MASTER OF SCIENCES
BOTANY

SYLLABUS & REGULATIONS
WITH EFFECT FROM 2025-26

M.Sc. Botany
P.G. Degree Programme (CBCS) Regulations-2016
Amended as per NEP-2020
CHOICE BASED CREDIT SYSTEM (CBCS)

CENTRE FOR DISTANCE AND ONLINE EDUCATION(CDOE)
SRI VENKATESWARA UNIVERSITY
Accredited by "NAAC" with A+ Grade
Tirupati, Andhra Pradesh – 517502

CENTRE FOR DISTANCE AND ONLINE EDUCATION (CDOE)
SRI VENKATESWARA UNIVERSITY::TIRUPATI
S.V.U.COLLEGE OF SCIENCES
DEPARTMENT OF BOTANY

(Revised Scheme of Instruction and Examination, Syllabus etc., (with effect from the Academic Years 2024-2025)

M.Sc. Botany
SEMESTER – I

Sl. No.	Course Code	Title of the Paper	No.of contact hours	No. of credits	IA Marks	Sem. End Exam marks	Total
1	BOT-101	Pteridophytes, Gymnosperms, Paleobotany, Anatomy and Embryology	6	4	30	70	100
2	BOT-102	Plant Taxonomy	6	4	30	70	100
3	BOT-103	Microbiology	6	4	30	70	100
4	BOT-104	Plant Reproduction, Plant Development and Plant Tissue Culture	6	4	30	70	100
5	BOT-105	Practical's - I	6	4	-	-	100
6	BOT-106	Practical's - II	6	4	-	-	100
		Total :	36	24	--	--	600

SEMESTER – II

Sl. No.	Course Code	Title of the course	No. of hours	No. of credits	IA Marks	Sem. End Exam marks	Total
1.	BOT-201	Plant Physiology and Biochemistry	6	4	30	70	100
2.	BOT-202	Ecology and Biodiversity	6	4	30	70	100
3.	BOT-203	Plant Molecular Biology and Genetic Engineering	6	4	30	70	100
4.	BOT-204	Biosystematics, Ethnobotany and Pharmacognosy	6	4	30	70	100
5.	BOT-205	Practical's - III	6	4	--	--	100
6.	BOT-206	Practical's - IV	6	4	--	--	100
		Total :	**36**	**24**	**--**	**--**	**600**

SEMESTER – III

Course Code	Title of the course	No. of hours	No. of credits	IA Marks	Sem. End Exam marks	Total
BOT-301	Cell Biology, Genetics and Evolution	6	4	30	70	100
BOT-302	Molecular Biology and Techniques	6	4	30	70	100
BOT-303A	Molecular Plant Pathology	6	4	30	70	100
BOT-303B	Soil and Seed Science					
BOT-303C	Environmental Studies and Disaster Management					
BOT-304	Theory Papers : (301, 302 & 303a/303b/303c)	6	4	--	--	100
BOT-305	Mushroom Cultivation (theory & practical)	6	4	10	90 (40+50)	100
BOT-306A	Organic Farming	6	4	30	70	100
BOT-306B	Gardening and Nursery Techniques					
	Total :	**36**	**24**	**--**	**--**	**600**

SEMESTER – IV

Course Code	Title of the course	No. of hours	No. of credits	IA Marks	Sem. End Exam marks	Total
BOT-401	Genomics and Proteomics	6	4	30	70	100
BOT-402	Plant Biotechnology	6	4	30	70	100
BOT-403A	Ethnobotany and Plant Drugs	6	4	30	70	100
BOT-403B	Horticulture					
BOT-403C	Forest Protection					
BOT-404	Theory Papers Bot-401 & 402 and Bot-403a/403b/403c	6	4	-	-	100
BOT-405	Presentation, Viva & Dissertation	6	4	-	-	100
BOT-406A	Nanobiotechnology	6	4	30	70	100
BOT-406B	Herbal Medicine					
	Total :	**36**	**24**			**600**

SRI VENKATESWARA UNIVERSITY::TIRUPATI

S.V.U.COLLEGE OF SCIENCES

DEPARTMENT OF BOTANY

(Revised Scheme of Instruction and Examination, Syllabus etc., (with effect from the Academic Years 2025-26)

M.Sc. - Botany
SEMESTER – I

BOT-101: Pteridophytes, Gymnosperms, Paleobotany, Anatomy and Embryology

Course Objectives

1. To create awareness on classification and description of lower plants.
2. To create the knowledge about lower plants and their utilization in different methods.
3. Economic importance of lower plants.
4. To provide basic distribution pattern and structural organization of lower plants.

