.J. 1996. *Ethnobotany. A methods manual*. Chapman&Hall. London
- Ramachandran, S.P. 1991. *Recent Advances in Medicinal, aromatic and spice crops*.
- Trease, GE and WC Evans. 2002. *Pharmacognosy*. Saunders. New York.
- Tyler, V.E., Brandy, L.R. and Robbers, J.E. 1988. *Pharmacognosy*. 9th edition. Lea and Febiger.Philadelphia. USA.

(IE)BOT-303 - B. PLANT PROPAGATION.

UNIT 1: INTRODUCTION – History, Principles, concepts, scope and importance of plant propagation

UNIT 2: PROPAGATION STRUCTURES- Green house, Shade house, Net house, Mist propagation unit, Different types of containers and equipment for growing plants.

UNIT 3: MEDIA FOR PROPAGATION - Soil, soil mixtures, Fertilizers and sanitation
Seed propagation – Seed selection, testing and methods of storage, seed germination, seed dormancy, methods to break seed dormancy. Seed health, seed viability tests, seed testing and seed certification. Hardening of seeds.

UNIT4: VEGETATIVE PROPAGATION: 1.Propagation by cuttings: Stem cuttings – hard wood, semi hard wood, soft wood and herbaceous, leaf cuttings, leaf bud cuttings, root cuttings. 2.Propagation by grafting: Whip and tongue, wedge and cleft, bark and side grafting, 3.Propagation by budding: T – budding patch budding, chip budding, ring budding.

4.Propagation by Layering and its natural modifications: simple layering, tip layering, mound or stool layering, air layering, compound or serpentine layering and trench layering. 5.Propagation by specialized vegetative structures: Bulbs,tubers,corms, stems and roots. Advantages, limitations and applications of vegetative propagation, clones, genetic variation in asexually propagated plants. **6.**Methods of propagation of some important plants – Citrus, gape, mango, mulberry, hibiscus, rose, Croton, Eucalyptus.

7.Micropropagation – Methods and applications of Micropropagation in forestry and horticulture.

PRACTICALS:

- Propagation structures, types of containers and equipment for growing plants
- Media for propagation
- Vegetative propagation by different types of Cuttings
- Vegetative propagation by different types of Grafting
- Vegetative propagation by different types of Budding
- Vegetative propagation by different types of Layering
- Propagation by specialized vegetative structures
- Micropropagation -Preparation of media, preparation of explants, culture, initiation of shoot multiplication (demonstration)

REFERENCES:

- Abbott, A.J. and Atkin, R.K. (eds.) 1987 Improving vegetatively propagated crops. Academic press, New York.
- Bose, T.K., Sadhu, M.K., & Das, P., 1986. Propagation of Tropical and Subtropical Horticultural crops, Nowya Prakash, Calcutta.
- Hartmann and Kester, 1983. Plant propagation
- Hartmann, H.T., Kester E.D., Davis, F.T., and Geneve, R.L. 1997. Plant propagation. Principles and practices. Prentice Hall of India Private Limited, New Delhi.
- Krishnamurthy. H.M. 1981. Plant Growth substances including application in Agriculture.
- L.M. Pierik 1987. In vitro culture of Higher plants Murtinus Nijhoff pub. Dordrecht.
- M.K. Razdan 1994. An Introduction to Plant tissue culture, Oxford and IBH Pub. Co., PVT. Ltd., Bombay and Calcutta.
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- Sadhu, M.K. 1989. Plant propagation Wiley eastern Ltd. N. Delhi.

BOT (EE) 304: MEDICINAL BOTANY

UNIT III: PLANTS AND MEDICINE

Introduction, history, scope and importance of medicinal botany. Indigenous systems of medicine-ethnomedicine, traditional medicine, ayurveda, siddha, unani, homeopathy and allopathy. Role of phytomedicine in modern systems of medicine. Phytopharmaceuticals: inventory, taxonomic validation and evaluation of sources.

UNIT I: ETHNOBOTANICALS

Ethnobotany-Introduction, history, scope and importance. Different aspects related to tribes of Andhra Pradesh. Ethnomedicine- different types of crude drugs (based on origin, application and purpose / use). Wild medicinal plants and their therapeutic values with reference to the forests of Andhra Pradesh. Ethnomedicine in the establishment of alternative medicine.

