SEMESTER II

HCT-2.1 ECOLOGY AND ENVIRONMENTAL BIOLOGY		48 hrs
Unit-I	Scope of ecology in environmental management. Climatic factors: interaction of ecological factors- light-temp, precipitation, humidity, wind and atmospheric gases; Fire factor; Edaphic factors-composition of soil- formation of soil, soil profile, soil classification, soil components and properties, soil erosion and conservation.	**8hrs**
Unit-II	Ecosystem – Structure and function; Energy flow, food chain, tropic levels. Ecological pyramids, charting of ecology; pathway and measurement rate; primary and secondary metabolic activities.	**6hrs**
Unit-III	Biogeochemical cycles : hydrological, gaseous (Carbon and Nitrogen) & sedimentary cycles, nutrient budget with reference to nitrogen, and carbon sequestration, climate change protocol, global warming issues. Ecological succession: models, trends and causes; time factor and stability.	**8hrs**
Unit-IV	Population ecology: attributes, density and distribution, natality, mortality, age distribution, population growth, growth rate composition, Hardy Weinberg law.	**8hrs**
Unit-V	Major ecosystems of the world: pond, river, marine, deserts, tundra and forest, productivity of different ecosystems: grassland, forest, shola, savanna, thar, Chillka lake, Western and east Himalaya, Western Ghats. Ganga action plan.	**4hrs**
Unit-VI	Environmental pollution: Introduction, causes, effects and control measures of water pollution, air pollution, soil (Land) pollution, noise pollution, acid rain, global warming, ozone depletion and public health	**6hrs**
Unit VII	Remote sensing and GIS: Basic and fundamental concepts of remote sensing.	**4hrs**
Unit VIII	Environmental Impact Assessment: Introduction, process and methods of impact analysis. International biological program, UNESCO, MAB. UNEP.	**4hrs**

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20. Williams, I. 2001. Environmental Chemistry. John Wiley and Sons, Ltd., New York.

HCT-2.2 CELL AND MOLECULAR BIOLOGY		**48 hrs**
Unit-I	Prokaryotic cell, ultrastructure of mycoplasma, bacteria. Structure of eukaryotic cell. Plasma membrane – organization and function. Cytoskeleton – microtubules, cilia and flagella. Structure and function of endoplasmic reticulum, Golgi complex, Ribosomes, mitochondria, chloroplast, lysosomes and peroxisomes. Structure and function of nucleus and nucleolus.	**10hrs**
Unit-II	Structure and organization of eukaryotic chromosome, centromeric and telomeric structure, Law of DNA constancy and C-value paradox. Special chromosomes – B-chromosomes, polytene and lampbrush chromosomes.	**6hrs**
Unit-III	Mechanism of cell division: Cell cycle regulatory enzymes and proteins, chiasma formation, mechanism of recombination, synaptonemal complex.	**4hrs**
Unit-IV	Chromosomal Aberrations: types and evolutionary significance. Numerical changes in chromosomes – euploidy, haploidy, polyploidy, aneuploidy and evolutionary significance.	**6hrs**
Unit-V	Mutagenesis – physical and chemical mutagens, molecular basis of mutation, DNA repair mechanism. Transposable elements, transposon tagging of genes, genetic and evolutionary significance.	**4hrs**

HCT-2.3: GENETICS AND EVOLUTION		48 hrs
Unit-I	Mendelian principles, alleles, linkage and crossing over, genetic maps. Sex determination in plants. Extrachromosomal inheritance, somatic cell genetics. Inheritance of quantitative characters.	**8hrs**
Unit-II	Concept of genes – fine structure of gene, spit genes, overlapping genes, included genes. Recombination in bacteria and phages – conjugation, transformation and transduction.	**8hrs**
Unit-III	Gene expression in prokaryotes and in eukaryotes.	**4hrs**
Unit-IV	Genetic engineering – Restriction endonucleases, ligase, vectors, gene cloning techniques, polymerase chain reaction, southern and northern blotting.	**6hrs**
Unit-V	Origin of life, chemical evolution, molecular evolution. Theories of evolution – Lamarckism, neo-Lamarckism, Darwinism, neo-Darwinism, Mutation theory and synthetic theory.	**6hrs**
Unit-VI	Population genetics and evolution – Mendelian population, gene pool, gene frequency, genetic drift, founder effect, genetic polymorphism. Hardy-Weinberg law, mechanism of speciation	**8hrs**
Unit VII	Molecular Evolution: Concepts of neutral evolution, molecular divergence and molecular clocks; Molecular tools in phylogeny, classification and identification; Protein and nucleotide sequence analysis; origin of new genes and proteins; Gene duplication and divergence.	**8hrs**

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1. Goodenough U, 1990. Genetics. Armugam N, 1992. Organic evolution.
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26. Swanson, C.P. 1972. Cytology and Cytogenetics. Mac Millan. New York.

SCT-2.1: METHODS IN PLANT SCIENCE		**48 hrs**
Unit-I	Microscopy – Principles and working mechanism of transmitted and incident microscopy. Principles, working mechanism and uses of Dark field microscopy, polarization microscopy, fluorescence microscopy, phase contrast microscopy. Electron microscopy – TEM, SEM, STM.	**8hrs**
Unit-II	Processing of plant material for light and electron microscopy. Principles and uses of microtomy; Fixing of plant material, dehydration, staining procedures.	**6hrs**
Unit-III	Centrifugation techniques – differential, density gradient centrifugation. Spectroscopic methods – ultraviolet and visible spectroscopy, Raman spectroscopy, nuclear magnetic resonance technique, fluorescence and mass spectroscopy.	**8hrs**
Unit-IV	Isolation and purification of RNA, DNA (genomic and plasmid) and proteins, different separation methods. Generation of genomic and cDNA libraries in plasmid, phage, cosmid, BAC and YAC vectors. Expression vector and expression of protein in brief, Autoradiography, Method of DNA sequencing, micro array technique.	**12hrs**
Unit-V	Techniques of protein isolation, purification and separation – chromatographic techniques, ion exchange, gel filtration affinity chromatography, high performance liquid chromatography. Electrophoresis techniques – agarose, polyacrylamide	**10hrs**

