K.V.R. GOVT. COLLEGE FOR WOMEN (AUTONOMOUS), KURNOOL

ACCREDITED BY NAAC WITH 'A' GRADE,

Established in 1958 under G.O.Ms.No.197 Edn. Dt.27-01-1958

DEPARTMENT OF BOTANY- M.Sc. (Botany)

(Syllabus W.e.f Academic Year 2020-21)

SEMESTER -III

S.NO	PAPER CODE	TITLE OF THE PAPER	NO OF CREDITS	SEMESTER END EXAM DURATION	TOTAL MARKS IAE	SEE
THEORY						
1	3111	Plant Ecology	4	3	20	80
2	3121	Plant Molecular Biology & Bioinformatics	4	3	20	80
3	3151	Plant Development, Reproduction and Tissue Culture	4	3	20	80
4	3131	Biosystematics	4	3	20	80
PRACTICALS						
1	3111& 3121	Plant Ecology & Plant Molecular Biology & Bioinformatics	4	3		100
2	3151& 3131	Plant Development, Reproduction and Tissue Culture & Biosystematics	4	3		100

SEMESTER -IV

S.NO	PAPER CODE	TITLE OF THE PAPER	NO OF CREDITS	SEMESTER END EXAM DURATION	TOTAL MARKS IAE	SEE
THEORY						
1	4112	Plant Genetic Engineering	4	3	20	80
2	4122	Ethnobotany & Pharmacognosy	4	3	20	80
3	4132	Biodiversity, Conservation & Management	4	3	20	80
4	4141	Horticulture	4	3	20	80
PRACTICALS						
1	4112& 4122	Plant Biotechnology& Ethnobotany & Phytomedicine	4	3		100
2	4132 & 4141	Biodiversity, Conservation & Management& Horticulture and Agriculture Biology	4	3		100
3	Dissertation of Project work in last semester along with Viva and Seminar		4			100

PAPER.I(3111). PLANT ECOLOGY

Unit- I: Ecology and Environment

Definition, Scope and History of Ecology; climatic and topographic factor; physical environment and plant life- light, temperature and fire factors and biotic environment; Ecosystem-structure and function; energy flow in ecosystems-concept of productivity, types of food chains; Biogeochemical cycling- global carbon cycle, sulphur and water cycle; Ecosystems of the world- terrestrial (tropical forests- seasonal and rainforests; grasslands) and aquatic ecosystems.

Unit- II: Plant Communities and Classification

Characteristics of plant communities; analytic-qualitative (life forms, phenology), and quantitative (abundance, density, frequency, basal area); synthetic-species dominance and species diversity. Methods of study of plant communities- quadrats and transects; Importance Value Index, dominance index, similarity index, species diversity indices; community succession process and modeling; concept of climax. Ecological adaptations.

Unit- III: Populations and Individuals

Characteristics of plant populations-density, dispersion, natality, mortality and survival, age structure and biotic potential; population growth patterns; population regulation; concept of metapopulation; Population dynamics. Species interactions: plant-plant (inter-specific competition) and plant-animal (pollination ecology and plant defense against herbivores); concept of ecological niche.

Unit- IV: Environmental Challenges

Natural resources, Classification of natural resources. Energy resources: Renewable energy resources- solar energy, wind energy, hydro-tidal energy, thermal energy, bio energy. Non-renewable energy resources- fossil fuels; coal, natural gas, petroleum. Environmental pollution; sources, effects and control measures of air pollution, water pollution, soil pollution and noise pollution. Global warming-greenhouse gases, impacts on global environment and biodiversity; Ozone layer depletion; El Nino Southern Oscillation, La Nino; Earth Summit – 1992 (RIO DE JANERIO) and 2002 (JOHANNESBURG) and its outcome. Bioremediation. Environmental Impact Assessment (EIA).

Practicals:

1. Determination of texture of different soil samples.
2. Determination of organic matter in soil samples.
3. Determination of salinity in soil and water samples.
4. Estimation of dissolved oxygen in water samples.
5. Determination of minimum size of quadrates.
6. Determination of minimum number of quadrates.
7. Determination of quantitative characters of plant community.