Unit- I: Pteridophytes

General Characteristics, Classification (Sporne), Structure, Reproduction and Life cycle of the following genera. *Psilotum*, *Lycopodium*, Equisetum and *Marsilea*.Stelar Evolution - Homospory, Heterospory and seed Habit.

Unit- II : Gymnosperms

General Characteristics, Classification (Sporne), Structure; Reproduction and Life Cycle of the following genera.*Pinus*and *Gnetum*.

Unit- III :Paleobotany

Fossil, Fossil types and Fossilization methods - Geological time scale, Carbon dating.A Brief study of the following form genera.*Rhynia*, *Lepidodendron*and *Calamites*.

Unit- IV: Anatomy

Classification of Tissues.Meristems and their types.Complex tissues, xylem and phloem.Stomatal types.Secondary growth and Anomalous secondary growth.

Embryology

Microsporogenesis, Male gametophyte development, Development of ovule.Megasporogenesis, Female gametophyte development (Polygonum type) Double fertilization.Embryogeny of Dicot and Monocot.

REFERENCES

PTERIDOPIYTES

1. Sporne, K.R (1970): The Morphology of pteridophytes (The Structure of Ferns and Allied Plants) Hutchinson University Library, London

2. SundaraRajan, S. (1994) : Introduction to Pteridophyta New Age InternationalPublishers Ltd., Wiley Eastern Ltd., New Delhi, Bangalore, Bombay,Calcutta,Guwahati, Hyderabad, Lucknow, Madras, Pune, London

3. Vashista, P.C. (1997): Botany for Degree Students- Pteridophyta S. Chand & Co., New Delhi,

4. Rashhed, A. (1999) : An Introduction to PteridophytaVikas publishing Co., New Delhi,

GYMNOSPERMS

1. Coulter, J.M.& C.J. Chamberlain (1964): Morphology of Gymnosperms Cental BookDepot, Allahabad

2. Sporne, K.R (1971) : The Morpholory of Gymnosperms (The Structure and Evolutionof Primitive seed Plants) Hutchinson University Library, London

3. Vashista, P.C. (1996) : Botany forDegree Students-Gymnosperms(2nd Edn.,) S. Chand&Co.,New Delhi,

Course Outcomes

1. Discuss the importance of morphological structure, classification, reproduction and economic importance of Algae. Study and impart knowledge about the general Characteristics, structure, reproduction, life history and economic importance of fungi. Understand the features of Lichens.
2. Know the control measures of plant diseases. Students are able to explain about structure, classification, reproduction, life cycle and economic importance of Bryophytes.
3. Study and impart knowledge about the Structure, reproduction, life cycle, fossil, fossilization and geological time scale.
4. Students able to explain about structure, classification, reproduction, life cycle and economic importance of Gymnosperms.

BOT-102: Plant Taxonomy

Course Objectives

1. To create awareness in Classification of Plants and its arrangements.
2. To train the students to naming (create new names) the newly identified plants.
3. Recognize the plants with the scientific names.
4. To develop skills in identifying the pants for research work to other departments.

Unit- I :SCOPE AND APPLICATIONS OF PLANT TAXONOMY

Unit-1: Scope and applications- Species concept, Biotype, Ecad, Ecotype- Binomial System of Nomenclature.

Unit-2: Theories of Biological Classification- Structural, Biological and Molecular systematics.

Unit-3: Historical Background, Plant classification- Plant classification systems: Bentham and Hooker, Engler and Prantl, Takhtajan and Hutchinson.

Unit- II: TAXONOMIC STRUCTURE

Unit-4: Taxonomic structure: Biosystematics, Chemotaxonomy, Numerical taxonomy- Modern inter-disciplinary approaches to Taxonomy.

Unit-5: Botanical Nomenclature- Need for scientific names- Principles of ICBN. Type method, author citation, Publication of names, rejection of names.

Unit-6: Principle of priority, limitations, conservation of names of species- Draft Biocode.

Unit- III: SALIENT FEATURES OF PLANT FAMILIES

Unit-7: Study of the Monocotyledons: *Hydrocharitaceae*and *Dioscoreaceae*

Unit-8: Study of the Monocotyledons: *Arecaceae*and *Cyperaceae*.

