

Proposed Syllabus for B.Sc. Botany
B.Sc. I year

There will be Three theory papers and a practical examination as follows:

Paper I	- Diversity of Viruses, Bacteria & Fungi	M. M.: 50
Paper II	- Diversity of Algae, Lichens, & Bryophytes	M. M.: 50
Paper III	- Diversity of Pteridophytes & Gymnosperms	M. M.: 50

(There will be 9 questions in each paper and candidate has to attempt only 5 questions. Q.1 will be compulsory based on units I - IV. Two questions will be set from each unit of which one question has to be attempted. All questions will carry equal marks.

Practicals: Based on papers I - III M. M.: 50

The course details are as follows:-

Paper I: Diversity of Viruses, Bacteria, & Fungi M.M. 50

Unit-I

History, nature and classification of Viruses, Bacteria and Fungi.

History of virology and bacteriology; prokaryotic and eukaryotic cell structure (bacteria, mycoplasma and yeast); structure, classification and nature of viruses; structure (gram positive and gram negative) and classification (based on cell structure) of bacteria; classification, thallus organisation and reproduction in fungi; economic importance of fungi.

Unit-II

Viruses:Symptoms of virus infection in plants; transmission of plant viruses; genome organisation, replication of plant virus (tobacco mosaic virus); techniques in plant viruses - purification, serology and electron microscopy; structure and multiplication of bacteriophages; structure and multiplication of viroids.

Unit-III

Bacteria:Nutritional types of bacteria (based on carbon and energy sources), metabolism in different nutritional types (basics only) and nitrogen cycle; bacterial genome and plasmids; bacterial cell division, variability in bacteria - mutation, principles of genetic recombination; techniques in sterilisation, bacterial culture and staining; economic importance.

Unit-IV

Fungi:The characteristics and life cycles of the following:

Mastigomycotina: *Albugo, Pythium,*; **Ascomycotina:** *Saccharomyces, Aspergillus, Ascobolus;*
Basidiomycotina : *Ustilago, Puccinia, Polyporus, Agaricus;* **Deuteromycotina:** *Fusarium.*

Paper II - Diversity of Algae, Lichens, and Bryophytes

M.M. 50

Unit-I

General characters. Range of thallus organization, classification, ultrastructure of eukaryotic algal cell and cyanobacterial cell, economic importance of algae. Lichens, classification, thallus organization, reproduction, physiology and role in environmental pollution.

Unit-II

The characteristics and life cycles of the following:-

Cyanophyta *Microcystis, Oscillatoria*; **Chlorophyta** *Volvox, Hydrodictyon, Oedogonium, Coleochaete, Chara*; **Bacillariophyta** *Navicula*; **Xanthophyta** *Vaucheria*; **Phaeophyta**; *Ectocarpus*

Rhodophyta *Polysiphonia*

Unit – III

Bryophytes, general characters, classification, reproduction and affinities. Gametophytic and sporophytic organization of:

Bryopsida: *Pogonatum*; **Anthocerotopsida**: *Anthoceros*

Unit - IV

Gametophytic and sporophytic organization of **Hepaticopsida** : *Riccia, Marchantia*.

Paper III – Diversity of Pteridophytes, Gymnosperms and elementary Palaeobotany

M.M. 50

Unit - I

Pteridophytes: General features, classification, stellar system and its evolution. Comparative study of morphology, anatomy, development, vegetative and reproductive systems of following:

Lycopsidea - *Lycopodium, Selaginella*; **Psilopsida**- *Rhynia*

Unit – II

General and comparative account of gametophytic and sporophytic system in

Filicopsida -*Pteridium, Nephrolepis. Marsilea*.

Heterospory and seed habit.

Unit - III

Gymnosperms: General characters, classification. Comparative study of morphology, anatomy, development of vegetative and reproductive parts in:

Cycadales: *Cycas*

Unit –IV

Study of morphology, anatomy, development and reproductive parts in:

Coniferales – *Pinus* ; **Gnetales** - *Ephedra*

Affinities and relationship of Gymnosperms, evolutionary significance.