Suggested Readings:

1. Alan beebay & Anne-Maria Brennan. 2008. First Ecology. 3rd ed. Oxford University Press.
2. Begon Michael, Colin Townsend & John L. Harper. 2005. Ecology, From Individuals to Ecosystems. 4th ed.Black well Publishing, Oxford.
3. Brower, J., Jerold Zar and Carl von Ende. 1989. Field and laboratory methods for General Ecology. Wm. C. Brown Publishers.
4. Chapman, J.I. & M.J. Reiss. 1992. Ecology-Principles and applications. OUP.
5. Cunningham, W.P. & M.A.Cunningham 2007. Principles of Environmental ScienceInquiry and applications. Tata Mc GrawHill Pub.New Delhi.
6. Dash, M.C.2009. Fundementals of Ecology. Tata Mc GrawHill Pub.New Delhi.

7.Girard, James. 2005.Principles of Environmental Chemistry. Jones & Barlett. Sudbury.MA, USA.
.8.Harborne, H.B. 1998. Introduction to Ecological Biochemistry.
Academic Press. 9.Kormondy, E.J.1996. Concepts of Ecology. PHI.
New Delhi.
10.Mackenzie, A., A.S. Ball & S.R.Virdee. 2001. Instant Notes in Ecology. Viva Books.New Delhi. 11.Molles, M.C. 2005. Ecology-concepts and applications. Mc GrawHill. Boston
12.Moore, P.D. & S.H.Chapman. 1986. Methods in Plant Ecology.
Blackwell, Oxford. 13.Odum.E.P. 1971. Fundamentals of Ecology.
W.B.Saunders, Phiadelphia.
14.Odum.E.P. & Gary W.Barrett. 2005. Ecology.Tomson Brooks/Cole, Singapore.

PAPER.II(3121). PLANT MOLECULAR BIOLOGY & BIOINFORMATICS

Unit – I: DNA Replication and Repair: Modes of Replication Experimental evidences for Semi Conservative mode of Replication –Messelson- 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.

Unit – II: Transcription (RNA Biosynthesis) & Translation (Protein synthesis) - Polynucleotide phosphorylase; 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. Mechanism of Initiation, Elongation and Termination of Protein synthesis; Translational factors; Inhibitors of Protein synthesis - Antibiotic and other Inhibitors; Post- Translational Modifications; Protein sorting and targeting.

Unit – III: Regulation of Gene Expression - House Keeping genes; Constitutive genes and Regulatory genes; Induction and Repression; Regulation of Gene expression in Prokaryotic Operons - Negative regulation and Positive regulation; Fine structure of lac operon - Repressor and the Catabolite activator proteins in gene regulation of lac operon; Dual functions of the Repressor in araoperon; Antisense RNA; Hormones and Environmental factors affecting Gene expression; Homeotic genes and their Regulation.

UNIT IV: Bioinformatics: Introduction - Origin of bioinformatics. Biological database - Introduction of database (DB), need, organization, search of DB. An over view of biological databases - NCBI, EMBL, DDBJ, SWISS-PROT, PDB, KEGG. Introduction to Sequence alignment - Pairwise and multiple sequence alignment (MSA) using Clustal programs. Sequence analysis - concepts of sequence analysis and their importance. BLAST – blastn, blastp, blastx, tblastx. Disciplines of bioinformatics-Genomics, transcriptomics, proteomics, functional genomics, structural genomics, meta-bolomics, pharmacogenomics. Genome projects - General introduction to genome projects (Arabidopsis and rice genome project).

Practicals:

1. Estimation of DNA by Diphenylamine method.

2. Estimation of RNA by Orcinol method.
3. Determination of purity and quantity of DNA by UV absorption method.
4. Determination of Melting Temperature (Tm) of DNA.
5. Determination of log phase during Culturing of E. coli.
6. Demonstration of β-galactosidase induction in E. coli lac+ strains.
7. Demonstration of Southern and western blotting techniques.
8. Familiarization with Windows, UNIX and Internet, Database searching (Given name of gene/protein search sequence with key words, downloads the sequence, locate related literature reference}
9. BLAST analysis and FASTA analysis.

Suggested Readings:

1. B. Alberts, D. Bray, J.Lewis, M.Raff, K. Roberts and J.D.Watson - Molecular Biology of the Cell, Garald Publishing, New York & London.
2. D.Freifelder - Molecular Biology – A Comprehensive Introduction to Prokaryotes and Eukaryotes, Jones and Bartlett, USA.
3. Maniatis, E.F.Fritsch and J.Sambrook - Molecular Cloning: Laboratory Manual, Cold Spring Harber Laboratory, NewYork.
4. Benjamin Lewin – Genes, Oxford University Press.
5. Nelson and Cox - Principles of Biochemistry.
6. Alberts Johnson et al. – Molecular
7. Biology of the Cell, Garland Science, New York.