Unit-9: Study of the Monochlamydeae families: *Polygonaceae*and *Amaranthaceae*.

Unit-10: Study of the Monochlamydeae families: *Aristolochiaceae*and *Loranthaceae*.

Unit- IV: SALIENT FEATURES OF PLANT FAMILIES

Unit-11: Study of the Gamopetalae families: *Sapotaceae, Rubiaceae,Asteraceae, Apocynaceae.*

Unit-12: Study of the Gamopetalae families: *Convolvulaceae,Bignoniaceae, Scrophulariaceae*and *Verbenaceae*.

Unit-13: Study of the Polypetalae families: *Magnoliaceae, Menispermaceae, Papaveraceae, Polygalaceae*and *Tiliaceae*.

Unit-14: Study of the Polypetalae families: *Geramiaceae, Mimosaceae, Myrtaceae, Meliaceae*and *Sapindaceae*.

Course Outcomes:

1. Classify the plants based on the Morphological variation for experimental work.
2. Every student able to create new name to the innovative plant species as per the rules formulated by ICN.
3. Student can help to other Scientists for identification of plants for their research fields.
4. He can learn the preparation of Herbaria for identification purpose.

Suggested Books:

1. Battacharya, B and Johri, B. M.1998. Flowering Plant taxonomy and Phylogeny. Narosa Publishing House, NewDelhi.
2. Cronquist, A. 1981. An integrated system of classification of Flowering Plants. Columbia University Press, NewYork.
3. Davis, P.H. and Heywood, V.H. 1963. Principles of Angiosperm Taxonomy, Oliver andBoyed.
4. Gifford, E.M. and Foster, A.S. 1998. Morphology and Evolution of Vascular Plants. W.H.freemen& Co., NewYork.
5. Singh, Gurucharan. 2012. *Plant Systematics*: *Theory and Pactise*. Oxford & IBH. 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.) oxoford Univ. Press, NewYork.
8. Jeffrey, E. 1982. An introduction to plant Taxonomy.Cambridge.
9. Jones, S.B. Jr. and Luchsinger, A.E. 1986. Plant systematics (2nd Ed.). McGraw Hill. Book Co., New York.
10. Mayr, E. 1942. Systematic and Origin of Species. Columbia Univ. Press, NewYork.
11. Pullaiah, T. 1997. Taxonomy of Angiosperms. Regency Publications, NewDelhi.
12. Radford,A.E.1986.FundamentalsofPlantTaxonomy.W.H.FreemenandCompany, SanFrancisco.
13. Stebbins, G. L. 1974. Flowering plants Evolution above the Species level. Academic PressLondon.
14. APG III (2009) An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG III. *Bot. J. Linnaean Soc.* 161: 105-121.

BOT-103: MICROBIOLOGY

Course Objectives

1. To impart the knowledge on basic principles and techniques of microbiology.
2. To provide understanding on antigen-antibody interactions and scope of vaccines.
3. To give an insight on Fungal/Bacterial and Viral diseases to plants.
4. To describe the structure and isolation of different Viruses.

Unit- I: HISTORY AND CLASSIFICATION OF MICROORGANISMS

Unit-1: Introduction to Microbiology, Haeckel's Three–Kingdom Concept, Whittaker's Five-Kingdom Concept, Three-domain Concept of Carl Woese.

Unit-2: Classification of Bacteria According to Bergey's Manual.

Unit-3: Fungi: Classification of Fungi based on Alexopoulos System-Characteristics of Fungi, Industrial Uses of Yeast and Moulds.

Unit- II: MICROSCOPY AND STAINING TECHNIQUES

Unit-4: Simple, Compound, Dark-Field, Phase Contrast, Fluorescent and Electron Microscopes. (SEM & TEM), Confocal Microscopy–Principles and their Applications.

Unit-5: Stains and Staining Techniques: Simple, Differential, Structural Staining Methods and Imaging Techniques.

Unit- III: GROWTH AND PRESERVATION METHODS

Unit-6: Auxenic and Synchronous, Aerobic and Anaerobic, Culture Media and Nutritional Types, Growth Curve, Generation Time and Growth Kinetics. Factors Influencing Microbial Growth.

Unit-7: Preservation Methods of Microbes for Storage, Sterilization and Disinfection.

