Unified Syllabus of Botany for U.P.State Universities
(B.Sc. I, II, & III year)

Effective from July , 2012

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

B.Sc. I Year		
Papers	**Title of Paper**	**Max. Marks**
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.Sc. II Year		
Papers	**Title of Paper**	**Max. Marks**
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.Sc. III Year		
Papers	**Title of Paper**	**Max. Marks**
Paper I	Plant Resource Utilisation, Palynology, Plant Pathology and Biostatistics	75
Paper II	Molecular Biology & Biotechnology	75
Paper III	Environment Botany	75
Practical	Practical Syllabus based on theory papers	75

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

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- *Viva-Voce*	05 Marks
8- Practical class record	05 Marks
Total Marks	**50**

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- *Viva-Voce*	05 Marks
7- Practical class record/ chart/ model/ herbarium	05 Marks
Total Marks	**50**

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

Time: 4.00 hrs **Max Marks: 75**

1- Identification and comment upon economic use of plant parts	10 Marks
2- Biotechnology exercise (Tissue culture based)/ Etiology of a disease	10 Marks
3-Environmental Pollution analysis (spot tests)	10 Marks
4-Temporary Mount/ Diagram (Pollen grains)/Biostatistics exercise	05 Marks
5-Qualitative Test of Carbohydrate, Proteins or Amino acids/soil types	05 Marks
6- Identify and Comment upon spots (1-10)	20 Marks
7- *Viva-Voce*	05 Marks
8- Practical class record	05 Marks
9-Collection of Model, Chart, Project etc.	05 Marks
Total Marks	**75**

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: 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. Economic importance of viruses

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 outline life cycles of the following:

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

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

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. Ecological and economic importance of lichens.

Unit-II

The characteristics and life cycles of the following:-

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

Rhodophyta *Polysiphonia*

Unit – III

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

Unit - IV

Gametophytic and soporophytic organization only of:

Anthocerotopsida: A*nthoceros;* **Bryopsida:** *Pogonatum;*

Paper III – Diversity of Pteridophytes, Gymnosperms and elementary Palaeobotany M.M. 50

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 - L*ycopodium, Selaginella;***Psilopsida-** *Rhynia*

Unit – II

General and comparative account of gametophytic and sporophytic system only in

Filicopsida -Pteridium*, Nephrolepis. 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 Algea. 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; Nymphaeaceae, Nelumbonaceae. Ranunculaceae, Malvaceae, Bombacaceae, Brassicaceae, Cucurbitaceac, Rosaceae, Leguminosacae, 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; 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.

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, 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, Saccharum, Begonia.* Plant succession – xeroseres, hydroseres.

Ecosystems - concept, basic types, components, & functioning. Food chain, food web, energy flow and productivity.

Paper III - Plant Physiology and Biochemistry. M.M. 5O

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, CO_2 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; photoperiodisin 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 utilization, Palynology, Plant Pathology and Biostatistics M.M. 75 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, co-relation, χ^2 test and experimental designs

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

Unit – I

Structure and properties polysaccharides, amino acids, 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 – II

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 - III

Replication of DNA in prokaryotes and enkaryotes, 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.

Paper III- Environmental botany M.M. 75

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

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.

OR if the name of the course is to be retained then Unit IV of Paper III be exchanged with Unit III of Paper I of the same year of B Sc.