

PART-III BOTANY HONOURS

Course: 1. Microbiology, Economic Botany, Pharmacognosy, Palynology, Reproductive Biology and Ecology

Course outcomes:

Theory

- CO 01.** What are Bacteria and Archaea. Describe the structure of Bacterial Capsule, flagella, pili, Cell envelopes, ribosomes, cytoplasmic inclusions (PHB, Volutin), Plasmids and bacterial chromosome, endospore. Briefly mention the functions of these bacterial structures.
- CO 02.** Write down the basis of bacterial Taxonomy in light of recent molecular approaches. Briefly describe the Prokaryotic classification based on Bergey's Manual of systematic Bacteriology, 2nd edition, 2001).
- CO 03.** Mention the agricultural, industrial and medical applications of microorganisms. Produce a brief idea about epidemiology, causal organism and control of Influenza, Cholera, Botulism.
- CO 04.** Describe Transformation, Conjugation and Transduction in bacteria. What are the general characteristics of virus. Describe the structure of TMV, T₂ and HIV. Describe Lytic and Lysogenic multiplication of Virus. What do you mean by Prion and Viroid.
- CO 05.** Describe the methods of cultivation, processing and utilities of the products of Rice, Tea and Jute. Mention the use of economically important parts of Cotton (fibre), Sal (wood), Sugarcane (sugar), Mustard (oil) and Coconut (oil).
- CO 06.** Define pharmacognosy, drugs, folk medicine, active principles, Pharmacy, Pharmacognosy, Pharmacopeia and adulteration.
- CO 07.** Elucidate the diagnostic features, active principles and uses of root of *Rauwolfia serpentina*, leaf of *Adhatoda vasica*, seed of *Strychnos nuxvomica*, bark of *Cinchona succirubra*.
- CO 08.** Define microsporogenesis and megasporogenesis. Describe polarity, size, shape, symmetry, aperture and sculpture of Spore/pollen morphology. Mention the types of ovules. Development of male and female gametophytes (*Polygonum* type) Define and describe an orthotropous ovule. Describe different types of Pollination and its

contrivances. Describe Fertilization process and development of free nuclear type of endosperm in plants. Elucidate the development of crucifer-type of embryo.

CO 09. Define the Autecology and Synecology Ecosystem, ecological pyramids and energy flow . Mention the role of Climatic, edaphic and biotic factors in ecology.: Definition, concept of ecosystem, ecological pyramids. Describe the Ecological succession (Hydrosere, Xerosere) and morphological, anatomical and physiological adaptations of xerophytes, hydrophytes, halophytes and epiphytes.

CO 10. Define Biodiversity *in-situ*-, *ex-situ* conservation, *inter-situ* conservation and cryopreservation.

CO 11. Define Pollution. Describe causes of different types with special reference to air and water pollution.

Course: 2. Cell Biology, Biotechnology , Genetics & Plant Breeding

Course outcomes:

Theory

CO 01. Describe Cell structure: Ultrastructure and functions of Plasma membrane, Mitochondrion, Chloroplast, Nuclear envelope with nuclear pore complex, Golgi apparatus, Endoplasmic reticulum and Ribosome.

CO 02. Describe Nucleic acid: DNA and RNA – Types, Physical and Chemical structures of B-DNA and t-RNA. Point out total process of replication of DNA - Mechanism and evidence of semi-conservative replication in prokaryotes. Briefly describe the transcription of DNA: Mechanism in Prokaryotes; Nuclear mRNA processing in Eukaryotes (Capping, Polyadenylation or tailing and Splicing) and Translation: Mechanism in Prokaryotes.

CO 03. Define Genetic code:, salient features and deciphering the genetic code.

CO 04 Gene regulation in Prokaryotes: Lac operon (negative and positive control).

CO 05. Eukaryotic chromosome structure: Ultrastructure of chromatin and its organization into chromosome, Concept of euchromatin and heterochromatin. . Cell cycle and its regulation (MPF only), phases and events of Mitosis and Meiosis with their significance.

