BHARATHIAR UNIVERSITY: COIMBATORE – 641 046
M.Phil. /Ph.D. - BOTANY

PART I: SYLLABUS
(For the candidates admitted from the academic year 2018-19 onwards)

PAPER I – RESEARCH METHODOLOGY

UNIT 1:
Principals and methodology of spectrophotometer, dialysis and Lyophilization, centrifugation, (high speed and ultra), Microscopy (SEM, TEM and Fluorescent).

UNIT II:
Principles and methodology of chromatoghraphy- GC, HPLC, & GCMS. Electrophoresis - Agarose, SDS – PAGE, Western blot. Phytochemistry – extraction, isolation, characterization and identification of alkaloids and flavanoids.

UNIT III:
Nucleic acids - Isolation and purification of DNA, PCR & RTPCR. Genome mapping; molecular markers – RFLP, AFLP, RAPD. Southern and Northern hybridization techniques, Colony hybridization. ,

UNIT IV:
Culture techniques – Media preparation; (PDA, Nutrient Agar,CHU-10); Isolation, purification and maintenance of microorganisms, Plant tissue culture – MS medium, Gamborg medium; Sterilization techniques- (physical and chemical). Cytological techniques – pretreatment, fixatives and stains. Microtomy.

UNIT V:
Field Techniques – Herbarium preparation Vegetation analysis (floristic, physiognomic and phytosociology (transect, quadrat, point or pointless and loop); Forest mapping and change detection using remote sensing and GIS. Thesis writing-Manuscript preparation, Citation style: Introduction to SPSS. (Statistical package for social science).

References:

1. Bhattacharyya, 2006, D. K, Research Methodology, Excel Books India, PP 1-414
2. Gupta, P.K., 1994, Elements of Biotechnology, Rastogi, Meerut
3. Kothari C. R., 2004, Research Methodology: Methods and Techniques, New Age International, pp- 1- 401
4. N. Gurumani, 2006, Research Methodology: For Biological Sciences, MJP Publishers, ISBN 9788180940163, PP 1- 753
5. Sam Daniel P., Aroma G. Sam, 2011, Research Methodology, Gyan Publishing House, PP 1-254
6. Trease G.E. and Evans W.C. 1978 – Pharmacognosy Bailliere Tindal, Londan

PAPER II - TRENDS IN PLANT SCIENCE

UNIT 1:
Plant –animal interaction: Pollination and seed dispersal. Bioresourses – SCP, biomass energy, biofuel, bioinoculants and biosensors.

UNIT II:
Taxonomy – Chemo, numerical, sero and digital. DNA Barcoding in plants. Species identification using software (Linneaus version), Digital herbarium.

UNIT III:
Plant Genomics. Transgenics - Genetic transformation: Agro-bacterium mediated gene transfer. Transgenic plants: *Pros* and *Cons*, Bio-safety protocol, Molecular pharming.

UNIT IV:
Ethnobotany in relation to human welfare: Elementary knowledge of crude drugs – Preparation and preservation; classification of active principles (flavonoids, steroids and alkaloids). Drug designing.

UNIT V:
Germplasm collection and conservation methods (ex-situ and in-situ); IPR: Outline and patenting of Biological products. Nanobiology – Introduction, approaches, green synthesis, characterization and applications.

Reference:

1. Gurcharan Singh, Plant Systematics: An Integrated Approach, Science Publishers, 2004.
2. Mukherjee P. K. (2002). Quality Control of Herbal Drugs, Business Horizons Pharmaceutical Publisher, Delhi, Ist edn.
3. Harborne J.B. 1998. Phytochemical Methods - A guide to modern technique of plant analysis, 3rd edn, Champan & Hall, UK.
4. Chawla, H.S. 2002. Introduction to Plant Biotechnology. 2nd Ed. Oxford University Press and IBH.
5. Drug Discovery and Evaluation –Pharmacological assays. (1997) Ed.Vogel HG & Vogel WH. Springer-New York.