1. Abbottt, A.J. and Atkin, R.K. 9eds.) 1987 Improving vegetatively propagated crops. Academic press, New York.
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OE-3.1 PLANT DIVERSITY AND HUMAN WELFARE		**48hrs**
Unit-I	Plant diversity and its scope- Genetic diversity, Species diversity, Plant diversity at the ecosystem level, Agrobiodivesity and cultivated plant taxa, wild taxa. Values and uses of Biodiversity: Ethical and aesthetic values, Precautionary principle, Methodologies for valuation, Uses of plants, Uses of microbes.	**12hrs**
Unit-II	Loss of Biodiversity: Loss of genetic diversity, Loss of species diversity, Loss of ecosystem diversity, Loss of agrobiodiversity, Projected scenario for biodiversity loss, Management of Plant Biodiversity: Organizations associated with biodiversity management-Methodology for execution-IUCN, UNEP, UNESCO, WWF, NBPGR; Biodiversity legislation and conservations, Biodiversity information management and communication	**14hrs**
Unit-III	Conservation of Biodiversity: Conservation of genetic diversity, species diversity and ecosystem diversity, In situ and ex situ conservation, Social approaches to conservation, Biodiversity awareness programmes, Sustainable development.	**10hrs**
Unit-IV	Role of plants in relation to Human Welfare; a) Importance of forestry their utilization and commercial aspects b) Avenue trees, c) Ornamental plants of India. d) Alcoholic beverages through ages. Fruits and nuts: Fruit crops of Karnataka and their commercial importance. Wood and its uses.	**12hrs**

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12. Sharma J R (1994). Principles and practices of Plant Breeding. Tata McGraw-Hill Publishers
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SCT-4.1 PLANT BIOTECHNOLOGY		**48 hrs**
Unit-I	Plant tissue culture: Scope and Importance of plant tissue culture-Media composition and types, hormones and growth regulators, explants for organogenesis, somaclonal variation and cell line selection, production of haploid plants and homozygous cell lines. Micro propagation, somatic embryogenesis, protoplast culture and somatic hybridization. Selection and maintaiinance of cell lines, cryopreservation, germplasm collection and conservation, plant tissue culture certification.	**8hrs**
Unit-II	Plant transformation techniques: Mechanism of DNA transfer – Agro bacterium mediated gene transfer, Ti and Ri plasmids as vectors, role of virulence genes; design of expression vectors; 35S promoter, genetic markers, reporter genes; viral vectors and binary vectors. Direct gene transfer methods-particle bombardment, electroporation and microinjection. Binary vectors.	**8hrs**
Unit-III	Metabolic engineering of plants: Plant cell culture for the production of useful chemicals and secondary metabolites (Hairy root culture, Biotransformation, Elicitation) - pigments, flavonoids, alkaloids; mechanism and manipulation of shikimate pathway. Commercial production of enzymes, biodegradable plastics, therapeutic proteins, edible vaccines and antibiotics using transgenic technology.	**8hrs**
Unit-IV	Plant Development: Plant growth regulators- auxin, gibberlins, cytokinins, abscicic acid and acetylene. Biological nitrogen fixation, importance and mechanism.Biofertilizers- production, VAM, Rhizobium, Azotobacter, Mycorhiza, Actinorhiza Vermicomposting technology and Biopesticides.	**6hrs**
Unit-V	Gene Manipulation Technology: Crop improvement, productivity, performance and fortification of agricultural products–Bt cotton, Btbrinjal. Herbicide resistance, viral resistance, bacterial resistance, fungal resistance crops. Golden rice and transgenic sweet potato.Stratagies for engineering stress tolerance. Transgenic plants;	**10hrs**

	ethnobotany, ethnomedicine, ethnoecology, ethnic communities of India. Application of natural products to certain diseases- Jaundice, cardiac, infertility, diabetics, Blood pressure and skin diseases.	

References

1. Trivedi P C, 2006. Medicinal Plants: Ethnobotanical Approach, Agrobios, India.
2. Purohit and Vyas, 2008. Medicinal Plant Cultivation: A Scientific Approach, 2nd edn. Agrobios, India.
3. Yoganarasimhan S N. Medicinal Plants of India- Vol 1- Karnataka, Interline Publishing Pvt. Ltd.

OE-4.1 AESTHETIC BOTANY		**48 hrs**
Unit-I	**Phytogeography:** Climate and Vegetation of the world Floristic regions of the world. Phytogeographical regions of India; Endemism; Concept of hotspots, hot spots of the world. Forest types of India	**8hrs**
Unit-II	**Gardening** Garden Design: Scope and objectives of gardening; Style of gardens (Formal, Informal); Types of gardens (English, Mughal and Japanese) Components of garden; Planning of outdoor gardens- Small, Residential, Larger Home Garden, Roof Garden, Terrace Garden, Industrial garden, Housing complex, Indoor gardening Garden Features and Ornamentation: Water, Garden pool, Stream, Waterfall, Fountain, Rocks, Roads, Walks, Pavements and Steps, Walls fences and Gates, Hedges, Edges, Arches, Statues, Towers.	**12hrs**
Unit-III	**Floriculture** Nursery production and management: Scope, Site, Soil, Environment, Layout, Manure, Fertilizers, Maintenance, Garden tools, Culture and Garden calendar, Types, Nursery beds, Pest & Disease management. Propagation of ornamental plants by seeds, bulbs, layering, cuttings, grafting, budding & tissue culture. Plant disorders including nutrition, pests and diseases, and chimaeras Ornamental ferns and their propagation; herbaceous perennials, Annuals & Biennials: Important Genera and Species, their importance in garden designs.	**14hrs**
Unit-IV	**Landscaping** Landscape Design: Definition, objectives and scope, Landscape elements of construction and designing of Residential, Commercial, Bungalow, Public area, Hotel, Educational Institute and religious places Palms and Cycas: Characteristics, propagation, culture, pest and disease, importance and uses, genera and species of palms and	**14hrs**

	Cycads. Bamboo and conifers: Genera, species and varieties Lawns & Grasses: Planting methods, maintenance, pest management Ornamental succulents, Cacti Polyhouse technology: Scope and objectives of floriculture.	

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1. Randhawa GS and Mukhopadhyay A. 2004. Floriculture in India. Allied Publishers Pvt. Limited. 72
2. Swarup Vishnu. 2003. Garden Flowers. National Book Trust
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6. Biochemistry, Strayer W.H. 1976. Foreman Company.
7. Introduction to Plant Physiology. Willium G. Hopkins and Norman P. A. Huner
8. Plant Physiology. Lincoln Taiz and Eduardo Zeiger. International Edition
9. Plant Biochemistry. P.M. Dey and J.B. Harborne
10. Plant Biochemistry. Hans-Walter Heldt
11. Physicochemical and Environmental Plant Physiology. Park S. Nobel.

