Enclosure- 4

SCT-1.1: PLANT PATHOLOGY		48 hrs
Course objectives: • This paper deals about plant diseases caused by bacteria, fungi & viruses. • To understand mechanism of infection, diagnosis procedure and control measures. **Possible outcomes:** Learner will definitely realize how food production is severely is affected by pathogens. They will participate in food production by eliminating major threats that affect plants and management practices.		
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 development disease epidemiology and forecasting.	**6 hrs**
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**

Year of Introduction - 2018

References:

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.

Year of Introduction - 2018

SCT-1.1: PHYTOGEOGRAPHY AND EVOLUTION		48 hrs
Course objectives: • The purpose of the course is to give a fundamental understanding of the distribution of vascular plants and of the basic models which describe it. • In particular, the students will know about the floristic regions and plant formations of the Planet, in the light of previous continental and climatic evolution. **Possible outcomes:** The, the student will deepen the applied points of view floristic recording of specific habitats and the assessment of their naturality on the basis of chronological and life form spectra of the flora.		
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. Formation of species.	**12hrs**
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.

3. Cain, S.A. 1944. Foundations of Plant Geography. Harper & Bros, NY.
4. Good, R.D. 1974. The Geography of flowering Plants. 3rd edition, Long Mans, London.
5. Jha, A. P. 1993. Genes and Evolution. Mac Millan India Ltd, New Delhi.

Year of Introduction - 2018

SCT-2.1: PLANT GENETIC ENGINEERING		48 hrs
Course objectives: • This course is designed to provide a contextual and inquiry based learning of modern day advances in the field of recombinant DNA technology and molecular farming. • The main objective of this course is to familiarize students with techniques of genetic manipulations of plants and quality enhancement of plant products through the use of recombinant DNA technology. **Possible outcomes:** Students will acquire understanding of basic principles and modern age applications of recombinant DNA technology. Students should be able to learn the utility of genetic engineering tools that are helpful in creation of transgenic plants for better production. Learning molecular and technical skills along with applications of the instrumentation.		
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 Plants, 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	**12hrs**

	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.	
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.
5. I. Potrykus and G.Spangenberg, 1995 Gene Transfer to plants Springer, Berlin. Heidelberg.
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.

Year of Introduction - 2018

SCT-3.1 BIODIVERSITY AND CONSERVATION		48 hrs
Course objectives: • This paper is meant for students to gain in-depth knowledge of different levels, threats and distribution of Biodiversity and focus on the different approaches for biodiversity conservation. • To emphasize the importance of conserving rare plants and animals. **Possible outcomes:** The student will be able to appreciate the value of biodiversity. They will also develop the skills necessary to work efficiently in areas of in-situ and ex-situ conservation. Students will know the position of India in conserving rare plants and animals.		
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.
3. Hambler, C. 2004. Conservation. Cambridge University Press.
4. Southwood, T.R.E. and Henderson. 2000. Ecological methods. Blackwell Science Ltd., Oxford.

Year of Introduction - 2018

SCT -4.1 ETHNOBOTANY AND IPR		48hrs
Course objectives: • The main objective of this course to explain the basic concepts of ethnobotany and the geographical distribution of the most important pharmaceutical plants. • To make the students recognize the ethnobotanically important plants species. • To explain which parts of these plants are important for usage. • To familiarize the students with the issues of intellectual property rights and disputes arising due to biotechnological patents. **Possible outcomes:** The study will express the historical development of ethnobotany. Give information about the plants and their natural habitats and cultivated lands and explain in which sectors these plants are used. Impart knowledge on various tribal groups of India. Students will know and/or identify important plant species. Get knowledge on important plant families, their characteristics and its economic importance. Students will become aware of biosafety, bioethics and IPR.		
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	**14hrs**

	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.	

Year of Introduction - 2018

OE-3.1 PLANT DIVERSITY AND HUMAN WELFARE		**48hrs**
Course objectives: • To enlighten the students on the sources and role of plants in meeting the basic demands of the human. • To reveal the range of products and their novel usage in human life. **Possible outcomes:** Students will understand the inseparable interaction between human and plants and the related ecology as a whole. This will create a respect for plants among the community.		
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**

References:

1. Krishnamurthy, K.V. (2004). An advanced text book of biodiversity - Principles and Practices. Oxford and IBH Publications Co. Pvt. Ltd. New Delhi.

