**DEPARTMENT OF BOTANY**

**Aim**
To impart an education that promises an integrated growth of knowledge, skills and values and enables the students to have confidence and positive outlook.

**Objectives**
1. To develop an in-depth knowledge in the subject.
2. To enable the students to pursue higher studies.
3. To create an awareness on environment.

**Courses Offered**

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**TOTAL**

180

140 + 3

**Semester I**

**Major Core I: Algae, Fungi and Lichens**

Sub. Code: BC1711

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Objectives
To understand the importance of different groups of plants and their diversity.
To study in detail the different genera belonging to various classes of Algae, Fungi, Lichens and their economic importance.

Unit I
Algae: Classification of Algae according to Fritsch (1945). General Characters, Salient features of the classes, occurrence, structure, reproduction and life cycle of the following (Development aspect not included)
Cyanophyceae – Nostoc
Chlorophyceae- Volvox, Caulerpa

Unit II
Phaeophyceae- Sargassum
Rhodophyceae- Gracilaria

Unit III
Morphology and life cycle of the following
Xanthophyceae – Vaucheria
Bacillariophyceae – Diatoms
Economic and Ecological importance of Algae

Unit IV
Fungi: Classification of fungi according to Alexopoulos and Mims (1962). General characters, Salient features of the classes, occurrence, structure, reproduction and life cycle of the following (Development aspect not included)
Oomycetes – Albugo
Ascomycetes – Aspergillus, Peziza
Basidiomycetes – Puccinia
Economic importance of Fungi

Unit V
Lichens:
General characters of Lichens, Classification of Lichens
Ascolichens- Usnea
Economic importance of Lichens

Text Books

Reference Books

### Semester I

**Allied I: Cell Biology and Plant Anatomy**  
**Sub. Code: BA1711**

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**Objectives**
- To study the structure and functions of cell organelles.
- To know the internal structure of higher plants.

**Unit I**  
Cell - Prokaryotic and Eukaryotic; Structure of plant cell, chemical composition and functions of the following - Plasma membrane (fluid mosaic model), Chloroplast and Mitochondria

**Unit II**  
Non living inclusions – starch grains, aleurone grain, cystolith and raphide.  

**Unit III**  
Tissues – Meristems – Classification (origin, position and function); Permanent – structure and functions of simple tissues – parenchyma, collenchyma, sclerenchyma. structure and functions of complex tissues – xylem and phloem.

**Unit IV**  
Primary structure of dicot stem and root - Primary structure of monocot stem and root.

**Unit V**  
Study of the internal structure of dicot and monocot leaf - Normal secondary thickening of dicot stem

**Text Books**

**Reference Books**
Semester I
Food and Nutrition (NMEC)
Sub. Code: BNM171

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Objectives
To study the sources and nutritive value of food.
To be aware of food adulteration and ill effects of junkfood.

Unit I

Unit II
Nutritive value of rice and wheat
Cereals - Rice, processing and products; Wheat- processing, bread manufacturing and other value added products of wheat.
Beverages: Non-alcoholic- Coffee, tea and cocoa-processing.
Alcoholic- Beer, wine and distilled liquors

Unit III
Food Preservation: Importance of preservation. Methods of preservation - low and high temperature, use of oil and spices, salt and sugar. Preparation of jam, jelly, pickles and squashes.
Nutritive value of meat, fish and egg
Meat and meat products; sea foods- storage and processing of fish and fish products Egg- egg products

Unit IV
Food Additives: Definition and types. Milk and milk products, ice cream and related products; cheese, reduced fat dairy products. Food adulteration- harmful effects, simple physical tests for detection of food adulterants.

Unit V
Food borne infection and their prevention- Botulism, Salmonellosis and Shigellosis.
Food intoxication- bacterial toxins and fungal toxins.

Text Book
Reference Books
Bangalore Print and Publishing Company.
Publications and Information Division.

Semester II
Major Core II: Plant Anatomy and Embryology
Sub. Code: BC1721

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Objectives
To know the internal structure of plants.
To learn the structure and development of reproductive units in higher plants.

Unit I
Meristems – Classification (origin, position and function); Apical organization of shoot and root.
Tissues – Structure and function of simple tissue (parenchyma, collenchyma and sclerenchyma) and complex tissue (xylem and phloem). Primary structure of dicot and monocot stem, root and leaf.

Unit II
Secondary growth in stem and root – Formation of cambial ring, activity of cambial ring, secondary vascular tissue, formation of periderm, lenticels, annual ring, Wood (heartwood and sapwood). Anomalous secondary thickening in dicot stem (Boerhaavia) and monocot stem (Dracaena).

Unit III
Epidermal tissue system, trichomes, glandular hairs, cuticle, stomata and its types; Nodal anatomy types - unilacunar (Justicea), trilacunar (Azadirachta) and multilacunar (Aralia), Hydathodes and laticifers.

Unit IV
Embryology – Structure of anther; Structure of microsporoangium, microsporogenesis, structure of pollen; development of male gametophyte. Structure and
types of ovules; Structure of megasporangium, megasporogenesis and development of female gametophyte.

Unit V
Types of embryo sac – Monosporic – Polygonum type. Fertilization, endosperm - types- nuclear, cellular and helobial, ruminant endosperm, perisperm. Development of embryo in dicot (Capsella) and monocot (Luzula).