Elementary Palaeobotany: general account, types of fossils, methods of fossilization and geological time scale.

B.Sc. II year

Paper I:	Diversity of Angiosperms: Systematics, Development & Reproduction	M.M. 50
Paper II:	Cytology, Genetics, Evolution & Ecology	M.M. 50
Paper III:	Plant Physiology and Biochemistry	M.M. 50

(There will be 9 questions in each paper and candidate has to attempt only 5 questions. Q.1 will be compulsory based on units I - IV. Two questions will be set from each unit of which one question has to be attempted. All questions will carry equal marks)

Practicals: Based on papers I-III M.M. 50

Paper - I: Diversity of Angiosperms: Systematics, Development & Reproduction M.M. 50

Unit - 1

Systematics

Principles of classification, nomenclature; comparative study of different classification systems, viz. Linnaeus, Bentham & Hooker, Engler & Prantl, Hutchinson, and Cronquist. Herbarium techniques and important Botanic Gardens.

Unit – II

Taxonomic study of following families and their economic importance:

Dicots; Nymphaeaceae, Nelumbonaceae, Ranunculaceae, Malvaceae, Bombacaceae, Brassicaceae, Cucurbitaceae, Rosaceae, Leguminosaceae, Myrtaceae, Rutaceae, Apiaceae, Apocynaceae, Solanaceae, Convolvulaceae, Cuscutaceae, Scrophulariaceae, Acanthaceae, Lamiaceae, Asteraceae, Rubiaceae, Euphorbiaceae, and Amaranthaceae.

Monocots: Cyperaceae, Poaceae, Arecaceae, Liliaceae.

Unit - III

External morphology of vegetative and floral parts; modifications – phyllodes, cladodes, and phylloclades.

Meristems-kinds study of tissue system - epidermal, ground, and vascular.

Anatomy of roots, stems, and leaves. Cambium - its function and anomalies in roots and stems.

Unit – IV

Structure and development of male and female gametophytes – microsporogenesis microgametogenesis, megasporogenesis, and megagametogenesis, embryo sac types. Double fertilization development of embryo, endosperm development and its morphological nature, apomixis and polyembryony.

Paper II: Cytology, Genetics, Evolution & Ecology M.M. 50

Unit - I

Cell structure, cell organelles, nucleus, chromosome structure, nucleosome and solenoid model, salivary gland, lampbrush and B chromosomes.

Cell division – mitosis, meiosis; their significance, chromosomal aberrations

Unit- II

Genetics, laws of inheritance; gene interaction; linkage and; cytoplasmic inheritance; sex determination.

Unit-III

Mutation- spontaneous, induced mutations, molecular mechanism and evolutionary significance; polyploidy- origin, kinds and role in evolution. Evidences and theories of evolution.

Unit - IV

Ecology, relation with other disciplines. Plant types: Hydrophytes - *Hydrilla*, *Eichhorina*, *Nymphaea*, *Typha*. Xerophytes – *Nerium*, *Casuarina*, *Saccharum*, *Begonia*. Plant succession – xeroseres, hydroseres. Ecosystems - concept, basic types, components, & functioning.

Paper III - Plant Physiology and Biochemistry.

M.M. 50

Unit - I

Plant and water relationship, colligative properties of water, free energy concept. Water uptake, conduction, transpiration, mechanism and its regulation by environmental variables.

Mineral nutrition : Macro, and micronutrients, their role, deficiency and toxicity symptoms, plant culture practices, mechanism of ion uptake and translocation.

Unit - II

Photosynthesis and Chemosynthesis : photosynthetic pigments, O₂ evolution, photophosphorylation, CO₂ fixation - C₃- C₄ and CAM plants.

Respiration : aerobic and anaerobic respiration, respiratory pathways glycolysis, krebs 'cycle, electron transport, oxidative phosphorylation, pentose phosphate pathway, photorespiration, cyanide resistant respiration. Lipid biosynthesis and its oxidation.