PAPER.III (3151). PLANT DEVELOPMENT, REPRODUCTION AND TISSUE CULTURE

UNIT I 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 II 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.

UNIT III:

Introduction to Plant Tissue culture; Organization of Plant Tissue culture Lab; Sterilization of Explants; Media Preparation; Inoculation and Instrumentation; mitochondrial and chloroplast genome; Concept of totipotency; Dedifferentiation and Redifferentiation; Cell suspension culture Organogenesis; Methods of sterilizatiom; principals of micropropagation.

UNIT IV

Embryo and endosperm culture;pollen culture; Somatic Embryogenesis; Synthetic seeds;Somatic hybridization- protoplast isolation, fusion and hybrid selection and regeneration; somaclonal variations; production of secondary metabolites/ natural

products, eliucitorsCryopreservation and Germplasmconservation.

Practicals:

1. Study of microsporogensis and gametogensis in anther sections.
2. Examinations of anthers dehiscence and collection of pollen grains for microscopic examination (maize, grasses, Cannabis sativa, Crotalaria,Tadescantia, Brassica, Petunia, Solanummelongena etc.)
3. Study of pollen grains by acetolysis
4. Dissection and mounting of endosperm and embryo showing developmental stages and haustoria. 5.Microtomy: Fixation, Processing, Sectioning, Staining and mounting.

6.Micrometry: Use of stage and ocular micrometer.

7.Preparation of different types of culture media

8. Callus induction from carrot cambial explants or any other source. Callus cytological studies
9. Induction of Somatic Embryogenesis

10 In vitro rooting of cultures

11 Induction of multiple shoots

12 Preparation of artificial seeds by sodium alginate.

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 (3rdEd.), 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, TM. 1989. Patterns in Plant Development (2ndEd.). Cambridge Univ Press, Cambridge.

11. Waisel, Y., Esnel, A, and Kafkaki U. (Eds.). 1996. Plant Roots. The Hiden Hall (2nd Ed.), New York, USA.

12. Bhojwani, S. S. and Bhatnagar, S.P. 2000. The embryology of Angiosperms (4th Revised and Enlarged Ed.). Vikas Publishing House, New Delhi.

13. The plant cell. Special issue on Reproductive Biology of Plants, Vol. 5. 1993. The American Society of plant physiologist, Rockville, Maryland, USA.

14. Howell, S. H. 1998. Molecular genetics of Plant Development. Cambridge Univ. Press, Cambridge. 15.Murphy, T .M. and Thompson, W. F. 1988. Molecular plant development, prentice Hall, New

Jersey.

16. Pullaiah, T .Lakshiminarayana, K. & Hanumantha rao, B. 2008.plant

reproduction. Scientific publishers, Jodhpur.
17. Raghavan, V. 1997. Molecular embryology of Flowering plants, Cambridge Univ. Press, Cambridge.

PAPER.IV(3131). 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 quantitave, 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 behaviour, 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.

PRACTICALS

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 ofstudy.

SUGGESTED READINGS

Crawford, DJ. 1990. Plant molecular systematics:Macromolecular approach,John Wiley,New York

Davis, PH. & VM.Heywood.1963. Principles of Angiosperm Taxonomy Oliver & Boyd. Edinburgh.

Gibbs, RD. 1974. Chemotaxonomy of flowering plants. Montreal. &London.

Heywood, VH.(ed) 1968. Modern methods in Plant Taxonomy. Academic press. London.

Hollis, DM.1996. Molecular Systematics 2nd . edn. Freeman & Co.

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, GHM.1951. Taxonomy of vascular plants. McMillan, New York.

Naik, VN. 1992. Taxnomy of Angiosperms. 2nd Edn. Tata Mc. Graw Hill

Radford. AE.et al., 1974. Vascular Plant systematics. Harper & Row. New York.

Radhakrishnaiah, M. 1996. Essentials of Plant Taxonomy. Hyderabad

Sivarajan, VV.1991. Introduction to principles of Plant Taxonomy. 2nd edn.Oxford&IBH, New Delhi.

Sneath, PHA & RR.Sokal, 1973. Numerical Taxonomy. WH Freeman & Co.

Solbrig, O.T.1970. Priciples and Methods of Plant Biosystematics.Macmillan series, London.

