

Based on Unified Syllabus of Botany for U.P.State Universities

**(B.Sc. I, II, & III year)**

All syllabi are effective from July , 2018 Revised on 13.03.2018

Theory Paper's duration is of Three hours and duration of practicals is Four hours

<b>B.Sc. I Year</b>		
<b>Papers</b>	<b>Title of Paper</b>	<b>Max. Marks</b>
Paper I	Diversity of Viruses, Bacteria & Fungi	50
Paper II	Diversity of Algae, Lichens, & Bryophytes	50
Paper III	Diversity of Pteridophytes & Gymnosperms	50
Practical	Practical Syllabus based on theory papers	50
<b>B.Sc. II Year</b>		
<b>Papers</b>	<b>Title of Paper</b>	<b>Max. Marks</b>
Paper I	Diversity of Angiosperms: Systematics, Development & Reproduction	50
Paper II	Cytology, Genetics, Evolution & Ecology	50
Paper III	Plant Physiology and Biochemistry	50
Practical	Practical Syllabus based on theory papers	50
<b>B.Sc. III Year</b>		
<b>Papers</b>	<b>Title of Paper</b>	<b>Max. Marks</b>
Paper I	Plant Resource Utilization, Palynology, Plant Pathology and Biostatistics	50
Paper II	Molecular Biology & Biotechnology	50
Paper III	Environmental Botany	50
Practical	Practical Syllabus based on theory papers	50
Grand Total		600

At least one Field trip in B.Sc. II is compulsory.

**Based on Unified Syllabus of Botany for U.P.State Universities**  
**Subject- Botany**  
**B.Sc. - First Year**  
**Practical**

**Time: 4.00 hrs**

**Max Marks: 50**

1- Temporary slide preparation & Identification (Fungi)/Bacteria	08 Marks
2- Temporary slide preparation & Identification (Pteridophyte/Gymnosperm)	08 Marks
3- Temporary Mount & Identification (Algae/ Bryophyte)	08 Marks
4- Temporary mount of rhizoid/scale/spore; or Gram staining of Bacteria	04 Marks
4- Identify and Comment upon spots (1-6)	12 Marks
7- <i>Viva-Voce</i>	05 Marks
8- Practical class record	05 Marks
Total Marks	<b>50</b>

**Unified Syllabus of Botany for U.P.State Universities**  
**Subject- Botany**  
**B.Sc. -Second Year**  
**Practical**

**Time: 4.00 hrs**

**Max Marks: 50**

1- Description, Identification and Classification of given Angiospermic Plant	08 Marks
2- To perform and write the observations, results & conclusion (Physiology)	08 Marks
3- Temporary slide preparation & Identification (Anatomy)/ Temporary Mount (Embryology)/ Biochemistry / Genetics Exercise	04 Marks
4- Cytology/Ecology Exercise	08 Marks
5- Identify and Comment upon spots (1-6)	12 Marks
6- <i>Viva-Voce</i>	05 Marks
7- Practical class record/ chart/ model/ herbarium	05 Marks
Total Marks	<b>50</b>

**Unified Syllabus of Botany for U.P.State Universities**  
**Subject- Botany**  
**B.Sc. - Third Year**  
**Practical**

**Time: 4.00 hrs**

**Max Marks: 50**

1- Biotechnology exercise (Tissue culture based)/ Plant diseases	8 Marks
2-Environmental Pollution analysis/ Biostatistics exercise	8 Marks
3-Temporary Mount/ Diagram (Pollen grains)	5 Marks
4-Structure of Different Molecules/soil types	4 Marks
5- Identify and Comment upon spots (1-5)	10 Marks
6- <i>Viva-Voce</i>	5 Marks
7- Practical class record	5 Marks
8- Collection of Model, Chart, Project etc.	5 Marks
Total Marks	<b>50</b>

The course details are as follows:-

## B.Sc. I Year

**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 (Ainsworth), thallus organization and reproduction in fungi; economic importance of fungi.

### Unit-II

**Viruses:** Genome organisation, replication of plant viruses (tobacco mosaic virus), bacteriophages and viroids; techniques in plant viruses - purification, serology and electron microscopy; Economic importance of viruses

### Unit-III

**Bacteria:** Bacterial genome and plasmids; bacterial reproduction, techniques of sterilisation and staining; economic importance.