UNIT III: CULTIVATION OF MEDICINAL PLANTS AND CRUDE DRUGS

Medicinal Plant cultivation- a general account. Potential medicinal plants cultivated in Andhra Pradesh. Cultivation practices and Marketing of Medicinal plants in Andhra Pradesh. Role of Government agencies in cultivation-NMPB and APMAPB. Classification of plant drugs-based on origin, application and purpose/use.; analytical methods-drug adulteration, drug evaluation, and phytochemical analysis of crude drugs. Preliminary screening, fractionation and separation of different groups of biodynamic compounds.

UNIT IV: PHARMACOGNOSY

Introduction, history, scope and applications of Pharmacognosy. Phytopharmacy: constitution, identification of different constituents; Ethnopharmacology, phytopharmacology, dosimetry and administration of drugs; Phytopharmaceuticals: Alkaloids, coumarins, volatile oils, tannins, resins and gums. Natural pesticides, antibiotics, allergens. Biotechnological intervention in effective utilisation and sustainable management of drug yielding plants. Potential drug yielding plants and their marketing avenues. Intellectual Property Rights and patenting of active principles.

SUGGESTED READINGS

- Cotton, CM. 1996. *Ethnobotany: principles and applications*.
- Dey, A.C.1988. *Indian Medicinal Plants and Ayurvedic preparations*, Bishen Singh, M. Singh.
- Gibbs, R.D. 1974. *Chemotaxonomy of flowering plants*. Montreal & London.
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BOT 401: PLANT BIOTECHNOLOGY

UNIT III: PRINCIPLES OF PLANT BIOTECHNOLOGY

Introduction to Plant Biotechnology. Isolation of single cells, Suspension cultures, Culture medium for cell suspensions. Applications of cell culture, Bioreactors for bioactive compounds. Biotransformation using plant cell cultures. Methods of gene transfer techniques (*Agrobacterium*, Microprojectile bombardment)-different types of vectors used for transformation, Selectable markers genes, Reporter genes. Virus-mediated, Vector-less or direct and Chemical mediated gene transfer.

UNIT I: INTRODUCTION TO PLANT TISSUE CULTURE AND TECHNIQUES

Concept of cellular differentiation, totipotency, Laboratory organization-infrastructure and equipments. Media composition-organic, inorganic components, gelling agents, supplements; preparation of medium. Methods of sterilization-dry, heat and moist sterilization. Principles of micropropagation and factors affecting micropropagation. Axillary shoot formation. Steps involved in plant multiplication.

UNIT II: APPLICATIONS OF PLANT TISSUE CULTURE

Embryo and Endosperm culture. Somatic embryogenesis - production of haploids - techniques of development of androgenic haploids; factors affecting anther culture, pollen culture, gynogenesis; applications of haploids. Somatic hybridization-protoplast isolation, fusion and culture, hybrid selection and regeneration. Somaclonal variations. Artificial seeds and their applications. Production of secondary metabolites/ natural products, elicitors; Cryopreservation and germplasm storage.

UNIT IV: APPLICATIONS OF PLANT BIOTECHNOLOGY

Application of plant transformation for productivity and performance: Herbicide resistance-phosphinothricin, glyphosate, atrazine. Insect resistance – bt genes. Structure and function of cry proteins- mechanism of action, critical evaluation of its impact in on insect control. Disease resistance chitinase, 1-3 beta glucanase, antifungal proteins, thionins, RS proteins. Abiotic stress - drought and salinity. Post-harvest losses, long shelf life of fruits and flowers: use of ACC synthase, polygalacturanase, ACC oxidase. Male sterile lines: barstar and barnase systems. Biofertilizers.

PRACTICALS

- Preparation of different types of media
- Callus induction from carrot cambial explants or any other source. Callus cytological studies
- Induction of Somatic Embryogenesis
- *In vitro* rooting of cultures
- Induction of multiple shoots
- Preparation of artificial seeds by sodium alginate.

REFERENCES:

- Bhojwani, S.S. and M.K.Razdan 1996. *Plant Tissue Culture. Theory and practice* (rev. ed) Elsevier Science Publishers, New York.
- Chawk, H.S. 2008. *Plant Biotechnology*. 3rd ed. Oxford & IBH. 2008.
- Halford, N. 2006. *Plant Biotechnology: Current and future applications of genetically modified crops*. JW Pub.
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- Lindsey, K. and MGK Jones. 1989. *Plant Biotechnology in Agriculture*. Open University Press.
- Oksman, K.M.-Caldentey & W.H. Barz. 2002. *Plant Biotechnology and Transgenic plants*. CRC Pub.
- Pandian, T.T. & D. Kandavel. 2008. *Text book of Biotechnology*. IK International.
- Pullaiah, T. 2009. *Plant Tissue Culture*. Scientific Publishers, Jodhpur.
- Raghavan, A. 1986. *Embryogenesis in Angiosperms A developmental and Experimental study*. CUP.
- Ramawat, K,G. and J.M. Merillon. 2007. *Biotechnology: secondary metabolites*. 2nd ed. Science Pub., Netherlands..
- Rashid, A. 2009. *Introduction to Genetic Engineering of plants*. IK International Publications.
- Razdan, M.K. 2003. *An Introduction to Plant Tissue Culture*. Oxford & IBH, New Delhi
- Vasil, I.K and T.A. Thorpe 1994. *Plant Cell and Tissue Culture*. Kluwer.