Semester-IV

PAPER.I(4112)- PLANT GENETIC ENGINEERING

UNIT I: INTRODUCTION AND OUTLINES OF GENE CLONING:

DNA cutting and joining-enzymatic cleavage of DNA restriction and modification enzymes-classification, nomenclature and importance of restriction endonucleases. Restriction mapping, DNA ligases, polynucleotide kinase, alkaline phosphatases, SI nuclease, terminal transferase, Bal31 nuclease. Polymerase chain reaction-principle, types (RT-PCR, nested and inverse PCR), primer design, and applications of PCR. Sequencing methods- Sanger's and Maxam-Gilbert's method. Automated sequencing.

UNIT-II: CLONING VECTORS:

Characteristics of a vector. Natural plasmids used as vectors-advantages and disadvantages. Artificial plasmids and their importance as cloning vectors. Vectors used for cloning in *E. coli* (plasmids, bacteriophage derivatives, Cosmids, BACs), yeast(YACs, Shuttle vectors), higher plants(Ti plasmid derivatives, Caulimo virus).Joining of DNA fragments to vector molecules, cohesive terminal ligation and blunt end ligation-linkers, adaptors and homopolymer tails.

UNIT-III: GENE[DNA] LIBRARIES:

Genomic and cDNA libraries. Screening of recombinants for a positive clone-genetic, biochemical and hybridization methods. Microarrays. Introduction of Recombinant DNA molecules into appropriate hosts-competent cells preparation, electroporation, microinjection and particle bombardment method, and selection of transformants. *Agrobacterium*- mediated transformation of plant cells-identification of transformed cells and micropropagation of transformed cell into callus, and regeneration of transgenic plants. Transgenic plants IPRs.

UNIT IV: EXPRESSION OF CLONES GENES AND PRODUCTION TECHNOLOGIES:

Construction of expression vectors: Vectors having inducible *lac, tac* promoters. Expression of proteins with His tag and purification of recombinant proteins. Production technologies-synthesis of plantibodies. Molecular markers and their applications in agriculture. DNA fingerprinting-RAPD, RFLP and AFLP analysis.

Practicals:

1. Bacterial culture and antibiotic selection media. Preparation of competent cells.
2. Isolation of plasmid DNA.
3. Agarose gel electrophoresis and restriction mapping of DNA.
4. Construction of restriction map of plasmid DNA.
5. Cloning in plasmid/phasmid vectors- selection of positive clones using blue/white colours.
6. PCR
7. Receptor gene assay(Gus CAT/b-GAL)
8. Demonstration of RFLP and RAPD.
9. Project work Minor research project has to be taken up and submit a report.

Suggested Readings:

1. D. Balasubramanian 2005. *Concepts of Biotechnology* new edition.
2. Old and S.B. Primrose. 2002. *Principles of Gene Manipulation* by Blackwell, Oxford.
3. T.A. Brown, 2002. *Gene cloning – DNA Analysis* – Blackwell, London.
4. Davies, J.A. and WS Reznikoff. 1992. *Milestones in Biotechnology*.
5. Glick and Pasternock.2002. *Molecular Biotechnology*. Panima
6. Kaufman, P.B, W.Wu, D.Kim and L.J. Cacke. 2000. *Molecular and Cellular methods in Biology and Medicine.*CRC Press
7. Lewin, Benjamin. 2008. Genes VIII. Pearson and Mc Milam.

8. Mickloss, D.A. and GA Freyer. 1990. *DNA Science. A first course in Recombinant Technology.* Cold Spring Harbor Laboratory Press. New York.
9. Primrose, S.B.1994.*Molecular Biotechnology*(2nd Edn),Blackwell scientific pub. Oxford.
10. Sambrook,J., E. Frisch and T. Maniatis. 2000. *Molecular cloning laboratory manual.* Cold Spring Harbor Laboratory Press. New York.
11. Styanarayana.U. 2005. *Biotechnology*.
12. Winnacker, E.L. 2003. *From genes to clothes.*Panima

PAPER.II(4122)- ETHNOBOTANY & PHARMACOGNOSY

UNIT I: ETHNOBOTANY:

Ethnobotany, its scope and various subdisciplines. Methods and literature in ethnobotany. Recent ethnobotanical works in India. Main world centers and workers of ethnobotany. Different aspects related to tribes of Andhra Pradesh. Wild medicinal plants and their therapeutic values with reference to tribes of Eastern Ghats.