OE-4.1 MEDICINAL BOTANY		**48hrs**
Unit-I	History, Scope and Importance of Medicinal Plants. Indigenous Medicinal Sciences; Definition and Scope-Ayurveda: History, origin, panchamahabhutas, saptadhatu and tridosha concepts, Rasayana, plants used in ayurvedic treatments, Siddha: Origin of Siddha medicinal systems, Basis of Siddha system, plants used in Siddha medicine. Unani: History, concept: Umoor-etabiya, tumors treatments/ therapy, polyherbal formulations.	**12hrs**
Unit-II	Conservation of endangered and endemic medicinal plants. Definition: endemic and endangered medicinal plants, Red list criteria; In situ conservation: Biosphere reserves, sacred groves, National Parks; Ex situ conservation: Botanic Gardens, Ethnomedicinal plant Gardens. Propagation of Medicinal Plants: Objectives of the nursery, its classification, important components of a nursery, sowing, pricking, use of green house for nursery production, propagation through cuttings, layering, grafting and budding.	**14hrs**
Unit-III	Sources of financial aids for medicinal plant cultivation: Aims and objectives, Functions and activities of the board, Schemes and Projects for Financial assistance, Funding of projects; Procedure for processing project proposal for approval, Implementation and monitoring.	**12hrs**
Unit-IV	Ethnobotany and Folk medicines. Definition; Ethnobotany in India: Methods to study ethnobotany; Applications of Ethnobotany: National interacts, Palaeo-ethnobotany. Folk medicines of	**10hrs**

	ethnobotany, ethnomedicine, ethnoecology, ethnic communities of India. Application of natural products to certain diseases- Jaundice, cardiac, infertility, diabetics, Blood pressure and skin diseases.	

References

1. Trivedi P C, 2006. Medicinal Plants: Ethnobotanical Approach, Agrobios, India.
2. Purohit and Vyas, 2008. Medicinal Plant Cultivation: A Scientific Approach, 2nd edn. Agrobios, India.
3. Yoganarasimhan S N. Medicinal Plants of India- Vol 1- Karnataka, Interline Publishing Pvt. Ltd.

OE-4.1 AESTHETIC BOTANY		**48 hrs**
Unit-I	**Phytogeography:** Climate and Vegetation of the world Floristic regions of the world. Phytogeographical regions of India; Endemism; Concept of hotspots, hot spots of the world. Forest types of India	**8hrs**
Unit-II	**Gardening** Garden Design: Scope and objectives of gardening; Style of gardens (Formal, Informal); Types of gardens (English, Mughal and Japanese) Components of garden; Planning of outdoor gardens- Small, Residential, Larger Home Garden, Roof Garden, Terrace Garden, Industrial garden, Housing complex, Indoor gardening Garden Features and Ornamentation: Water, Garden pool, Stream, Waterfall, Fountain, Rocks, Roads, Walks, Pavements and Steps, Walls fences and Gates, Hedges, Edges, Arches, Statues, Towers.	**12hrs**
Unit-III	**Floriculture** Nursery production and management: Scope, Site, Soil, Environment, Layout, Manure, Fertilizers, Maintenance, Garden tools, Culture and Garden calendar, Types, Nursery beds, Pest & Disease management. Propagation of ornamental plants by seeds, bulbs, layering, cuttings, grafting, budding & tissue culture. Plant disorders including nutrition, pests and diseases, and chimaeras Ornamental ferns and their propagation; herbaceous perennials, Annuals & Biennials: Important Genera and Species, their importance in garden designs.	**14hrs**
Unit-IV	**Landscaping** Landscape Design: Definition, objectives and scope, Landscape elements of construction and designing of Residential, Commercial, Bungalow, Public area, Hotel, Educational Institute and religious places Palms and Cycas: Characteristics, propagation, culture, pest and disease, importance and uses, genera and species of palms and	**14hrs**

HCT-1.3: GYMNOSPERMS AND PALAEOBOTANY		48 Hours
Unit-I	Gymnosperms-Introduction Distribution, General characters, Origin, Evolution and Classification of Gymnosperms.	**4hrs**
Unit-II	Comparative account of habit, anatomy and reproduction of Cycadales: Cycas and Zamia. Coniferales: Pinus, Araucaria, Thuja. Gnetales: Gnetum, Ephedra and Welwitschia Ginkgoales: Ginkgo	**20hrs**
Unit-III	Economic importance of Gymnosperms. Experimental works in Gymnosperms	**4hrs**
Unit-IV	Paleobotany - Objectives, Nomenclature and Geological time scale	**4hrs**
Unit-V	Fossilization and types of fossils, techniques for fossil study, factors affecting fossilization.	**4hrs**
Unit-VI	Study of morphology, anatomy and evolutionary trends of following group of fossil plants: Psilophytales, Lepidodendrales, Calmitales, Filicales, Coenopteridales, Pteridospermales, Bennettitales, Pentoxylales, Cordiatales, Cycadales, Coniferales.	**12hrs**

References:

1. Bhatnagar, S.P. and Moitra, A. 1996. Gymnosperms. New Age International Pvt. Ltd., New Delhi.
2. Coulter and Chamberlin, J. M. 1978. Morphology of Gymnosperms.
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5. Stewart W. N. and Rathwell G.W. 1993. Palaeobotany and Evolution of Plants.
6. Shila A. C. and Mishra S. D. 1975. Essentials of Palaeobotany.

SCT-1.1: PLANT PATHOLOGY		48 hrs
Unit-I	Introduction, scope and significance of plant pathology, significant contributions of plant pathologists. Importance of plant diseases. Methods of studying plant diseases, classification of plant diseases.	**4 hrs**
Unit-II	Major diseases caused by fungi, bacteria, viruses, mycoplasma, nematodes, angiosperm parasitic diseases, non-parasitic diseases on cereals, pulses, vegetables and oil crops.	**8 hrs**
Unit-III	Pathogenesis: penetration - indirect entry of pathogens through natural openings, wounds, root hairs, buds, direct penetration. Role of toxins in pathogenesis- Introduction, microscopic system, bioassay, Host-relation toxins, non-host selective toxins, control of toxin biosynthesis	**8 hrs**
Unit-IV	Mode of transmission of pathogens by seeds air, soil, water, vectors, contagious, animals. Effect of environmental factors on disease	**6 hrs**

	development disease epidemiology and forecasting.	
Unit-V	Detection and diagnosis of plant pathogenesis- Introduction host range and symptomatology, morphology of the causal organism, selective media, biochemical markers-substrate metabolism, fatty acid profiles (FAME analysis), protein analysis, serological techniques, nucleic acid techniques, choice of diagnostic techniques.	**8 hrs**
Unit-VI	Management of plant diseases by conventional methods: cultural, chemical and biological.	**4 hrs**
Unit-VII	Mycoparasitism of soil borne plant pathogens- biotropic and necrotropic parasitism, techniques for studying mycoparasitism in natural system, ecological factors affecting parasitism, distribution of mycoparasites, mycoparasites in biological control. Predatory and parasitic fungi - predatory hyphomycetes, and hymenomycetes.	**10 hrs**

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1. Singh, R.S. 1973. Plant Disease. Oxford and IBH Pub. Co., New Delhi.
2. Agrios, G.N. 1994. Plant Pathology. 2nd Edn. Academic Press New York.
3. Johnston, A. and Both, C. 1983. Plant Pathologists Pocket Book. 2nd Edn. Commonwealth Mycological Institute, Oxford and IBH Pub. Co., Calcutta.
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6. Vidhyasekaran, P. 2004. Encyclopedia of Plant Pathology. Viva Books Pvt. Ltd., New Delhi.

