

**P.G AND RESEARCH DEPARTMENT
OF
BOTANY

UG SYLLABUS**

From the Academic Year 2023-2024



**J.J.COLLEGE OF ARTS AND SCIENCE
(AUTONOMOUS)
(Reaccredited by NAAC with B++ Grade)
(Affiliated to Bharathidasan University)
PUDUKKOTTAI – 622 422**

SEMESTER I

Title of the Course	:	PLANT DIVERSITY I - ALGAE
Category of the Course	:	Core Course
Course Code	:	U1R3BOCC1
Nature of the Course	:	Skill Development

Marks: CIA: 25 + Ext: 75 = 100**Hrs / Week: 5****Credits: 5****Total Inst. Hrs: 75****Course Objectives**

1. To provide a comprehensive knowledge on the biology of algae.
2. To provide a basis for better understanding of the evolution higher of plants.
3. To understand reproductive biology, ecology of plants by studying the simpler systems in algae.
4. To understand the role of algae in ecosystems as primary producers of nutrition.
5. To understand importance of algae to animals and humans.

Unit – I**(Ins. Hours: 15)**

Classification (Fritsch-1935-1945), criteria for classification, algal distribution.

Unit – II**(Ins. Hours: 15)**Thallus organization (unicellular-*Chlorella*, Diatoms, colonial-*Volvox*, filamentous, *Oedogonium*, siphonous-*Caulerpa*, parenchymatous- *Sargassum*, *Gracilaria*).**Unit- III****(Ins. Hours: 15)**Reproduction-Vegetative, asexual, sexual reproduction (over view) and life cycle (haplontic-, *Oedogonium*, diplontic- *Sargassum*, diplohaplontic- *Ulva* and diplobiontic-*Gracilaria*) (Examples may be changed according to the availability of the specimens).**Unit – IV****(Ins. Hours: 15)**

Algal cultivation methods, Algal production systems; indoor cultivation methods and large-scale cultivation of algae, harvesting of algae.

Unit – V**(Ins. Hours: 15)**

Algae as food and feed: Agar-agar, Alginic acid and Carrageenan; Diatomite.

Resource potential of algae: Application of algae as fuel, agriculture and pharmaceutical. Phycoremediation. Role of algae in CO₂ sequestration, Algae as indicator of water pollution, algal bioinoculants, Bioluminescence.

Title of the Course	:	PRACTICAL-I (COVERING CC1)
Category of the Course	:	Core Course
Course Code	:	U1R3BOCC2P
Nature of the Course	:	Skill Development

Marks: CIA: 40 + Ext: 60 = 100

Hrs / Week: 5

Credits: 5

Total Inst. Hrs: 60

Course Objectives

1. To develop skills to identify algae based on habitat, thallus structure and the internal organization.
2. To identify microalgae in a mixture.
3. To develop skills to prepare the micro-slides of algae.
4. To study the economic importance of few species.
5. To understand importance of algae to animals and humans

EXPERIMENTS

1. Micro-preparation of the types prescribed in the syllabus.
2. **Identifying the micro slides relevant to the syllabus.**
3. Identifying types of algal mixture.
4. **Economic importance of Algae as: (i) Food (ii) Feed (iii) Biofertilizers (iv) Seaweed liquid fertilizer (v) Hydrogen production by algae (vi) SCP (vii) Agar-Agar (viii) Alginate (ix) Diatomaceous earth.**
5. Field Project to study fresh water/marine water algal habitats.
6. Visit to nearby industry actively engaged in algal technology.

Title of the Course	:	ALLIED ZOOLOGY - I
Category of the Course	:	Discipline Specific Elective
Course Code	:	U1R3BODSE1
Nature of the Course	:	Skill Development

Marks: CIA: 25 + Ext: 75 = 100

Hrs / Week: 4

Credits: 2

Total Inst. Hrs: 60

Course Objectives

1. To acquire a basic knowledge of the diversity and organisation of Protozoa, Coelenterata, Helminthes and Annelida
2. To acquire a basic knowledge of diversity and organisation of Arthropoda, Mollusca and Echinodermata
3. To comprehend the taxonomic position and diversity among Protochordata, Pisces and Amphibia
4. To comprehend the taxonomic position and diversity among Reptilia, Aves and Mammalia
5. To acquire detailed knowledge of select invertebrate and chordate forms

Unit- I

(Ins. Hours: 12)

Diversity of Invertebrates–I Principles of Taxonomy. Criteria for classification–Symmetry and Coelom–Binomial nomenclature. Classification of Protozoa, Coelenterata, Helminthes and Annelida up to classes with two examples.

Unit- II

(Ins. Hours: 6)

Diversity of Invertebrates–II: Classification of Arthropoda, Mollusca and Echinodermata up to class level with examples.

Unit- III

(Ins. Hours: 6)

Diversity of Chordates–I: Classification of Prochordata, Pisces and Amphibia up to orders giving two examples.

Unit- IV

(Ins. Hours: 6)

Diversity of Chordates–II: Classification of Reptilia, Aves and Mammalia up to orders giving two examples.

Unit- V

(Ins. Hours: 6)

Animal organization: **Structure and organisation of (i).Earthworm (ii) Rabbit/Rat (iii)Prawn/Fish**

Title of the Course	:	ORGANIC FARMING
Category of the Course	:	NON-MAJOR ELECTIVE-I
Course Code	:	U1R3BOSEC1:1
Nature of the Course	:	Skill Development

Marks: CIA: 25 + Ext: 75 = 100

Hrs / Week: 2

Credits: 2

Total Inst. Hrs: 30

Course Objectives

1. To enable students to gain knowledge on the scope of organic farming and its significance.
2. To impart practical insights sustainable agriculture, green manuring, recycling and composting.
3. To understand the physical and chemical properties of soil.
4. To study sustainable agriculture.
5. To know about the importance of biofertilizers.

Unit – I

(Ins. Hours: 6)

Soil – physical, chemical properties. Soil pollution – oil, chemicals –fertilizers, pesticide and herbicide, non-degradable solids, biomagnification, consequences of land pollution – damage to soil and crops.

Unit – II

(Ins. Hours: 6)

Organic farming – definition, basic concept of organic farming, integrated plant nutrient supply management, integrated insect pest and disease management, integrated soil and water management. Sustainable agriculture practices-crop rotation, mixed cropping.

Unit – III

(Ins. Hours: 6)

Management of organic wastes and green manures: Farm manures, Composts, Mulches and pest control, importance of organic manure, importance of green manure, crops of green manure, oil cake. Animal based organic manure–cow dung, vermicompost-methods, production and utilization.

Unit – IV

(Ins. Hours: 6)

Biofertilizers–classification, nitrogen fixers–*Rhizobium*, Cyanobacteria, *Azolla* and Vesicular Arbuscular Mycorrhiza.

Unit – V

(Ins. Hours: 6)

Recycling of bio-degradable municipal, agricultural and Industrial wastes – biocompost making methods.

Title of the Course	:	ENVIRONMENTAL BIOTECHNOLOGY
Category of the Course	:	NON-MAJOR ELECTIVE-2
Course Code	:	U1R3BOSEC1:2
Nature of the Course	:	Skill Development

Marks: CIA: 25 + Ext: 75 = 100

Hrs / Week: 2

Credits: 1

Total Inst. Hrs: 30

Course Objectives

1. To introduce the student to the various developed and applications of environmental biotechnology.
2. To provide knowledge about the scope of bioremediation and bioleaching using GMOs.
3. To study about pollution of water bodies.
4. To know about bioremediation.
5. To study about biomineralization.

Unit – I: Introduction

(Ins. Hours: 6)

The environment-soil, water and air, Pollution and its causes (outline only)

Unit – II: Source and treatment of polluted waters and effluents

(Ins. Hours: 6)

Pollution of water bodies by heavy metals and pesticides – removal of heavy metals and pesticides by Biosorption. Removal of oil spills by using microbes. Biological treatment of sewage – characteristics of sewage and objectives in sewage treatment – Anaerobic digestion.

Unit – III: Soil and air pollution and their treatment

(Ins. Hours: 6)

Soil pollution by Xenobiotics. Degradation of Xenobiotics – pathways of phenol, pentachlorophenol and polychlorinated biphenyl degradation.

Unit – IV: Bioremediation

(Ins. Hours: 6)

Introduction to bioremediation, *ex situ* and *in situ* bioremediation.

Unit – V: Biometallurgy and related topics

(Ins. Hours: 6)

Biomineralization – bioleaching - Biofilms and biocorrosion.

Title of the Course	:	NURSERY AND LANDSCAPING
Category of the course	:	NON-MAJOR ELECTIVE-3
Course code	:	U1R3BOSEC1:3
Nature of the course	:	Skill Development

Marks: CIA: 25 + Ext: 75 = 100

Hrs / Week:

Credits: 2

Total Inst. Hrs: 30

Course Objectives

1. To recognize the importance of growing plants and practice the knowledge gained by developing kitchen garden and ornamental garden.
2. To be able to design gardens and become entrepreneur in Horticulture.
3. To study the methods of propagation.
4. To know about nursery structure.
5. To learn about gardening.

Unit – I

(Ins. Hours: 6)

Introduction, prospects and scope of nursery and landscaping..

Unit – II

(Ins. Hours: 6)

Methods of Propagation – cutting, layering, grafting, budding, Floriculture – Rose, Chrysanthemum, Jasmine – cultivation.

Unit – III

(Ins. Hours: 6)

Gardening – formal garden, informal garden, vegetable garden, landscaped layout designing – formation and maintenance of lawn.

Unit – IV

(Ins. Hours: 6)

Nursery structures – Green house – Shade house, Mist chamber – Topiary, Bonsai culture.

Unit – V

(Ins. Hours: 6)

Manures, composting – vermicomposting.

Title of the Course	:	BASICS OF BOTANY
Category of the course	:	FOUNDATION COURSE
Course code	:	U1R3BOFC
Nature of the course	:	Skill Development

Marks: CIA: 25 + Ext: 75 = 100

Hrs / Week: 2

Credits: 2

Total Inst. Hrs: 30

Course Objectives

1. To learn about the classification, distinguishing traits, geographic distribution, and reproductive cycle of algae, fungi, lichens, and bryophytes.
2. To understand the biodiversity by describing and explaining the morphology and reproductive processes of algae, fungi, bryophytes and microorganisms.
3. To investigate the classification, distinctive traits, distribution and reproduction and life history of the various classes and major types of Pteridophytes and Gymnosperms.
4. To learn various cell structures and functions of prokaryotes and eukaryotes and understand the salient features and functions of cellular organelles.
5. To understand of laws of inheritance, genetic basis of loci and alleles.