Text Books

Reference Books

Semester
Major Practical I: Algae, Fungi and Lichens
Sub. Code: BC17P1

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To make suitable micro preparations of types prescribed in the syllabus
Caulerpa – Rhizome
Sargassum – Stipe, ‘leaf’
Gracilaria – Thallus
Albugo – Conidia
Peziza - Apothecium
Puccinia – Uredosorus and Teleutosorus
Lichens – Thallus

To identify the Specimens
Nostoc – Filament
Volvox – Vegetative colony with daughter colonies, antheridum and oogonium Sargassum – Entire thallus, Male and Female Conceptacles
Gracilaria – Thallus with cystocarp
Vaucheria – Sexual reproduction
Diatoms- Pennate and Centric
Algal mixture
Aspergillus – Conidia
Puccinia – Aecidium and pycnidium
Lichens – Apothecium and Soredium

Semester II
Major Practical II: Plant Anatomy and Embryology
Sub. Code: BC17P2

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Plant Anatomy and Embryology

To observe and identify different types of tissues
Sectioning, staining, mounting and identification of primary structure of dicot stem, dicot root, monocot stem and monocot root; Dicot and monocot leaf.
Normal secondary thickening of dicot stem and dicot root.
Anomalous secondary thickening – Dicot stem (Boerhaavia) and monocot stem (Dracaena)
Nodal types – Unilacunar, trilacunar and multilacunar.
Stomatal types – anomocytic, anisocytic, paracytic, diacytic and graminaceous.
To observe and identify the slides of
T.S of Anther (Sporogenous, Tetrad and Mature)
L.S of Ovule – Orthotropous and Anatropous
Dissection of Tridax embryo (Globular or Cordate stage).

Semester II
Allied I: Taxonomy of Angiosperms and Plant Physiology
Sub. Code: BA1721

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Objectives
To impart basic knowledge of morphology to understand Taxonomy
To study the vegetative and floral characters of Angiosperm families.
To study the functions of plants.

Unit I
Brief account of morphology: Root, stem, leaf, inflorescence and fruits.
Classification – artificial, natural (Bentham & Hooker’s) and phylogenetic, Bionomial nomenclature
Unit II
Study of the following families and their economic importance - Annonaceae, Rutaceae, Lamiaceae, Euphorbiaceae and Poaceae.

Unit III
**Plant Physiology:** Water relations - Importance of water to plant life - imbibition, diffusion, osmosis and plasmolysis. Absorption of water - passive and active mechanisms, ascent of sap, transpiration – types and brief note on stomatal movement.

Unit IV
**Photosynthesis:** photosynthetic apparatus, Mechanism of photosynthesis, pigment systems, light dependent reactions (cyclic and non-cyclic), C\textsubscript{3} Cycle. Factors affecting photosynthesis.

Unit V:
**Respiration:** Types - aerobic (glycolysis, Kreb’s cycle and oxidative phosphorylation) anaerobic (fermentation) –Brief account on oxidative phosphorylation. Factors affecting respiration.

Plant growth - Growth hormones – physiological role of auxins and gibberellins.

Text Books

Reference Books


Semester II

**Allied Practical I**

Cell Biology and Plant Anatomy; Taxonomy of Angiosperms and Plant Physiology

Sub. Code: BA17P1

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**Cell Biology and Plant Anatomy (To be conducted in Semester – I)**
To identify electron micrographs of the cell organelles and non living inclusions.
To observe and identify different types of tissues.
Sectioning, staining, mounting and identification of primary structure of dicot stem, dicot root, monocot stem and monocot root.

Sectioning, staining, mounting and identification of Dicot leaf.

**Taxonomy of Angiosperms and Plant Physiology (To be conducted in Semester – II)**

To make dissections of the floral parts of the families prescribed in the syllabus and to make drawings to bring out the salient features including floral diagram and floral formula.

Assigning plants to their respective families.

Demonstration only

- Transpiration pull
- Oxygen evolved during photosynthesis
- Light-screen experiment
- Khune’s apparatus

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<tr>
<th>Semester II</th>
<th>Eco-Friendly Technology (NMEC)</th>
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**Objectives**

To enable the students to acquire knowledge on the importance of biological resources

To be self employable.

**Unit I**

Mushroom: Nutritional value of Mushrooms; Cultivation, processing and marketing of Plerotus and *Agaricus*.

**Unit II**

Vermicomposting: Conditioning of sludge, disinfection of sludge, dewatering, heat drying and disposal of sludge; advantages of vermicompost.

**Unit III**

Fermentation: Definition – Role of microorganisms in fermentation process - wine and vinegar preparation.

**Unit IV**

Biogas Technology: Anaerobic digestion- Biogas production by KVIC model.

Solar Energy: Solar cooker, solar lamp and solar water heater.

**Unit V**

Banana Fibre Processing: Cutting and slitting, fibre separation and drying, uses of banana fibre. Craft Articles from natural fibres of Palm, Bamboo and Cyperus.

**Text Book**


**Reference Books**

### Semester III
#### Major Core III: Archegoniate
**Sub. Code: BC1731**

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**Objectives**
- To acquire knowledge on early land plants.
- To understand the life cycle patterns of archegoniate.

**Unit I**
Unifying features of Bryophytes, transition to land habit, classification by Rothmalar (1951). Distribution, systematic position, morphology, anatomy, reproduction and life cycle of *Marchantia* and *Polytrichum*. (Developmental details not to be included). Ecological and economic importance of Bryophytes.

**Unit II**
General characteristics, classification by Smith (1955), Salient features, types of stele, life cycle patterns. Distribution, systematic position, morphology, anatomy, reproduction and life cycle of Psilotum (Developmental details not to be included).

**Unit III**
Distribution, systematic position, morphology, anatomy, reproduction and life cycle of *Selaginella* and *Marsilea* (Developmental details not to be included). Heterospory, seed habit and stelar evolution. Ecological and economical importance of Pteridophytes.

**Unit IV**
General characteristics, classification by Chamberlain (1935), salient features, distribution, systematic position, morphology, anatomy and reproduction of *Pinus*. (Developmental details not to be included). Ecological and economical importance of Gymnosperms.

**Unit V**
Geological time scale. Fossils - Methods of fossilization and importance of fossils. Distribution, systematic position, morphology, anatomy and reproduction of *Rhynia* and *Lyginopteris*.