BOT 402. BIODIVERSITY, CONSERVATION AND MANAGEMENT

UNIT I: NATURE, VALUES AND DISTRIBUTION OF BIODIVERSITY

Nature of biodiversity-genetic, species and ecosystem diversity. Use Values of biodiversity-economic and environmental. Plants for food, forage, fibre, medicine, yielding gums and resins, essential oils and timber. Concept of Non-Timber Forest Produce. Biodiversity of the world-magnitude and distribution pattern. Global biodiversity hotspots and hotspots in India. India as a mega diversity center-floristic richness and Centers of Plant Diversity of India. Agrodiversity-Centers of Origin.

UNIT II: BIODIVERSITY CONSERVATION AND ASSESSMENT

Principles of conservation; the process of extinction; threats to biodiversity-habitat destruction, invasive species and climate change. IUCN Threat categories and criteria. Threatened plants of India. *In situ* conservation of biodiversity: natural protected areas-biosphere reserves, sanctuaries, national parks and sacred groves with reference to India. *Ex situ* conservation-botanical gardens and gene banks.

UNIT III: REMOTE SENSING APPLICATIONS TO PLANT RESOURCES CONSERVATION

Principles of remote sensing-acquiring, processing and interpreting the remote sensed data; a brief account on aerial photography; satellite remote sensing- types of satellites and sensors; characteristics of sensors-resolution. Applications of remote sensing technology-forest cover, vegetation type mapping, forest fire monitoring, applications in agriculture, global climate studies. Geographical Information Systems (GIS) and Global Positioning System (GPS)- a general account

UNIT IV: CONSERVATION ORGANISATIONS AND CONCEPTS

Brief account on the conservation organization and their activities-international (CI, WWF, UNEP, IUCN) and national (BSI, NBPGR); International agreements on biodiversity conservation-CBD, CITES, UNFCCC and RAMSAR). Intellectual Property Rights (IPR) and Patents; Biodiversity Bill of India; Biodiversity Registers; Environmental Impact Assessment (EIA).

PRACTICALS

- Study of local crops, each one from cereals/ pulses/ oil seeds.
- Visit to any protected area-documentation of biodiversity and their utility.
- Assessment of plant resources-biomass/species dominance and species diversity.
- Mapping of endemic and threatened taxa of Andhra Pradesh.
- Acquaintance with the science of aerial photography.
- Test for stereoscopic view.
- Measurement of scale of aerial photographs.
- Acquaintance with satellite remote sensing.
- Study of satellite imageries.
- Demonstration of GIS.
- Experiments with Radiometer and GPS
- Project work on any local biodiversity issue and submission of report.

REFERENCES:

- Alan beebay & Anne-Maria Brennan. 2008. *First Ecology*. 3rd ed. Oxford University Press.
- Christian Leveque, Jean-claude Mounolou and Vivien Reuter. 2004. *Biodiversity*. John Wiley
- Cunningham, W.P. & M.A.Cunningham 2007. *Principles of Environmental Science- Inquiry and applications*. Tata Mc GrawHill Pub.New Delhi.
- Dash, M.C.2009. *Fundamentals of Ecology*. Tata Mc GrawHill Pub.New Delhi.
- Given, D.R.. 1995. *Principles and practice of plant conservation*. Timber Press, Oregon.
- Jensen, John R. 2007. *Remote Sensing of the Environment: An Earth Resource Perspective*. PHI.
- Krishnamurthy,K.V.2004. *Advanced Textbook On Biodiversity: Principles and Practice*. Oxford
- Ravi Prasad Rao, B. 2005. Biodiversity. In Pullaiah,T. (ed.)*Taxonomy of Angiosperms*. Regency
- Sabins, F.F.2007. *Remote Sensing-principles and interpretation*. 3rded. Waveland Press Inc.