PAPER III: 1. PLANT CYTOGENETICS

UNIT I:
Architecture of the chromosome – prokaryotic and eukaryotic chromosomes – plasmids, episomes, transposomes; Genomes of mitochondria and plastids – Euchromatin and heterochromatin – Chromatin and nucleosome – B-chromosomes and special types of chromosomes

UNIT II:
Structural changes in chromosomes – Duplications, Deficiencies, Inversions and Translocations – classification, identification, meiotic pairing, breeding behaviour and role in evolution of structural changes.

UNIT III:
Numerical changes in chromosomes : Haploidy – classification, methods of production, identification and utility. Polyploidy – Auto and Allopolyploidy, their classification, meiotic pairing, production, utility and role in evolution; Aneuploidy – trisomy, tetrasomy, monosomy, and nullisomy.

UNIT IV:
Chromosome banding techniques – Different types and their application. In-situ hybridization. Induced mutation in plants and their application.

UNIT V:
Alien gene transfer through chromosome manipulation – whole genome, individual chromosome, individual gene. Molecular markers and their utility – PCR, RAPD, RFLP, AFLP, VNTR, SSR.

References:

1. Khush, G.S., 1973. Cytogenetics ofo Aneuploids, Academic Press, New York, London.
2. Burnham, C.R. 1962. Discussions in Cytogenetics, Burgess Publishing Co., Minnesota.
3. Swanson, Merz and Young. Cytogenetics. Prentice Hall . India.
4. Sybenga, J. 1973. General Cytogenetics. North Hall and American Elsvier.
5. Gupta, P.K. 1995. Cytogenetics. Rastogi & Company, Meerut.
6. David M. Prescott. Cells. 1988. Jones and Bartlett Publ. Boston.

PAPER III - 2. MOLECULAR BIOLOGY AND PLANT BIOTECHNOLOGY

UNIT I:

Gene Concept

DNA as genetic material. Organization of Pro- and Eukaryotic genomes. Gene expression, gene regulation, Micro RNA- gene silencing.

UNIT II:

Gene Transfer Techniques

Gene isolation methods - Direct gene transfer methods – electroporation – microinjection – biolistics– liposome mediated and plastid transformation - Indirect gene transfer methods – *Agrobacterium* mediated gene transfer, Gene silencing, Gene function analysis – Genome editing

UNIT III :

Genetic Markers

Marker assisted selection for crop improvement – PCR, RAPD, RFLP, AFLP, SSR, EST Genome mapping, NGS.

UNIT IV:

Plant Tissue Culture

Types of cultures – Cell, protoplast, callus, embryo and organ; Germplasm storage and conservation *in-vitro*, somaclonal variation, haploid production with reference to Rice and Cotton

UNIT V:

Transgenics in Crop Improvement

Production of transgenics for resistance to abiotic (temperature, salt and herbicide) and biotic (pests and diseases). Quality improvement – Vitamin enrichment, improvement in shelf life.

References:

1. Chawla, H.S. 2002. Introduction to Plant Biotechnology. 2 nd Ed. Oxford University Press and IBH.
2. Gupta, P.K. Elements of Biotechnology, Rastogi, Meerut.
3. Lindsey, K. 1997. Transgenic Plant Research, Harwood Acad. Pub.
4. Primrose, S.B. Molecular Biotechnology, Blackwell Sc. Publications.
5. Chahal, G.s. and Gosal, S.S. 2002. Principles and Procedures of Plant Breeding. Narosa Publ Hos. New Delhi.

PAPER III – 3. ENVIRONMENT AND CONSERVATION BIOLOGY

UNIT I:
Scope of Environmental Biology, Ecosystem, Energy Flow. Pollution – Air, Water and Soil – Its impact on plant, control measures. Bioremediation.

UNIT II:
Global warming, Ozone depletion and Greenhouse effect, climate change & biodiversity, Energy – sources – Fossil fuels, natural gas, wind energy, Bio energy and energy conservation.

UNIT III:
Historical account of conservation of fauna and flora in India: Phytogeographical regions. Biodiversity –Types, values, threats and "Hotspots". Biodiversity Act (2002) & Rules (2004). Convention on Biological Diversity (CBD).

UNIT IV:
Plant genetic resources: Conservation strategies for plant genetic resources (in situ and ex situ). IUCN classification – Red data book. Role of NBPGR, WWF, UNDP, IPGRI, FAO in conservation programmes in India.