SCT-1.1: PHYTOGEOGRAPHY AND EVOLUTION		**48 hrs**
Unit-I	Phytogeographical regions of the World. India: Western Himalaya, Eastern Himalaya, Indus plane, Gangetic sub-mountain zone, Temperate zone, Alpine zone. General characters of flora of India. Native taxa, naturalization of exotic taxa.	**8hrs**
Unit-II	Floristics: Floristic study of the world and India. Continental drift: A general account, tectonic movements, disjunct distribution, dispersal, migration and endemics.	**4hrs**
Unit-III	Plant Distribution: Continuous, discontinuous, Centre of origin endemic, bathymetric distribution, Centre of origin of crop plants. Evolution and Plant Migration, Dispersal, isolation, migration and barriers, vicarious species, relict species, isofloras, polytopy, centers of origin of crop plants.	**12hrs**
Unit-IV	Darwin and origin of species, models of speciation- Allopatric speciation, Sympatric speciation, Statispatric speciation. Isolating mechanism and rate of speciation. Genetic variation-inbreeding depression, protein polymorphism, variation in nucleotide sequences.	**12hrs**

	Formation of species.	
Unit-V	Evolution of sex in plants-Asexual reproduction, origin and evolution of sex organs, alternation of generations. Parthenogenesis and its applications.	**12hrs**

References:

1. Alberts, B. Bray, D. Lewis, Ralf M., Roberts, K and Watson, J.D. 1994. Molecular Biology of Cell. 3rd Edition Garland publishing co. New York.
2. Arumugam, N. 1992. Organic evolution. Saras Publication, Nagercoil.
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SCT-1.1: BIOSTATISTICS AND BIOINFORMATICS		**48 hrs**
Unit-I	Biostatistics -Introduction and scope of Biostatistics. Basic concepts of Biostatistics: Variables, constants, observation, data, population.	**2 hrs**
Unit-II	Types and collection of data: Sampling, primary data, Secondary data. Presentation of data: Line diagram, bar diagram, pie diagram, graphic presentation of data.	**4 hrs**
Unit-III	Measurement of central tendency: Mean, Median, Mode. Measures of dispersion: Range, Quartile deviation, Mean deviation, Standard deviation, Standard error, Coefficient of variation.	**6 hrs**
Unit-IV	Probability and Probability distribution: Binomial, passion and normal distribution. Testing of Hypothesis: Null hypothesis,	**8hrs**

	alternative hypothesis, z test, t test and chi-square test.	
Unit-V	Correlation and regression: Scatter diagram, simple linear regression and nonlinear regression, correlation and correlation coefficient and application. One way and two way analysis of variance and multivariate analysis of variance.	**4hrs**
Unit-VI	Computer application: Knowledge of computer systems, hardware and software, CPU and other peripheral devices, software packages, programming language, scientific application of packages.	**8 hrs**
Unit-VII	Internet: The World Wide Web and local area network (LAN), wide area network (WAN). Information retrieval, communication using internet, web data base directories, search engine.	**8hrs**
Unit-VIII	Biological Databases, Bioinformatics tools, Sequence Alignment tool, Database Searching (BLAST, FASTA), Comparative genomics, Structural and Functional genomics in brief.	**8hrs**

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SCT-2.1: PLANT GENETIC ENGINEERING		48 hrs
Unit-I	Introduction to Genetic Engineering: Concepts and scope of genetic engineering. Milestones in Plant Recombinant DNA Technology. Importance of gene manipulation in future perspectives.	**2hrs**
Unit-II	Tools in Genetic Engineering: Enzymes in genetic engineering - Restriction endonucleases- types and action, All DNA modifying enzymes. Cloning vectors: Plasmids isolation and purification- Ti Plasmid, pBR322, pUC –series. Phage vectors-M13 phage vectors, Cosmids-Types, Phasmids or Phagemids, Shuttle vectors-types. YAC and BAC vectors, Lambda phage vectors, Lamda phage DNA as a vectors. Cloning vectors and expression vectors.	**10hrs**
Unit-III	Techniques for plant Transformation: Integration of plant tissue culture in to plant transformation protocols. Introduction, *Agrobacterium* mediated gene transfer, The Ti-plasmid, The process of T-DNA transfer and integration, Practical applications of Agrobacterium-mediated plant transformation, Transformation in Planta, Direct gene transfer methods.	**8hrs**
Unit-IV	The genetic manipulation of herbicide resistance: The use of herbicide in modern agriculture, Strategies for engineering herbicide resistance, The environmental impact of herbicide-resistant crops. The genetic manipulation of pest resistance: GM strategies for insect resistance. The *Bacillus thuringiensis* approach to insect resistance, The Copy Nature Strategy, Insect resistant crops and food safety. The genetic manipulation to plant disease resistance: Plant pathogen interaction, Natural disease resistance pathways-Overlap between pests and diseases, Biotechnological resistance to disease resistance. Transgenic approaches to viral disease resistance.	**12hrs**
Unit-V	Engineering stress tolerance: The nature of Abiotic Stress, The nature of Water deficit stress, Targeted approaches towards the manipulation of tolerance to specific water deficit stresses.	**4hrs**
Unit-VI	The Improvement of crop yield and quality: The genetic manipulation of fruit ripening, engineering plant protein composition for improved nutrition, The genetic manipulation of crop yield by enhancement of photosynthesis.	**4hrs**
Unit-VII	Molecular Farming/Pharming: Metabolic engineering of plants. Carbohydates and lipids, Molecular farming of proteins, Economic consideration of molecular farming.	**4hrs**
Unit-VIII	Future prospects for GM crops: The current state of transgenic crops, Concerns about GM crops, the regulations of GM crops and products.	**4hrs**

References

1. A. Slater, N. Scott and M. Fowler. 2003. Plant Biotechnology: The genetic manipulation of plants. Oxford University Press, Oxford.

2. B.B. Buchanan, W. Gruissen and R.L. Jones (eds). 2000. Biochemistry and Molecular Biology of Plants. American Society of Plant Biology, Rockville, USA.
3. J.H. Hammond, P. Mcgarvey, and V. Yusibov (eds). 2000 Plant Biotechnology. Springer Verlag, Heidelberg.
4. H.K. Das (ed.) 2004. Text Book of Biotechnology. Wiley India Pvt. Ltd., New Delhi.
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6. J. Sambrook, E.F.Fritsch and T.Maniatis 1989. Molecular Cloning - A Laboratory Manual
7. Adrian Slater, Nigel Scott and Mark Flower, 2000 Plant Biotechnology -The Genetic Manipulation of Plants,Oxford University Press,).
8. J. Draper 1988. Plant Genetic Transformation and Gene Expression Blackwell Scientific Publications, Oxford.
9. R.W. Old, S.B. Primrose. 2004. Principles of Gene Manipulation. An Introduction to Genetic Engineering. Fifth Edition, Blackwell Science Publications.