### Unit-IV

**Fungi:** The outline life cycles of the following:

**Mastigomycotina:** *Albugo, Pythium*,; **Ascomycotina:** *Saccharomyces, Aspergillus, Ascobolus*;

**Basidiomycotina :** *Ustilago, Puccinia, Polyporus, Agaricus*; **Deuteromycotina:** *Fusarium, Cercospora*.

**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. Ecological and economic importance of lichens.

**Unit-II**

The characteristics and life cycles of the following:-

**Cyanophyta**, *Oscillatoria*; **Chlorophyta** *Volvox*, *Hydrodictyon*, *Oedogonium*,  
*Chara*; **Bacillariophyta** *Navicula*; **Xanthophyta** *Vaucheria*; **Phaeophyta**; *Ectocarpus*, *Saragassum*,  
**Rhodophyta** *Polysiphonia*

**Unit – III**

Bryophytes, general characters, classification, reproduction and affinities. Gametophytic and sporophytic organization only of **Hepaticopsida** : *Riccia*, *Marchantia*.

**Unit - IV**

Gametophytic and sporophytic organization only of:

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

**Unit - I**

**Pteridophytes**: General features, classification, stelar system and its evolution. Heterospory and seed habit. Comparative study of morphology, anatomy, development, vegetative and reproductive systems of following:

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

**Unit – II**

General and comparative account of gametophytic and sporophytic system only in

**Filicopsida** -*Pteridium*, *Equisetum*. *Marsilea*.

**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.

### Books Recommended:

1. Ganguly and Kar. College Botany Vo. II. Calcutta
2. Khan, M.1983 Fundamentals of Phycology. Bishen Singh Mahendra Pal Singh, Dehradun
3. Parihar, N.S. The Biology and Morphology of Bryophytes, Central Book Depo. Allahabad.
4. Puri, P. 1980. Bryophytes. Atma Ram & Sons, Delhi.
5. Sharma, O.P. A Text Book of Bryophyta.
6. Singh, V., Pandey, P.C. and Jain, D.K. A text book of botany Vashishta, B.R. Text Book of Algae. New Delhi
7. Parihar, N.S. 1996 Biology & Morphology of Pteridophytes. Central Book Depot, Allahabad.
8. Pandey, S.N. A Text book of Pteridophyta
9. Sharma, O.P. An Introduction to Gymnosperms, Pragati Prakashan, Meerut.
10. Vashishta, P.C. A Text book of Pteridophyta. New Delhi.
11. Vashishta, P.C. Text Book of Gymnosperm

## **B.Sc. II year**

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

### **Unit - I**

Systematics

Principles of classification, Binomial 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; Ranunculaceae, Malvaceae, Brassicaceae, Cucurbitaceae, Rosaceae, Leguminosaceae, Myrtaceae, Rutaceae, Apiaceae, Apocynaceae, Asclepiadaceae, Solanaceae, Convolvulaceae, Acanthaceae, Lamiaceae, Asteraceae, Rubiaceae, Verbenaceae, 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; root-shoot transition.

### **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.

**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, cell cycle.

**Unit- II**

Genetics, laws of inheritance; gene interaction; linkage and crossing over; 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*, *Eichhornia*, *Nymphaea*, *Typha*.

Xerophytes – *Nerium*, *Casuarina*, *Asparagus*, *Calotropis*, *Parkinsonia*. Plant succession – xeroseres, hydroseres. Ecosystems - concept, basic types, components, & functioning. Food chain, food web, energy flow and productivity.

**Unit - I**

Plant and water relationship, colligative properties of water. 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, O<sub>2</sub> evolution, photophosphorylation, CO<sub>2</sub> fixation – C-3, C-4 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, abscission and senescence.

### **Unit - IV**

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

Chemistry of nucleic acids, vitamins.

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

Bioenergetics: Laws of thermodynamics, concept of Gibb's free energy and high energy compounds.

## **B.Sc. III year**

**Paper I** Plant Resource utilization, Palynology, Plant Pathology and Biostatistics M.M. 50 marks

### **Unit I**

Centres of diversity of plants, origin of crop plants. Domestication and introduction of crop plants. Basic concepts of Plant Breeding, hybridization, heterosis. 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**

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

### **Unit IV**

An introductory knowledge of palynology, morphology, viability and germination of pollens. Classification of data, mean, median and mode. Standard deviation, standard error, variance, correlation,  $\chi^2$  test and experimental designs

**Paper II:** Molecular biology and biotechnology

M.M. 50

### **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**

Replication of DNA in prokaryotes and eukaryotes, gene expression and regulation. Hormonal control and second messengers  $\text{Ca}^{2+}$ , Cyclic AMP,  $\text{IP}_3$  etc.

### **Unit- III**

Introduction to biotechnology, recombinant DNA technology, biotechnology and healthcare, IPR issues.

### **Unit- IV**

Plant tissue culture, methods of gene transfer, transgenic plants, , microbial and environmental biotechnology.

**Paper III-** Environmental botany

M.M. 50

### **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). CO<sub>2</sub> 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**

Conservation of plants resources for agriculture and forestry.

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

*Ex situ* conservation; botanical gardens, field gene banks, seed banks, cryobanks.