UNIT-I

(Ins. Hours: 6)

BIODIVERSITY: Systematics: Two Kingdom and Five Kingdom systems (Outer line)-
Salient features of various Plant Groups: Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms- Viruses - Bacteria.

UNIT-II

(Ins. Hours: 6)

CELL BIOLOGY: Cell as the basic unit of life - Prokaryotic and Eukaryotic Cell (Plant Cell) - Light Microscope - Ultra Structure of Prokaryotic and Eukaryotic Cells - Cell Wall - Cell Membrane Plastids, Ribosomes.

UNIT-III

(Ins. Hours: 6)

PLANT MORPHOLOGY : Structure and Modification of Root, Stem and Leaf - Structure and Types of Inflorescences - Structure and Types of Flowers, Fruits and Seeds.

UNIT-IV

(Ins. Hours: 6)

GENETICS: Concept of Heredity and Variation - Mendel's Laws of Inheritance.

UNIT-V

(Ins. Hours: 6)

PLANT PHYSIOLOGY: Cell as a Physiological: Water relations -Absorption and movement: Diffusion, Osmosis, Plasmolysis, Imbibition -Permeability, Water Potential - Transpiration - Movement - Mineral Nutrition.

SEMESTER II		
Title of the Course	:	Plant Diversity II Fungi, Bacteria, Viruses, Plant Pathology And Lichens
Category of the Course	:	Core Course
Course Code	:	U2R3BOCC3
Nature of the Course	:	Skill Development

Marks: CIA: 25 + Ext: 75 = 100**Hrs / Week: 5****Credits: 5****Total Inst. Hrs: 75****Course Objectives**

- To describe the common characteristics of fungi as being heterotrophic, unicellular/multicellular.
- To understand the biology of fungi and to discuss the importance of fungi in various ecological roles
- To understand lichen structure, function, identification, and ecology; Comprehend the events of symbiosis and lichenization and to demonstrate the use of lichens as bioindicator species.
- To identify the main groups of plant pathogens, their symptoms.
- To understand the various types of plant diseases.

**Unit – I
FUNGI****(Ins. Hours: 15)**

Characteristic features, thallus organization- Classification of fungi - (Alexopoulos and Mims, 1979), Life of Cycle (each with one suitable example – excluding developmental stages) Zygomycotina (*Rhizopus*), Ascomycotina (*Peziza*), Basidiomycotina (*Puccinia*) and Deuteromycotina (*Cercospora*). (Examples may be changed according to the availability of the specimens).

Unit – II**(Ins. Hours: 15)****ECONOMIC IMPORTANCE OF FUNGI:**

Cultivation of mushroom – *Pleurotus*(food). Fungi in agriculture application (biofertilizers); Mycotoxins (biopesticides), Production of industrially important products from fungi- alcohol (ethanol), organic acids (citric acid), enzymes (protease). Vitamins (Vitamin B-complex and Vitamin B-12) - Importance of VAM fungi. Mycotoxins

Unit- III**(Ins. Hours: 15)****BACTERIA, VIRUS:**

Classification (Bergey's, 1994 - outline), structure and reproduction of bacteria, Mycoplasma, Virology -Viruses general characters, Classification, structure and reproduction.

Unit – IV**(Ins. Hours: 15)****PLANT PATHOLOGY:**

General symptoms of plant diseases; Etiology; Host-Pathogen relationships; Disease cycle and environmental relation; prevention and control of the following plant diseases. **Bacterial diseases** – Citrus canker and Bacterial wilt of Banana **Viral diseases** – Tobacco Mosaic and Vein clearing of Papaya **Fungal diseases** – Blast disease in rice and Tikka disease

Unit – V**(Ins. Hours: 15)****LICHEN:**

General characters of Lichen - Classification (Hale, 1969). Nature of Mycobionts and Phycobionts, Study of growth forms of lichens (crustose, foliose and fruticose), reproduction and ecological significance of lichens with special reference to *Usnea*. Economic importance of Lichens.

SEMESTER II		
Title of the Course	:	PLANT DIVERSITY II FUNGI, BACTERIA, VIRUSES, PATHOLOGY AND LICHENS - PRACTICAL-II
Category of the Course	:	Core Course
Course Code	:	U2R3BOCC4P
Nature of the Course	:	Skill Development

Marks: CIA: 40 + Ext: 60 = 100

Credits: 5

Hrs / Week: 5

Total Inst. Hrs: 60

Course Objectives

- 1.To enable students to identify microscopic and macroscopic fungi.
2. To prepare microslides of fungi and lichens.
3. To know the presence of pathogen inside the plant tissues through microscopic sections.
4. To identify the bryophytes based on the morphology, and microslides
5. To know the economic importance of the microbes studied.

EXPERIMENTS

1. Microscopic observation of vegetative and reproductive structures of types prescribed in the syllabus through temporary preparations and permanent slides.
2. Identifying the micro slides relevant to the syllabus.
3. Herbarium specimens of bacterial diseases/photograph.
3. Protocol for mushroom cultivation.
4. Inoculation techniques for fungal culture (Demonstration only).
5. Study of economically important products obtained from fungi: Fungal biofertilizers, biopesticides, biofungicide (*Trichoderma*), edible mushroom/Yeast, organic acids (citric acid) enzymes (protease), antibiotics and vitamins.
6. Mycorrhiza: ecto-mycorrhiza and endo-mycorrhiza (Photographs)
7. Visit to fungal biotechnology laboratories.
8. Ultra structure of bacteria.
9. Structure of bacteriophage.
10. Micro-preparation of *Usnea* to study vegetative and reproductive structures.
11. Identifying the micro slides relevant to the syllabus.
12. Study of thallus and reproductive structures (apothecium) through permanent slides.
13. Economic importance of Lichens - Dye and perfume.

SEMESTER II		
Title of the Course	:	ALLIED ZOOLOGY – PRACTICAL II
Category of the Course	:	DISCIPLINE SPECIFIC ELECTIVE
Course Code	:	U2R3BODSE2P
Nature of the Course	:	Skill Development

Marks: CIA: 40 + Ext: 60 = 100**Credits: 3****Hrs / Week: 4****Total Inst. Hrs: 60****Course Objectives**

1. Dissect Alimentary canal, Arterial system and Brain of the specimens belonging to Invertebrate and Chordata.
2. Mount the body setae of Earthworm and mouth parts of Cockroach.
3. To evaluate and examine the various parameters of haematology and biochemistry and Identify the nitrogenous waste products of animals
4. To enhance good drawing and writing skills based on the identification of specimens.
5. To acquire detailed knowledge of select invertebrate and chordate forms

Major Dissection:Cockroach: Circulatory system, Earthworm: Nervous System, Prawn: Appendages.

Mounting: Earthworm: Body setae, Fish: Placoid scales

Specimen and Slides:

(i). **Protozoa:**Amoeba, **Porifera:**Sycon

ii). **Coelenterata:**Obelia – Colony, **Helminthes:** Ascaris (Male & Female), **Annelida:**Nereis

iii) **Arthropoda:**Palaemon, **Mollusca:** Pila, **Echinodermata:**Asterias,

(iv). **Pisces:** Hippocampus,

(v). **Amphibia:** Rana, Axolotal larva

(vi). **Reptilia :**Chamaeleon, Naja,.

(vii). **Aves:**Columba, (viii). **Mammalia:**Rabbit.

Blood Grouping. Total WBC and RBC.

Estimation of Ammonia and analysis of Excretory Products

NON-MAJOR ELECTIVE-II

SEMESTER II		
Title of the Course	:	MUSHROOM CULTIVATION
Category of the Course	:	Skill Enhancement Course
Course Code	:	U2R3BOSEC2:1
Nature of the Course	:	Skill Development/ Entrepreneurial Skill

Marks: CIA: 25 + Ext: 75 = 100**Hrs / Week: 2****Credits: 2****Total Inst. Hrs: 30****Course Objectives**

1. **To learn and develop skills in mushroom cultivation.**
2. To understand and appreciate the role of mushrooms in Nutrition, Medicine and health.
3. To cultivate mushroom cultivation in small scale industry
4. To learn about diseases and post harvest technology.
5. To study new methods and strategies to contribute to mushroom production.

Unit- I

Introduction: **Morphology, Types of Mushroom, identification of edible and poisonous mushroom, Nutritive values, life cycle of common edible mushrooms.**

Unit- II

Mushroom cultivation, **prospects and scope of Mushroom cultivation in small scale Industry.**

Unit- III

Life cycle of *Pleurotus* spp and *Agaricus* spp.

Unit- IV

Spawn **production, growth media, spawn running and harvesting of mushrooms and marketing.**

Unit- V

Diseases and post harvest technology, **Insect pests, nematodes, mites, viruses, fungal competitors and other important diseases.**

NON-MAJOR ELECTIVE-II

SEMESTER II		
Title of the Course	:	HERBAL MEDICINE
Category of the Course	:	Skill Enhancement Course
Course Code	:	U2R3BOSEC2:2
Nature of the Course	:	Entrepreneurial Skill

Marks: CIA: 25 + Ext: 75 = 100**Hrs / Week: 2****Credits: 2****Total Inst. Hrs: 30****Course Objectives**

1. To understand the nuances of medicinal plants and their phytoconstituents of commercial value
2. To design and develop medicinal garden.
3. To apply the knowledge to cultivate medical plants.
4. To know the pharmacological importance of medicinal plants.
5. To enlist phytochemicals and secondary metabolites of market and commercial value.

Unit- I

Importance and Relevance of Herbal drugs in Indian System of Medicine, Pharmacognosy – Aim and scope.

Unit- II

Medicinal gardening – Gardens in the Hills and plains; House gardens; plants for gardening – Poisonous plants – Types of plant poison; action of poisons; treatment for poisons, some poisonous plants; their toxicity and action.

Unit-III

Adulteration of crude drugs and its detection – methods of adulteration; types of adulteration. Medicinal plants of export values; rejuvenating herbs; Medicinal uses of Non-flowering plants.

Unit- IV

Botanical description and active principles of Root drugs; Rhizomes woods and bark drugs (Two examples for each plant organs).

Unit- V

Botanical description and active principles of leaves; Flowers; Fruits seed and entire plants as drugs. Taxonomic study of some selected herbals (Two examples for each plant organs).