SCT-2.1: NUTRACEUTICALS		**48 hrs**
Unit-I	Nutriceuticals as science: Importance of nutriceuticals in human health; basic food types, cultural diets, fast foods, street foods, junk foods; functional foods; food pyramids; classification of nutrients and their functions; anti-nutritional factors. Industrial fortification, forms of nutrient supplementation, vitamin and mineral supplements; biofortification, fortified crops; Golden Rice; energy drinks and infant food formulae; dietary supplements, health benefits; nutriceuticals on the market.	**12hrs**
Unit-II	Plant and animal based nutriceuticals: Antioxidants, saponins, vitamins, minerals, carotenoids, amino acids, gum and resins, chitin, chitosan, glucosamine, chondroitin, cod liver oil; Algal nutriceuticals (Spirulina, Sea weeds); Bacterial nutriceuticals, Probiotics (youghurt), Prebiotics and Synbiotics; fermented foods in health care. Lipid, carbohydrate and protein based nutriceuticals; dietary fibers, source and health benefits. Recommended Daily Allowances.	**12hrs**
Unit-III	Nutriceuticals in health and disease: In preventive and protective medicine, in cancer treatment, cholesterol and obesity control. Nutriceuticals from home garden (Aloe, Honey, Turmeric, Saffron, Ginseng, Neem, fruits, spices, herbs, Bramhi, Tulasi, Bitter guard, Fenugreek, Asafoetida, Ginger, Pepper, Garlic, Onion, Betel leaves). Diets in pregnancy, geriatric diets, paediatric diets; diets in diabetes and hypertension. Cosmeceuticals, plant based cosmeceutics in skin, hair, eye and dental care.	**12hrs**
Unit-IV	Legal control of food safety and standards: National and international regulation of food and nutriceutical standards. The Food Safety and Standards Authority of India: Food Safety and Standards Act, 2006, Indian National Codex Committee, US Foods and Drugs Administration, Codex Alimentarius Commission.	**12hrs**

2. B.B. Buchanan, W. Gruissen and R.L. Jones (eds). 2000. Biochemistry and Molecular Biology of Plants. American Society of Plant Biology, Rockville, USA.
3. J.H. Hammond, P. Mcgarvey, and V. Yusibov (eds). 2000 Plant Biotechnology. Springer Verlag, Heidelberg.
4. H.K. Das (ed.) 2004. Text Book of Biotechnology. Wiley India Pvt. Ltd., New Delhi.
5. I. Potrykus and G.Spangenberg, 1995 Gene Transfer to plants Springer, Berlin. Heidelberg.
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7. Adrian Slater, Nigel Scott and Mark Flower, 2000 Plant Biotechnology -The Genetic Manipulation of Plants,Oxford University Press,).
8. J. Draper 1988. Plant Genetic Transformation and Gene Expression Blackwell Scientific Publications, Oxford.
9. R.W. Old, S.B. Primrose. 2004. Principles of Gene Manipulation. An Introduction to Genetic Engineering. Fifth Edition, Blackwell Science Publications.

SCT-2.1: NUTRACEUTICALS		**48 hrs**
Unit-I	Nutriceuticals as science: Importance of nutriceuticals in human health; basic food types, cultural diets, fast foods, street foods, junk foods; functional foods; food pyramids; classification of nutrients and their functions; anti-nutritional factors. Industrial fortification, forms of nutrient supplementation, vitamin and mineral supplements; biofortification, fortified crops; Golden Rice; energy drinks and infant food formulae; dietary supplements, health benefits; nutriceuticals on the market.	**12hrs**
Unit-II	Plant and animal based nutriceuticals: Antioxidants, saponins, vitamins, minerals, carotenoids, amino acids, gum and resins, chitin, chitosan, glucosamine, chondroitin, cod liver oil; Algal nutriceuticals (Spirulina, Sea weeds); Bacterial nutriceuticals, Probiotics (youghurt), Prebiotics and Synbiotics; fermented foods in health care. Lipid, carbohydrate and protein based nutriceuticals; dietary fibers, source and health benefits. Recommended Daily Allowances.	**12hrs**
Unit-III	Nutriceuticals in health and disease: In preventive and protective medicine, in cancer treatment, cholesterol and obesity control. Nutriceuticals from home garden (Aloe, Honey, Turmeric, Saffron, Ginseng, Neem, fruits, spices, herbs, Bramhi, Tulasi, Bitter guard, Fenugreek, Asafoetida, Ginger, Pepper, Garlic, Onion, Betel leaves). Diets in pregnancy, geriatric diets, paediatric diets; diets in diabetes and hypertension. Cosmeceuticals, plant based cosmeceutics in skin, hair, eye and dental care.	**12hrs**
Unit-IV	Legal control of food safety and standards: National and international regulation of food and nutriceutical standards. The Food Safety and Standards Authority of India: Food Safety and Standards Act, 2006, Indian National Codex Committee, US Foods and Drugs Administration, Codex Alimentarius Commission.	**12hrs**

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1. Bagchi, D., Lau, F.C. and Ghosh, D.K. (Eds.). 2010. Biotechnology in functional foods and nutraceuticals. CRC Press, Boca Raton, Florida, USA.
2. Duggan, C., Watkins, J.B. and Walker, W.A. (Eds.). 2008. Nutrition in pediatrics: basic science and clinical applications. People's Medical Publishing House, Hamilton, USA.
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HCP-2.1 ECOLOGY AND ENVIRONMENTAL BIOLOGY

1. Analysis of water samples of lotic and lentic with reference to.
    a. Corbon dioxide
    b. Dissolved oxygen
    c. Total hardness
    d. Phosphate
    e. Sulphate
    f. Nitrates
2. Effect of SO_2 and Cl_2 gasses on plants.
3. Water holding capacity of different soil samples
4. Determination of organic content, carbonates, exchangeable bases and oxidzable organic content of soils
5. Study of vegetation by quadrat and transect method
6. Ecological instruments-Animometer, Lux meter, Rain guaze, Max and min thermometer
7. Visit to meteorological station
8. Morphological and anatomical adaptation in hydrophytes, xerophytes (succulents and non-