BOT 403: PLANT PATHOLOGY

UNIT-I: GENERAL CONCEPTS

History and development of plant pathology. Concept of plant disease. Types of plant diseases. Causative agents of plant diseases, symptoms and diagnosis of plant diseases. Disease development: stages in disease cycle-inoculum, inoculum potential, penetration, infection, invasion, reproduction spread and survival.

UNIT-II: DISEASES EPIDEMIOLOGY AND PHYSIOLOGICAL PLANT PATHOLOGY

Development of plant disease-epidemics, modelling, computer simulation of epidemics, plant disease forecasting. Monocyclic and polycyclic pathogens. Role of environment and meteorological factors in the development of plant disease epidemics. Molecular mechanisms of pathogenesis: recognition phenomenon, penetration, invasion, primary disease determinant. Enzymes and toxins in relation to plant disease. Mechanisms of resistance. Phytoalexins.

UNIT-III: MANAGEMENT OF PLANT DISEASES

General principles of plant quarantine. Exotic pathogens and pathogens introduced into India. Exclusion, Eradication, Immunization and Resistance. Physical and Chemical methods of plant disease control and management. Integrated pest management. Biological control of plant of plant diseases-different organisms used in biological control. Biotechnological methods of plant disease management (Bt-Cotton)

UNIT-IV: STUDY OF PLANT DISEASES

Symptoms, aetiology, disease cycle and management (control) of the following diseases. Tobacco Mosaic disease of Tobacco, Citrus Canker, Bacterial blight of paddy, Angular leaf spot of cotton, Club root disease of crucifers, Damping off of vegetables, Late blight of potato, Downy mildew of bajra, Tikka disease of groundnut, Powdery mildew of teak, Rust of Wheat, Whip smut of sugarcane, Brown spot of rice and Blast of paddy. Post harvest diseases in transit and storage; aflatoxins and their integrated management.

PRACTICAL

- Preparation and sterilization of common media.
- Methods of isolation of pathogens and their identification.
- Preservation of microorganisms in pure culture.
- Methods of inoculation.
- Study of Symptomology of locally available diseased specimens.

REFERENCES:

- Agrios, G.N. 2005. *Plant pathology*. 5th ed. Academic press.
- Pandey, B.P. 2005. *Plant Pathology*. S. Chand & Company, New Delhi.
- Horst, R. K. 2001. *Wescott's Plant Disease Handbook*, 6th Ed. Kluwer Academic Publishers, Massachusetts
- Schumann, G. L. and D'Arcy, C. J. 2006. *Essential Plant Pathology*. APS Press.
- Ainsworth GC, Sparrow FK & Susman HS. 1973. *The Fungi ñ An Advanced Treatise*. Vol. IV (A & B). Academic Press, New York.
- Alexopoulos CJ, Mims CW & Blackwell M. 2000. *Introductory Mycology*. 5th Ed. John Wiley & Sons, New York.
- Mehrotra RS & Arneja KR. 1990. *An Introductory Mycology*. Wiley Eastern, New Delhi.
- Sarbhoy AK. 2000. *Text book of Mycology*. ICAR, New Delhi.
- Singh RS. 1982. *Plant Pathogens ñ The Fungi*. Oxford & IBH, New Delhi.

(IE)BOT - 404 - A. PHYTOCHEMISTRY AND PHARMACOGNOSY.

UNIT 1:PHYTOCHEMISTRY: 1. Carbohydrates: mono and disaccharides, sugar alcohols, sugar acids, sugar amines. Polysaccharides: dextrans, inulin, matrix polysaccharides, gums and mucilages.

2. Proteins : peptides, lectins.

3.Lipids, Volatile oils Fattyacids and fatty oils Sesquiterpenes, diterpenes, triterpenes and tetraterpenes.

4.Glycosides: anthraquinones, isothiocynates, Flavonols, Lactones phenols Saponins and cardiac glycosides.

5. Alkaloids, indoles, isoquinolines, tropanes, pyridine and piperidine, steroidal alkaloids.

6. Bitter principle.

7. Phenols and tannins.

8. Antibiotics

UNIT 2: PHORMOCGNOSY: 1. Introduction to Pharmacognosy,Definition, History, Scope and development of Pharmacognosy.Importance of Pharmacognosy with special reference to Herbal drug Industry,Sources of natural medicinal products.Classification of crude drugs with suitable examples including chemotaxonomy.

UNIT 3: A SYSTEMATIC PHARMACOGNOSTIC STUDY OF MEDICINAL AND AROMATIC PLANTS Definition , Classification , Synonym, biological source, geographical sources, history, Cultivation,collection, processing,macroscopy and microscopic characters, standards, chemical constituents with structures, chemical tests, therapeutic and other uses, commercial varieties, substituents, adulterants and storage.