NON-MAJOR ELECTIVE-II

SEMESTER II		
Title of the Course	:	GLOBAL CLIMATE CHANGE
Category of the Course	:	Skill Enhancement Course
Course Code	:	U2R3BOSEC2:3
Nature of the Course	:	Entrepreneurial Skill

Marks: CIA: 25 + Ext: 75 = 100**Hrs / Week: 2****Credits: 2****Total Inst. Hrs: 30****Course Objectives**

1. To gain insights on the impact of greenhouse effect on global climate change and mitigation measures.
2. To understand the implications of carbon and ecological footprint.
3. To apply the knowledge to green house effects.
4. To know the rain and its effects on plants.
5. To know about Global Environmental change issues.

Unit- I

Global Environmental change issues. UNFCCC, IPCC, Koyoto protocol, CDM, Carbon footprint and ecological footprint.

Unit- II

Stratospheric ozone layer: Evolution of ozone layer; Causes of depletion and consequences; Effects of enhanced UV-B on plants, microbes, animals, human health and materials; Global efforts for mitigation ozone layer depletion.

Unit- III

Climate change: Green house effects; causes; Green house gases and their sources; Consequences of climate, oceans, agriculture, natural vegetation and humans; International efforts on climate change issues.

Unit- IV

Atmospheric deposition: Past and present scenario; Causes and consequences of excessive atmospheric deposition of nutrients and trace elements; Eutrophication.

Unit- V

Acid rain and its effects on plants, animals, microbes and ecosystems.

SEMESTER II		
Title of the Course	:	BOTANICAL GARDEN AND LANDSCAPING
Category of the Course	:	Skill Enhancement Course
Course Code	:	U2R3BOSEC3:1
Nature of the Course	:	Skill Development

Marks: CIA: 25 + Ext: 75 = 100**Hrs / Week: 2****Credits: 2****Total Inst. Hrs: 30****Course Objectives**

1. To know about the fundamental concepts of gardening and landscaping.
2. To provide an overview of various gardening styles and its scope in recreation and bio-aesthetic planning.
3. To illustrate the significance of garden adornments and propagation structures.
4. To inculcate entrepreneurial skills in students for creative landscaping design using CAD software.
5. To create the design outdoor and indoor gardens and inculcate entrepreneurial skills for landscaping.

Unit- I**6 Hours**

Principles of gardening, garden components, adornments, lawn making, methods of designing rockery, water garden, etc. Special types of gardens, their walk-paths, bridges, constructed features. Greenhouse. Special types of gardens, trees, their design, values in landscaping, propagation, planting shrubs and herbaceous perennials. Importance, design values, propagation, plating, climbers and creepers, palms, ferns, grasses and cacti succulents.

Unit-II**6 Hours**

Flower arrangement: importance, production EXPERIMENTS and cultural operations, constraints, postharvest practices. Bioaesthetic planning, definition, need, round country planning, urban planning and planting avenues, schools, villages, beautifying railway stations, dam sites, hydroelectric stations, colonies, river banks, planting material for play grounds.

Unit –III**6 Hours**

Vertical gardens, roof gardens. Culture of bonsai, art of making bonsai. Parks and public gardens. Landscape designs, Styles of garden, formal, informal and free style gardens, types of gardens, Urban landscaping, Landscaping for specific situations, institutions, industries, residents, hospitals, roadsides, traffic islands, damsites, IT parks, corporate.

Unit – IV**6 Hours**

Establishment and maintenance, special types of gardens, Bio-aesthetic planning, ecotourism, theme parks, indoor gardening, therapeutic gardening, non-plant components, water scaping, xeriscaping, hardscaping.

Unit- V**6 Hours**

Computer Aided Designing (CAD) for outdoor and indoorscaping Exposure to CAD (Computer Aided Designing).

SEMESTER II		
Title of the Course	:	ORGANIC FARMING
Category of the Course	:	Skill Enhancement Course
Course Code	:	U2R3BOSEC3:2
Nature of the Course	:	Skill Development

Marks: CIA: 25 + Ext: 75 = 100

Hrs / Week: 2

Credits: 2

Total Inst. Hrs: 30

Course Objectives

- To enable students to gain knowledge on the scope of organic farming and its significance.
- To impart practical insights sustainable agriculture, green manuring, recycling and composting.
- To understand the physical and chemical properties of soil.
- To study sustainable agriculture.
- To know about the importance of biofertilizers.

Unit – I: Soil – physical, chemical properties. Soil pollution – oil, chemicals –fertilizers, pesticide and herbicide, non-degradable solids, biomagnification, consequences of land pollution – damage to soil and crops.

Unit – II: Organic farming – definition, basic concept of organic farming, integrated plant nutrient supply management, integrated insect pest and disease management, integrated soil and water management. Sustainable agriculture practices-crop rotation, mixed cropping.

Unit – III: Management of organic wastes and green manures: Farm manures, Composts, Mulches and pest control, importance of organic manure, importance of green manure, crops of green manure, oil cake. Animal based organic manure–cow dung, vermicompost-methods, production and utilization.

Unit – IV: Biofertilizers–classification, nitrogen fixers–*Rhizobium*, Cyanobacteria, *Azolla* and Vesicular Arbuscular Mycorrhiza.

Unit – V: Recycling of bio-degradable municipal, agricultural and Industrial wastes – biocompost making methods.

SEMESTER III		
Title of the Course	:	PLANT DIVERSITY-III BRYOPHYTES, PTERIDOPHYTES, GYMNOSPERMS AND PALEOBOTANY.
Category of the Course	:	Core Course
Course Code	:	U3R3BOCC5
Nature of the Course	:	Skill Development

Marks: CIA: 25 + Ext: 75 = 100

Credits: 5

Course Objectives

Hrs / Week: 5

Total Inst. Hrs: 75

1. To provide students with comprehensive knowledge of basics in nanotechnology.
2. To enable the students understand and appreciate the various applications of nanoparticles.
3. To give perspective to researchers and students who are interested in nanoscale physical and biological systems and their applications in medicine.
4. To introduce the concepts in nonmaterial's and their use with bio components to synthesize and interact with larger systems.
5. To impart knowledge on the most recent molecular diagnostic and therapeutic tools used to treat various diseases.

Unit- I

(14 Hours)

BRYOPHYTES

General characters of Bryophytes, classification (Watson, 1971). Structure, reproduction and life cycle (excluding developmental studies) of the following classes each with a suitable example: Hepaticopsida (*Riccia*); Anthocerotopsida (*Anthoceros*) and Bryopsida (*Polytrichum*), Economic importance.

Unit –II

(15 Hours)

PTERIDOPHYTES

General Characters of Pteridophytes - Classification (Reimer, 1954). Morphology, anatomy and life cycle excluding the developmental stages of the following classes: Psilotopsida (*Psilotum*), Lycopsidea (*Lycopodium*), Sphenopsida (*Equisetum*), Pteropsida (*Marsilea*). Apogamy and apospory, and seed habit. Stellar Evolution. Economic importance of Pteridophytes.

Unit- III

(16 Hours)

GYMNOSPERMS

Classification of Gymnosperms (Sporne, 1954) (up to family). General characteristics, Economic importance of Gymnosperms with special reference to oil, resin, timber, etc. Morphology, anatomy and life cycle (excluding developmental stages) reproduction of the taxa belonging to each of the following orders: Cycadales (*Cycas*), Coniferales (*Pinus*), Gnetales (*Gnetum*).

Unit-IV

(15 Hours)

PALEOBOTANY

Introduction to fossils and fossilization processes such as compression, casts, molds, petrification, impressions and coal balls. Geological time scale. Radiocarbon dating. Contribution of Birbal Sahni

Unit- V

(15 Hours)

Study of the following fossils: *Rhynia*, *Lepidodendron*, *Lepidocarpon*, *Calamites* and *Williamsonia* *sewardiana*.

SEMESTER III		
Title of the Course	:	Major Practical - III Covering(CC5)
Category of the Course	:	Core Course
Course Code	:	U3R3BOCC6P
Nature of the Course	:	Skill Development

Marks: CIA: 25 + Ext: 75 = 100**Hrs / Week: 5****Credits: 5****Total Inst. Hrs: 75****Course Objectives**

1. To enable students gain expertise in hand sectioning technique.
2. To study diversity of Bryophytes and Pteridophytes.
3. To understand the anatomical structure of the Bryophytes and Pteridophytes.
4. Develop comprehensive skills in sectioning and micro preparation.
5. Describe the structure of fossil forms prescribed in the syllabus.

EXPERIMENTS**Bryophytes**

1. Study of morphology, anatomy and structure of the vegetative and reproductive organs of Bryophytes genera included in the theory syllabus.
2. Hepaticopsida (*Riccia/Marchantia*); Anthocerotopsida (*Anthoceros*) and Bryopsida (*Funaria/Polytrichum*) (Examples may be changed according to the availability of the specimens) (need not study developmental aspects).

Pteridophytes

3. Study of morphology, anatomy and structure of the vegetative and reproductive organs of Pteridophytes genera and fossils included in the theory syllabus.
Psilotopsida (*Psilotum*), Lycopsidea (*Lycopodium/Selaginella*), Sphenopsida (*Equisetum*), Pteropsida (*Adiantum/Marsilea*). (Examples may be changed according to the availability of the specimens).
4. Identifying the micro slides relevant to the syllabus.

Gymnosperms

Study of morphology and anatomy of the vegetative and reproductive parts of the following:

1. *Cycas*,
2. *Pinus* and
3. *Gnetum*.

Paleobotany

Study of internal morphology of the following fossils:

1. *Lepidodendron*
2. *Calamites* and
3. *Williamsonia*. (Extinct and fossil forms).

Botanical excursion.

SEMESTER - III		
Title of the Course	:	HERBAL TECHNOLOGY
Category of the Course	:	Skill Enhancement Course (SEC)
Course Code	:	U3R3BOSEC4:1
Nature of the Course	:	Skill Development

Marks: CIA: 25 + Ext: 75 = 100

Hrs / Week: 2

Credits: 2

Total Inst. Hrs: 30

Course Objectives**Course Objective**

1. To provide students with knowledge of herbal drug industry, the quality of raw material, and guidelines for quality maintenance.
2. To gain an insight into the commercially important secondary products and significance of bioprospecting.
3. To understand various plants based drugs used in ayurvedha, unani, homeopathy, siddha etc.
4. To apply the knowledge to cultivate medical plants.
5. To know the pharmacological importance of medicinal plants.