Unit - III

Nitrogen metabolism : atmospheric nitrogen fixation, nitrogen cycle, nitrogen assimilation,

Growth: general aspects of phytohormones, inhibitors-auxins. kinetin, gibberellins, and ethylene: action and their application; photoperiodism and vernalization. Germination, growth movements, parthenocarpy, abscission and senescence.

Unit - IV

Biomolecules : Classification, properties and biological role of carbohydrates, Protein and lipids. Chemistry of nucleic acids.

Discovery and nomenclature. Characteristics of enzymes, concepts of holoenzyme, apoenzyme, coenzyme and cofactors. Regulation of enzyme activity, Mechanism of action.

B.Sc. III year

Paper I:	Plant resource utilisation, Palynology and Biostatistics	M.M. 75
Paper II:	Molecular biology & biotechnology	M.M. 75
Paper III:	Environment Botany and Plant Pathology	M.M. 75

(There will be 9 questions in each paper and candidate has to attempt only 5 questions. Q.1 will be compulsory based on Units I - IV. Two questions will be set from each unit of which one question has to be attempted. All questions will carry equal marks)

Practicals: Based on papers I-III M.M. 75

Paper I Plant Resource utilization, Palynology and Biostatistics 75 marks

Unit I

Centres of diversity of plants, origin of crop plants. Domestication and introduction of crop plants. Concepts of sustainable development; cultivation, production and uses of - wheat, rice, legumes, sugarcane

Unit II

A general account of plants yielding oils, spices, beverages. An account of major fiber, medicinal, petro, plants of Uttar Pradesh.

Unit III

Conservation of plants resources for agriculture and forestry.

In situ conservation sanctuaries, national parks, biosphere reserves, wetlands, mangroves.

Exsitu conservation; botanical gardens, field gene banks, seed banks, cryobanks.

Unit IV

An introductory knowledge to palynology, morphology, viability and germination of pollens.

Classification of data, mean, median and mode. Standard deviation, standard error, variance, co-relation, X^2 test and experimental designs

Paper II: Molecular biology and biotechnology M.M. 75

Unit – I

Nucleic acid as genetic material, nucleotides, structure of nucleic acids, properties of genetic code, codons assignments, chain initiation of codons mechanism of protein synthesis and its regulation.

Unit - II

Structure and properties polysaccharides, aminoacids, proteins, vitamins and hormones; Enzymes: active sites, specificity, mechanisms, factors, general aspects of enzyme kinetics. Bioenergetics: Laws of thermodynamics, concept of Gibb's free energy, high energy compounds.

Unit - III

Replication of DNA in prokaryotes and eukaryotes, gene expression and regulation. Hormonal control and second messengers Ca^{2+} , Cyclic AMP, IP_3 etc.

Unit- IV

Introduction to biotechnology, recombinant DNA technology, plant tissue culture, methods of gene transfer, transgenic plants, biotechnology and healthcare, microbial and environmental biotechnology.

Unit - I

Mineral resources of planet earth, Conservation of mineral resources. soils; types, properties and various problem soils; water; the source of water, physico-chemical and biological properties of water. Sustainable management of water; energy resources in India; Forests: global forest wealth, importance of forests, deforestation.

Unit - II

Environmental pollution : air, water, soil, radioactive, thermal and noise pollutions, their sources, effects and control. (greenhouse effect, ozone depletion and acid rain). CO₂ enrichment and climate change.

Unit - III

Biodiversity and Phytogeography : biotic communities and populations, their characteristics and population dynamics. Natural vegetation of India, static and dynamic plant geography, basic principles governing geographical distribution of plants, endemism.

Unit - IV

Etiology of viral, bacterial, fungal and insect-pest diseases: mosaic diseases on tobacco, and cucumber, yellow vein mosaic of bhindi; citrus canker, potato scab, little leaf of brinjal; damping off of seedlings late blight of potato, red rot of sugarcane

Integrated pest disease management