SCT-3.1 ECONOMIC BOTANY		48 hrs
Unit-I	**Introduction:** Plants in commerce and industry. General account: History, methods of cultivation and uses of economic crops.	**2hrs**
Unit-II	Study and utility of the useful parts of the following: Cereals and Millets- Rice, Wheat, Maize, Barley, Sorghum and Millets. Pulses: Red gram, Green gram, Black gram, Horse gram, Pea, Cow pea, Bengal gram. Oil Yielding plants: Sunflower, Safflower, Groundnut, Linseed, Rape seed. A brief introduction to horticultural plants. Floriculture.	**12hrs**
Unit-III	Study and utility of the useful parts of the following: Sugar yielding plants- Sugar cane and Sweet potato. Spices and condiments- Ginger, Turmeric, Cardamom, Cinnamon, Clove, Saffron, All spice, Black pepper, Nutmeg, Red pepper, Coriander, Cumin, Fennel and Vanilla,	**10hrs**
Unit-IV	Study and utility of the useful parts of the following: Fibre- Cotton, Jute, Flax, Hemp, Sann hemp, China grass, Coconut and Kapok. Timber yielding plants- Tectona, Dalbergia and Rosewood. Dyes- Indigo, Henna: Masticatories and fumitories: Areca nut, Beetle leaf, Tobacco. Rubber- Para rubber and other substitutes Gums- Gum Arabic, Karya gum	**12hrs**
Unit-V	Medicinal Botany: Scope and Importance of Medicinal Plants. Indigenous Medicinal Sciences. Ethnomedicinal plant Gardens. Important medicinal plants and their uses. Palaeoethnobotany. Folk medicines of ethnobotany, ethnomedicine, ethnoecology, ethnic communities of India. Application of natural products to certain diseases- Jaundice, cardiac, infertility, diabetics, Blood pressure and skin diseases.	**12hrs**

References

1. Hill, A.F. 1952. Economic Botany, TataMcGraw Hill
2. Kocchar, S.L. 1998. Economic Botany of Tropics.
3. Kochar, L.S. 1981. Economic Botany in the Tropics, Macmillan
4. Pandey, B.P. 2000. Economic Botany. S. Chand & Company, New Delhi.
5. Pandey, S.N. and Chandha, A. 1999. Economic Botany. Vikas Publishing House Pvt. Ltd. New Delhi.
6. Peter B. Kaufman *et al*., 1999. Natural Products from Plants
7. Purseglove, J.W. 1972. Tropical Crops-Monocotyledons and Dicotyledons.

SCT-3.1 MEDICINAL PLANTS AND PHYTOCHEMISTRY		48 hrs
Unit-I	Ethnobotany and Ethnomedicine: A brief account at world level and in India. A brief account on therapeutic values of important plant drugs of different taxonomic groups. Classification of medicinal plants.	**10hrs**
Unit-II	Pharmacognosy: Raw drug analysis, microscopic, macroscopic,	**10hrs**

SCT-3.1 ECONOMIC BOTANY		48 hrs
Unit-I	**Introduction:** Plants in commerce and industry. General account: History, methods of cultivation and uses of economic crops.	**2hrs**
Unit-II	Study and utility of the useful parts of the following: Cereals and Millets- Rice, Wheat, Maize, Barley, Sorghum and Millets. Pulses: Red gram, Green gram, Black gram, Horse gram, Pea, Cow pea, Bengal gram. Oil Yielding plants: Sunflower, Safflower, Groundnut, Linseed, Rape seed. A brief introduction to horticultural plants. Floriculture.	**12hrs**
Unit-III	Study and utility of the useful parts of the following: Sugar yielding plants- Sugar cane and Sweet potato. Spices and condiments- Ginger, Turmeric, Cardamom, Cinnamon, Clove, Saffron, All spice, Black pepper, Nutmeg, Red pepper, Coriander, Cumin, Fennel and Vanilla,	**10hrs**
Unit-IV	Study and utility of the useful parts of the following: Fibre- Cotton, Jute, Flax, Hemp, Sann hemp, China grass, Coconut and Kapok. Timber yielding plants- Tectona, Dalbergia and Rosewood. Dyes- Indigo, Henna: Masticatories and fumitories: Areca nut, Beetle leaf, Tobacco. Rubber- Para rubber and other substitutes Gums- Gum Arabic, Karya gum	**12hrs**
Unit-V	Medicinal Botany: Scope and Importance of Medicinal Plants. Indigenous Medicinal Sciences. Ethnomedicinal plant Gardens. Important medicinal plants and their uses. Palaeoethnobotany. Folk medicines of ethnobotany, ethnomedicine, ethnoecology, ethnic communities of India. Application of natural products to certain diseases- Jaundice, cardiac, infertility, diabetics, Blood pressure and skin diseases.	**12hrs**

References

1. Hill, A.F. 1952. Economic Botany, TataMcGraw Hill
2. Kocchar, S.L. 1998. Economic Botany of Tropics.
3. Kochar, L.S. 1981. Economic Botany in the Tropics, Macmillan
4. Pandey, B.P. 2000. Economic Botany. S. Chand & Company, New Delhi.
5. Pandey, S.N. and Chandha, A. 1999. Economic Botany. Vikas Publishing House Pvt. Ltd. New Delhi.
6. Peter B. Kaufman *et al*., 1999. Natural Products from Plants
7. Purseglove, J.W. 1972. Tropical Crops-Monocotyledons and Dicotyledons.

SCT-3.1 MEDICINAL PLANTS AND PHYTOCHEMISTRY		48 hrs
Unit-I	Ethnobotany and Ethnomedicine: A brief account at world level and in India. A brief account on therapeutic values of important plant drugs of different taxonomic groups. Classification of medicinal plants.	**10hrs**
Unit-II	Pharmacognosy: Raw drug analysis, microscopic, macroscopic,	**10hrs**

	Characteristics, preliminary chemical analysis, qualitative and quantitative analysis of raw drug using Colorimetry, Spectophotometry, Chromatography (*Senna, Datura, Cinchona, Ginger, Nuxvomica, Withania, Rauwolfia, Emblica*)	
Unit-III	Cultivation of medicinal and aromatic plants: Cultivation practice, disease and pest control, harvesting and storage of medicinal plants, post-harvest care, deterioration and disintegration of active compounds during storage and its control. (*Dioscorea, Isabgol, Senna, Liquiorice, Rauwolfia, Costus, Withania, Citronella, Vetiver, Artimisia, Acorus, Vanilla*)	**12hrs**
Unit-IV	Phytochemistry - Occurrence, classification and properties of Alkaloids, Steroids, Terpenoids, Lectins, Non Protein Amino acids. Pesticidal, and Insecticidal properties of compounds of plant origin	**8hrs**
Unit-V	Medicinal oil: occurrence, distribution and importance of aromatic and non-aromatic oils of plant source. Use of vegetable oil as food, medicine and industry..	**4hrs**
Unit-VI	Plants in the treatment of Stress, Heart diseases, Cancer, AIDS, anti-fertility, anti-microbial activity	**4hrs**

References:

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10. Vijay adnhaleshi C 2004 Compendium on Controversial Drugs, Jagdguru Sriman Madhwacharya Moolamahasamsthana Sri Raghavendraswamy Matha, Manthralayam.