UNIT –I**(4 Hours)**

Herbal Technology: Definition and scope; Herbal medicines: history and scope; Traditional systems of medicine, and overview of AYUSH (Traditional Indian Systems of Medicine); Cultivation - harvesting - processing - storage of herbs and herbal products.

Unit—II**(7 Hours)**

Value added plant products: Herbs and herbal products recognized in India; Major herbs used as herbal medicines, nutraceuticals, cosmetics and biopesticides, their Botanical names, plant parts used, major chemical constituents.

Unit-III**(5 Hours)**

Pharmacognosy - Systematic position, botany of the plant part used and active principles of the following herbs: Tulsi, Ginger, Curcuma, Fenugreek, Indian Gooseberry, Catharanthus roseus, Withania somnifera, Centella asiatica, Achyranthes aspera, Kalmegh, Giloe (Tinospora), Saravar. Herbal foods, future of pharmacognosy.

Unit-IV**(8 Hours)**

Analytical pharmacognosy: Morphological and microscopic examination of herbs, Evaluation of drug adulteration - types, methods of drug evaluation - Biological testing of herbal drugs - Phytochemical screening tests for secondary metabolites (alkaloids, flavonoids, steroids, triterpenoids, phenolic compounds).

Unit-V**(6 Hours)**

Plant gene banks, Cultivation of Plants and their value added processing / storage / quality control for use in herbal formulations, Introductory knowledge of Tissue culture and Micro propagation of some medicinal plants (*Withania somnifera*, neem and tulsi).

SEMESTER III		
Title of the Course	:	ENTREPRENEURIAL OPPORTUNITIES IN BOTANY
Category of the Course	:	Skill Enhancement Course (SEC)
Course Code	:	U3R3BOSEC4:2
Nature of the Course	:	Skill Development

Marks: CIA: 25 + Ext: 75 = 100

Hrs / Week: 2

Credits: 2

Total Inst. Hrs: 30

Course Objectives

1. To enable students to develop innovative ideas to exploit the economically useful plant products for commercial purposes.
2. To inculcate entrepreneurial values to start a new business.
3. To comprehend the molecular processes.
4. To expose the students a fundamental of the various value added products.
5. To introduce the entrepreneurial opportunities.

Unit- I

(4 Hours)

INTRODUCTION:

Need - definition and concept - Types and characterization - entrepreneurial values- motivation and barriers-entrepreneurship as innovation, risk assessment and solutions.

Unit –II

(8 Hours)

BIOVENTURE:

Industry - overview of *Spirulina*, *Pleurotus*, Natural dyes, Banana fibers, Wine, Hydroponics, Drumstick and coconut - Straight Vegetable Oil (SVO) and Pure Plant Oil (PPO) -methods and marketing - fresh and dry flowers for aesthetics.

Unit- III

(4 Hours)

VALUE ADDED PRODUCTS:

Canning of fruits - process and equipment, fruit and vegetable based products (squash) - ready to serve (RTS) (syrup, pulp, paste, ketchup, soup, vegetable sauces, jam and jellies), Palmyrah Palm products, Perfumes from Rose/Jasmine - Bamboo and cane based products-virgin coconut oil, jasmine oil production, nutraceuticals, standards and quality management.

Unit-IV

(10 Hours)

ORGANIZATIONS AND AGENCIES:

TIIC, DIC, NABARD, MICROSTAT, DBT - case study - sarvodaya – SIDCO – Micro Small and Medium Enterprises – support structure for promoting entrepreneurship – various government schemes.

Unit- V

(4 Hours)

ENTREPRENEURIAL OPPORTUNITIES:

Understanding a market and assessment, selection of an enterprise, business planning, mobilization of resources, Break Even Analysis, project proposal (guidelines, collection of information and preparation of project report), steps in filing patents, trademarks and copyright, Intellectual Property Rights, export and import license.

SEMESTER - IV			
Title of the Course	:	ANATOMY AND EMBRYOLOGY OF ANGIOSPERMS	
Category of the Course	:	Core Course (CC)	
Course Code	:	U4R3BOCC7	
Nature of the Course	:	Skill Development	
Marks	:	CIA:25+ Ext:75 =100	Hrs/Week : 5
Credit	:	5	Total Inst. Hrs:75

Course Objective

1. To know fundamental concepts of plant anatomy and embryology.
2. To understand the internal tissue organization of various plant organs.
3. To differentiate normal and abnormal secondary growth.
4. To comprehend the structural organization of flower with relevance to the process of pollination and fertilization.
5. To know embryology of plants.

UNIT I**(15 Hours)**

General Account – classification and theories of Meristem. Concept of totipotency, differentiation, dedifferentiation and re-differentiation. Structure and Function of Simple tissue (Parenchyma, collenchyma, sclerenchyma; fibres and sclereids) and Complex tissues (xylem and phloem)

UNIT II**(15 Hours)**

Primary and secondary structure of stem in dicotyledons and Monocotyledons. Nodal Anatomy - unilacunar, trilacunar and multilacunar. Leaf Anatomy of monocot and dicot. The root - primary and secondary structure of dicotyledonous and monocotyledonous roots. Anomalous secondary growth – *Boerhaavia*, *Dracaena*.

UNIT III**(15 Hours)**

Wood anatomy - secondary xylem. Physical and chemical properties of wood. Classification of wood. General account on Commercial wood species of South India (teak wood, rose wood, sandal wood, red sandal wood and silver oak).

UNIT IV**(15 Hours)**

Microsporangium, Microsporogenesis - Development of male gametophyte. Megasporangium, Megasporeogenesis. Development of female gametophyte (Polygonum). Type and Structure of monosporic (Polygonum), bisporic (Allium) and tetrasporic (Peperomia) embryo sacs.

UNIT V**(15 Hours)**

Fertilization - Double fertilization. Triple fusion. Development of dicot embryo – Polygonum: type, Development of monocot embryo – Luzula: type. Endosperm - Definition. Apomixis - types and significance, Polyembryony, Parthenogenesis and its significance.

SEMESTER - IV			
Title of the Course	:	Major Practical	
Category of the Course	:	Core Course (CC)	
Course Code	:	U4R3BOCC8P	
Nature of the Course	:	Skill Development	
Marks	:	CIA:40+ Ext:60 =100	Hrs/Week : 5
Credit	:	5	Total Inst. Hrs:75

Course Objective

1. To study the anatomy of the plant organs using various techniques
2. To study the embryology of the plant.
3. To identify the structure of various cell organelles.
4. To comprehend the structural organization of flower with relevance to the process of pollination and fertilization.
5. To know embryology of plants.

Anatomy

1. Study of simple and complex (Primary and Secondary) tissues by maceration.
2. Study the internal structure of primary (young) and secondary (old) stems. Internal structure of dicot and monocot stem. Internal structure of dicot and monocot root.
3. Anomalous secondary growth in the stems of *Boerhaavia*, *Nyctanthus* and *Dracaena*.
4. T.S of dicot and monocot leaves.
5. Study of stomatal types.

Embryology

1. T.S of (young and mature) anther (section from *Datura* or *Cassia* flower).
2. Observation of pollinia (slide only).
3. Types of ovules- Anatropous, Orthotropous, Circinotropous, Amphitropous, Campylotropous (Permanent slides).
4. Types of Endosperm - Nuclear, cellular and helobial.
5. Dissection and display of any two stages of embryo in *Tridax*

SEMESTER IV		
Title of the Course	:	CULTIVATION OF ALGAE
Category of the Course	:	Skill Enhancement Course
Course Code	:	U4R3BOSEC5:1
Nature of the Course	:	Skill Development

Marks: CIA: 25 + Ext: 75 = 100

Hrs / Week: 2

Credits: 2

Total Inst. Hrs: 30

Course Objectives

1. To impart sufficient information about the culture and cultivation of algae under laboratory and outdoor conditions.
2. To study the media composition for algae cultivation and high value products and its applications.
3. To know about the important sea weeds and its cultivation practices.
4. To study the SLF production and applications in agriculture crops.
5. To understand about the Environment Impact Assessment of algal cultivation.

Unit- I

(4 Hours)

Morphology, life history and mass culture of microalgae: *Spirulina*, *Chlorella*, *Dunaliella* and *Botryococcus*.

Unit –II

(8 Hours)

High value products: Single Cell Protein (SCP), phycocyanin, β -carotene, astaxanthin –biofuel, media composition-scale up- labtol and – race way ponds and photobioreactor.

Unit- III

(4 Hours)

Marine macroalgae: Morphology, life history and mass cultivation of *Gracilaria*, *Kappaphycus*, *Sargassum* and *Ulva*.

Unit-IV

(10 Hours)

Polysaccharides: agar, carrageen, alginate-economic importance-seaweed as food, feed and Seaweed Liquid Fertilizer (SLF).

Unit- V

(4 Hours)

Role of seaweed in aquaculture: Environment Impact Assessment of algal cultivation.

SEMESTER IV		
Title of the Course	:	FERMENTATION TECHNOLOGY
Category of the Course	:	Skill Enhancement Course
Course Code	:	U4R3BOSEC5:2
Nature of the Course	:	Skill Development

Marks: CIA: 25 + Ext: 75 = 100

Hrs / Week: 2

Credits: 2

Total Inst. Hrs: 30

Course Objectives

1. To appreciate the significance of microbes synthesizing fermented products.
2. To gain insights on safety and quality control in large scale production of fermentative products.
3. To design and operation of industrial practices in mass production of fermented products.
4. To know about the various fermentation technology.
5. To learn about the bioproduct recovery.

Unit- I

(8 Hours)

Preparation of microbial culture, Preparation and sterilization of fermentation media. Isolation and improvement of industrially important microorganisms.

Unit –II

(6 Hours)

Maintenance and preservation of microorganisms, Metabolic regulations and overproduction of metabolites. Kinetics of microbial growth and product formation.

Unit- III

(4 Hours)

Scope and opportunities of fermentation technology. Principles of fermentation: Submerged, solid state, batch, fed-batch and continuous culture.

Unit-IV

(6 Hours)

Fermentative production of vinegar, alcohol (ethanol, wine, beer), acids (citric acid and gluconic acid), amino acids (lysine and glutamic acid) and antibiotics (penicillin and streptomycin).

Unit- V

(6 Hours)

Microbial production of enzymes: Amylase and Protease. Bioproduct recovery.