UNIT V:
Human dimension in ecosystem management – Predominant ethnic communities of India – with special reference to Tamil Nadu and their role in conservation of plants. Tribal development programmes in Indian society and environment. Tribal bill.

References:

1. Sharma, P.D., 2010, Environmental Biology, Rastogi Publications publishers, India
2. Krishnan Kannan. 1999, Fundamentals of Environmental pollution. S Chand & Co Ltd, Delhi
3. R.G.Bondand and C.P Straub. 1973, Environmental Control, CRC Press Inc.,U.S.
4. Khan, T.I. and Shishoda, Y.S. (1998). Biodiversity conservation and sustainable development., Pointer Publ., Jaipur
5. Trivedi, P.R. and Gurudeep Raj. 1992. Environmental Wildlife and Plant conservation. Akashdeep Publ. Hojuse, New Delhi.
6. Agarwal, K.C. 1996. Biodiversity. Agrobotanical Publishers, India.
7. Jain, S.K. 1995. A manual of Ethnobotany, 2nd Ed..
10.Mukherjee, B. 1997. Environmental Biology, Tata McGrew Hill Publ. Co. Ltd. New Delhi.

PAPER – III – 4. BIOPROSPECTING OF MEDICINAL AND AROMATIC PLANTS

UNIT I :

Plant genetic resources and their conservation: Medicinal and Aromatic Plants – Scope and importance. Approaches and strategies for *ex-situ* conservation: botanical garden, arboreta, herbal garden and field gene bank.

UNIT-II:

Chromatography: Principle, instrumentation and application of HPLC, GC-MS and LCMS. Spectroscopy: Principle, instrumentation and application of UV-Vis Spectrophotometer, NMR and FTIR.

UNIT-III:

Extraction methods: Maceration, percolation, digestion, infusion and distillation. Classification, chemical nature and tests for carbohydrates, proteins, aminoacids, phenolics and alkaloids. Stress physiology: Drought and freezing resistance, Heat shock and salinity stress. Antioxidants: Types, importance and therapeutic properties.

UNIT- IV:

Pharmacology: Routes of drug administration, absorption and distribution. Pharmacological activity of morphine, atropine, ephedrine and camphor. Development of drugs: Pre clinical and clinical phases of drug evaluation.

UNIT-V:

Post harvest technology in medicinal crops: Scope and importance. Adulteration with reference to plant drugs, type of adulterants and method of adulteration. Biodiversity Act (2002) and Intellectual Property Rights in the area of medicinal plants.

References:

1. Goodman Gillman's The Pharmacological basis of therapeutics. (2001) Ed. Hardman JG, Limbird LE (Tenth Edition) McGraw Hill press New York.
2. Wilson K and John Walker, 1999. Principles and techniques of practical biochemistry, Cambridge University Press.
3. Drug Discovery and Evaluation –Pharmacological assays. (1997) Ed.Vogel HG & Vogel WH. Springer-New York.
4. Aktal C K and B M Kapur, 1982. Cultivation and utilization of medicinal plants. RRL, CSIR, Jammu-Tawi.
5. Mukherjee P. K. (2002). *Quality Control of Herbal Drugs*, Business Horizons Pharmaceutical Publisher, Delhi, Ist edn.
6. Harborne J.B. 1998. *Phytochemical Methods - A guide to modern technique of plant analysis*, 3rd edn, Champan & Hall, UK.
7. Ali, M. 1997. *Textbook of Pharmacognosy*, CBS Publishers and Distributors, New Delhi.
8. Chaudhary R. D 1996. *Herbal Drug Industry*, 1st edn, Eastern Publication, New Delhi.
9. Trease, G. E. and Evans, W. C. 1985. *Pharmacognosy*, Bailliere Tindall. London. 12th edn.
10. Lester Packer. 2001. Hand book of Antioxidants. CRC press
11. Finar, I. L. 1975. *Organic Chemistry, Stereochemistry and the Chemistry of Natural Products*, ELBS, Longman Singapore Publication (P) Ltd., Singapore, 5th edn.
12. Swain T. 1963. Chemical Plant Taxonomy, Academic Press London.
13. Anonymous. 1993. Standardization of Single Unani Drugs, CCRUM, New Delhi.

