

Subject: Botany

Effective from Academic Session-2015

UNIT: I

- i. **Cell structure: Salient features of Prokaryotic and Eukaryotic cells.**
- ii. **The cell envelope: Plant cell wall-ultrastructure; Plasma membrane: Fluid Mosaic Organization (model)**
- iii. **Non-membrane organelle: Structure and function of Ribosomes**
- iv. **Single membrane organelles: Structure and function of Endoplasmic reticulum and Golgi bodies**
- v. **Double membrane organelles: Mitochondria and Plastids**
- vi. **Nucleus: Ultrastructure, nuclear envelope, nucleolus; and functions**

UNIT: II

- i. **Chromosome organization: Nucleosome organization, Morphology of chromosome; chemical composition, characteristics and role of centromere and telomere; giant chromosomes (polytene and lampbrush chromosomes)**
- ii. **Genetic material: Structure of DNA (Watson & Crick model), DNA replication (Semi-conservative), DNA as genetic material (experimental proof)**
- iii. **Chromosome alterations: Origin and meiotic behavior of deletions, duplications, translocations and inversions; variations in chromosome number, aneuploidy and polyploidy (types, origin and significance).**
- iv. **Cell cycle: Mitosis and Meiosis – mechanism and significance**

UNIT: III

- i. **RNA: Structure, types and properties of RNA (mRNA, tRNA, rRNA), properties of genetic code, mechanism of transcription and translation (prokaryotes).**
- ii. **Regulation of gene expression in prokaryotes (Lac operon).**
- iii. **Gene mutations: Concept and types of point mutations, frame shift mutations – concept and significance.**

UNIT: IV

- ii. **Mendelism; Symbols and terminology, Mendel's laws of inheritance, Monohybrid, dihybrid and test crosses (suitable examples),**
- iii. **Extensions of and deviations from Mendelian Principles: (allelic and non-allelic interactions) – incomplete dominance, Co-dominance, epistasis, complementary genes, duplicate genes and multiple alleles (with suitable examples in all).**
- iv. **Linkage and crossing over: Coupling and repulsion hypothesis, chromosome theory of linkage, mechanism of crossing over.**

Syllabus for B.Sc 1st year (Semester-II)

Subject: Botany

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UNIT: I

- vii. Viruses: Structure with special reference to TMV, T-2 phages, lytic and lysogenic cycles; general account of mycoplasma, viroids and prions.
- viii. Bacteria and Cyanobacteria: Bacteria – overview of structure, Gram positive and Gram negative bacteria; general characters of cyanobacteria with special reference to *Nostoc*.
- ix. Economic aspect: Microbes in industrial production (with emphasis on dairy industry, production of organic acids, enzymes and antibiotics).

UNIT: II

- v. Fungi: General characteristics, classification proposed by Alexopoulos and Mims (1973); structure and life cycle of representative types shown against each group:
 - Oomycetes *Phytophthora*
 - Ascomycetes *Morchella*
 - Basidiomycetes *Agaricus*
 - Deuteromycetes *Alternaria*
- ii. Plant Pathology: General account of Pathogenicity; Symptoms, etiology and management of black stem rust of wheat, apple scab.
- iii. Lichens: General characters and types.

UNIT: III

- iv. Algae: General characteristics; Range of thallus structure; criteria for algal classification; Round's (1965) system of classification; Structure and life cycle of representative types shown against each group:

Chlorophyceae	<i>Volvox</i>
Xanthophyceae	<i>Vaucheria</i>
Rhodophyceae	<i>Batrachospermum</i>
Phaeophyceae	<i>Ectocarpus</i>
- v. Economic importance of algae.