SEMESTER - IV			
Title of the Course	:	ENVIRONMENTAL IMPACT ANALYSIS	
Category of the Course	:	Skill Enhancement Course (SEC)	
Course Code	:	U4R3BOSEC6:1	
Nature of the Course	:	Skill Development	
Marks	:	CIA:25+ Ext:75 =100	Hrs/Week : 2
Credit	:	2	Total Inst. Hrs:30

Course Objectives

1. To understand about the theory and practice of environmental impact assessment.
2. To develop skills in identifying and solving problems of environmental concerns.
3. To define and classify Environmental Impacts and the terminology.
4. To understand the environmental Impact assessment procedure.
5. To list out and describe environmental audits.

UNIT- I**(4 Hours)**

Aim and Purpose, Origin and Development, principles and History of EIA, Environmental Management Plan, Scope of EIA in Project planning and Implementation.

Unit- II**(10 Hours)**

Process and Components of EIA, EIA Methodology- Screening, Scoping, Baseline data, Impact Identification, Prediction, Evaluation and Mitigation, Appendices and Forms of Application.

Unit- III**(8 Hours)**

Techniques of Assessment-Cost-benefit Analysis, Matrices, Checklist, Overlays, Impact on Environmental component: air, noise, water, land, biological, social and environmental factors. EIA Document.

Unit –IV**(4 Hours)**

Main participants in EIA Process Role of Project proponent, environmental consultant, PCBs, PCCs, public and IAA. Public participation.

Unit- V**(4 Hours)**

Environmental Appraisal and Procedures in India, Environmental Audit of different environmental resources, Risk Analysis, Strategic environmental assessment.

SEMESTER IV		
Title of the Course	:	GLOBAL CLIMATE CHANGES
Category of the Course	:	Skill Enhancement Course
Course Code	:	U4R3BOSEC6:2
Nature of the Course	:	Skill Development

Marks: CIA: 25 + Ext: 75 = 100

Hrs / Week: 2

Credits: 2

Total Inst. Hrs: 30

Course Objectives

1. To gain insights on the impact of greenhouse effect on global climate change and mitigation measures.
2. To understand the implications of carbon and ecological footprint.
3. To apply the knowledge to greenhouse effects.
4. To know the rain and its effects on plants.
5. To know about Global Environmental change issues.

Unit- I

(5 Hours)

Global Environmental change issues. UNFCCC, IPCC, Kyoto protocol, CDM, Carbon footprint and ecological footprint.

Unit –II

(7 Hours)

Stratospheric ozone layer: Evolution of ozone layer; Causes of depletion and consequences; Effects of enhanced UV-B on plants, microbes, animals, human health and materials; Global efforts for mitigation ozone layer depletion.

Unit- III

(6 Hours)

Climate change: Green house effects; causes; Green house gases and their sources; Consequences of climate, oceans, agriculture, natural vegetation and humans; International efforts on climate change issues.

Unit-IV

(7 Hours)

Atmospheric deposition: Past and present scenario; Causes and consequences of excessive atmospheric deposition of nutrients and trace elements; Eutrophication.

Unit- V

(5 Hours)

Acid rain and its effects on plants, animals, microbes and ecosystems.

SEMESTER V		
Title of the Course	:	PLANT MORPHOLOGY, TAXONOMY AND ECONOMIC BOTANY
Category of the Course	:	Core Course
Course Code	:	U5R3BOCC9
Nature of the Course	:	Skill Development

Marks: CIA: 25 + Ext: 75 = 100

Credits: 5

Course Objectives

Hrs / Week:5

Total Inst. Hrs: 75

1. Students will have extensive knowledge of the morphology (vegetative structures and floral structures) of flowering plants.
2. Students will know about the basic concepts of classification of plants.
3. Understand major evolutionary trends in Angiosperm plants.
4. To know the characteristic features of the selected families.
5. To know the economic importance of plants.

Unit- I

(13 Hours)

Morphology – root system – modifications. Shoot system – modifications – (Aerial, sub-aerial and underground). Leaf-Types-simple and compound- phyllotaxy, modifications (phyllode, pitcher), tendrils, stipules. Inflorescences – definition and types – racemose, cymose, mixed and special types. Fruits - classification.

Unit –II

(17 Hours)

History of Angiosperm classification – Artificial, Natural and Phylogenetic system of classification. An outline of Bentham and Hooker system of classification, an overview of APG Classification. Herbarium technique—collection, pressing, drying, mounting and preservation of plant specimens, digital herbarium. Botanical Survey of India. Botanical nomenclature—rules, typification and author citation.

Unit- III

(15 Hours)

Study of the following families based on the Natural system and their economic importance: *Anonaceae*, *Nymphaeaceae*, *Capparidaceae*, *Rutaceae*, *Caesalpinaceae*, *Cucurbitaceae*, *Asteraceae*, *Apocynaceae* and *Asclepiadaceae*.

Unit-IV**(13 Hours)**

Study of the following families based on the natural system and their economic importance: *Convolvulaceae*, *Acanthaceae*, *Lamiaceae*, *Amaranthaceae*, *Euphorbiaceae*, *Liliaceae*, *Orchidaceae* and *Poaceae*.

Unit- V**(17 Hours)**

Source, cultivation method (brief) and the extraction/processing of the economically important products of the following – Cereal (Rice), Pulses (Black gram), Sugar (Sugarcane), Beverage (Coffee), Oil seed (Groundnut), spices (Cardamom), essential oil (Rose), natural rubber and timber plants (Teak) and Fibre (Cotton).

SEMESTER V		
Title of the Course	:	CELL BIOLOGY, MOLECULAR GENETICS AND PLANT BREEDING
Category of the Course	:	Core Course
Course Code	:	U5R3BOCC10
Nature of the Course	:	Skill Development

Marks: CIA: 25 + Ext: 75 = 100**Hrs / Week: 5****Credits: 5****Total Inst. Hrs: 75****Course Objectives**

1. To enable students to gain insights into cell wall organization and its functions.
2. To familiarize with various cell organelles and their functions.
3. To gain knowledge in classical genetics.
4. To know about sex linked inheritance.
5. To have knowledge about plant breeding techniques for crop improvement.

Unit- I**(15 Hours)**

Introduction- scope- cell organisation- Ultra structure of Prokaryotic cell and Eukaryotic cell. Plant cell structure and function. Cell boundaries- cell wall- gross layer i.e. middle lamella, primary wall, secondary wall- Structure, chemistry and functions of cell wall, pits- (simple and bordered), Plasmodesmata. Plasma membrane- occurrence, structure (fluid mosaic model) chemistry, function and origin. Properties of Cytoplasm Membrane transport – Passive, active and facilitated transport, endocytosis and exocytosis.

Unit –II**(15 Hours)**

Occurrence, structure, function and origin of Endoplasmic reticulum, Golgi apparatus, Lysosomes, Ribosome's, Mitochondria, Chloroplast and Micro bodies. Semi genetic autonomy of Mitochondria and Chloroplast. Ultra structure and functions of Nucleus, nuclear envelope, nuclear pore complex, nucleolus, chromosomes structure molecular organization of chromatin, Euchromatin, heterochromatin, Polytene and Lampbrush chromosomes-, Centromere: types. cell inclusion. Cell cycle, Cell division, Mitosis and Meiosis- their significance.

Unit- III**(15 Hours)**

Mendelian genetics – monohybrid, dihybrid crosses. Laws of Mendel, Reciprocal cross and Test cross. Incomplete dominance - *Mirabilis jalapa*. Interaction of factors – Complementary genes, Supplementary genes, inhibitory genes, epistasis (dominant and recessive), duplicate genes and multiple alleles. Multiple alleles. ABO Blood grouping in Human. Chromosome theory of linkage, crossing over, recombination's and mapping of genes on chromosomes. Sex determination in plants.

Unit-IV**(15 Hours)**

Sex linked inheritance – Hemophilia and colour blindness. Polyploidy origin, types and significance. Mutation-types and significance. chromosomal aberration – addition, deletion, inversion, duplication and translocation . Extra nuclear inheritance and its significance - Male sterility in corn , Maternal inheritance – Plastid Inheritance in *Mirabilis jalapa*. Genetics of *Neurospora*. Population genetics – Hardy – Weinberg principle.

Unit- V**(15 Hours)**

Principles involved in plant breeding. Plant introduction and acclimatization. Methods of crop improvement: selection (mass, pure line and clonal), hybridization techniques. Heterosis – Interspecific and intergeneric, causes and effects. Mutation in plant breeding, polyploidy in plant breeding and its applications. Breeding for crop improvement for paddy and sugarcane. Biotechnology in crop improvement: Transgenics – scope and limitations; Bt-Cotton.

SEMESTER V		
Title of the Course	:	PLANT ECOLOGY AND PHYTOGEOGRAPHY
Category of the Course	:	Core Course
Course Code	:	U5R3BOCC11
Nature of the Course	:	Skill Development

Marks: CIA: 25 + Ext: 75 = 100**Hrs / Week: 5****Credits: 4****Total Inst. Hrs: 75****Course Objectives**

1. To relate to the significance of the biotic and abiotic components of the ecosystems.
2. To understand the energy flow in ecosystem.
3. To conceptualize the biodiversity.
4. To know implication of pollution on the environment.
5. To familiarize with the phytogeography.

Unit- I**(20 Hours)**

Biotic and abiotic factors and their influence on vegetation – a brief account of microbes, plants, animals, soil, wind, light, temperature, rainfall, and fire. Autecology and Synecology – Vegetation – Units of Vegetation – Formation, Association, Consociation, Society – development of vegetation. Migration – ecesis, colonization, Methods of study of vegetation (Quadrat and transect). Plant succession –Hydrosere and Xerosere. Ecological classification of plants: Morphological and anatomical features of plants and their correlation to the habitat factors.

Unit –II**(12 Hours)**

Structure, trophic organization; food chains and food web, energy flow in an ecosystem. Types of ecosystems: pond, forest and grassland. Ecological pyramids and Biogeochemical cycles of carbon and nitrogen and phosphorus.

Unit- III**(12 Hours)**

Biodiversity: Ecosystem/community, species and genetic diversity. Endemism and hotspots, Natural resources and its conservation (*In situ* and *ex situ*).

Unit-IV**(15 Hours)**

Pollution: Types of pollution: Primary and secondary and their impacts: Air - Greenhouse effect, global warming, ozone depletion, acid rain, Water, soil-causes and consequences. Remedial measures – Green building. Disaster management.