**Text Books**
Reference Books


<table>
<thead>
<tr>
<th>Semester III</th>
<th>Elective I (a): Herbal Botany</th>
<th>Sub. Code: BC1732</th>
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Objectives
To encourage, protect and safeguard the patent rights and Intellectual Property Rights

To serve as a source of supply of improved plants not readily available from other agencies

Unit I
Herbal medicines-History and scope: Knowledge on-Ayurveda, Siddha, Unani and Homeopathy. Brief knowledge on Ethnomedicine, Ethnomedicinal plants of Kanyakumari District.

Unit II
Folk medicines including grandmother medicinal practices (Home remedies) for common ailments like cold, fever, cough, diarrhoea

Skin and hair care: Herbal preparation, decoction, extract, infusions, oils, shampoos and powders.

Unit III
Botanical name, family, morphology of medicinally importance of useful parts, active principles and utilization of the following medicinal herbs: *Catharanthus roseus*, *Withaniasomnifera*, *Clerodendrumphlomidis* and *Centellaasiatica*. Drug yielding plants: therapeutic and habit forming drugs with special reference to *Cinchona*, *Rauvolfia* and *Cannabis*.

Unit IV
Evaluation and standardization of herbal drugs. Physio chemical properties - Ash, Fluroscence analysis. Phytochemical screening tests for secondary metabolites (alkaloids,
flavonoids, steroids, terpenoids and phenolic compounds). Adulteration: Identification of five common herbal adulterants.

**Unit V**


**Text Book**


**Reference Books**


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**Semester III**

**Elective I (b): Nursery and Gardening**

**Sub. Code: BC1733**

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**Objectives**

To create a successful, sustainable garden using organic methods.

To encourage the students to develop valuable new life skill by creating their own seed bed.
Unit I

**Nursery:** definition, objectives and scope and building up of infrastructure for nursery, planning and seasonal activities - Planting - direct seeding and transplants.

Nursery practices for some important crops – Coconut, Areca nut, Pepper and Cardamom.

Unit II

**Seed:** structure and types - seed dormancy; causes and methods of breaking dormancy. Seed storage- seed banks , factors affecting seed viability, genetic erosion- Seed production technology - seed testing and certification.

Unit III

**Vegetative Propagation:** Layering - air and ground layering, cutting, selection of cutting, collecting season, treatment of cutting, rooting medium and planting of cuttings. Hardening of plants – greenhouse, mist chamber, shade house and glass house.

Unit IV

**Gardening:** definition and scope, types of gardens- formal (Mughal) and informal (--- ---Japanese) Special types of gardens – Rock garden, water garden, Bog or Marsh garden, Sunken garden and roof garden.

**Gardening Operations:** soil laying, manuring, watering, management of pests and diseases and harvesting.

Unit V


Text Book


Reference Books


Semester III  
Elective I (c): Agricultural Botany  
Sub. Code: BC1734

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Objectives

To study the various parameters and their influence on agriculture.

To give student elementary information on basic agronomic principles and practices.

Unit I  
Introduction to agriculture, Classification of crops, Crop rotation-principles, limitation, advantages, rotational intensity, cropping scheme, cropping intensity. Cropping system – intercropping, mixed cropping, multiple cropping and relay cropping.

Unit II  
Cultivation – area, soil, seed rate requirements, manuring, weed management and harvest of: Cereals and Millets: Rice and Maize; Pulses: Green gram and Horse gram; Oil Seeds: Ground nut and Sesame

Unit III  
Seed Technology: Seed Viability, Dormancy, Methods of breaking dormancy, seed processing, Seed treatment for storage and seed certification

Unit IV  

Unit V  
Beneficial microorganisms in Agriculture; Brief account on Biofertilizer, microbial insecticides, microbial agents for control of plant diseases, Modern agriculture- Implements and practices. Implication of GMO crops.

Text Book


Reference Books


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### Major Practical Paper III

**Archegoniate**

**Sub Code: BC17P3**

**To be conducted during the Semester III**

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**Objectives**

1. To gain knowledge in distinguishing and identifying the cryptogams.
2. To understand the mode of formation of reproductive organs among the various groups in Archegoniate.

**Archegoniate (Bryophytes, Pteridophytes and Gymnosperms)**

Morphological and Anatomical study of the following:

**Bryophytes:**

- *Marchantia*
- *Polytricum*

**Pteridophytes:**

- *Psilotum*
- *Selaginella*
- *Marsilea*
- *Rhynia* (fossil)

**Gymnosperms:**

- *Pinus*
- *Lyginopteris* (fossil)
Semester III

Allied II: Taxonomy of Angiosperms and Plant Physiology

Sub. Code: BA1731

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Objectives

To impart basic knowledge of morphology to understand taxonomy

To understand importance of water and its relation to the plants

To organize awareness programme about economic importance of plants and its conservation

Unit I

Morphology: Leaf - phyllotaxy, simple and compound leaf, venation. Inflorescence types. Fruit types.

Unit II

Taxonomy: Bentham & Hooker’s classification. Study of the following families and their economic importance- Rutaceae, Lamiaceae, Euphorbiaceae and Poaceae.

Unit III


Unit IV

Photosynthesis: pigment systems, mechanism of photosynthesis: light dependent (cyclic and non-cyclic photophosphorylation) light independent (C₃cycle). Factors affecting photosynthesis.

Unit V

Respiration: Glycolysis, anaerobic (Fermentation), aerobic (Kreb’s cycle), Electron Transport System and Oxidative phosphorylation. Factors affecting respiration.

Phyto hormones – physiological role of auxins, gibberellins and ethylene.

Text Books


Reference Books

Semester III
Allied Practical II: Taxonomy of Angiosperms and Plant Physiology
Sub Code: BA17P2

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Taxonomy of Angiosperms and Plant Physiology (To be conducted during semester III)

To make dissections of the floral parts of the families prescribed in the syllabus and
To make drawings to bring out the salient features including floral diagram
and floral formula.
Assigning plants to their respective families.
Demonstration only
- Transpiration pull
- Oxygen evolved during photosynthesis
- Light- screen experiment
- Khune's apparatus e.
- Ascent of sap
Semester IV  
Major Core IV: Plant Ecology and Phytogeography  
Sub. Code: BC1741

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Objectives

To understand the ecological groups and their interactions

To learn and create awareness about environmental problems at local, national and international levels

Unit I  
**Soil** - importance; origin; types, formation; composition; physical, chemical and biological components; Soil profile; Role of climate in soil development.