PAPER III – 5. MICROBIOLOGY AND PLANT PATHOLOGY

UNIT I

Fungal cell and its structure; Reproduction, Factors affecting asexual spore formation, maturation, spore dispersal mechanisms, dormancy and germination.

Fungal nutrition, use of fungi in immobilized cell technology (outline only).

UNIT II

Ectomycorrhiza – Structure and development, Growth and carbon economy, Nitrogen and phosphorous nutrition, Ectendomycorrhizas.

Endomycorrhiza – Arbuscular mycorrhiza: fungi involved, Root colonization and anatomy, Genetic, Cellular and molecular interactions, Growth and carbon economy of AM plants, Mineral nutrition, heavy metal accumulation and water relations of AM plants.

Role of mycorrhizas in ecosystems - AM in agriculture and horticulture - Mycorrhizas in managed environment: forest production, interactions with other microorganisms and pollutants.

UNIT III

Effects of pathogens on host physiology, Genetic basis of host – Pathogen interaction – pathogenesis – Toxins –Definition, Classification, Chemistry, production and mode of action of bacterial toxins with special reference to wildfire toxin – Chemistry production and synthesis of fungal toxins with reference to Helminthosporium toxin – Host defense mechanisms – Epidemiology, assessment and forecasting of plant diseases.

UNIT IV

Microbes and soil fertility: Nitrogen fixing organisms (Symbiotic, nonsymbiotic and associative)- phosphate solubilizers (bacteria and fungi) – Inoculum production

Microbes in plant protection: Biological control of plant pathogens – Mechanism – bio-insecticides, bio-herbicides, biofungicides.

UNIT V

Application of microbes in sewage and wastewater treatment, degradation of xenobiotics, mineral recovery, removal of heavy metals from aqueous effluents, composting, Microbial biosensors.

Microorganisms as source of food – single cell protein, Cultivation of mushrooms

Reference books:

1. Smith J.E, Berry D.R, Kristiansen B, 1983, The filamentous fungi–Vol. IV – fungal technology, Edward Arnold, London, UK.
2. Cochrane V.W, 1958, Physiology of fungi, John Wiley & Sons, Incorporated, New York.
3. Burnett J.H, 1976, Fundamentals of Mycology 2nd ed., Edward Arnold, London, and Crane Russak, New York.
4. Mehrotra R.S, Aneja K.R, 1990, An Introduction to Mycology, New Age International Publisher, New Delhi, India.
5. Weber D.J, Hess W.H, 1976, The fungal spore–formation & function, John Wiley & Sons, Inc., New York.
6. Agrios G.W, 2005, Plant Pathology, 5th edition, Elsevier Academic Press, London, UK.
7. Wheeler H, 1975, Plant Pathogenesis, Springer-Verlag Berlin Heidelberg, New York.
8. Michael J. Pelezar Jr., E.C.S. Chacor. Noel R. Krieg, 1986, Microbiology, 5th edition, McGraw-Hill, New York.
9. Purohit S.S, 2008, Microbiology – Fundamentals & applications, 7th edition, Agrobios, India.

10. Powar C.B, Daginawala H.F, 2010, General Microbiology – Vol. II, Himalaya Publishing House, Mumbai, India.
11. Smith S.E, Read D.J, 2008, Mycorrhizal Symbiosis, Academic Press, London.
12. Sharma P.D, 2006, Plant Pathology, Alpha Science International Ltd, Oxford, UK.
13. Ahmed M, Basumatary S.K, 2008, Applied Microbiology, MJP Publishers, New Delhi, India.

PAPER III – 6. ALGOLOGY

UNIT I
HABIT and HABITATS
Algae - Structure of micro algae and macro algae. Occurrence and seasonal distribution of fresh water and marine algae. Fresh water and marine phytoplankton and phytobenthos. Thermophilic algae; soil algae; algae in relation to pollution.

UNIT II :
TAXONOMY
Modern criteria (biochemical, cytological, physiological, ultra structural) in taxonomy and phylogeny of algae current taxonomic treatment of algal phyla. Fossil algae.

UNIT III :
PHYSIOLOGY
Nutrition, photosynthesisand respiration, N_2-fixation in blue greens. Cyaenophyages. Morphogenesis in algae.