Unit- IV: PROKARYOTIC AND EUKARYOTIC CELL STRUCTURE

Unit-8: Prokaryotic Cell Structure & Organization, Cell Membrane, Plasma Membrane, Cytoplasmic Matrix, Inclusion Bodies, Ribosome, Nucleiod, Prokaryotic Cell Wall, Capsule, Slime Layers, S Layers, Pili and Fimbriae, Flagella and Motility. Bacterial Endospores.Archaeal Cell Structures.

Unit-9: General Characters and Classification of Blue Green Algae (Cyanobacteria) Macroalgae-Biological and Economic Importance of Algae. Protozoa–Structural Characteristics, Classification and Reproduction.

Unit-10: Eukaryotic Cell Structure and Its Organelles. Lichens and Microalgae-Structural Organization and their Properties.

Course Outcomes

1. Develop the skill of isolation and identification of Pathogenic and Non-Pathogenic micro-organisms.
2. To prepare different media for cultivation of industrially important microorganisms.
3. Equip with the methods to control Plant Pathogens.
4. Understands the Ag-Ab mechanism.

Suggested Books

1. Alexopoulos, C.J., Mims, C.W. and Blackwel, M. 1996. Introductory mycology. John Wiley & SonsInc.
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 Internation al Press.
4. Mehrotra, R.S. 1980. Plant Pathology. Tata Mcgraw hill,India.
5. Sharma, P.D. 2000. Plant Pathology. Narosa Publishing House,India.

BOT-104: PLANT DEVELOPMENT AND REPRODUCTION

Course Objectives

1. Making the students acquainted with the fundamentals and present understanding of development differentiation and internal structure of root and shoot, and vascular tissue differentiation.
2. Enable the students to know present understanding of leaf development and tissue differentiation, Transition to flowering, Floral Organ differentiation and development.
3. Making the students familiar with basic and present understanding of reproductive processes: Male and female gametophyte development, gametogenesis, pollination and fertilization.
4. Making the students familiar with basic and present understanding of Endosperm, Dicot and embryo development, fruit growth and Seed Development.

Unit I

PLANT REPRODUCTION

GAMETOPHYTES, PALYNOLOGY AND FERTILIZATION: Development and structure of anther wall, structure and function of anther tapetum; Palynology, NPC system, applied aspects of palynology. Ovule types, aril, arillode, sarcotesta, caruncle, hypostase, epistase, mamelon. Development of Embryo sac.Ultra structure of embryo sac.Fertilization.

Unit II

PLANT REPRODUCTION

Endosperm development, Haustoria. Embryo development, Polyembryony, Types-Nucellar, integementary, synergid, zygotic suspensor and multiple polyembryony, Twins and triplets, causes of polyembryony. Apomixis- Apospory, Diplospory, Pseudogamy, semigamy parthenogenesis, polyploidy and apomixis, causes of apomixis,

UNIT III

PLANT DEVELOPMENT

Structure of xylem and phloem. Organisation of shoot Apical meristem, theories associated with Shoot Apical Meristem Primary and secondary grwoth of stem. Root apical Meristem-Theories. Root Development. Root Development and structure of Foliar Leaf. Anomalous secondary growth-Abnormal position and activity of cambium, intraxylary phloem, interxylary work, secondary growth in monocot stem and Dicot root.

Unit IV

PLANT TISSUE CULTURE

Laboratory organization; Media composition.and preparation; Methods of Sterilization, Cell Culture; somatic embryogenesis technique and utility; synthetic seeds Micropropagation of higher plants; Somaclonal Variations.

Haploid production Anther Culture, Pollen Culture,Gynogenesis, Application of haploids; Embryo and Endosperm Culture. Protoplast isolation and Culture, protoplast fusion, production of somatic hybrids and cybrids, hybrid selection and regeneration, application and limitations of protoplast research. Production of secondary metabolites through Tissue Culture, suspension Cultures Bioreactors, cell immobilization, hairy root Cultures.

Course Outcome

1. Describe the organization of shoot and root apices and development of shoot and root; Differentiation of vascular tissue and wood formation
2. Describe development and differentiation of leaf, transition to flowering and flower development
3. Describe the formation of male and female gametophytes, pollination, pollen tube germination and Double fertilization.
5. Describe development of endosperm, embryogenesis, seed and fruit development.