Unit II  
**Water** - importance: states of water in the environment; atmospheric moisture; precipitation types (rain, fog, snow, hail, dew); water in soil; water table; water bodies: aquifers, water shed management.

Unit III  
**Ecological groups**: study of hydrophytes, xerophytes and halophytes with reference to their morphological, anatomical and physiological adaptations; Study of vegetation-Quadrat and Transect.

Unit IV  
**Ecosystem**: Fresh water (pond) ecosystem; marine ecosystem; trophic organization, basic source of energy, autotrophy, heterotrophy, food chains and webs, ecological pyramids. Plant interactions-symbiosis, commensalism, parasitism.

Unit V  
**Phytogeography** - principles of phytogeography; Types of plants distribution - continous, discontinous and endemic. Plate tectonics, Continental drift, theory of land bridges, age and area hypothesis. Centers of origin of cultivated crops.

Text Book


Reference Books


Objectives

To know the potentiality of major biomass systems, both for "green energy" and for other renewable resources.

Utilize and apply the methods to keep the planet healthy.

Unit I


Unit II

Single Cell Protein and Mycoprotein: Sources of single cell protein, Nutritive value of single cell protein. Mass Cultivation of *Spirulina*. Mushroom Cultivation- *Pleurotus* and *Agaricus*, nutritional values and value added products.

Unit III

Forest cover, forest resources – Utility and Values of forests: Commercial benefits, ecological benefits and aesthetic benefits

Unit IV


Unit V


Text Book


Reference Books


**Semester IV**  
**Elective II (b): Food Science**  
**Sub. Code: BC1743**

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**Objectives**
To learn about the importance, constituents and health practices of food and balanced diet.  
To obtain knowledge about fermented food products.

**Unit I**  
**Food Science** – Definition, aim, constituents of food and their value. Energy value of balanced diet, carbohydrates, proteins, fats, enzymes and vitamins.  
**Cooking** - Objectives of cooking, Preliminary preparations, Cooking methods, (Moist heat methods, Dry heat methods, Microwave cooking, Solar cooking).

**Unit II**  
**Food Colourants**: Natural, Artificial and Special flavours: Spices and Condiments.  
Food additives – Sweetners, Emulsifiers and Stabilisers, Antioxidants, Flavour improvers.  
Safety measures of food additives.

**Unit III**  
Fermented milk products – butter, yoghurt, cheese. Fermented vegetable products- sauerkraut, cucumber, Fermented meat products- Sausage and Dried Fish.

**Unit IV**  
**Food Preservation**: Principle, Food spoilage, Methods of food preservation – preservation by low and high temperature, Pasteurization, Canned food.

**Unit V**  
Industrial production of the following:  
Alcoholic beverages - Beer, Wine, Ethyl alcohol  
Non alcoholic beverages - Vinegar, Coffee, Tea.
Text Book

Reference Books


Semester IV
Elective II (c): Biodiversity and Human Welfare
Sub. Code: BC1744

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Objectives
To understand the biodiversity and its importance.
To utilize the plants for human use.

Unit I
Bio diversity and its Scope- genetic diversity, species diversity, biodiversity at the ecosystem level, agro biodiversity and cultivated plant taxa, wild taxa. Values of biodiversity; Ethical and aesthetic values of biodiversity.
Unit II

**Biodiversity Hot Spots**- History of hotspots, evolution of hotspots, Critical role of hotspots in species richness and endemism, Biodiversity in tropics, National biodiversity hotspots, hottest biospots of Western Ghats, biodiversity of Tamilnadu.

Unit III

**Economical Values of Biodiversity**- plants, animals and microbes. Loss of genetic diversity, loss of species diversity, loss of ecosystem diversity, loss of agro biodiversity, consequences and implications; projected scenario for biodiversity loss.

Unit IV


Unit V

**Conservation**- Role of NGOs in biodiversity conversation, Conservation of genetic diversity, species diversity and ecosystem diversity, in situ and ex situ conservation, social approaches for conservation, biodiversity awareness programmes, sustainable development.

Text Book


Reference Books


Major Practical Paper IV  
Plant Ecology and Phytogeography  
Sub Code: BC17P4  
To be conducted during the Semester IV

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**Objectives**
To distinguish plants based on the morphological and anatomical features.
To realize the concept of phytogeography.

**Plant Ecology**
Methods of studying vegetation – Quadrat and Belt transect

Morphology of locally available Hydrophytes, Xerophytes and Halophytes

To make suitable micropreparations of:

- *Hydrilla* stem T.S.
- *Eichhornia* petiole T.S.
- Phylloclade T.S. (**Casuarina**)
- Phyllode T.S. (**Parkinsonia**, **Acacia**)

Demonstration – soil permeability – (Percolation and soil holding capacity).

Models – Related to phytogeography

Field visit – One day.

Semester IV  
Allied II: Cell Biology and Plant Anatomy  
Sub. Code: BA1741

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**Objectives**
To understand the structure and purpose of basic organelles of plant cells
To know how to classify meristems.
To learn the internal structure of leaf, root and shoot.
Unit I
Cell - Prokaryotic and Eukaryotic; Structure of plant cell, chemical composition and functions of the following - Plasma membrane (fluid mosaic model), Chloroplast and Mitochondria

Unit II

Unit III
Tissues – Meristems – Classification (origin, position and function); Characteristic features of meristematic tissues, Difference between meristematic and Permanent tissues. Permanent tissues–structure and functions of simple permanent tissues – parenchyma, collenchyma, sclerenchyma

Unit IV
Structure and functions of complex tissues – xylem and phloem.

