2. BOTANY

DETAIL OF COURSES

NOTE:

(a) HEC course of B.Sc. examination will be adopted as it which consists of four papers. Paper-A & B will be taught in the 3rd year and Paper - C & D in the 4th year.

(b) Each paper will be of 50 marks (35 for theory and 15 for practical).

(c) The 60% portion of question paper will be subjective type and 40% objective type. The question paper will be section wise and each question will be divided in parts.

(d) The choice in attempting the question will be minimized to some extent.

PAPER-A

DIVERSITY OF PLANTS

Definition, scope and classification of the kingdoms
Basic concepts of evolution in plant diversity

1. Viruses

(a) General structure, types and reproduction of viruses

(b) Viral diseases and their economic importance

2. Kingdom Monera/Prokaryotae (Bacteria and Cyanobacteria)

General structure, reproduction, classification and economic (such as Nitrogen Cycle and industrial role)
3. **Kingdom Protista/Protista (Algae)**
   
   (a) **General structure, occurrence, reproduction and economic importance**
   
   (b) **Classification of algae with specific examples**
      
      (i) Chlorophyta: Volvox
      (ii) Charophyta: Chara
      (iii) Vaucheriophyta: Vauchea
      (iv) Bacillariophyta: Pinnularia
      (v) Phaeophyta: Laminaria
      (vi) Rhodophyta: Grateloupia Polysiphonia

4. **Kingdom Fungi**
   
   (a) **General structure, life cycle, classification with specific examples**
      
      (i) Plasmodiophoromycota: Plasmodiophora
      (ii) Oomycota: Pythium
      (iii) Ascomycota: Penicillium, Saccharomyces, Alternaria
      (iv) Basidiomycota: Ustilago, Puccinia and Agaricus

   (b) **Role of fungi in agriculture, diseases of major economic crop Plants: rusts, smuts, downy and powdery mildews, damping off, root rots food and industry**

**Lichens**

**General account, structure and life history of Physcia**

5. **Kingdom Plantae**
   
   (a) **Bryophyta (Atracheophyta)**
      
      General account, reproduction, classification, affinities and ecological importance with special reference to the life cycle of *Aniboceros, Porcella* and *Polytrichum*.

   (b) **Pteridophyta (Tracheophyta)**
      
      General account, structure, life cycle and biological importance with specific examples:
      
      (i) Psilopsida: *Psilotum*
      (ii) Lycopsida: *Selaginella*
      (iii) Sphenopsida: *Equisetum*
      (iv) Pteropsida: *Polypodium, Adiantum* and *Matteina*

   (c) **Gymnospermae (seed Plants)**
      
      General account with reference to structure and life history of *Cycas, Pinus* and *Ephedra* and their affinities.
(d) Angiospermae

Introduction

Practical


Recommended Books


PAPER-B

PLANT SYSTEMATICS, ANATOMY AND DEVELOPMENT

Plant Systematics

1. Introduction to Plant systematics its aim, objectives and importance.
2. Classification: Importance, brief history, introduction, various systems of classification (Brief account of all the systems)
3. Brief introduction to nomenclature, importance of Latin names and binomial system with an introduction to international code of Botanical Nomenclature (ICBN).
5. Diagnostic characters, economic importance and distribution pattern of the following families:

1. Ranunculaceae
2. Brassicaceae (Cruciferae)
3. Fabaceae (Leguminosae)
4. Rosaceae
5. Euphorbiaceae
6. Rutaceae
7. Moraceae
8. Chenopodiaceae
9. Cucurbitaceae
10. Solanaceae
11. Lamiaceae (Labiatae)
12. Asteraceae (Compositae)
13. Liliaceae
14. Poaceae (Gramineae)

**Anatomy and Development**

1. Cell wall; structure and chemical composition.
2. Tissue and Tissue System; Concept; structure and function of various tissues.
3. Structure and development of root, stem and leaf including various type of meristem; Primary and secondary growth of dicot stem.
4. Early development of Plant body (embryology) *Capsella bursa-pastoris* or *Arabidopsis*.

**Practical.**

1. Study of cross section of monocot and dicot stem.
2. Study of the simple and compound tissue in macerated and sectioned material.
4. To study the Prepared slides of secondary growth in dicot stem.
5. Identification of families given in syllabus with the help of keys.
6. Technical description of common flowering plants belonging to families mentioned in theory syllabus.
7. Field trips shall be undertaken to study and collect local plants. Students shall submit 40 fully identified herbarium specimens.
Recommended Books


PAPER-C

CELL BIOLOGY, GENETICS AND EVOLUTION

Cell Biology

1. Structures and Functions of Bio-molecules
   Carbohydrates
   Lipids
   Proteins
   Nucleic Acids


3. The ultra structure of plant cell with a brief description and functions of the following organelles
   (i) Endoplasmic reticulum (ii) Plastids
   (iii) Mitochondria (iv) Ribosomes
   (v) Dictyosomes (vi) Vacuole
   (vii) Microbodies (Glyoxysomes + Peroxisomes)

4. Nucleus: Nuclear membrane, nucleolus, ultrastructure and morphology of chromosomes, karyotype analysis
   1. Reproduction in somatic and embryogenic cell, mitosis & meiosis, cell cycle
   2. Chromosomal aberrations.
(i) Changes in the number of chromosomes. Aneuploidy and euploidy

(ii) Changes in the structure of chromosomes, deficiency, duplication, inversion and translocation.