UNIT: IV

- i. Bryophytes: General characteristics; Proskauer's (1957) system of classification..
- ii. Structure and life cycle of representative types shown against each group (Development excluded):
 - Hepaticopsida *Marchantia*
 - Anthocerotopsida *Anthoceros*
 - Bryopsida *Polytrichum*

Botany

Effective from academic session-2016

Bot-03 (B. Sc. 3rd Semester)

UNIT: I

- i. **Pteridophytes:** General characteristics, classification of pteridophytes (Smith et al., 2006) structure and life cycle of representative types shown against each group (anatomy and development excluded):
 - Psilopsida***Psilotum*
 - Sphenopsida***Equisetum*
- ii. Heterospory and origin of seed habit; stellar systems in pteridophytes

UNIT: II

- i. **Gymnosperms:** General characters, Sporne's (1965) system of classification.
- ii. Morphology, anatomy and reproduction in *Cycas*, *Pinus* and *Ephedra*.
- iii. Fossilization , Geological Time scale
- iv. **Fossil gymnosperms:** *Caytonia*, *Williamsonia*.

UNIT: III

- i. **Angiosperm taxonomy:** Scope of taxonomy; fundamental components of taxonomy.
Angiosperm evolution and classification: Diversity and phylogeny of angiosperms; salient features of classification systems proposed by Bentham and Hooker, Takhtajan, and Angiosperm Phylogeny Group (APG).
- vi. **Botanical nomenclature:** Principles of International Code of Botanical Nomenclature (ICBN); taxonomic hierarchy; type concept.

UNIT: V

- v. **Plant identification:** Methods of plant identification, types of identification keys; role of cytology, anatomy and embryology in plant taxonomy (with suitable examples in all).
- vi. **Taxonomic institutions:** Methods of herbaria; role of botanical gardens
- iii. **Diversity of Angiosperms:** Morphology and economic importance of families- Ranunculaceae, Brassicaceae, Fabaceae, Apiaceae; Rosaceae, Asteraceae, Solanaceae, Lamiaceae; Liliaceae, and Poaceae.

Botany
Effective From Academic Session-2016
Bot-04 (B. Sc. 4th Semester)

UNIT: I

- i. **Tissue systems:** classification, distribution and functions
- ii. **The root system:** Organization of the root apical meristem; differentiation of primary and secondary tissues and their roles; structural modifications for storage, support, respiration and reproduction; root-microbe interaction with special reference to mycorrhiza.
- iii. **The shoot system:** The shoot apical meristem and its histological organization; vascularization of primary shoot in monocotyledons and dicotyledons

UNIT: II

- i. Cambium and its functions; formation of secondary xylem; general account of
 - a. wood structure; formation of growth rings, sapwood and heart wood; secondary phloem- structure and function; periderm; anomalous secondary growth in *Dracena*
- ii. **Leaf:** Origin, anatomy of monocotyledon (Wheat, Maize) and dicotyledon (Waterlily and Sunflower) leaf.
- iii. **Leaf appendages:** Structure and function of hairs, trichomes, thorns etc.
- iv. **Stomata:** types and their characteristics.

UNIT: III

- i. **Flower:** basic structure of flower; flower as a modified shoot, structure of typical flower; functions and structure of anther and pistil, development of the male and female gametophytes; types of pollination, attractants and rewards for pollinators; pollen-pistil interaction, self incompatibility; double fertilization

UNIT: IV

- i. **Formation of seed:** development of embryo and endosperm (in *Capsella* and *Poa*); fruit development
- ii. **Seed:** Seed appendages and dispersal strategies.
- iii. **Apomixis:** causes, concerns and commercial potential
- iv. **Polyembryony:** general account
 - i. **Vegetative reproduction:** Vegetative propagules and vegetative propagation by different methods; economic aspects.

Botany

Effective From Academic Session-2017

Bot-05 (B. Sc. 5th Semester)

UNIT: I

- I. Plant water relations:** Importance of water to plant life, physical properties of water; diffusion, bulkflow, osmosis (thermodynamics concept); absorption, transport and transpiration; physiology of stomata.
- II. Mineral nutrition:** Essential macro- and micro-nutrient elements and their role; ion uptake; mineral deficiency and toxicity symptoms.
- III. Transport of organic substances:** evidences and mechanism of phloem transport; source-sink relationship.
- iv. Proteins:** Classification of proteins based on structure and solubility.
- v. Basics of enzymology:** Discovery and nomenclature; characteristics of enzymes; concept of holoenzyme, apoenzyme, coenzyme and cofactors; mechanism of enzyme action.