Year of Introduction - 2018

OE-4.1 MEDICINAL BOTANY		**48hrs**
Course objectives: • To enlighten the students on the sources and role of plants in meeting the basic demands of the human. • To appreciate how plants have influenced medicine throughout human history. • To reveal the range of products and their novel usage in human life. **Possible outcomes:** The study explores the uses of plants as medicine by traditional indigenous approaches. Student will understand different systems of medicine and their uses. Students will be able to explain how current medicinal practices are often based on indigenous plant knowledge. Students will get introduced to different perspectives on treating ailments.		
Unit-I	History, Scope and Importance of Medicinal Plants. Indigenous Medicinal Sciences; Definition and Scope-Ayurveda: History, origin, panchamaha bhutas, sapta dhatu 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	**12hrs**

	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.	
Unit-IV	Ethnobotany and Folk medicines. Definition; Ethnobotany in India: Methods to study ethnobotany; Applications of Ethnobotany: National interacts, Palaeo-ethnobotany. Folk medicines of ethnobotany, ethnomedicine, ethnoecology, ethnic communities of India. Application of natural products to certain diseases- Jaundice, cardiac, infertility, diabetics, Blood pressure and skin diseases.	**10hrs**

Year of Introduction - 2018

OE-4.1 AESTHETIC BOTANY		**48 hrs**
Course objectives: • To learn about Phytogeographical regions of India. • To make students appreciate the Aesthetic beauty of beautiful plants and their value in nature. • To reveal the cultivation methods of aesthetic plants. • To learn about various types of gardening and maintenance of the same. **Possible outcomes:** Students will know about the floristic regions and plant formation of the planet. The study of aesthetic botany gives knowledge about the art, science, technology and business of growing plants. The course will make the learners skilled in cultivation of plants. Students will get familiar with the aesthetic value and the importance on improving the aesthetics of the surrounding.		
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**	**14hrs**

	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 chimeras Ornamental ferns and their propagation; herbaceous perennials, Annuals & Biennials: Important Genera and Species, their importance in garden designs.	
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 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.	**14hrs**

References

1. Randhawa GS and Mukhopadhyay A. 2004. Floriculture in India. Allied Publishers Pvt. Limited. 72
2. Swarup Vishnu. 2003. Garden Flowers. National Book Trust
3. Hartmann HT, Kester DE, Davies FT and Geneve RL. 2002. Plant Propagation – Principles and Practices. Prentice Hall India Ltd.
4. Royal Horticultural Society"s Encyclopedia of Gardening.

Year of Introduction - 2021

OE-3.1 PRINCIPLES AND PRACTICES OF ORGANIC FARMING		48hrs
Course objectives: • To develop a deep understanding of the following principles and practices and how each relates to various organic farming systems. • To make students think critically about organic farming and demonstrate the ability to knowledgeably discuss organic and sustainable agriculture ideas and methods. **Possible outcomes:** The course will make the learners knowing about various benefits of organic farming as compared to conventional agriculture. Students will be able discuss the contribution of organic farming to food quality, environmental and social policy objectives and outline the policy measures which have a direct influence on the extent and adoption of organic farming.		
Unit-I	Organic farming - concept and definition, its relevance to India and global agriculture and future prospects; land and water management - land use, minimum tillage; shelter zones, hedges, pasture management, agro-forestry.	**10hrs**
Unit-II	Organic farming and water use efficiency; soil fertility, nutrient recycling, organic residues, organic manures, composting, soil biota and decomposition of organic residues, earthworms and vermicompost, green manures and biofertilizers.	**12hrs**
Unit-III	Farming systems, crop rotations, multiple and relay cropping systems, intercropping in relation to maintenance of soil productivity.	**10hrs**
Unit-IV	Control of weeds, diseases and insect pest management, biological agents and pheromones, biopesticides	**6hrs**
Unit-V	Socio-economic impacts; marketing and export potential: inspection, certification, labeling and accreditation procedures; organic farming and national economy.	**10hrs**