Study the anatomy of Primary structure of dicot stem and root.

Unit V
Primary structure of monocot stem and root.
Dicot leaf and monocot leaf.
Normal secondary thickening in dicot stem.

Text Books


Reference Books


Allied Practical II
Taxonomy of Angiosperms, Anatomy and Plant Physiology; Cell Biology and Plant Anatomy
Sub Code: BA17P2

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Objectives
To enable the students to identify plants prescribed in the syllabus.
To learn the skills related to physiological experiments.
To develop an interest to know about the plant cell organelles and the anatomy of plant parts.

Taxonomy of Angiosperms and Plant Physiology (To be conducted during semester III)
To make dissections of the floral parts of the families prescribed in the syllabus and
To make drawings to bring out the salient features including floral diagram and floral formula.
Assigning plants to their respective families.
Demonstration only
- Transpiration pull
- Oxygen evolved during photosynthesis
- Light-screen experiment
- Khune's apparatus e.
- Ascent of Sap

Cell Biology and Plant Anatomy (To be conducted during semester IV)
To identify electron micrographs of the cell organelles and non living inclusions.
To observe and identify different types of tissues
Sectioning, staining, mounting and identification of primary structure of dicot stem, dicot root, monocot stem and monocot root.
Sectioning, staining, mounting and identification of Dicot and Monocot leaf.
Stomatal types – anomocytic, anisocytic, paracytic, diacytic and graminaceous.

Semester V
Major Core V: Taxonomy and Economic botany
Sub. Code: BC1751

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Objectives
To list out the characteristic features and economic importance of selected families
To utilize the taxonomical terminology and use their skills to identify plants.
Unit I
Objectives and importance of systematic botany: Morphology – root, stem, leaf, inflorescence, flower and fruits – their modifications. Contribution to systematic botany by Indian Taxonomists – K.M. Mathew and Hermenegild Santapau

Unit II
Systems of classification; Artificial – Linnaeus; Natural – Bentham and Hooker – merits and demerits; Phylogenetic - Engler and Prantle. Nomenclature – Binomial system, Principles of ICN, Type method – Principle of priority – Author citation – Effective and valid publication. Herbarium techniques. Digital Herbarium

Unit III
Detailed study of the following families with their economic importance:
Annonaceae, Brassicaceae, Rutaceae, Anacardiaceae, Caesalpiniaceae and Myrtaceae.

Unit IV
Cucurbitaceae, Rubiaceae, Solanaceae, Sapotaceae, Apocynaceae and Asclepiadaceae.

Unit V
Lamiaceae, Euphorbiaceae, Arecaceae, Cannaceae, Orchidaceae and Poaceae,

Text Book

Reference Books

Semester V
Major Core VI: Biochemistry and Biophysics
Sub. Code: BC1752

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Objectives
To understand the structure and properties of biomolecules.
To know the role of enzymes in physiological activities.
To study the principles of bioenergetics.

**Unit I**
Structure and properties of water; bonds - types; pH and buffers. Carbohydrates classification; Monosaccharides: Structure and properties of glucose (structure - linear, open chain, ring form) and fructose. Disaccharides: Structure and properties of maltose, sucrose and lactose. Polysaccharides: Structure and properties of starch, cellulose and Isomerism.

**Unit II**
Classification, structure and properties of amino acids; Protein - primary, secondary, tertiary and quaternary. Protein denaturation and biological roles of proteins. Vitamins - fat soluble and water soluble, sources and deficiency syndrome.

**Unit III**
Structural classification and properties of lipids; Fatty acids structure and functions; essential fatty acids. General account of simple lipids (Triglycerides), compound lipids (Phospholipids), derived lipids (Cholesterol). Nucleic acids: Structure of DNA, RNA.

**Unit IV**
Enzymes: Nomenclature and classification, Structure of enzyme: activesite cofactors, coenzymes, isoenzyme; mechanism of action (activation energy, lock and key hypothesis, induced - fit theory), enzyme inhibition and factors affecting enzyme activity.

**Unit V**

**Text Book**

**Reference Books**
Objectives

To study the role of microorganisms in soil, water and food industries.

To be equipped in specific areas in the field of microbiology to seek jobs in relevant areas.

Unit I

- Morphology of bacterial cells – size, shape, arrangement, Structure of bacteria - Cell wall (chemical composition), cytoplasmic membrane, flagella, pili (fimbriae), capsule and mesosomes
- Nutritional types of bacteria - autotrophs and heterotrophs
- Reproduction of bacteria – binary fission, endospore formation, conjugation, transformation and transduction.

Unit II

- Contributions to Microbiology: Anton Van Leeuwenhoek, Louis Pasteur and Robert Koch.

Unit III


Unit IV

- Food Microbiology: General account of food spoilage through microbes. Food borne infections and preventions – Botulism and Salmonellosis
- Dairy microbiology – Sources of milk contamination, Pasteurization technique, Test for grading milk quality
- Water microbiology: Potable and non potable water, Test for detection of coliform bacteria

Unit V

- Plant pathology: An introduction to plant pathology.

- Study of the following diseases with reference to causal agents, symptoms, cycle, dissemination, disease cycle and control measures of: Citrus Canker; Bunchy top of Banana; Tikka disease of Groundnut; Red Rot of Sugarcane; Late Blight of Potato

Text Book


Reference Books


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**Semester V**

**Elective III (a): Horticulture and Plant Breeding**

Sub. Code: BC1754

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**Objectives**

To learn the different techniques of vegetative propagation through hands-on training.

To develop skills for growing fresh and safe vegetables through organic farming.

**Unit I**


- Cuttage - root, stem and leaf
- Layerage - simple, compound and air layering
- Graftage - approach, tongue and cleft
- Budding - T-budding and patch budding
- Vegetative propagules - tubers, suckers, bulbs and corm.

**Unit II**

Propagation by seeds - Advantages and disadvantages, raising nurseries, aftercare and transplantation.