Unit- V**(16 Hours)**

Phytogeography Introduction, continuous and discontinuous distribution, Phytogeography of India, Vegetational regions of India,. Plant indicators. Diversification of land plants. Speciation Changing Earth. Island Biogeography. Plant Biodiversity and its importance.

Definition, levels of biodiversity-genetic, species and ecosystem. Biodiversity hotspots- Criteria, Biodiversity hotspots of India. Loss of biodiversity – causes and conservation (*In situ* and *ex situ* methods). Seed banks - conservation of genetic resources and their importance. Consequences of deforestation and exploitation of targeted species; Forest conservation, Social forestry and Participatory Management of Forest. Concept of degeneration and regeneration of plants.

SEMESTER V		
Title of the Course	:	Major Practical – V (Covering CC9, CC10 and CC11)
Category of the Course	:	Core Course
Course Code	:	U5R3BOCC12P
Nature of the Course	:	Skill Development

Marks: CIA: 60 + Ext: 60 = 100

Credits: 4

Hrs / Week: 5

Total Inst. Hrs: 75

Course Objectives

1. To study morphological characters of the families.
2. Able to describe the plant technically using the floral characteristics.
3. To preserve the plants and prepare herbarium sheets.
4. To study the cell division in root tip as well as flower buds.
5. To understand plant breeding techniques for crop improvement.

EXPERIMENTS

1. Morphology of root, stem and leaf modification, types of inflorescence.
2. Plants of local flora included under theory syllabus and family identification and derivation based on reasoning.
3. Dissection, identification, observation and sketching the floral parts of the plants belonging to the families included in the syllabus.
4. Students must describe the floral parts, draw the L.S., floral diagram and write the floral formula of at least one flower from each family.
5. Twenty (20) Herbarium sheets, field notebook and bonafide record to be submitted.
6. Study the products of plants mentioned in the syllabus of economic botany with special reference to the morphology, botanical name and family.
7. Squash and Smear techniques- Onion root tip and Rheo flower buds.
8. Isolation of DNA from plant source (Onion Bulb, Coconut Endosperm)
9. Micro slide preparation of the internal structure of Hydrophytes and Xerophytes (Habitats)
10. To estimate the vegetation analysis of quadrat method of sampling

Field trips to places for observation, study and collection of plants prescribed in the syllabus for 2 to 5 days under the guidance of faculties.

SEMESTER V		
Title of the Course	:	PLANT BIOTECHNOLOGY
Category of the Course	:	Discipline Specific Elective
Course Code	:	U5R3BODSE5:1
Nature of the Course	:	Skill Development

Marks: CIA: 25 + Ext: 75 = 100**Hrs / Week: 5****Credits: 3****Total Inst. Hrs: 75****Course Objectives**

1. To know various aspects of biotechnology
2. To know the concept and techniques of plant tissue culture.
3. To familiarize with the gene transfer techniques.
4. To know about DNA replication and repair.
5. To familiarize with gene regulation.

Unit- I**(17 Hours)**

Biotechnology – definition, history and scope. Application of plant biotechnology in various fields. Agriculture - Biofertilizers, Biopesticides. Medicine – Antibiotics (Penicillin) Recombinant vaccines, insulin and interferons. Environment – Bioremediation and Biofuel. Industry – ethanol production (yeast), citric acid production (*Aspergillus niger*) and Proteases production (*Bacillus* spp).

Unit –II**(16 Hours)**

Plant tissue culture - introduction, scope and importance, concept of totipotency, aseptic techniques in plant tissue culture. Composition of media, types of media, sterilization, explant preparation and inoculation. Callus induction and micropropagation. Application of plant tissue culture in agriculture, horticulture and forestry. Synthetic seed technology.

Unit- III**(16 Hours)**

Vectors; plasmid, bacteriophage, viral vectors, cosmids. Restriction enzymes. Recombinant DNA technology, gene transfer – indirect method, *Agrobacterium* mediated gene transfer. Direct method – Biolistic method. Development of transgenic plants with reference to insect resistance, Pros and cons of GM food.

Unit-IV**(13 Hours)**

Nature and function of genetic materials, Nucleic acid – base pairing – Chargaff's rule, DNA – structure. Types, denaturation - renaturation. Replication of DNA in prokaryotes. RNA structure and types. DNA repair mechanism.

Unit- V**(13 Hours)**

Transcription – Enzymology – RNA polymerase – classes of RNA molecules – transcription in prokaryotes. Protein synthesis – Genetic code – characters – codons and anticodons. Gene regulation in Prokaryotes – *lac* operon and *trp* operon

SEMESTER - V			
Title of the Course	:	HORTICULTURE	
Category of the Course	:	Discipline Specific Course (DSE)	
Course Code	:	U5R3BODSE5:2	
Nature of the Course	:	Skill Development	
Marks	:	CIA:25+ Ext:75 =100	Hrs/Week : 5
Credit	:	3	Total Inst. Hrs:75

Course Objective

1. To gain an understanding of the fundamentals of horticulture and techniques needed to grow and maintain plants.
2. To develop skills in students to work as gardeners, therapists, designers, growers and technical advisors in the food and non-food sectors of horticulture.
3. To know about hydroponic culture.
4. To develop the various horticultural crop protection.
5. To impart the knowledge on market preparation.

UNIT I**(15 Hours)**

Introduction - scope and division of Horticulture, History of Gardening some famous gardens in India, Types of Garden: **Indoor garden, public garden, kitchen garden**. Garden implements and accessories.

UNIT II**(16 Hours)**

Nursery structures-Nursery beds, **propagating frames, green house and glass house**. Nursery Management- **cutting, layering, grafting, budding and potting**. Preparation of soil mixture. Garden operations-**planting and transplantation, staking, pruning, topiary** and watering.

UNIT III**(14 Hours)**

Basic principles and Model of Terrace garden, rock garden hydroponics, terrarium, arches, pergolas, and Bonsai techniques.

UNIT IV**(10 Hours)**

Cut flowers: Flower arrangements, **Commercial floriculture, Cultural practices of Rose, Jasmine, Chrysanthemum and Orchids**.

UNIT V**(20 Hours)**

Landscaping principles - planning designs for house gardens, institutional and industrial gardens. Different grasses, **maintenance of lawns and turf in play grounds, gardens and golf courses; special types of gardens: traffic islands, bog garden, water garden and public garden**.

SEMESTER V		
Title of the Course	:	BIO NANOTECHNOLOGY
Category of the Course	:	Discipline Specific Elective
Course Code	:	U5R3BODSE6:1
Nature of the Course	:	Skill Development

Marks: CIA: 25 + Ext: 75 = 100**Hrs / Week: 3****Credits: 3****Total Inst. Hrs: 75****Course Objectives**

1. To provide students with comprehensive knowledge of basics in nanotechnology.
2. To enable the students understand and appreciate the various applications of nanoparticles.
3. To give perspective to researchers and students who are interested in nanoscale physical and biological systems and their applications in medicine.
4. To introduce the concepts in nanomaterials and their use with biocomponents to synthesize and interact with larger systems.
5. To impart knowledge on the most recent molecular diagnostic and therapeutic tools used to treat various diseases.

Unit- I**(15 Hours)****INTRODUCTION TO NANOTECHNOLOGY:**

History, Concepts, Prospects and Challenges. Scope of nanotechnology in Indian and global perspectives. Definition - Nanoscience, Nanotechnology. Classification based on the dimensionality- basic understanding of 1D, 2D and 3D nanostructures. Overview of nanoparticles, nanoclusters - nanotubes, nanowires and nanodots. Biotemplates – DNA to build nanocubes and hinges – smart glue, DNA as wire template.

Unit –II**(15 Hours)****SYNTHESIS OF NANOPARTICLES:**

Synthesis of nanoparticles - Top down and bottom up approach. Methods of synthesis: Physical, Chemical reduction – reducing agents, capping agents, stabilizing of nanoparticles and Biological – Novel synthetic methods using plant extracts, bacteria and fungi.

Unit- III**(18 Hours)****FOREST UTILIZATION AND WOOD TECHNOLOGY:****PROPERTIES & CHARACTERIZATION OF NANOPARTICLES:**

Nano size effects - optical, electrical, mechanical, magnetic and catalytic activity. Characterization of nanoparticles using UV-Visible spectroscopy, SEM, TEM, Atomic force microscopy, Scanning tunnel microscopy, NMR, X-ray Crystallography and Photoluminescence.

Unit-IV**(12 Hours)****NANOCARRIERS:**

Introduction. Nanocarriers for drug delivery (DDS) – Polimeric nanotubes and solid lipid nanoparticles (SLN) as carriers, controlled release, site specific targeting. Magnetic nanoparticles as drug carriers and its applications.

Unit- V**(15 Hours)****APPLICATIONS OF NANOPARTICLES:**

Textiles, Food industry - nutraceutical, Medicine - antimicrobial activity, wound healing and dressing; Environment – green manufacturing. Agriculture - nanofertilizers and nanopesticides. Smart biosensors – Components and its application.

SEMESTER - V			
Title of the Course	:	FORESTRY	
Category of the Course	:	Discipline Specific Course (DSE)	
Course Code	:	U5R3BODSE6:2	
Nature of the Course	:	Skill Development	
Marks	:	CIA:25+ Ext:75 =100	Hrs/Week : 5
Credit	:	3	Total Inst. Hrs:75

Course Objective

1. To study the distribution pattern, composition and diversity of forest ecosystem
2. To understand the method of forest management principles and conservation
3. To enable them to meaningfully contribute in the forest conservation.
4. To raise student awareness of the need to create a sustainable way of living and the current global issues with forestry caused by human interference
5. To provide a platform to appreciate biodiversity and the importance.

UNIT –I**SILVICULTURE:****(15 Hours)**

Forests - definition. Forest types of India and Tamil Nadu . Role of forests. Factors of locality - climatic - edaphic - topographic - biotic - interaction of forest with the environment. Silviculture - objectives - scope - general principles. Nursery techniques - Vegetative and clonal propagation techniques and methods - macro and micro propagation techniques.

Unit—II**(10 Hours)****FOREST MENSURATION AND MANAGEMENT:**

Forest Mensuration - Definition and objectives. Measurement of diameter, girth, height, crown and volume of trees - methods and principles - tree stem form - form factor. Volume estimation of stand - age - basal area determinations Stem and Stump Analysis.