SCT-3.1 BIODIVERSITY AND CONSERVATION		48 hrs
Unit-I	Species concept: Concept and importance of biodiversity, Earth summit 1992, and agenda 21, species diversity, genetic diversity, ecosystem diversity, Biodiversity of the world, India and Karnataka, Hotspots of world and India, Mega biodiversity centres of world and India. Origin centers of crop plants.	**10hrs**
Unit-II	Loss of Biodiversity: Casual factors of threat, Impact of habitat loss and habitat fragmentation, Categories of treat endangered, vulnerable, rare, threatened and extinct. Red Data Book. Environmental impact assessment, sustainable development.	**10hrs**
Unit-III	Biodiversity Conservation: Objectives, implication and action plans, International and National organizations for conservation of natural resources. In situ conservation – protected areas, biosphere reserves, national parks, sanctuaries and sacred groves. ex situ – conservation, botanical gardens, gene banks, medicinal conservation parks, herbal gardens.	**10hrs**
Unit-IV	International organizations for biodiversity conservation- IUCN, Species survival commission (SSC), convention on biological diversity (CBD), CITES, TRAFFIC, WWF. Plant genetic resources: Conservation, gene bank- methods, types, NBPGR, IPGR.	**10hrs**
Unit-V	Biodiversity conservation Legal aspects: Legal aspects of biodiversity in India. Policy and priority setting. Biodiversity conservation future strategies for India.	**8hrs**

References

1. Ramakrishna, P.S. 1991. Ecology of Biological innovation in the Tropics. National Trust of Ecology and International science Publication, New Delhi.
2. Ramakrishna, P.S., Das, A.K. and K.G. Saxena. 1996. Conserving Biodiversity for Sustainble Development. INSA, New Delhi.
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11. Glasson, J., Therivel, R. & Chadwick, A. 1995. - Introduction to environment impact assessment. UCL Press Ltd., London.

3. Survey of important timber yielding trees of the region.
4. Determination of the minimum size of the quadrat suitable for an area using 'species area curve' method.
5. Determination of Importance Value Index (IVI) of the plant species in the community by quadrant method.
6. Study of Phytogeographic maps of world and India.
7. Map of Hot spots, Continental drift.

OE-3.1 PLANT PROPAGATION TECHNIQUES		**48hrs**
Unit-I	Plant propagation- History, scope and importance. Propagation structures with reference to greenhouse equipment and media.	**3hrs**
Unit-II	Seed propagation; Germination, type of seed dormancy and breaking, techniques of seed production and handling principles.	**6hrs**
Unit-III	Vegetative propagation: Techniques of propagation a) Cuttings: Stem cuttings – hard wood, semi hard wood, soft wood and herbaceous, leaf cuttings, leaf bud cuttings, root cuttings. b) Layering: Simple layering, compound, tip layering, stool, air, serpentine and trench layering. c) Budding: T – budding patch budding, chip budding, ring budding. d) Grafting: Whip and tongue, wedge and cleft, bark, side grafting, approach. e) Propagation by specialized stems and roots	**12hrs**
Unit-IV	Micropropagation – Techniques and applications in forestry and horticulture.	**5hrs**
Unit-V	Advantage, limitations and applications of vegetative propagation, clones, genetic variation in asexually propagated plants, different methods.	**5hrs**
Unit-VI	Seed propagation: Seed production, types of seed sowing, harvesting, drying and thrashing, storage, types of storage, pathogens in storage and their control, seed health, purity, vigor, and tests to check. Dormancy types, factors affecting dormancy, methods to overcome dormancy, advantages of dormancy. Seed germination and viability tests seed protectants; priming. Coating, pelleting, Classes of seeds; breeder seeds, nuclear seeds, founder seeds, certified seeds and cultivar seeds, seed act 1966, seed certification. Liner production and hardening of seedlings, seed certification, seed act	**12hrs**
Unit-VII	Propagation methods of some selected plants – Citrus, Grape, Mango, Mulberry, Hibiscus, Rose, Croton, Eucalyptus.	**5hrs**

References

12. Sharma J R (1994). Principles and practices of Plant Breeding. Tata McGraw-Hill Publishers
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SCT-4.1 PLANT BIOTECHNOLOGY		**48 hrs**
Unit-I	Plant tissue culture: Scope and Importance of plant tissue culture-Media composition and types, hormones and growth regulators, explants for organogenesis, somaclonal variation and cell line selection, production of haploid plants and homozygous cell lines. Micro propagation, somatic embryogenesis, protoplast culture and somatic hybridization. Selection and maintaiinance of cell lines, cryopreservation, germplasm collection and conservation, plant tissue culture certification.	**8hrs**
Unit-II	Plant transformation techniques: Mechanism of DNA transfer – Agro bacterium mediated gene transfer, Ti and Ri plasmids as vectors, role of virulence genes; design of expression vectors; 35S promoter, genetic markers, reporter genes; viral vectors and binary vectors. Direct gene transfer methods-particle bombardment, electroporation and microinjection. Binary vectors.	**8hrs**
Unit-III	Metabolic engineering of plants: Plant cell culture for the production of useful chemicals and secondary metabolites (Hairy root culture, Biotransformation, Elicitation) - pigments, flavonoids, alkaloids; mechanism and manipulation of shikimate pathway. Commercial production of enzymes, biodegradable plastics, therapeutic proteins, edible vaccines and antibiotics using transgenic technology.	**8hrs**
Unit-IV	Plant Development: Plant growth regulators- auxin, gibberlins, cytokinins, abscicic acid and acetylene. Biological nitrogen fixation, importance and mechanism.Biofertilizers- production, VAM, Rhizobium, Azotobacter, Mycorhiza, Actinorhiza Vermicomposting technology and Biopesticides.	**6hrs**
Unit-V	Gene Manipulation Technology: Crop improvement, productivity, performance and fortification of agricultural products–Bt cotton, Btbrinjal. Herbicide resistance, viral resistance, bacterial resistance, fungal resistance crops. Golden rice and transgenic sweet potato.Stratagies for engineering stress tolerance. Transgenic plants;	**10hrs**

	Current status of transgenic plants in India and other countries, Ethical issues associated with GM crops and GM food; labelling of GM plants and products. Importance of integrated pest management.	
Unit-VI	Post-harvest technology: RNAi and antisense RNA technology for extending shelf life of fruits and flowers (ACC synthase gene and polygalactoronase); delay of softening and ripening of fleshy fruits (tomato, banana, watermelons). Post-harvest protection of cereals, millets and pulses.	**8hrs**