- CO 06.** Brief idea: Transposable elements, Gene amplification (PCR), Transgenic plant (Bt cotton).
- CO 07.** Recombinant DNA Technology: Basic concepts; Tools - Restriction enzymes (types with examples); Lygase; Vectors (Plasmid and Bacteriophage). Plant tissue culture: General techniques, concept of Basal medium, Micropropagation, Application of Plant tissue culture.
- CO 08.** Mendelism and Chromosomal basis of inheritance. Modified Mendelian Ratios: Lethal gene, Epistasis and Complementary gene interaction.
- CO 09.** Basic concept of Linkage: General idea of Crossing over including molecular mechanism (Holiday Model).
- CO 10** Structural changes of chromosome (Deletion, Duplication, Translocation and Inversion) with their meiotic behavior and genetic consequences. Numerical changes of chromosome (Euploidy and Aneuploidy) and their applications.
- CO 11.** Gene mutation- types, physical & chemical mutagens and their effects.
- CO 12.** Aims and methods of Plant breeding: Introduction, Acclimatization, Domestication, Selection and Hybridization.
- CO 13.** Biometry: Frequency distribution - mean, median, mode, class range, standard deviation and standard error. Probability: product law, Sum law, conditional probability, Chi-square test of goodness of fit;

Course: 3. Plant physiology and Biochemistry

Course outcomes:

Theory

- CO 01.** What are the chemical and physical nature of water. Point out Importance of water in plant life. What do you mean by Water potential. Describe the components of water potential. Mention the status of water in soil and plant cell. What are the routes of water absorption, cavitation in xylem and embolism. Define Transpiration, its types. Describe the mechanism of stomatal transpiration effected by CO_2 , blue light, potassium ion. Define Antitranspirants and their roles in agriculture.
- CO 02.** What are Essential elements which help in mineral nutrition in plants. Define macro and micro nutrients. Describe the role of minerals in plant life. Describe different routes and mechanism of ion-uptake.
- CO 03.** Define Photosynthesis with equation. Discovery of Pigment System and its evolutionary significance. Mention different photosynthetic pigments and their organization in Pigment System. Describe the Role of main and accessory plant pigments

in light trapping. Describe the photosynthetic light reaction along with Z-scheme. Discovery of C₃-cycle. Distinguish C₃-, C₄ - and CAM pathways of CO₂ fixation. Mechanism of C₃-, C₄ - and CAM pathways and advantages of C₄ and CAM over C₃. Activation and Role of Rubisco. Define Photorespiration its operation in different plant cell organelles and importances. Define Respiration. Distinguish respiration and photosynthesis. Basic concept of Aerobic and Anaerobic respiration. Describe the Glycolysis, Krebs cycle, electron transport system. What do you mean by phosphorylation. Describe mechanism of oxidative phosphorylation by chemiosmotic system. Distinguish photophosphorylation and oxidative phosphorylation. What is Girdling hypothesis for phloem translocation. Define sink and source. What is P-Protein. What are Phloem loading and unloading. Describe phloem loading for long distance transport in light of Pressure flow hypothesis. What is Polymer Trapping.

CO 04. Importance and source of Nitrogen in plant life. Nitrogen metabolism in plant cell using nitrate reductase and nitrite reductase. Nitrogen fixation from environment by nitrogen fixing organisms (free living, symbiotic and associative symbiotic organisms). Mechanism of asymbiotic and symbiotic nitrogen fixation with special reference to nitrogenase and leghaemoglobin. Describe nitrogen cycle in environment.

CO 05. Define growth and development. Define phytohormone. What are the main Phytohormones and their chemical nature. Describe the physiological roles of Auxins, Gibberellins, Cytokinins, Abscisic acid and Ethylene. Define Bioassay. Describe bioassay of IAA and GA₃. Concept of immunoassay and radio immunoassay (RIA) of phytohormones. Concept of Biological clock and sense of stimulus. Define photoperiodism and vernalization. Concept of LDP, SDP, LSDP, SLDP, DNP. What is Phytochrome, mention chemical nature and photobiological properties. Role of phytochrome in role in flowering.