- Pomology - establishment of an orchard – planning, layout, planting and cultivation of Banana and Mango.
- Special techniques – ringing, notching, smudging, de-blossoming, thinning and pruning.
Unit III
Olericulture - importance and objectives of vegetable culture. Kitchen garden - site, layout and choice of plants.
Vegetable cultivation - Brinjal and Tomato.
Plantation crops - Tea, Cardamom, Pepper and Cloves.

Unit IV

Unit V

Text Books

Reference Books

Semester V
Elective III (b): Forestry
Sub. Code: BC1755

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Objectives
To enable the students to have a broad knowledge about the forest and forest products.
To know forest management plans.

Unit I
Importance of forest– utility and values of forests: Commercial benefits, ecological benefits and aesthetic benefits. Forest as a balanced ecosystem; Types and distribution of forest with reference to India and Tamilnadu (Champion and Seth’s classification).
Unit II
Forest management and conservation - Regeneration - Tending operations - Sustainable utilization of forest resources - Forest organizations. Role of remote sensing in forest management. Eco tourism.

Unit III
Forest utilization - Harvesting, conservation, storage and disposal of wood in forest; major and minor forest products; Forest based industries - paper and pulp industry, resin tapping and turpentine manufacture.

Unit IV
Forest degradation - Damage caused by fire, climatic factors and injuries by insects, plants, animals and diseases, activities of man including encroachment and shifting cultivation; Measures to protect the forest damage caused by various factors. Social forestry.

Unit V
Agroforestry - objectives - advantages and disadvantages - Energy plantations; recreational forestry - role of botanical gardens, Zoos, National Parks and Sanctuaries in recreation/conservation of wild life, social forestry.

Text Book

Reference Books

Semester V
Elective III (c): Biological Techniques
Sub. Code: BC1756

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Objectives
To know the techniques of preparing permanent slides.
To study the principle, working mechanism and uses of instruments used in biology.

**Unit I**
Microscopy and micrometry: Light microscopic techniques-Principles of microscopy types- light –dark field. Electron microscopy-TEM and SEM.

**Unit II**
Micro technique –fixatives, stains-dehydration and embedding-sectioning with rotary microtome and staining-microphotography-principles and methods.

**Unit III**
Basics of weights- Atomic weight, molecular weight, Gram molecular weight, Equivalent weight, Gram equivalent weight, Units measurements-units of length, units of area, units of volume, units of mass, units of depth, units of speed, units of temperature and Concentrations- Density, specific gravity, expression of concentration of solutions (molar(M), normal(N), Weight - volume per cent w/v, osmolar, molal(m), parts per million(PPM), Per cent by weight (W/W), expression of concentration of ionic strength, expression of concentration in logarithmic form (pH).

Centrifugation techniques-basic principles, types and their applications with special reference to Ultracentrifuge.

**Unit IV**
Spectroscopic techniques-basic principles-Basic laws of light absorption-visible and UV spectrophotometry.

FTIR Spectroscopy, NMR Spectroscopy

**Unit V**
Chromatographic techniques-basic principles and applications of Paper Chromatography; Thin Layer Chromatography and Column Chromatography.

Electrophoresis technique: Principles, types and applications – Agarose Gel Electrophoresis, SDS – PAGE.

**Text Book**

**Reference Books**
Objectives
To enable the students to identify and to know the economic importance of plants.
To quantitatively estimate the different plant biomolecules.

Taxonomy and Economic Botany
Identification of commonly available Leaves, Inflorescence and Fruit types
Technical description of plant parts, including floral parts (L.S. of flower, floral diagram and floral formula) with reference to the families prescribed in theory.
Identification of the plant specimens with reference to their families following the Bentham & Hooker’s classification.
Survey of locally available plant species belonging to the families prescribed in the syllabus.
Taxonomic field trip under supervision and submission of 10 photographs. Field note book to be submitted for external evaluation.
Study of various modifications and record of economically important products from the members of the families prescribed in the syllabus.
Submission and Record note book, Photographs and Field note book

Biochemistry and Biophysics
Verification of Beer’s law
Quantitative estimation of soluble starch by Colorimetry (Iodine-Test Method)
Quantitative estimation of insoluble starch by gravimetric method
Quantitative estimation of sugar by Colorimetry (Phenol - Sulfuric Acid method)
Quantitative estimation of proteins in plant samples. (Lowry’s method)
Titration of weak acid against strong base
Preparation of Buffers
Separation of dye mixture by circular paper chromatography
Spotters –a. Instruments – Colorimeter, pH meter
   b. Enzyme model - Lock and Key, Koshland’s induced fit model
   c. Effect of pH on enzyme activity
   d. Effect of substrate concentration on enzyme action
      Fluorescence
      Phosphorescence
Demonstration
   Qualitative estimation of Glucose (Benedict’s Test)
   Qualitative estimation of Starch (Iodine Test)
   Qualitative estimation of Protein (Biuret Test)
Qualitative estimation of Lipid (Sudan III Test)

Semester V  
Major Practical VI: Microbiology and Plant Pathology  
Sub. Code: BC17P6

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Objectives

To identify the plant pathogens and the diseases caused by them.  
To improve their capacities in microbiology in maintaining the accuracy in diagnostic approach.

I. Demonstration only

- Bacterial culture. (plate, slant)
- Gram’s staining of bacteria.
- Detection of Coliform bacteria in water samples.
- Motility Test (hanging drop)

Spotters

- Sterilization - Autoclave, Pressure Cooker, Laminar Air Flow, Hot Air Oven.
- Ultrastructure of Bacteria and Bacteriophage
- Plant pathology specimens
- Citrus Canker
- Bunchy top of Banana
- Tikka disease of Groundnut
- Red Rot of Sugarcane
- Late Blight of Potato
- Photographs of famous Microbiologist

III. Field Visit

Dairy farm visit.