Suggested Books:

1. Burgess, J. 1985. An introduction to Plant Cell development. Cambridge Univ. Press, Cambridge.
2. Fahn, A. 1982. Plant Anatomy (3^{rd}Ed.), Pergamon Press,Oxford.
3. Fosket, D.E. 1994. Plant growth and Development. A molecular approach, Academic Press, San Diego,USA.
4. Howell, S.H. 1998. Molecular Genetics of Plant Development, Cambridge Univ. Press, Cambridge.
5. Lyndon, R.F. 1990. Plant Development. The Cellular Basis, Unnin Hyman,London.
6. Murphy, T.M. and Thompson, W.F. 1988. Molecular Plant Development, Prentice Hall, New Jersey.
7. Pullaih, T., Naidu, K. C., Lakshminarayana, K. &HanumanthaRao, B. 2007. Plant Development. Regency Publications, NewDelhi.
8. Raghavan, V. 1999. Developmental Biology of Flowering Plants, Springer-Verlag, New York.
9. Steeves,T.A.andSussex,TM.1989.PatternsinPlantDevelopment(2^{nd}Ed.).Cambridge Univ Press, Cambridge.
10. Waisel, Y., Esnel, A, and Kafkaki U. (Eds.). 1996. Plant Roots. The Hiden Hall (2^{nd}Ed.), New York,USA.
11. Bhojwani, S. S. and Bhatnagar, S.P. 2000. The embryology of Angiosperms (4^{th}Revised and Enlarged Ed.). Vikas Publishing House, New Delhi.
12. The plant cell. Special issue on Reproductive Biology of Plants, Vol. 5. 1993. The

American Society of plant physiologist, Rockville, Maryland,USA.
13. Pullaiah, T. Lakshiminarayana, K. &Hanumantharao, B. 2008.plant reproduction. Scientific publishers,Jodhpur.
14. Raghavan, V. 1997. Molecular embryology of Flowering plants, Cambridge Univ. Press, Cambridge.
15. Shivanna, K.R. and Johri, B.M. 1985. The Angiosperm pollen: the Structure and function. Wiley Eastern Ltd., NewYork.
16. Shivanna, K.R. and Sawhney, V.K. (Eds). 1997. Pollen Biotechnology for Crop Production and Improvement. Cambridge Univ. Press,Cambridge.

SEMESTER – II

BOT-201 :Plant Physiology and Biochemistry

Course Objectives

1. To study the method of respiration in plants
2. To study HMP pathway in plants
3. To study importance of growth regulators
4. To study the fat metabolism in plants

Unit- I: PLANT-WATER RELATIONS

Unit-1: Water transport process, diffusion, osmosis, water potential, Chemical potential,

Unit-2: Absorption of water, water transport through trachieds and xylem.

Unit-3: Transpiration and its significance, factors affecting transpiration, mechanism of stomatal movement- Water stress on crop production.

Unit- II: PHOTOSYNTHESIS

Unit-4: Ultra structure of photosynthetic apparatus.

Unit-5: Photochemical reaction- electron transport pathway in chloroplast membranes,photophosphorylation.

Unit-6: C4 carbon cycle- Crassulacean acid metabolismPhotorespiration.

Unit- III: RESPIRATION AND FLOW OF ENERGY

Unit-7: Glycolysis- TCA Cycle- electron transport in mitochondria.

Unit-8: Oxidative phosphorylation- pentose phosphate pathwaycyanide –resistant respiration.

Unit-9: Nutrient uptake and transport mechanism.

Unit-10: Biological nitrogen fixation, Nitrate and ammonia assimilation.

Unit- IV: CHEMISTRY OF BIOMOLECULES

Unit-11: Carbohydrates - Classification, Structure of mono, di and polysaccharides, stereoisomers, enatiomers and epimers.

Unit-12: Amino acids and Proteins - Structure, characteristics and classification - amino acid synthesis - peptide bond and polypeptide chain - primary, secondary, tertiary and quaternary structure of proteins.

Unit-13: Enzymes - General aspects (Classification and structure), allosteric mechanism, regulatory and active sites, isoenzymes, enzymatic catalysis - Michaelis-Menton equation and its significance.

Unit-14: Lipids- Classification and structure, biosynthesis of fatty acids, Oxidation of fatty acids - Nucleic acids - Composition of nucleic acids and nucleotide synthesis.

Course Outcomes

1. Explain what a Plant Physiologists does.
2. Describe how cell, tissue and whole-plant structures are related to their function.
3. Describe the physiological processes in plants, with an emphasis on water, energy, and mineral relations in higher plants.
4. Understand the fundamental processes of metabolism in plants and describe how a plant obtains and uses energy. Understanding of the functioning of plants as organisms.