UNIT II: PHYTOMEDICINE AND SYSTEMS OF MEDICINE:

Complementary/Alternative medicine. Different systems of indigenous medicine. Ayurveda-Origin and understanding of Ayurveda. Siddha-Origin and understanding of Siddha. Unani-History and principles of practices and perspectives of Unani. Homeopathy-History and principles of practices and perspectives of Homeopathy. Phytopharmaceuticals: Inventory, taxonomic validation and evaluation of sources.

UNIT III: ANALYTICAL PHARMACOGNOSY:

Introduction, History, Scope and applications of pharmacognosy. Phytopharmacy: Constitution, identification of different constituents. Classification of drugs. Analytical methods- Drug adulteration, Drug evaluation. Phytochemical analysis of crude drugs: Preliminary screening.

UNIT IV: PHARMOCOLOGICAL ANALYSIS AND UTILISATION:

Drugs of alkaloids, coumarins, tannins, terpenoids ang glycosides. Natural pesticides, antibiotics and poisonous plants. Antimicrobial assay: Antibacterial and antifungal screening. Potential drug yielding plants and their marketing avenues. IPR and Patenting of active principles.

Practicals:

1. Recording Medicinal Practices and Herbal Formulations of Tribal Medicine.
2. Study of important medicinal plants used in drugs.
3. Field trip to study and identify locally occurring Medicinal plants.
4. Qualitative analysis of crude drugs for different phytochemicals
5. Quantitative estimation of secondary metabolites: Phenolic compounds and alkaloids.
6. Antimicrobial studies to determine MIC and MBC of different solvent extracts

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.

PAPER.III(4131)- BIODIVERSITY, CONSERVATION & MANAGEMENT

UNIT I: NATURE, VALUES AND MAGNITUDE OF BIODIVERSITY:

Nature of biodiversity-genetic, species and ecosystem diversity; Values of biodiversity – economic and environmental plants for food, forage, fiber, medicine, gums and resins, oils and timber; Non-Timber Forest Produce – a general account; Magnitude and global distribution of biodiversity; global biodiversity hotspots; hotspots in India; Mega diverse countries – India as a mega diversity center; floristic richness of India; Agrobiodiversity- Vavilov centers of crop plants.

UNIT II: BIODIVERSITY CONSERVATION:

Principles of conservation; 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: Plant propagation methods; botanical gardens and gene banks; Biodiversity assessment and monitoring – different methods.

UNIT III: APPLICATIONS OF REMOTE SENSING TO PLANT RESOURCES AND CONSERVATION:

Principles of remote sensing-acquiring, processing and interpreting the remote sensed data; a brief account on aerial photography-types of photographs; satellite remote sensing- types of satellites and sensors; sensors resolution –types; ; applications of remote sensing technology in forest cover, forest fire monitoring, applications in agriculture, global climate studies and biodiversity monitoring; principles and applications of geographical information systems (GIS); Global Positioning System (GPS).

UNIT IV: CONSERVATION ORGANIZATION AND CONCEPTS:

Brief account on the conservation organizations and their activities – International (WWF, UNEP, FAO, IUCN) and national (NBPGR); International agreements on biodiversity conservation-CBD, CITES, IPCC; Intellectual Property Rights (IPR) and Patents; Biodiversity Bill of India; Role of NGO's in Biodiversity Conservation; Biodiversity Registers; Environmental Impact Assessment (EIA); Ecological Footprints – Carbon credits.

Practicals:

1. Study of local crops, each one from cereals/ pulses/ oil seeds.

2. Documentaion of biodiversity of any protected area
3. Assessment of plant resources- biomass/species dominance and species diversity.
4. Mapping of endemic and threatened taxa of Andhra Pradesh.
5. Test for stereoscopic view - aerial photographs.
6. Measurement of scale of aerial photographs.
7. Study of satellite imageries-visual and digital.
8. Experiments with GPS.
9. Demonstration of GIS.

Suggested Readings:

1. Campbell, J.B. & R.H. Wynne. 2011. Introduction to Remote Sensing. 5thed.The Guilford Press. 2.Christian Leveque, Jean-claude Mounolou and Vivien Reuter. 2004. Biodiversity. John Wiley

3. Jensen, John R. 2007. Remote Sensing of the Environment: An Earth Resource Perspective. 2nd ed., Upper Saddle River, NJ: Prentice Hall

4. Kevin J.Gaston & John I. Spicer, 2004. Biodiversity, an introduction. Blackwell. 5.Lillesand. T.M. &R.W.Kiefer. 2000. Remote Sensing and Image Interpretation. John Wiley

6.Meerabai, G. & T. Pullaiah,2015. Plant Biodiversity, Conservation & Management; Astral International Publishers.