Semester V  
Skill Based Course: Floriculture  
Sub. Code: BSK175

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Objectives
1. To learn the cultivation methods of cut flowers.
2. To develop an interest to create a garden around the home and office to reduce stress related depression.

Unit I
Introduction: Importance and scope of floriculture - pluck flowers – cultivation of Chrysanthemum, Polyanthus, Jasmine, Rose and Gomphrena.

Unit II

Unit III
Cultivation of plants in pots; Indoor gardening- Bonsai. Cultivation of Anthurium and Orchids.

Unit IV
Features of a garden: Garden wall, Fencing, Steps, Hedge, Edging, Lawn, Flower beds, Shrubbery, Borders, Water garden.

Unit V
Flower arrangement: General Principles of flower arrangement - Western and Japanese style - Dry flower decorations.

Text Books


Reference Books


Semester VI
Major Core VIII: Genetics, Biostatistics and Bioinformatics
Sub. Code: BC1761

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Objectives

To enable the students to predict genetic inheritance patterns using Mendelian principles. To generate logical interpretations and conclusions from graphs, models, and data of scientific research.

Unit I


Unit II

Polygenic inheritance with reference to ear length in maize; Multiple alleles with reference to ABO blood group in man, Rh factor. Linkage, crossing over and its significance.

Unit III

DNA as the Genetic material, Cell division, Replication of DNA (semi conservative method). Mutation types - Chromosomal aberrations- addition, deletion, translocation, inversion, polyploidy.

Chromosomal abnormality- Down Syndrome and Klinefelter Syndrome.

Unit IV


Unit V


Text Books


Reference Books


### Semester VI

#### Major Core IX: Biotechnology and Molecular Biology

**Sub. Code:** BC1762

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**Objectives**

To learn and apply the general principles of biotechnology and ensure adequate training in modern biotechnology

To evaluate and use biological information effectively, ethically, and legally.

#### Unit I


#### Unit II

Scope and importance, laboratory requirements for plant tissue culture, Sterilization techniques

Culture media preparation (M.S. Medium). Concept of totipotency – differentiation, de-differentiation and redifferentiation. Explants- culture of explants, callus induction and maintenance, callus sub culture on a fresh nutrient medium, Organogenesis

#### Unit III

GM crops (Bt – Cotton and Golden rice)  
Transgenic plants- merits and demerits; Cryopreservation, Brief knowledge on IPR

**Unit IV**

DNA Replication in prokaryotes and transcription in prokaryotes, Protein Synthesis-Translation, post translation processing, inhibitors of protein synthesis

**Unit V**

Characteristic of Genetic Code, Codons, anticodons. Degeneracy of codons, Wobble hypothesis.


**Text Books**


**Reference Books**


Semester VI  
Major Core X: Plant Physiology and Metabolism  
Sub. Code: BC1763  

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Objectives

To understand biological, and physiological activities of plant cells.
To integrate and interconnect plant physiological knowledge in agriculture, forestry, environmental science and genetics.

Unit I  

Unit II  
**Mineral Nutrition:** Essential elements, macro and micronutrients; Criteria of essentiality of elements; Role of essential elements; Ascent of sap. Mechanism SPAC Concept. Transport of ions across cell membrane, active and passive transport, carriers, channels and pumps, root pressure theory. Hydroponics

Unit III  
**Photosynthesis:** Ultrastructure of chloroplast, Photosynthetic pigments structure; Photosystem I and II, reaction centre, antenna molecules; Electron transport (cyclic and non cyclic) and photophosphorylation; C3, C4 and CAM pathways of carbon fixation; Photorespiration.

Unit IV  
**Respiration:** Ultrastructure of mitochondria, Glycolysis, anaerobic respiration, TCA cycle; Oxidative phosphorylation, GS-GOGAT pathway. Nitrogen metabolism: Biological nitrogen fixation; Nitrate and ammonia assimilation.

Unit V  
**Plant Growth Regulators:** Growth, Growth curve, Physiological roles of Auxin, Gibberellin, Abscisic acid and Ethylene. Photoperiodism (SDP, LDP, Day neutral plants); Vernalization, Phytochrome.

Text Book

Reference Books


<table>
<thead>
<tr>
<th>Semester VI</th>
<th>Elective IV (a): Marine Botany</th>
<th>Sub. Code: BC1764</th>
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Objectives

To understand the different adaptations (morphological, physical, conduct) of living beings in the marine environment.

To recognize the marine pollution and conservation methods.

Unit I


Unit II


Unit III


Unit IV

Unit V
Mangroves – present status and stresses on mangroves, regeneration of mangroves, coral reefs – ecology, species interaction, economic importance and conservations.

Text Book

Reference Books

Semester VI
Elective IV (b): Organic Farming
Sub. Code: BC1765

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Objectives
To sensitize the need and generating knowledge and skill on various organic farming practice 2. To carry out organic agricultural farming and retailing it.

Unit I
**Organic Farming**- Introduction, A legacy of damaged soils. Retail chemicals farming made cheap and easy. Contamination of food products by pesticides and chemicals. Threat to biodiversity. Present status of organic farming in India

Unit II

Unit III
**Balanced Nutrient Supply**: Sources of nutrients for organic farming. FYM, Rural Compost, City Compost, Oil cakes, Animal waste, Bio-fertilizer and Vermicompost.
Nutrient content of the above source (data chart).

Green manure, Liquid manure (Panchagavya)

Unit IV

Plants: Choosing the right crop for the environment, Best management practices for organic farming

Types of farming – Definition, Concepts and benefits – Pure Organic Farming, Integrated Organic system (Combination of organic and inorganic) and mixed farming

Unit V


Required management practices for organic farming certification

Text Book


Reference Books:


Semester VI

Elective IV (c): Ecotourism

Sub. Code: BC1766

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Objectives

To highlight the need for sustainable tourism.
To be aware about the role of various movements in the protection of nature and natural resources.