Unit-III**(15 Hours)****FOREST UTILIZATION AND WOOD TECHNOLOGY:**

Logging - extraction of timber - felling rules and methods - conversion methods - conversion season. Implements used - cross cutting system - sawing - different types - extraction methods. Grading of timbers. Transportation of timbers - major and minor transportation methods Storage and sales of logs - sales depot - management of depots. Wood Composites - plywood, fiber boards, hardboard - production technology. Non timber forest products (NTFP): collection - processing and storage of NTFP - fibres and bamboos and canes - katha and bidi leaves.

Unit-IV**(15 Hours)****FOREST BIOLOGY AND BOTANY:**

Forest ecology - definition - biotic and abiotic components - forest ecosystem - forest community - concepts - succession - primary productivity - nutrient cycling. Composition of forest types in India - classification of India's forests. Restoration ecology - global warming - green house effects - ozone layer depletion - acid rain - role of trees in environmental conservation. Biodiversity - Definition, origin, types - factors endangering biodiversity - biodiversity hotspots - endemism - Red Data Book. Biodiversity assessments - principles and methods.

Unit-V**(20 Hours)****FOREST BOTANY, AGRO FORESTRY AND SOCIAL FORESTRY**

Tree Improvement - Forest Genetics and Tree Breeding - Definition and concepts - Steps in tree improvement - Variation and selection. In situ and ex situ gene conservation. Exotics - role of exotic forest trees in India - application of biotechnological methods in forestry. Agro forestry - definition, concept and objectives. Classification of agro forestry systems. Agro forestry practices for different agro-climatic zones of Tamil Nadu. Social forestry - objectives and scope and necessity - its components and implementation in local and national levels - social attitudes and community participation.

SEMESTER VI		
Title of the Course	:	PLANT PHYSIOLOGY AND PLANT BIOCHEMISTRY
Category of the Course	:	Core Course
Course Code	:	U6R3BOCC13
Nature of the Course	:	Skill Development

Marks: CIA: 25 + Ext: 75 = 100**Hrs / Week: 6****Credits: 4****Total Inst. Hrs: 90****Course Objectives**

1. To relate to water relation of plants with respect to various physiological phenomenon.
2. To know the pathways of photosynthesis.
3. To familiarize with respiration and nitrogen metabolism.
4. To know about plant growth regulators.
5. To familiarize with plant biochemistry.

Unit- I**WATER RELATIONS:****(16 Hours)**

Properties of water—imbibition, diffusion, osmosis and plasmolysis- ascent of sap, mechanism of water absorption – active and passive, apoplast and symplast pathway. Transpiration – types and factors affecting transpiration and significance. Opening and closing of stomata- mechanisms and theories of transpiration.

Unit –II**PHOTOSYNTHESIS:****(20 Hours)**

Radiant energy, Photosynthetic unit, photosynthetic pigments and their role, photo systems, path of carbon in photosynthesis - Light reaction, electron transport system in the chloroplast (Z-Scheme). Dark reaction - C3 cycle, C4 cycle, CAM pathway, Photorespiration.

Unit- III**(18 Hours)**

RESPIRATION Aerobic, Glycolysis, Krebs Cycle, Electron Transport System, oxidative phosphorylation, respiratory quotient, Anaerobic- fermentation - Respiratory quotient.

NITROGEN METABOLISM Biological nitrogen fixation, nitrogen cycle

Unit-IV**(19 Hours)**

GROWTH: Growth – plant growth regulators (auxins, gibberellins, cytokinins, ethylene and abscisic acid) - Practical applications - Photo morphogenesis – photoperiodism – vernalization – dormancy- phytochromes. **Stress Physiology:** Concepts of plant responses to stresses (water, salt, temperature). **Unit- V** **(17 Hours)**

PLANT BIOCHEMISTRY:

Classification, properties and biological role of carbohydrates, proteins, lipids and nucleic acids. Enzyme – properties – classification – nomenclature of enzymes – mode of enzyme action – factors influencing enzyme action.

SEMESTER VI		
Title of the Course	:	Major Practical – VI (Covering CC13P)
Category of the Course	:	Core course
Course Code	:	U6R3BOCC14P
Nature of the Course	:	Skill Development

Marks: CIA: 40 + Ext: 60 = 100

Hrs / Week: 5

Credits: 4

Total Inst. Hrs: 75

Course Objectives

1. To study morphological and anatomical adaptations of plants of various habitats.
2. To demonstrate techniques of plant tissue culture.
3. To familiarize with the structure of DNA, RNA.
4. To carryout experiments related with plant physiology.
5. To perform biochemistry experiments.

Plant Ecology and Phytogeography

1. Study of morphological and anatomical adaptations of locally available hydrophytes, xerophytes, mesophytes and halophytes and correlate to their particular habitats.

Hydrophytes : *Nymphaea*, *Hydrilla*

Xerophytes : *Nerium*, *Casuarina*

Mesophytes : *Tridax*, *Vernonia*

Halophytes : *Avicennia*, *Rhizophora*

Epiphytes : *Vanda*

2. Map of the phytogeographical regions of India.
3. Quadrant study and line transect.
4. Plan for a green building.

Field trip to any one scrub jungle or wetland (Guindy National park/Nanmangalam Scrub jungle/Pallikaranai Marsh/Siruthavur Scrub/Vedanthangal Bird Sanctuary/Kelampakkam Marsh/Adyar Poonga).

Plant Biotechnology - Demonstration

1. Sterilization techniques in plant tissue culture.
2. MS - Media preparation.
3. Explants sterilization, Callus induction, Plantlet, hardening.

Molecular Biology – Photographs

1. DNA Structure
2. tRNA
3. DNA – Replication
4. DNA – Repair
5. Genetic code

Plant Physiology and Plant Biochemistry

1. Determination of water potential by plasmolytic method.
2. Effect of chemicals on membrane permeability.
3. Effect of environmental factors on rate of transpiration by gravimetric method.
4. Separation of plant pigments by paper chromatography.
5. Study the rate of photosynthesis under different light intensities by using Willmott's bubble counter.
6. Study of rate of photosynthesis under different wavelengths (red & blue) of light.
7. Comparison of rate of respiration of different respiratory substrates.
8. Measurement of pH of expressed cell sap and different soils using pH meter.
9. Enzyme activity – catalase.
10. Biochemical test for carbohydrates, proteins and lipids

Demonstration – Experiments

1. Study the rate of transpiration by using Ganong's photometer
2. Demonstration of stomatal movement.
3. Induction of roots in leaves by auxins.

SEMESTER VI		
Title of the Course	:	COMPUTER APPLICATIONS IN BOTANY
Category of the Course	:	Discipline Specific Elective
Course Code	:	U6R3BODSE7:1
Nature of the Course	:	Skill Development

Marks: CIA: 25 + Ext: 75 = 100**Hrs / Week: 5****Credits: 3****Total Inst. Hrs: 75****Course Objectives**

1. To familiarize the student with the fundamentals concepts of bioinformatics.
2. To equip students with computational skills for drug design.
3. To learn about the bioinformatics database, data format and data retrieval from online sources.
4. To develop interdisciplinary skills in using computers in botany to learn about the biological database.
5. Student is aware with the most recent technologies for sequencing and bioinformatics analysis and is able to apply them to the structural and functional genomics of plants.

Unit- I**(20 Hours)**

Introduction to computers and Bioinformatics. Introduction to Computers – classification, computer generation, low, medium and high level languages, software and hardware, operating systems personal, mini, main frame and super computers, characteristics and application, computer memory and its types, data representation and storage. Microsoft excel, data entry, graphs, aggregate functions, formulas and functions, number systems, conversion devices, secondary storage media

Unit –II**(15 Hours)**

Biological Research on the web: Using search engines, finding scientific articles. Fundamentals of networking, internet, and search engines- yahoo, Google, etc. telnet ftp.

Unit- III**(15 Hours)**

Computer fundamentals - programming languages in bioinformatics, role of supercomputers in biology. Historical background. Scope of bioinformatics - Genomics, Transcriptomics, Proteomics, Metabolomics, Molecular Phylogeny, computer aided Drug Design (structure based and ligand based approaches), Systems Biology and Functional Biology. Applications and Limitations of bioinformatics.

Unit-IV**(13 Hours)**

Introduction to databases. Biological databases- NCBI, EMBL and DDBJ. Data Generation and Data Retrieval Generation of data (Gene sequencing, Protein sequencing, Mass spectrometry, Microarray), Sequence submission tools (BankIt, Sequin, Webin); Sequence file format (flat file, FASTA, GCG, EMBL, Clustal, Phylip, Swiss-Prot); Sequence annotation; Data retrieval systems (SRS, Entrez) DNA sequencing methods. protein sequencing Phylogenetic analysis Similarity, identity and homology, Alignment – local and global alignment, pairwise and multiple sequence alignments, alignment algorithms. Methods of Alignment (Dot matrix, Dynamic Programming, BLAST and FASTA); Phylogenetic analysis: Construction of phylogenetic tree, dendrograms, methods of construction of phylogenetic trees.

Unit- V

(12 Hours)

Applications:

Application of Taxonomic Software for preparation of Dichotomous Key. Phylogenetic analysis.

Make line drawing of Plants for description. Usage of plant identification apps on android phones.

Computer application in biostatistics - MS Excel and SPSS. Computer Aided Designing (CAD) for outdoor and indoor Land scaping. Exposure to CAD (Computer Aided Designing).

SEMESTER - VI			
Title of the Course	:	FORENSIC BOTANY	
Category of the Course	:	Discipline Specific Course (DSE)	
Course Code	:	U6R3BODSE7:2	
Nature of the Course	:	Skill Enhancement Course	
Marks	:	CIA:25+ Ext:75 =100	Hrs/Week : 5
Credit	:	3	Total Inst. Hrs:75

Course Objectives

1. To provide basic knowledge about the application of Botany to Forensic investigations and legal disputes.
2. To provide students with knowledge of palynology, dendrology, plant anatomy, pharmacognosy, molecular biology and toxic compounds from plants that could serve as leads in crime spots.
3. To learn classification of plants from forensic point of view.
4. To understand forensic importance of different parts of plants.
5. To develop and identify main morphological and anatomical features of plants, which could be useful for forensic investigations.

UNIT –I**(15 hours)**

General plant classification schemes, Sub specialization of forensic botany: plant morphology, plant anatomy, plant systematic, palynology, plant ecology, limnology, Plant architecture- roots, stems, flowers, leaves. Practical plant classification schemes: vegetables and herbs, fruits bearing trees and plants. Landscaping plants: trees, shrubs and vines, grasses.