UNIT IV :
CULTURE
Isolation and culture and pure culturing of algae. Synchronous cultures, mass cultures, variations of algae in culture. Seaweed farming

UNIT V :
GENETICS AND BIOTECHNOLOGY
Mutation, recombination, molecular biology and biotechnology of cyanobacteria with special reference to *Spirulina*. Agricultural and industrial uses of algae (liquid fertilizer, pesticides & manure)

References:

1. Structure and reproduction of algae by Fritch vol-1 & 2.- Cambridge publication.
2. Botany for Degree students: algae - V.R.Vasta, A.K. Sinha and V.P .Singh. publication: S.Chand
3. Phycology -Lee.- 4th edition. Publication: Cambridge Publication.
4. Hand book of micro algal culture. Applied phycology & Biotechnology- Amos Richmond & Qiang hu- Wiley black bell publication.
5. A textbook of algology - A.V.S.S sambamurthy. I.K. International publications
6. Algae culturing techniques by Robert A Anderson. Publication: Elsevier.
7. Algae of India-vol.1, 2, 3 by BSI Publication.
8. Introduction to the algae. Structure and Reproduction. Bold H.C and Wynne. Prentice Hall of India PVT. New Delhi.
9. Text book of algae. O.P.Sharma.- Mc Graw Hill publication.
10. Marine algae: Biodiversity, taxonomy, environmental assessment and biotechnology- Leonel Pereira & Joao publication: CRC press, Tailor and Fravnics Group

PAPER III: 7. APPLIED PLANT BIOTECHNOLOGY

UNIT I :
History of plant tissue culture- types of media-medium composition and their function- Medium preparation (MS) - various types of *in vitro* techniques and their applications.

UNIT II:
Protocol followed for various *in vitro* techniques, Micro propagation- direct organogenesis (without callus intervention), and indirect organogenesis (with callus intervention) - direct somatic embryogenesis and indirect somatic embryogenesis, genetic fidelity of micropropagated plants.

UNIT III :
Germplasm Conservation – Cryopreservation, Production and application of synthetic seeds and haploid plants (androgenesis and gynogenesis), protoplast isolation, culture, fusion and establishment of culture, somatic hybridization by protoplast fusion and their implications in agriculture.

UNIT IV :
Plant secondary metabolites- definition, types and applications. *In vitro* production of secondary metabolites- methodology and application, elicitors and hairy root culture involvement for secondary metabolites production.

UNIT V:
Application of plant tissue culture in phytoremediation, abiotic stress (salt and drought) and biotic stress (pests and disease) tolerant plants development. Molecular docking studies of bioactive compounds, sequence analysis-FASTA, BLOST, CLASTALW.

References:

1. Plant Tissue Culture: An Introductory Text: Bhojwani, Sant Saran, Dantu, Prem Kumar, publisher: Springer.2013.
2. Introduction to Plant Tissue Culture by Razdan, Science Publishers, 2003.
3. Plant Tissue Culture, Third Edition: Techniques and Experiments 3rd Edition by Roberta H. Smith.2012.
4. Text book of biotechnology, by Dubey, R.C, S.Chand and Company Ltd, IV Edition.2007.
5. Plant Biotechnology, by Ramawat, K.G, S.Chand and Company Ltd, II Edition.2004.
6. Biotechnology of Bioactive Compounds: Sources and applications, Dr. Vijai Kumar Gupta, Dr. Maria G. Tuohy CRC Press .2015.
7. Bioinformatics principles and Applications. 2005. Harsha Vardhan. P, Tata Mc Graw Hill publishers, New Delhi.

PAPER III - 8. SEED TECHNOLOGY

UNIT I :
Germplasm resources of food grains – pulses, cereals and oil seeds – collection and ex situ and in situ conservation – Role of IPGRI (International Plant Genetic Research Institute) (Rome), NBPGR (New Delhi) and ICRISAT (Patancheru, Andhra Pradesh) in germplasm collection and conservation of most common cereal and pulse crops.

UNIT II:

Biochemical composition of legume and cereal seeds/grains. Seed proteins –albumins, globulins, glutelins and prolamines their structure, function and composition.Seed carbohydrates – starches and soluble carbohydrates including flatulence factors, structure and composition. Seed oils and lipids – structure and composition.