Suggested Books:

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 (2^{nd}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 Biochemsitry and Molecular biology of plant Hormones. Elsevier, Amsterdam, TheNetherlands.
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 (4tt Ed.). W.H. Freeman and Company, New York,USA.
7. Moore, T.C. 1989. Biochemistry and Physiology of plant Hormones (2^{nd}Ed.). Springer-Verlag, New York, USA.
8. Nobel, P.S. 1999. Physiochemical and Environmental Plant Physiology (2 Ed.). Academic Press, San diego,USA.
9. Salisbury, F.B. and Ross, C.W. 1992. Plant Physiology (4^{th}Ed.). Wadswroth PublishingCo., California, USA.
10. Singhal, G.S., Renger, G., Sopory, S.K. lrrgang 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 (2^{nd}Ed.). Sinauer Associates, Inc.,Publishers, Massachusetts, USA.
12. Thomas, B. and Vince-Prue, D. 1997. Photoperiodism in plants (2^{nd}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.

BOT-202 :ECOLOGY AND BIODIVERSITY

UNIT I: ECOSYSTEMS

Ecology and its domain; ecosystem-structure and functions; plant life and climatic factors; edaphic factor-physical and chemical properties of soils; energy flow in ecosystems-productivity; types of food chains; energy flow modeling; principles of biogeochemical cycling, global carbon cycle; major ecosystems of the world-forests, grasslands, deserts, freshwater and marine.

UNIT II: COMMUNITIES AND POPULATIONS

Characteristics of plant communities-analytic and synthetic characters (Raunkiaers life forms, Qualitative and Quantitative characters, Species dominance and species diversity); community succession-process, types and attributes. Characteristics of plant populations-Density and Dispersion, Natality, Mortality and Survival, Age structure and Biotic potential; population growth-exponential and logistic; life history strategies-*r* and Kselection; species interactions: plant-plant (competition) and plant-animal (ecology of pollination).

UNIT III: NATURAL RESOURCES AND ENVIRONMENTAL POLLUTION

Classification of natural resources; non-conventional energy resources; atmospheric pollution-types and sources; global warming-green house gases, impact on global environment; ozone layer depletion; Water pollution-sources and control; soil pollution-sources and control; concept of bioremediation.

UNIT IV: BIODIVERSITY AND ITS CONSERVATION

Nature of biodiversity; values of biodiversity; global biodiversity hotspots; agro diversity-centers of origin of crop plants; threats to biodiversity and process of extinction; IUCN threat categories and threatened plants of India; *in situ* conservation of biodiversity-biosphere reserves, wildlife sanctuaries, national parks and sacred groves; *ex situ* conservation-botanical gardens and gene banks.

CONCEPTS IN BIODIVERSITY CONSERVATION AND MANA-GEMENT

Remote sensing technology and its applications to plant resources conservation; Intellectual Property Rights (IPR) and Patents; Participatory Rural Appraisals and Biodiversity Registers; Environmental Impact Assessment (EIA); Concept of Sustainable Development.

Course Outcomes

1. Students achieve knowledge on variations in living organisms.
2. They can also know the availability of natural resources on Earth.
3. Once they know the degradation of biodiversity, they will contribute to the protection of nature (Plants/Animals/Minerals/Air/Water).
4. They got awareness in endemic, threatened species and par;ticipate in protection of the Taxa.

Suggested Books:

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, NewDelhi.
2. Chaudhuri, A. B. &Sarkar, D. D. 2002. Biodiversity Endangered. Scientific Publishers, NewDelhi.
3. Clive Hambler, 2004. Conservation. Cambridge University Press, Cambridge,UK.
4. Chuvieco, E. and Uete, A.H. 2010. Fundamentals of Satellite Remotesensing.
5. Frankel, O.H., Brown, A.HD. & 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, NewDelhi.
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. NewDelhi.
12. Prasad, B. N. 2000. Biotechnology & biodiversity in Agriculture / Forestry. Oxford UniversityPress.
13. Pullaiah, T. 2002. 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, NewDelhi.
17. SuprivaChakraborthy. 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.
19. *Kevin J. Gaston & John I. Spicer. 2004. Biodiversity, an introduction. Blackwell* Christian Leveque, Jean-claudeMounolou and Vivien Reuter. 2004. *Biodiversity*. John Wiley
20. Given, D.R. 1995. *Principles and practice of plant conservation.* Timber Press, Oregon.
21. *Jensen,* John R. 2007. *Remote Sensing of the Environment: An Earth Resource Perspective.*PHI.
22. Krishnamurthy, K.V. 2004. Advanced Textbook On Biodiversity: Principles And Practice. Oxford Lillesand. T.M. &R.W.Kiefer. 2015.
23. Remote Sensing and Image Interpretation. 7th ed. Wiley. Ravi Prasad Rao, B. 2005.
24. Pullaiah, T. (ed.) Taxonomy of Angiosperms. Regency Pub.
25. Sharma, P.D. 2015. Ecology and Environment. 12th ed. Ratogi Publications, Meerut.