UNIT: II

- i. Lipids:** Biological functions of triacylglycerols.
- ii. Nitrogen metabolism:** Biology of nitrogen fixation; ammonium assimilation.
- iii. Photosynthesis:** Photosynthetic pigments; absorption & action spectra,
 - a. enhancement effect; concept of two photosystems; Z-scheme; photophosphorylation; C₃, C₄ and CAM pathways; photorespiration.
 - b. Respiration:** ATP- the biological energy currency; aerobic and anaerobic respiration; Glycolysis, Krebs cycle; electron transport system, oxidative phosphorylation (chemi- osmotic mechanism).
- iv.**

UNIT: III

- i. Growth and development:** Differentiation and morphogenesis (elementary idea); phases of growth, concept of phasic development; kinetics of growth.
- ii. Physiology of flowering:** Photoperiodism; vernalization.
- iii. Plant movements:** Tropic and nastic movements.
- iv. Plant hormones:** History of discovery and physiological effects of auxins, gibberellins, cytokinins, abscissic acid and ethylene.

UNIT:IV

- i. **Biotechnology:** Basic aspects of plant tissue culture, cellular totipotency, differentiation and morphogenesis, applications of plant tissue culture (conservation, agriculture, industry).
- ii. **Genetic engineering:** Tools and techniques of recombinant DNA technology; cloning vectors (plasmids); construction of recombinant DNA, applications of genetic engineering.
- iii. **Polymerase chain reaction-** principle and applications; transgenic - concept and applications.

Botany Effective From Academic Session-2017

Bot-06 (B. Sc. 6th Semester)

UNIT: I

- ii. **Plants and environment:** Atmosphere (gaseous composition and layering of atmosphere); water (reservoirs and water cycle); soil (development, soil profile; basic concept of climate change and its impact on plants).
- iii. **Ecological adaptations:** Morphological, anatomical and physiological adaptation of plants to water (hydrophytes and xerophytes); chilling and light.
Forest types of India: Characteristics of various types as per Champion and Seth's Classification (1968).

UNIT: II

- iii. **Population ecology:** Primary and secondary characters of population; outline of intra- and interspecific population interactions with emphasis on intra- and inter-specific competition.
- iv. **Community ecology:** General characteristics of community; community development through ecological succession (Hydrosere and Xerosere).
- v. **Ecosystems:** Structure, abiotic and biotic components, food chains, food webs, ecological pyramids, energy flow, biogeochemical cycles of carbon, nitrogen and sulphur.

UNIT: III

- v. **Biogeographic regions of India:** status; national and global concerns
- vi. **Vegetation types of India:** Forests and grasslands
- vii. **Remote sensing and GIS:** role in environmental management
- viii. **Ex situ and In situ conservation:** strategies for plant resource maintenance; concept of rare, endangered and threatened (RET) plants
- ix. **Archaeobotany and Ethnobotany:** Plant use through ages; ethnobotany and its scope.

UNIT: IV

- x. **Food Plants:** Morphology, cultivation and economic importance of Rice and Potato
- xi. **Fibres:** Morphology, cultivation, extraction and economic importance of jute.
- xii. **Vegetable oils:** Fixed and volatile oils; morphology, cultivation, extraction and economic importance of mustard.
- v. **Wood:** General account of hard and soft woods.
- vii. **Spices and Condiments:** Source, part used and uses with particular reference to spices and condiments in Kashmir.
- vii. **Medicinal and Aromatic Plants (MAPs):** Morphology and uses of *Podophyllum hexandrum* and *Crocus sativus*.
- viii. **Beverages:** Morphology, cultivation, and processing of tea.