UNIT III:

Physiology of seed/grain development-growth patterns – sigmoid and double sigmoid growth curves – phases of growth – role of pericarp (hull), seed coats and flag leaf in seed/grain development. Biosynthesis of proteins, carbohydrates, lipids during seed grain development.

UNIT IV:

Physiology of seed germination – primary/early biochemical events of germination. Appearance and role of proteases, amylases and lipases in hydrolyzing stored food materials in storage organs. Mobilization of hydrolysed products to the growing embryonal axis/seeding.

UNIT V:

Antinutritional factors – Heat labile and heat stable antinutritional factors in food grains – their structure and role in human nutrition – Different processing methods to eliminate (post harvest technology) decrease antinutritional factors.

References :

1. (Bewley, J.D. and M. Black, 1985. Seeds : Physiology of development and germination, Plenum Press : New York.
2. Murray, D.R. 1984. Seed Physiology Vol. I & II. Academic Press. Sydney ,London.
3. Mehta S.L., Lodha, M.L. and Sane, P.V. 1993. Recent Advances in Plant Biochemistry. Publication and Information Division ICAR, New Delhi.
4. Weil J.H. 1990, General Biochemistry, Wiley Eastern Limited, New Delhi.
5. D.K. Salunkhe, Kadam S.S. and Chavsan J.K. 1985. Post harvest Biotechnology of food legumes. CRC Press, Boca Raton, Florida, USA.
6. Salunke D.K., Chavan J.K., and Kadam S.S. (1985) CRC Press, Boca Raton, Florida, Post harvest Biotechnology of Cereals. USA.
7. Arora S.K. (1982) Chemistry and Biochemistry of food leguemes, Oxford and IBH Publication, New Delhi.
8. Daussant, J., Mosse.J and Vaughan, J. (1983). Seed Proteins, Academic Press, New York, USA.
9. Murray, D.R. 1987, Nutritive role of seed coats in developing legume seeds. *Amer. J. Bot 74 :* 1122 – 1137.
10. Higgins T.J.V. 1984. Synthesis and regulation of major proteins in seeds. *Ann Rev. Plant Physiol. 35*:191-221

PAPER III – 9. MEDICINAL PLANT SCIENCE

UNIT I:
Ethonobotany in human welfare – food, health-care conservation, bio-chemistry. Regional studies, recent trends and socio-economic aspects.

UNIT II:
Pharmacognosy – Introduction, the oldest modern science classification of vegetable drugs, identification of drugs (taxonomical, anatomical, fluorescence, chemicals, organoleptic, microscopic only).

UNIT III:
Sources of vegetable drugs – Biological, geographical and culturals. Production of vegetable drugs – role of growth regulators. Deterioration of drugs and their control measures.

UNIT IV:
Chemistry of vegetable drugs – acid, alcohol, ester, carbohydrate, phenolic compounds, volatile oils, resin and saponin

UNIT V:
Importance and significance of flavonoids, alkaloids tumor inhibitors, vitamins, hormones, pesticides and antibiotics of plant origin.

References :

1. Anna de Pasguale 1984 – Pharmacognosy: The oldes modern Science, *J. Ethnobiology*, 11:1-16.
2. Anonymous 1970 – The Pharmocopoea of India – Govt. of India, New Delhi.
3. Chase, P.R. and Pratt 1949 – Fluorescence of powdered vegetable drugs with particular reference to development of a system of identification *J.Am. Pharm. Assoc*. 38:324-331.
4. Jain S.K. (Ed.) 1996 – Ethnobiology in human welfare. Deep. Pub. A/3/27A DDA Flats Pashim Vihar, New Delhi.
5. Nadkarni K.M. 1954 – Indian Materia Medica, Karnataka Printing Press, Bombay.
6. Trease G.E. and Evans W.C. 1978 – Pharmacognosy Bailliere Tindal, Londan.
7. Wallis T.E. 1985 – Text Book of Pharmacognosy (5^{th} Ed) CBS Pub. Distributors. Bhola North Nagar, Delhi – 110 032.
8. Harborne J.B. – Phytochemical Methods (2^{nd} Ed.) Chapman and Hall. London.