BOT-203: PLANT MOLECULAR BIOLOGY AND GENETIC ENGINEERING

UNIT I: DNA REPLICATION (DNA SYNTHESIS)

Introduction to Central Dogma.Modes of DNA replication. Experimental evidences for semi-conservative mode of replication- Meselson-Stahl, and Cairns experiments. Enzymes and proteins in replication – Single strand DNA binding Proteins (SSB), Helicases, Topoisomerase, DNA ligases.Priming by RNA polymerase and promase.DNA polymerases – E.coli DNA polymerase I, II and III, and Eukaryotic DNA Polymerases. DNA damage and Repair: Photoreactivation, exsicion repair, recombination repair, SOS repair.

UNIT II: TRANSCRIPTION (RNA BIOSYNTHESIS)

Polynucleotide phosphorylase. RNA polymerases – structure of E.coli RNA polymerase, and nature of eukaryotic RNA polymerases. Promoters and their characterization.Initiation, elongation and termination of RNA.synthesis.Moncistronic and polycistronic RNAs. Post transcriptional modification –Capping, methylation, polyadenylation. RNA splicing and splicing mechanisms. Splicing of nuclear pre-tRNA, group I and group II introns, and pre-mRNA splicing.

UNIT III: TRANSLATION (PROTEIN SYNTHESIS)

Elucidation of the genetic code. General features of genetic code, codon degeneracy and universality. tRNA role in protein synthesis. Amino acyl-tRNAsynthetases, wobble hypothesis. Protein synthesis: Mechanism of initiation, elongation and termination.

Regulation of gene expression: House keeping genes, constitutive genes and regulatory genes. Regulatory proteins–DNA–binding motif of regulatory proteins.Negative regulation and positive regulation.Lac operon.Regulation of gene expression in prokaryotic operons.

UNIT IV: PLANT GENETIC ENGINEERING

Principles of recombinant DNA technology and out lines of gene cloning.DNA cutting and joining.Restriction and modification enzymes.Restriction mapping.DNA ligases, polynucleotide kinase, alkaline phoshatases, SI nuclease, terminal transferase, Bal31 nuclease.Polymerase chain reaction-principle and applications.Outlines of sequencing methods.Cloning vectors.Characteristics of Plasmids, bacteriophages, cosmids, BACs and YACs.

GENE LIBRARIES, GENE TRANSFORMATION AND TRANSGENIC CROPS

Genomic and cDNA libraries.Screening recombinants.Recombinant DNA into host cells. Methods of gene transfer into plants cells. Outlines of physical methods and Agrobacterium mediated transformation. Transgenic crops for biotic and abotic stress resistance and important agronomic traits. Molecular markers: RFLP. RAPD, AFLP and SSR.

Suggested Practicals:

1. Preparation of *E.coli* growth curve by turbidimetricmehod.
2. Preparation of *E.coli* competent cells by $CaCl_2$ method.
3. Setting up a ligation reaction.
4. Bacterial transformation by heat shock method.
5. Isolation of plasmid DNA by alkalkinelysis method and separation by agarose gel electrophoresis.
6. Restriction digestion f plasmid DNA.
7. Polymerase Chain Reaction (PCR)
8. RAPD
9. Demonstration of Agrobacterium Mediated Plant Transformation Method.