7. Ravi Prasad Rao, B. 2005. Biodiversity. In Pullaiah, T (ed.) Taxonomy of Angiosperms. Regency publications, New Delhi. Pp. 287-317.

8. Sharma, P.D. 2015. Ecology and Environment.12th ed. Rastogi Publications, Meerut.

PAPER.IV(4142)- HORTICULTURE

UNIT I:FUNDAMENTALS OF HORTICULTURE:

Introduction to horticulture. Classification of horticultural crops based on soil and climatic requirements. Importance of vegetable and fruit cultivation in India and Andhra Pradesh. Nutritive value of vegetables and fruits. Area and production of vegetables and fruits in India and Andhra Pradesh.Export and import potential of vegetables and fruits in India. An account on different methods of plant propagation.

UNIT II:GARDENING AND NURSERY MANAGEMENT:

Gardening and its types. Vegetable crop gardens9nutrition and kitchen garden,tracer garden,market garden, roof garden) and floriculture gardens(flower gardens, soil and mixed gardens, landscape gardening), Plant nursery: Definition, importance, basic facilities for a nursery: layout and components of a good nursery. Nursery beds- types, their merits and demerits:precautions to be taken during preparation. Orchard: definition, different systems of planting Orchards- square, rectangular quincunx, hexagonal and contour.harvesting and labour concerns, grading, packing, storage and marketing

UNIT III:SOIL MANAGEMENT:

Soil: definition,minerals and weathering to form soils, factors of soil formation. Soil organic matter-composition and decomposability, Humus- fractionation of organic matter. Soil biology:soil microorganisms and fauna-beneficial and harmful roles. Biofertilizers and biopesticides.

UNIT IV:PESTS AND DISEASES OF HORTICULTURAL CROPS:

Vegetable crops-Bhendi(Spotted bollworms,Red cotton bug, Yellow vein mosaic) and Cucurbits(Fruit flies, Pumpkin beetles; Downy and Powdery mildews). Fruit crop-Banana(Banana Weevil,Banana aphids,Panama wilt, Bunchy top) and Custard apple(Mealy bug, Fruit boring caterpillar, Anthracnose, Glomerella, Fruit rots). Commercial flowers- Rose(Rose

aphid, Dieback, and Black spot) and Marigold(Aphida, Leaf spot and Bud rot). Integrated orchard management/Principles of IPM.

Practicals:

1. Study of plant propagation methods-Layering, grafting, budding and cutting.
2. Study of tools and equipments used in horticulture.
3. Study of features of orchard planning and layout orchard.
4. Identification, collection and preparation of herbarium of various horticultural crops.
5. Preparation of nursery bed to sow vegetable seeds.
6. Preparation of biofertilizer mixtures and field application.
7. Identification and management of nutritional disorders in important fruit, vegetable and flower crops as mentioned in the theory syllabus.
8. Identification and collection of major diseases and insect pests of fruits, vegetable and flower crops as mentioned in the theory syllabus.
9. Visit to horticulture university/ Research Station to learn about various vegetable crops.
10. Visit to avegetable nursery/Orchard/garden.

Suggested Readings:

1. Prasad and Kumar.2014. *Principles of horticulture.* 2nd edition. Agrobios. India.
2. Kumar, N.1990. *Introduction to horticulture.* Rajyalakshmi Publications, Nagarkoil, Tamilnadu.
3. Jithendra Singh.2002. *Basic Horticultuere.* Kalyani Pub;lishers. Hyderabad.
4. Kausal Kumar Misra and Rajesh Kumar.2014. *Fundamentals of Horticulture.* Biotech Books.
5. Brady Nyle, C and Ray R Well. 2014. *Nature and Properties of Soil.* Pearson Educational Inc. New Delhi
6. Indian Society of Soil Science. IARI. New Delhi.
7. Sarma, R.R.2002. *Propagation of Horticultural Crops: Principles and Practices.* Kalyani Publishers. New Delhi.
8. Hartman, H.T.and D.E. Kester. 1976.Plant *propagation: Principles and Practices.* Prentice Hall of India. Pvt.Limited. Mumbai.
9. Ratha Krishnan, P.2014. *Plant Nursery and Management: Principles and Practices.* Central Arid Zone Research Institute (ICAR). Jodhpur.