PAPER III – 10. FLORISTICS, TAXONOMY & ETHNOBOTANY

UNIT I:
History of classification (pre and post – Darwinian). Aims of taxonomy. Units of classification, taxonomic hierarchy, concepts of families, genera, species and infraspecific taxa. Importance of characters, including anatomical, cytological, embryological and palynological, in taxonomy.

UNIT II:
Herbarium and its functions. Major herbaria in India. Floras, revisions and monographs. Botanical nomenclature. History of floristic studies in peninsular India.

UNIT III:
Ethnobotany (particularly) of south Indian tribals. Ethnobotanical aspects of conservation and. management of plant resources. Importance of wild relatives of cultivated plants. Access Benefit Sharing

UNIT IV:
Floristic regions of India. Flora of peninsular India and their affinities and endemism with particular reference to angiosperms. Vegetation/forest types in peninsular India.

UNIT V:
Floristic diversity (flowering plants) in peninsular India. Services rendered and goods supplied by tropical forests. Causal factors of degradation and depletion of tropical forests. Rare and endangered species of flowering plants and their *in situ* (including National parks, Wildlife sanctuaries and biosphere reserves in peninsular India) and *ex situ* conservation. Sacred grooves. Convention on International Trade in Endangered Species (CITES).

References:

1. Third Edition An Integrated Approach by Gurcharan Singh, publisher: Science Science (2004).
2. Plant taxonomy by OP Sharma, Publisher: Tata McGraw-Hill Education (2011).
3. Revised Survey Of The Forest Types Of India Paperback –.by Harry G. Champion (Author), S.K. Seth (Author), (2005).
4. A Handbook of Field and Herbarium Methods by S. K. Jain (Author), R. R. Rao (Editor) publisher: Today & Tomorrows Printers and Publishers, New Delhi (2016).
5. Ethnobotany of India, Volume 3: North-East India and the Andaman and Nicobar Islands by T. Pullaiah, K. V. Krishnamurthy, Bir Bahadur publisher: Apple Academic Press (2017).
6. Indian Ethnobotany: Emerging Trend by Ashok K. Jain, Publisher: Scientific (2016).
7. Applied Ethnobotany: People, Wild Plant Use and Conservation by by Anthony B. Cunningham (Routledge), (2001).
8. Biodiversity in India : Vol. V Edited by T. Pullaiah, Publisher: Regency Pub (2011)
9. Methods and Practice in Biodiversity Conservation Editors: Hawksworth, David (Ed.) Publisher: springer (2010).

PAPER III – 11. TEA CULTIVATION

UNIT I:

Botany & breeding of tea - tea growing areas in India, health benefits of tea, taxonomy & morphology of tea producing *taxa*, clonal selection methods in tea, breeding methods in tea

UNIT II:

Propagation techniques of tea - tea seed propagation methods, clones and their characters, tea clonal propagation methods, nursery grafting techniques, nursery management : nutrients, pests and diseases

UNIT III:

Cultivation techniques of tea - land clearing, soil and water conservation measures, planting methods, training of young tea, shade trees and their management, types of pruning, pruning methods, tipping, types and development of crop shoots, methods of harvesting, nutrients application : major and minor nutrients in tea, bio fertilizers in tea

UNIT IV:

Pest, disease and weed management in tea - major pests and diseases in tea plantations and their control measures, integrated pest and disease management (IPDM), biological control, spraying techniques, plant protection code for tea plantations, microbial contamination in tea, maximum residue limits (MRL) in tea, classification of weeds, herbicides applied in tea, herbicide resistance weeds, properties and dosage of herbicides

UNIT V:

Biochemistry and plant physiology of tea – bio chemistry of different types of tea, chemical analysis of tea for quality, soil analysis for nutrient levels, plant growth regulators (PGR), tissue culture techniques in tea

References:

1. J. Durairaj, B. Radhakrishnan, JB Hudson & N Muraleedharan. 2015. Guidelines of tea culture. United planters association of southern India, Coonoor. India
2. Hand book of tea culture. UPASI Tea Research Institute, Valparai 642127, India
3. Ready Reckoner on tea. UPASI Tea Research Institute, Valparai 642127, India