Suggested Readings:

1. RobbeWunschiers, 2021 Genetic Engineering : Reaching, Writing and Editing Genes, Springer USA.
2. Abdin, Malik Zainul, Ali, Athar, Kamaluddin, Kiran, Usha 2017. Plant Biotechnology : Principles and Applications. Springer, Singapore.
3. T.A.Brown, 2016. Gene Cloning and DNA Analysis : An Introduction. Wiley-Blackwell, USA.
4. Michael S.D. Kormann 2016. Modern Tools for Genetic Engineering. Intech Open Publishers, USA.
5. David P. Clark and Nanette J. Pazdernik 2016. Biotechnology. Applying the Genetic Revolution. Elsevier/Academic Cell Press, USA.

BOT-204 :BIOSYSTEMATICS, ETHNOBOTANY AND PHARMACOGNOSY

UNIT I: BIOSYSTEMATIC STUDIES

Introduction, history, scope, objectives and importance of Biosystematics.Phenotype, genotype, biotype, plasticity of phenotypes, role of biosystematics in understanding evolution.

Ecotypes-nature, origin and their significance, phenecotype and genecotype; factors affecting phenotype variations.

Methods in biosystematic studies: Growth in uniform environment, growth in varied environments and cytogenetic analysis.

Biosystematic categories: Ecotype and ecospecies, sub-species, coenospecies, comparium and infra specific variations.

UNIT II: CONCEPT OF CHARACTER, BREEDING SYSTEMS AND SPECIATION

Concept of population: population – a unit for biosystematic studies. Concept of character: Definition of character, Different types of characters: analytic and synthetic; qualitative and quantitative, consistent and variable characters.

Breeding systems- role of breeding systems in sexual and asexual population.

Mechanism of speciation, Allopatry, parapatry and Sympatry.

Sources of taxonomic characters; Systematics -a synthetic discipline; Alfa taxonomy and Omega taxonomy.

UNIT III: EXPERIMENTAL TAXONOMY AND TAXIMETRICS

Anatomy and role of anatomical evidences in plant taxonomy

Embryology in relation to taxonomy.

Palynotaxonomy and Cytotaxonomy.

Chemosystematics, Serology in relation to taxonomy and Molecular Taxonomy.

Numerical taxonomy: Phenetics and Cladistics. Adansonian principles.Methods of sampling, construction of groups, summerizing the data.Merits and demerits of numerical taxonomy.

UNIT IV: ETHNOBOTANY

Ethnobotany: Introduction, history, scope and importance of ethnobotany.

Different aspects related to tribes; Ethnobotany an interdisciplinary subject.

Ethno-medico-botany; wild medicinal plant resources with special reference to the forests of Andhra Pradesh.

Different systems of traditional and Indigenous Medicine

PHARMACOGNOSY

Introduction, Scope and applications of Pharmacognosy.

General account of phytochemicals present in medicinal plants

Pharmacognosy, adulteration of drugs and Economic potential of phytomedicine

Potential drug yielding plants under cultivation in Andhra Pradesh.

Course Outcomes

1. Definition, history and scope of ethnomedicine; Difference between folk and traditional medicines.
2. Use of some routinely used Ayurvedic drugs and formulations.
3. About drug adulteration and methods of detecting the same.
4. Phytochemical and biological screening of herbal drugs ; Preparation of some herbal formulations mentioned in the syllabus.

Suggested Books:

1. Jain, S.K. 1968. Medicinal Plants National Book Trust of India, NewDelhi.
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, NewDelhi.
7. Cutler. S.J. & Cutler. H.G. 1999. Biologically Active Natural Products – Pharmaceuticals, Agro Science Book Centre, NewDelhi.
8. Harborne, J.B. 1948. Phytochemical methods. Chapman and Hall,London.
9. Kokate, C.K. Purohit, A.P. Gauchely, S.B. 1990. Pharmacognosy, (NarialPrakashan).
10. Khare, C.P. 2000. Indian herbal therapies. Delhi Book Co., Connaught, Circle, NewDelhi.
11. Mukherjee, B. 1998.The Wealth of Indian Alchemy & its MedicinalUses.
12. Nadkarni, K. M.2004. Indian plants & Drugs with their Medicinal Properties. Agro Sci. Publ. Centre, NewDelhi.
13. Panda, H. 2003.Medicinal Herbs & Their Uses with Formulations. DayaPubli. House, New Delhi.
14. Sharma, R. 2003. Medicinal plants of India – AnEncyclopedia
15. Trease, G.E. and Evans, W.C. 1983. Pharmacognosy. (12thEd.), Bailine,London.
16. Wallis, T.E. 1999. Text Book of Pharmacognosy, (5thEd.) CBS Publishers & Distributions, NewDelhi.