Unit- II**(15 hours)**

Identification and matching of various types of wood, timber varieties, seeds, leaves and their forensic importance. Types of fibers – forensic aspects of fiber examinations, Identification and comparison of man-made and natural fibres. Various types of planktons and diatoms and their forensic importance. Study and identification of pollen grains, Identification of starch grains, powder and stains of spices etc. Paper and Paper Pulp identification.

Unit-III**(15 hours)**

Various types of poisonous plants: *Abrus precatorius*, *Aconitum napellus*, *Argemone mexicana*, *Cannabis sativa*, *Claviceps purpurea*, *Croton tiglium*, *Atropa belladonna*, *Gloriosa superba*, *Lathyrus sativus*, *Nerium indicum*, *Strychnos nux-vomica*, *Thevetia nerifolia*.

Unit-IV**(15 hours)**

Types of plants yielding drugs of abuse – opium, cannabis, tobacco, datura, *Psilocybin* mushrooms. Collection and preservation of botanical evidences: Botanical samples, outdoor crime scene consideration.

Unit –V**(15 hours)**

Analysis of samples: DNA analysis, plant DNA typing, Classic forensic botany cases: Case histories by using Plant anatomy and systematic, Palynology, Plant ecology, Limnology, Plant Molecular Biology, Drug enforcement and DNA.

SEMESTER VI		
Title of the Course	:	VERMITECHNOLOGY
Category of the Course	:	Discipline Specific Elective
Course Code	:	U6R3BODSE8:1
Nature of the Course	:	Skill Development

Marks: CIA: 25 + Ext: 75 = 100**Hrs / Week: 3****Credits: 3****Total Inst. Hrs: 45****Course Objectives****Objectives**

- To provide basic understanding of biological, chemical and environmental concepts pertaining to vermicompost
- To create knowledge on environmental degradation
- To get the theoretical knowledge on vermicompost bed preparation
- To create knowledge on self-employment opportunity
- To get knowledge on earthworm

UNIT-I

Vermiculture: Definition, scope and importance- common species for culture- environmental Requirements- culture methods- benefits and constraints of vermicomposting.

UNIT-II

Earthworms: Taxonomic position and diversity – types- morphology and physiology of earthworm- Ecological roles and needs for earthworm culture – wormy breeding techniques- indoor and outdoor culture- monoculture and polyculture- relative merits and demerits

UNIT-III

Application of vermiculture- Earthworm for management of biomedical solid waste/ food/ belt for capture/ culture fisheries- forest regeneration – Future perspectives- predator- pathogen control in worms- Cost benefits analysis of vermicomposting- potential and constraints for vermiculture in India

UNIT-IV

Bio-fertilizers- classification, nitrogen fixers- Rhizobium, Azatobacter, Cyanobacteria, Azolla, Frankia, Azospirillum and VasicularMycorrhizae.

UNIT-V

Pest and disease management: classification of pest, integrated pest management- components; cultural, mechanical, physical control of pest. Biopesticides against microbial parasites, predators and insects.

SEMESTER VI		
Title of the Course	:	NATURAL RESOURCE MANAGEMENT
Category of the Course	:	Discipline Specific Elective
Course Code	:	U6R3BODSE8:2
Nature of the Course	:	Skill Development

Marks: CIA: 25 + Ext: 75 = 100**Hrs / Week: 3****Credits: 3****Total Inst. Hrs: 45****Course Objectives**

1. To develop an appreciation for the natural resources and their ecological and economic impact.
2. To gain an understanding of various strategies of natural resource management.
3. To understand the concept of different natural resources and their utilization.
4. To create the models of natural resource conservation and maintenance.
5. To study the significance of natural resources pertaining to economy and environment.

Unit- I**(8 Hours)**

Introduction to Natural Resource Bases: Concept of resource, classification of natural resources. Factors influencing resource availability, distribution and uses. Interrelationships among different types of natural resources. Concern on Productivity issues. Ecological, social and economic dimension of resource management.

Unit –II**(9 Hours)**

Forest resources: forest vegetation, status and distribution, major forest types and their characteristics. Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people, forest management. Developing and developed world strategies for forestry. Land resources: Land as a resource. Dry land, land use classification, land degradation, man induced landslides, soil erosion and desertification.

Unit- III**(10 Hours)**

Landscape impact analysis, wetland ecology & management. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Water ecology and management. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies Food resources: World food problems, changes caused by agriculture and over-grazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case-studies. Fish and other

marine resources: Production, status, dependence on fish resource, unsustainable harvesting, issues and challenges for resource supply, new prospects.

Unit-IV**(10 Hours)**

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. Resource Management Paradigms: Resource management the evolution and history of resource management paradigms. Resource conflicts: Resource extraction, access and control system. Approaches in Resource Management: Ecological approach; economic approach; ethnological approach; implications of the approaches; integrated resource management strategies. Poverty and implications in Resource Management in developing countries – Poverty in developing countries, causes and link with resources scarcity and poverty.

Unit- V**(8 Hours)**

Management of Common International Resources: Ocean, climate, International fisheries and management commissions; Antarctica: the evolution of an international resource management regime. Case Studies: 1. Resource management in mountain ecosystem 2. Dry-land ecosystem 3. The management of marine and coastal resources 4. Case study of shifting Cultivation 5. Mangrove ecosystem and their management.

SEMESTER VI		
Title of the Course	:	BOTANY FOR COMPETITIVE EXAMINATIONS
Category of the Course	:	Skill Enhancement Course
Course Code	:	U6R3BOSEC7:1
Nature of the Course	:	Skill Development

Marks: CIA: 25 + Ext: 75 = 100

Hrs / Week: 2

Credits: 2

Total Inst. Hrs: 45

Course Objectives

1. To develop the student for competitive examination.
2. To select the important topics as far as possible, with reference to the examination point of view. It gives a comprehensive account of botany.
3. To understand not only the basics of botany and also gives the broader perspective to prepare for the competitive examinations.
4. The essays give a detailed account of each aspect of botany to help students preparing for IAS, IFS and state civil services.
5. General understanding of plants around us, the different biophysical and biochemical processes that occur within them and their importance to human life.

Unit- I

(6 Hours)

PLANT WORLD:

Plant science and its branches . Five kingdom classification. Outline of Kingdom plantae General characters and Economic importance of Algae, Fungi and Lichens.

Unit –II

(8 Hours)

GENERAL CHARACTERS OF PLANT GROUPS:

General characters and Economic importance of Bryophytes, Pteridophytes and Gymnosperms .Palaeobotany- Types of fossils, Geological time scale ,Fossil beds of Tamil Nadu.

Unit- III

(12 Hours)

PLANT MORPHOLOGY AND TAXONOMY:

Root system and shoot system. Modifications (Pneumatophore, Stilt root, Epiphytic root, Cladode, Phylloclade ,Pitcher and Phyllode) Parts of a flower - Fruits types(Outline) Parthenocarpy- Pollination – types, Seed dispersal – types, Seed Germination types. Taxonomy –definition. Types of classification- Taxonomic hierarchy, ICN, Binomial nomenclature and BSI. Herbarium and Major Herbaria of the world.

Unit-IV

(10 Hours)

CYTOLOGY AND GENETICS:

Cell –Prokaryotic and Eukaryotic – Cell organelles with functions . DNA and RNA (Basic concepts) -Cell division and its significance -Mitosis and Meiosis (outline) Mendelism – Monohybrid and Dihybrid cross, Sex linked inheritance

Unit- V

(9 Hours)

ECOLOGY AND BIODIVERSITY:

Ecosystem – abiotic and biotic components. Energy flow in an ecosystem, Aforestation, Deforestation- Chipko movement –Forest Conservation act- Pollution types and effects- Eutrophication, Global warming ,Ozone depletion, Climate change. Biodiversity and types- Hot spots, Mega diversity countries, Conservation – *ex situ* and *in situ* methods. Endangered plants and Red data Book. Rio -Earth summit. Biodiversity Management Policies - IUCN, UNEP, WWF, ICSU, WCMC.

SEMESTER VI		
Title of the Course	:	AQUATIC BOTANY
Category of the Course	:	Discipline Specific Elective
Course Code	:	U6R3BODSE7:2
Nature of the Course	:	Skill Development

Marks: CIA: 25 + Ext: 75 = 100**Hrs / Week: 3****Credits: 2****Total Inst. Hrs: 45****Course Objectives**

1. To give an overview of the distribution of lower plants forms and its ecological significance.
2. To enable students to understand the ecological functions and economic uses of aquatic plants.
- 3 To equip students to collect, analyze and identify the planktons.
4. To give an exposure to various forms seaweeds.
5. To know about the values and uses of aquatic plants.

Unit- I**(10 Hours)****MARINE AND LIMNETIC MACRO ALGAE:**

Common seaweeds of Indian subcontinent: *Ulva*, *Caulerpa*, *Sargassum*, *Gracilaria*, etc. Common terrestrial algae, including cyanobacteria and lichen photobionts of Indian subcontinent and its life cycle, ecology and taxonomy: *Anabaena*, *Chlorella*, *Scenedesmus*.

Unit –II**(8 Hours)****MANGROVES:**

Mangrove forests of India, including Sundarbans, Pichavaram, Kerala mangroves, Rathnagiri mangroves. Common species of mangroves and mangrove associated plants, including *Avicennia*, *Rhizophora*, *Acanthus* and *Aegiceras*. Ecological significance of mangroves.

Unit- III**(10 Hours)****PHYTOPLANKTONS, CYANOBACTERIA, DINOFLAGELLATES AND DIATOMS:**

Common marine microalgae of India, including phytoplanktons and picoplanktons, Common diatoms and dinoflagellates of Indian Ocean, Common limnetic and terrestrial cyanobacteria of India.

Unit-IV**(9 Hours)****AQUATIC ANGIOSPERMS:**

Common aquatic angiosperms of India, including Lotus, Water Lilly, Water hyacinth. Ecology, life cycle, taxonomy and economic importance of aquatic angiosperms.

Unit- V

(8 Hours)

VALUES AND USES OF AQUATIC PLANTS:

Economic importance of aquatic plants, Ecosystem services of aquatic plants, including biogeochemical cycles, oxygen production and carbon sequestration and so on, edible seaweed and algal resources of India, aesthetic, cultural, spiritual importance of aquatic plants.