Practical
1. Study of cell structure using compound microscope and elucidation of ultra structure from electron microphotographs
3. Study of mitosis and meiosis by smear/squash method and from prepared slides.
4. Study of chromosome morphology and variation in chromosome number.
5. Extraction and estimation of carbohydrate, protein, RNA, DNA from plant sources.

Genetics
1. Introduction scope and brief history of genetics. Mendelian inheritance; Laws of segregation and independent assortment, back cross, test cross, dominance and incomplete dominance.
2. Sex linked inheritance, sex linkage in Drosophila and man (colour blindness, XO, XY, WZ mechanism, sex limited and sex linked characters, sex determination.
3. Linkage and crossing over : Definition, linkage groups, construction of linkage maps, detection of linkage.
4. Molecular genetics ; DNA replication- Nature of gene, genetic code, transcription, translation, protein synthesis, regulation of gene expression (e.g. lac operon).
5. Transmission of genetic material in Bacteria : Conjugation and gene recombination in E. coli transduction and transformation.
7. Application of genetics in plant improvement : Induction of genetic variability (gene mutation, recombination), physical and chemical mutagens, selection, hybridization and plant breeding techniques, establishment of varieties release of new varieties.
8. Introduction of genetic conservation
9. Evolution

Practical
1. Genetical problems related to transmission and distribution of genetic material.
2. Identification of DNA in plant material. Carmine, orcein staining.
Recommended Books


PHYSIOLOGY AND ECOLOGY

Physiology

1. Types and properties of solutions. Electrolytes and non-electrolytes. SI units for expressing concentration of solutions. acids, bases and salts, pH. Definition of buffers and their role in biological systems. Colloidal systems, their nature, properties, and biological significance.


4. Enzymes: Definition, nature, classification and properties.


7. Nitrogen Metabolism: Biological nitrogen fixation.

8. Growth: Definition; role of auxins, gibberellins, cytokinins, abscisic acid and ethylene in controlling growth, introduction to plant tissue culture.
9. Photoperiodism: Definition, historical background, short day, long day and day neutral plants. Role of phytochromes and hormones in photoperiodism.

10. Dormancy: Definition and causes of seed dormancy; methods of breaking seed dormancy.

11. Vernalization: Annual and biennial forms, Hormonal concept and phasic development theory.


Practical

1. Preparation of solutions of specific normality of acids/bases, salts, sugars, molal and molar solutions and their standardization.

2. Determination of uptake of water by swelling seeds when placed in sodium chloride of different concentrations.

3. Measurement of leaf water potential by the dye method.

4. Determination of the temperature at which beet root cells lose their permeability.

5. Determination of the effects of environmental factors on the rate of transpiration of a leafy shoot by means of a photometer by cobalt chloride paper method.


7. Chemical tests for the following cell constituents:

   (i) Starch  
   (ii) Cellulose  
   (iii) Lignin  
   (iv) Proteins

8. Extraction of chlorophyll from the leaves and separation of component pigments on a paper chromatogram. Study of absorption spectra using spectrophotometer.

9. Comparison of the effects of green, red and blue-coloured light on the amount of oxygen evolved by a photosynthesizing plant.


11. Extraction of amylase from germinating wheat seeds and study of its effect on starch breakdown.

12. Measurement of carbon dioxide evolution during respiration of germinating seeds by the titration method.


15. Study of different stages of seed germination.
Recommended Books


Ecology

1. Concepts of Ecology
2. Brief history of Ecology (General, Pakistan)
3. Ecophysiology
   (a) Light and temperature responses
      (i) Quantity of light
      (ii) Variation in light (temperature)
      (iii) Ecophysiological responses
   (b) Edaphology
      (i) Brief introduction of soil forming process
      (ii) Texture, structure, and water
      (iii) Chemical Properties
      (iv) Biological components: Soil Organisms. Organic matters
   (c) Water
      (i) Precipitation: kinds, and affectivity.
      (ii) Distribution of vegetation in relation to moisture.
   (d) Wind-Ecological importance of wind
4. Population Ecology:
   A brief introduction, history and background. Seed dispersal. Seed bank, demography, reproductive strategy.
5. Community Ecology:
   (i) Concept of plant community-attributes
   (ii) Sampling methods
   (iii) Succession-history, concept, development and modern theories of succession
(iv) Brief concept of productivity.
(v) Local vegetation

6. Ecosystem:
   (i) Definition and background
   (ii) Ecological energetic
   (iii) Biogeochemical cycle (Hydrologic and nitrogen cycle).

7. Applied Ecology

   Aridity, biodiversity, conservation, water logging and salinity, pollution, erosion, desertification, management.

Practical

2. Effect of light and temperature on seed germination
3. Determination of soil texture by hydrometer method
4. Determination of maximum water holding capacity.
5. Determination of carbonates, electrical conductivity and pH in Soil and Water.
8. Measurement of vegetation by Quadrat and pointless methods
9. Determination of productivity by harvest method
10. Several trips to ecologically diverse vegetation.

Recommended Books