References

1. Alan Scragg, 2005. Environemntal Biotechnology. II Edition. Oxford University Press. New York.
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SCT -4.1 ETHNOBOTANY AND IPR		**48hrs**
Unit-I	Ethnobotany: Introduction, concept, scope and objectives; Ethnobotany as an interdisciplinary science. The relevance of ethnobotany in the present context; Ethnic groups and Ethnobotany: Major and minor ethnic groups or Tribals of India, and their life styles. Forest Vs. ethnic groups; Plants in Tribal life with reference to Magico-religious rituals and social customs. Sacred groves.	**12hrs**
Unit-II	Methodology of Ethnobotanical studies: a) Field work b) Herbarium c) Ancient Literature d) Archaeological findings e) temples and sacred places f) Protocols.	**10hrs**
Unit-III	Role of ethnobotany in modern Medicine with special examples; Medico-ethnobotanical sources in India with special reference to Karnataka; Tribals Vs. Agriculture: Shifting, Podu and Jhum cultivation. Role of ethnic groups on surrounding environment. Crop Genetic sources. Endangered taxa and forest management (participatory forest management).	**12hrs**
Unit-IV	Ethnobotany and legal aspects. Ethnobotany as a tool to protect interests of ethnic groups. Sharing of wealth concept with few examples from India. Ethnobotany as a source (recent) of already known drugs: a) Withania as an antioxidant and relaxant b) Sarpagandha in brain ailments c) Becopa and Centella in epilepsy and memory development in children d) Phyllanthus fraternus in diabetic and viral jaundice e) Artemisia as a powerful cerebral antimalarial agent and its possible use in tuberculosis. Biopiracy, Intellectual Property Rights and Traditional Knowledge.	**14hrs**

21. NickoloffJ.A.Methods in molecular biology, Plant cell electroporation and electrofusion protocols-Humana press incorp, USA. 1995.
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References:

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7. Introduction to Plant Physiology. Willium G. Hopkins and Norman P. A. Huner
8. Plant Physiology. Lincoln Taiz and Eduardo Zeiger. International Edition
9. Plant Biochemistry. P.M. Dey and J.B. Harborne
10. Plant Biochemistry. Hans-Walter Heldt
11. Physicochemical and Environmental Plant Physiology. Park S. Nobel.

OE-4.1 MEDICINAL BOTANY		**48hrs**
Unit-I	History, Scope and Importance of Medicinal Plants. Indigenous Medicinal Sciences; Definition and Scope-Ayurveda: History, origin, panchamahabhutas, saptadhatu and tridosha concepts, Rasayana, plants used in ayurvedic treatments, Siddha: Origin of Siddha medicinal systems, Basis of Siddha system, plants used in Siddha medicine. Unani: History, concept: Umoor-etabiya, tumors treatments/ therapy, polyherbal formulations.	**12hrs**
Unit-II	Conservation of endangered and endemic medicinal plants. Definition: endemic and endangered medicinal plants, Red list criteria; In situ conservation: Biosphere reserves, sacred groves, National Parks; Ex situ conservation: Botanic Gardens, Ethnomedicinal plant Gardens. Propagation of Medicinal Plants: Objectives of the nursery, its classification, important components of a nursery, sowing, pricking, use of green house for nursery production, propagation through cuttings, layering, grafting and budding.	**14hrs**
Unit-III	Sources of financial aids for medicinal plant cultivation: Aims and objectives, Functions and activities of the board, Schemes and Projects for Financial assistance, Funding of projects; Procedure for processing project proposal for approval, Implementation and monitoring.	**12hrs**
Unit-IV	Ethnobotany and Folk medicines. Definition; Ethnobotany in India: Methods to study ethnobotany; Applications of Ethnobotany: National interacts, Palaeo-ethnobotany. Folk medicines of	**10hrs**

Akkamahadevi Women's University, Vijayapura

M.Sc. Botany Programme - Choice Based Credit System (CBCS) Syllabus

CORE SUBJECT: BOTANY – [Post Graduate]

Course code	Course name	Credits				Marks										Remark
						C1			C2			C3			Total	
		L	T	P	Total	L	T	P	L	T	P	L	T	P		
Semester I																
HCT-1.1	Phycology, Mycology, Bacteriology and Virology	04			04	15			15			70			100	
HCT-1.2	Bryophytes and Pteridophytes	04			04	15			15			70			100	
HCT-1.3	Gymnosperms and Palaeobotany	04			04	15			15			70			100	
SCT-1.1*	Plant Pathology Phytogeography and Evolution Biostatistics and Bioinformatics *(One of the above SOFT CORE subjects shall be selected by the candidate/ as per the decision of the Departmental Council one SC may be offered)	04			04	15			15			70			100	
HCP-1.1	Phycology, Mycology, Bacteriology and Virology			02	02			07			07			36	50	
HCP-1.2	Bryophytes and Pteridophytes			02	02			07			07			36	50	
HCP-1.3	Gymnosperms and Palaeobotany			02	02			07			07			36	50	
SCP-1.1*	*Based on Soft Core Paper offered			02	02			07			07			36	50	
O.E -1.1	Offered by Department of Women's Studies	04			04	15			15			70			100	
	Total	**20**		**08**	**28**	**75**		**28**	**75**		**28**	**350**		**144**	**700**	
Semester II																
HCT-2.1	Ecology and Environmental Biology	04			04	15			15			70			100	
HCT-2.2	Cell and Molecular Biology	04			04	15			15			70			100	

HCT-2.3	Genetics and Evolution	04			04	15			15			70			100	
SCT-2.1*	Methods in Plant Science Plant Genetic Engineering Nutraceuticals *(One of the above SOFT CORE subjects shall be selected by the candidate/ as per the decision of the Departmental Council one SC may be offered)	04			04	15			15			70			100	
HCP-2.1	Ecology and Environmental Biology			02	02			07			07			36	50	
HCP-2.2	Cell and Molecular Biology			02	02			07			07			36	50	
HCP-2.3	Genetics and Evolution			02	02			07			07			36	50	
SCP-2.1*	*Based on Soft Core paper offered			02	02			07			07			36	50	
OE-2.1	Offered by Department of Women's studies	04			04	15			15			70			100	
	Total	**20**		**08**	**28**	**75**		**28**	**75**		**28**	**350**		**144**	**700**	
Semester III																
HCT-3.1	Systematic Botany of Angiosperms	04			04	15			15			70			100	
HCP-3.2	Botanical Tour and Herbarium preparation 1. The candidate shall undertake compulsorily field work outside the campus area/ District, a minimum of 3 to 4 days to understand floristic diversity of Angiosperms and to collect specimens from various agro-climatic conditions for the preparation of the Herbarium. 2. The University shall encourage the Department by providing required funds to undertake field studies by the students, since it is hard core subject required for the completion of the M.Sc. Botany programme.			02	02										50	
HCT-3.3	Reproductive Biology of Angiosperms and Plant Anatomy	04			04	15			15			70			100	
SCT-3.1*	Economic Botany	04			04	15			15			70			100	