Unit I
Definition, introduction and scope. Classification of tourism: religion tourism, cultural tourism, heritage tourism, monumental tourism, adventure tourism, mass tourism, consumptive and non consumptive tourism.

Unit II
Interesting Eco-Tourism Places - global, national, regional (any five in each category). Eco circuit of Western Ghats. Identification of nature based ecotourism. Maintenance of ecological centers.

Unit III
Ecotourism opportunities - dam sites, waterfalls, mangroves, bird sanctuaries, pilgrim tourism, forest area, parks, sacred groves, beaches, wildlife sanctuaries and national parks.

Unit IV

Unit V
Infra structural facilities for ecotourism. Funding agencies- government, private legislations to be followed, Strategies to maintain these areas in an ecological sustainable way.

Text Books

Jadhav and Bhosale. Environmental Protection and Laws, V.M. Himalaya publishing House.

Reference Books


Semester VI
Major Practical V
Taxonomy and Economic Botany and Biochemistry and Biophysics
Sub Code: BC17P5

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Objectives

To enable the students to identify and to know the economic importance of plants.

To quantitatively estimate the different plant biomolecules.

Taxonomy and Economic Botany

Identification of commonly available Leaf, Inflorescence and Fruit types
Technical description of plant parts, including floral parts (L.S. of flower, floral diagram and floral formula) with reference to the families prescribed in theory.
Identification of the plant specimens with reference to their families following the Bentham & Hooker’s classification.
Survey of locally available plant species belonging to the families prescribed in the syllabus
Taxonomic field trip under supervision and submission of 10 photographs.
Field note book to be submitted for external evaluation.
Study of various modifications and record of economically important products from the members of the families prescribed in the syllabus.
Submission and Record note book, Photographs and Field note book

Biochemistry and Biophysics

Verification of Beer’s law
Quantitative estimation of soluble starch by Colorimetry (Iodine-Test Method)
Quantitative estimation of insoluble starch by gravimetric method
Quantitative estimation of sugar by Colorimetry (Phenol - Sulfuric Acid method)
Quantitative estimation of proteins in plant samples. (Lowry’s method)
Titration of weak acid against strong base
Preparation of Buffers
Separation of dye mixture by circular paper chromatography
Spotters –a. Instruments – Colorimeter, pH meter
  b. Enzyme model - Lock and Key, Koshland’s induced fit
  c. Effect of pH on enzyme activity
  d. Effect of substrate concentration on enzyme action
     Fluorescence
     Phosphorescence
Demonstration
  Qualitative estimation of Glucose (Benedict’s Test)
  Qualitative estimation of Starch (Iodine Test)
  Qualitative estimation of Protein (Biuret Test)
  Qualitative estimation of Lipid (Sudan III Test)
Objectives
1. To solve genetics problems that involve monohybrid, dihybrid, and interaction of genes.
   To establish linkages with international resources in biotechnology information.
   Eg. Databases.
   To develop understanding of techniques for tissue culture and cell culture.

Genetics and Biostatistics and Bioinformatics
   To prepare root tip squash of onion and to identify the various stages of mitosis.
   Solving genetic problems related to monohybrid, dihybrid ratio and interaction of genes (minimum of six problems in each topic).
   Finding out mean, median, mode and standard deviation for the given data.
   Problems using Chi-square test.
   Study of models showing
      DNA structure and replication
      Linkage and crossing over
      Mutation

Biotechnology and Molecular Biology
   Sterilization techniques
   Preparation of MS medium
   Meristem culture
   Demonstration:
      PCR Technique
   Southern and Northern Blotting Technique.
   Spotters:
      Photos/models/instruments
      Anther culture, Pollen culture and protoplast fusion. Vectors/Plasmids
   Southern and Northern Blotting Technique.
   Methods of direct gene transfer – Microinjection and Short Gun Method
   Transgenic plants – Bt-cotton and Golden Rice

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Semester VI
Major Practical - VI
Genetics, Biostatistics and Bioinformatics & Biotechnology and Molecular Biology
Sub. Code: BC17P6
Semester VI  
Major Practical VII  
Microbiology and Plant Pathology & Plant Physiology and Metabolism  
Sub. Code: BC17P7

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**Objectives**
To identify the plant pathogens and the diseases caused by them.  
To build up the knowledge in pertinent plant physiological process.

**Microbiology and Plant Pathology**
Demonstration/Spotters  
Sterilization - autoclave, pressure cooker, laminar air flow, sprit lamp, inoculation needle.  
Ultrastructure of Bacteria and Bacteriophage  
Plant pathology specimens  
  - Citrus Canker  
  - Bunchy top of Banana  
  - Tikka disease of Groundnut  
  - Red Rot of Sugarcane  
  - Late Blight of Potato  
Demonstration only  
  - Bacterial culture(plate, slant).  
  - Gram’s staining of bacteria.  
  - Detection of Coliform bacteria in water samples.  
Dairy farm visit.

**Plant Physiology and Metabolism**
Imbibition – by direct weighing method  
Plasmolysis – Onion Peel  
Determination of water potential by Chardakov’s method.  
Determination of water absorption and transpiration ratio.  
Rate of photosynthesis under varying concentration of CO₂  
Effect of quality of light on evolution of O₂ during photosynthesis -colour filters.  
Quantification of plant pigments by spectrophotometric method.  
Respiration- R.Q using Ganong’s respirometer.

**Demonstration only**
Imbibition - Dialatometer  
Tissue tension  
Suction due to transpiration  
Khune’s fermentation  
Growth – Arc auxanometer  
Phototropism  
Clinostat.
The Department of Botany is responsible for the Botany Master’s and Doctoral programmes. The research covers all fields of botany, including ecology of plants, restoration ecology, phycology, bryology, taxonomy of vascular plants and also mycology. Homepage: https://botanika.prf.jcu.cz/english/index.php Head of the Department: Doc. RNDr. Jan Kaštovský, PhD. E-mail: hanys@prf.jcu.cz. Ph.D. study in Botany.