1. Carbohydrates : Honey, Ispaghula
2. Glycosides: Senna, Digitalis, Aloe
3. Vitamins: Sauropus (Chakramuni)
4. Steroids: Dioscorea
5. Tannins: Catechu
6. Resins: Turmeric , Capsicum
7. Flavonoids: Orange
8. Volatile Oils: Peppermint, Lemongrass
9. Fibres:Cotton
10. Enzymes: Papain
11. Lipids:Ricinus
12. Proteins: Gelatin
13. Alkaloids: Opium, Cinchona, Ergot, Rauwolfia

UNIT4: PHARMACOLOGICAL SCREENING OF HERBAL DRUGS:

1. Need for phyto-pharmacological evaluation
2. Evaluation of anti diabetic agents
3. Evaluation of anti microbial agents
4. Evaluation of anti diarrheal agents

PRACTICALS:

1. Qualitative Analysis of Carbohydrates, Proteins, and Lipids.
2. Screening of the Secondary Metabolites.
3. Antimicrobial activity with crud plant extracts
4. Photochemical Analysis of the important medicinal plants.
5. Identification of the Alkaloids, Tannins, Flavonoids and Volatile oils. .

REFERENCES:

1. Phytochemical methods by Horbourne.
2. Text book of Pharmacognosy by T.E. Wallis, CBS, Delhi.
3. Phramcognosy by G.E. Trease, W.C. Evans, ELBS.
4. Cultivation of medicinal and aromatic crops, 1st edition, by AA Farooqui and B.S. Sreeramu. University Press, 2001.
5. Ayurvedic Formulary of India, Government of India.
6. Alternate medicine by Dr. K.B. Nangia
7. Pharmacognosy and Pharmacobiotechnology by Ashutoshkar.
8. Text book of Pharmacognosy by CK. Kokate

(IE)BOT - 404 - B.PLANT RESOURCES AND UTILIZATION.

UNIT 1: STUDY AND UTILITY OF THE USEFUL PARTS OF THE FOLLOWING: Cereals and Millets- Rice, Wheat, Maize, Barley, Sorghum and Millets. Pulses: Red gram, Green gram, Black gram, Horse gram, Pea, Cow pea, Bengal gram. Oil Yielding plants: Sunflower, Safflower, Groundnut, Linseed, Rape seed. A brief introduction to horticultural plants. Floriculture.

UNIT 2: STUDY AND UTILITY OF THE USEFUL PARTS OF THE FOLLOWING: Sugar yielding plants- Sugar cane and Sweet potato. Spices and condiments- Ginger, Turmeric, Cardamom, Cinnamon, Clove, Saffron, All spice, Black pepper, Nutmeg, Red pepper, Coriander, Cumin, Fennel and Vanilla,

UNIT 3: STUDY AND UTILITY OF THE USEFUL PARTS OF THE FOLLOWING: Fiber- Cotton, Jute, Flax, Hemp, Sann hemp, China grass, Coconut and Kapok. Timber yielding plants- *Tectona*, *Dalbergia* and *Rosewood*. Dyes- Indigo, Henna: Masticatories and fumitories: Areca nut, Beetle leaf, Tobacco. Rubber- Para rubber and other substitutes Gums- Gum Arabic, Karyia gum

UNIT 4: MEDICINAL BOTANY: Scope and Importance of Medicinal Plants. Indigenous Medicinal Sciences. Ethnomedicinal plant Gardens. Important medicinal plants and their uses. Palaeo-ethnobotany. folk medicines of ethnobotany, ethnomedicine, ethnoecology, ethnic communities of India. Application of natural products to certain diseases- Jaundice, cardiac, infertility, diabetics, Blood pressure and skin diseases.

PRACTICALS:

- Field survey for collection of economically important plants of the region.
- Study of locally available economic products of plant origin.
- Study of important medicinal plants and their uses.

REFERENCES:

- Hill, A.F. 1952. Economic Botany, TataMcGraw Hill
- Kocchar, S.L. 1998. Economic Botany of Tropics.
- Kochar, L.S. 1981. Economic Botany in the Tropics, Macmillan
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- Pandey, S.N. and Chandha, A. 1999. Economic Botany. Vikas Publishing House Pvt. Ltd. New Delhi.
- Peter B. Kaufman *et al.*, 1999. Natural Products from Plants
- Pursglove, J.W. 1972. Tropical Crops-Monocotyledons and Dicotyledons