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

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: 60**

Course Objectives

Learning Objectives

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

Unit – I: Classification (Fritsch-1935-1945), criteria for classification, algal distribution.

Unit – II: Thallus organization (unicellular-*Chlorella*, Diatoms, colonial-*Volvox*, filamentous-, *Oedogonium*, siphonous-*Caulerpa*, parenchymatous- *Sargassum*, *Gracilaria*).

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

Unit – V: 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 CO_2 sequestration, Algae as indicator of water pollution, algal bioinoculants, Bioluminescence.

Title of the course: **PRACTICAL-I Covering CCI**
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

- To develop skills to identify algae based on habitat, thallus structure and the internal organization.
- To identify microalgae in a mixture.
- To develop skills to prepare the micro-slides of algae.
- To study the economic importance of few species.
- 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: **DSE**
Course code: **U1R3BODSE1**
Nature of the course: **Skill Development**
Marks: CIA: 25 + Ext: 75 = 100 **Hrs / Week: 4**
Credits: 3 **Total Inst. Hrs: 60**

Course Objectives

Learning Objectives

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

Unit – I: Diversity of Invertebrates–IPrinciplesofTaxonomy.Criteriaforclassification–SymmetryandCoelom–Binomial nomenclature. Classification of Protozoa, Coelenterata, Helminthes and Annelida up to classes with two examples..

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

Unit- III: Diversity of Chordates–I
Classification of Prochordata, Pisces and Amphibiaup to orders giving two examples.

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

Unit – V: Animal organisationStructure and organisation of
(i).Earthworm(ii)Rabbit/Rat(iii)Prawn/Fish

Title of the course: **ENVIRONMENTAL BIOTECHNOLOGY**
Category of the course: **NON-MAJOR ELECTIVE-2**
Course code: **U1R3BOSEC1**
Nature of the course: **Skill Development**
Marks: CIA: 25 + Ext: 75 = 100 **Hrs / Week: 5**
Credits: 1 **Total Inst. Hrs: 60**

Course Objectives

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

Unit – I: Introduction:

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

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

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:

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

Unit – IV: Bioremediation:

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

Unit – V: Biometallurgy and related topics:

Biomineralization – bioleaching - Biofilms and biocorrosion.

FOUNDATION COURSE FOR BOTANY
BASICS OF BOTANY

Category of the course: **ELECTIVE**
Course code: **U1R3BOFC1**
Nature of the course: **Entrepreneurship and Skill Development**
Marks: CIA: 25 + Ext: 75 = 100 **Hrs / Week: 2**
Credits: 2 **Total Inst. Hrs: 60**

Course Objectives

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

Unit – I: 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: CELL BIOLOGY Cell as the basic unit of life - Prokaryotic and Eukaryotic Cell (PlantCell) - Light Microscope - Ultra Structureof Prokaryotic and Eukaryotic Cells - Cell Wall - Cell Membrane Plastids, Ribosomes.

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

Unit – V: PLANT PHYSIOLOGY Cell as a Physiological Unit : 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

1. To describe the common characteristics of fungi as being heterotrophic, unicellular/multicellular.
2. To understand the biology of fungi and to discuss the importance of fungi in various ecological roles
3. 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.
4. To identify the main groups of plant pathogens, their symptoms.
5. To understand the various types of plant diseases.

Unit – I **(Ins. Hours: 15)**

FUNGI

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 **Hrs / Week: 5**
Credits: 5 **Total Inst. Hrs: 75**

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 sturcture 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	**:**	**U2R3ZODSE2P**
Nature of the Course	**:**	**Skill Development**

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

Course Objectives

1. Dissect Alimentary canal, Arterial system andBrain 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
SpecimenandSlides:
(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 : Chemaeleon, Naja,.
(vii). Aves: Columba**viii). Mammalia:**Rabbit.
Blood Grouping. Total WBC and RBC.
Estimation of Ammonia and analysis of Excretory Products

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. Tocultivate 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 **6 Hours**

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

Unit-II **6 Hours**

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

Unit –III **6 Hours**

Culture methods of *Pleurotus* and *Agaricus.*

Unit – IV **6 Hours**

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

Unit- V **6 Hours**

Diseases and post harvest technology, Insect pests, nematodes, mites, viruses, fungal competitors and other important diseases. Marketing strategies – Economic of mushroom cultivation

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. UNFCC, 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; Globalefforts 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 (NME –II)**
Course Code	**:**	**U2R3BOSEC3:1**
Nature of the Course	**:**	**Entrepreneurship and 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).

ORGANIC FARMING

Category of the Course: **NON-MAJOR ELECTIVE-I**
Course Code: **U1R3BOSEC3:2**
Nature of the Course: **Entrepreneurship and 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.