CO 06. Define dormancy of plant propagules, quiescence and germination. Dormancy – describe types of dormancy, their causes and significance. How to break dormancy. Describe different phases of germination mentioning the role of hormones.

CO 07. Define Carbohydrates, Amino acids, Protein and Lipid. Classify Carbohydrates, Amino acids, Protein and Lipid. Concept of reducing and non-reducing sugars and their structures. Molecular bonding for amino acids and protein. Describe primary, secondary (α -helix & β -pleated sheet), tertiary and quaternary structures of proteins, structure of fatty acids. Describe β -oxidation pathway. Define Enzymes. Biological properties of enzymes and kinetics of enzymatic reactions. Define co-factors and prosthetic group with examples. Describe Lock-key model, induced-fit model. Classification of enzymes as IUB system of 1961. Describe the factors affecting enzyme action. Concept of Ribozyme, allosteric enzyme, abzyme.

Course: 4. Practical

Course outcomes:

Practical

CO 01. Concept of mitotic cell division and chromosome complement. Workout, light microscopic examination and characterization of mitotic cell division and chromosome complement of in *Allium cepa* by aceto-orcein squash technique and meiotic division in *Allium cepa* and *Rhoeo spathacea / discolor* by aceto carmine staining technique. Determine mitotic index in *Allium cepa* root tip by aceto-orcin squash technique. Study the Testing of goodness of fit with Mendelian mono- and dihybrid ratios.

CO 02. Preparation of standard bacteriological medium (Nutrient agar, Nutrient broth and glucose – peptone medium) and Description of Aseptic methodology. Demonstration and practice of Sterilization technique by Autoclaving, Hot air oven and surface sterilization, preparation of slant and plates, subculturing of pure bacteriological culture by dilution streak method. Microscopic examination of bacteria from natural habitats: curd and root nodules of leguminous plants. Methods of bacterial Gram staining.

CO 03. Microscopic examination of morphological of *Impatiens* and *Hibiscus* pollens form prepared slides.

Course: 5. Practical

Course outcomes:

Practical

CO 01. Methods of preparation of percent, normal, molal and molar solutions of sucrose and bicarbonates.

CO 02. Determine isotonic concentration and osmotic pressure of cell sap by plasmolytic method.

CO 03. Compare imbibition of starchy, proteinaceous and fatty seeds. Determine viability of seeds by TTC (TZ) test.

CO 04. Determine amount of water absorption, retention and transpiration by plant parts. Determine transpiration rate and effect of environmental factors (Humidity and light) by plant parts.

CO 05. Determine the effect of KNO_3 solution on stomatal opening using *Basella* leaf peelings.

CO 06. Determine the rate of respiration of different plant parts using Ganong's respirometer or respiroscope. Determine RQ of different types of seeds (starchy, proteinaceous and fatty seeds) using Ganong's respirometer or respiroscope.

CO 07. Determine the effect of CO₂ concentration on the rate of photosynthesis using molar solution of bicarbonate and by measurement of volume of O₂ liberation.

CO 08. Demonstration of General test for detection of carbohydrates, reducing and non-reducing sugars and proteins and Calcium, magnesium, iron and phosphorus from plant ash; oxalic, citric, tartaric and malic. Demonstration of specific tests for glucose, sucrose and starch.

CO 09. Microscopic examination of Ecological adaptive characters of *Ipomoea aquatica* stem, Phyllode of *Acaccia auriculiformis*, *Nerium* leaf and *Vanda* root

CO 10. Demonstration of Quadrat method using minimum size of quadrat, species area curve method and minimum number of quadrats).

CO 11. Identify plant drug materials pharmacognostically - *Adhatoda* (leaf), b) Ginger (rhizome) and c) *Strychnos* (seeds) on the basis of salient organoleptic and microscopic features of fresh and powder materials.