ALLAHABAD STATE UNIVERSITY
ALLAHABAD(U.P.)

PROPOSED SYLLABUS FOR B.Sc BOTANY

(To be implemented from the academic year 2017-18)

Question paper will contain nine questions in each year (B.Sc. I, II & III) among which candidates have to attempt only five questions.
Question number 1 will be compulsory based on unit I-IV. Two questions will be set from each unit of which one question has to be attempted. All questions will carry equal marks. The course details are as follows;

B.Sc. I Year

There will be three theory papers and a practical examination as follows:
Paper I – Diversity of Viruses, Bacteria and Fungi (M.M.: 50)
Paper II – Diversity of Algae, Lichens and Bryophytes (M.M.: 50)
Paper III – Diversity of Pteridophytes, Gymnosperms and Elementary Palaeobotany (M.M.: 50)
Practical – Based on Paper I-III. (M.M.: 50)

Paper I – Diversity of Viruses, Bacteria and Fungi **(M.M.: 50)**

Unit- I Viruses:

- History, structure, classification and nature of viruses.
- Symptoms of viral infection in plants.
- Transmission of virus, genome organization and replication of plant virus (TMV).
- Techniques in plant viruses i.e. purification, serology and electron microscopy.
- Structure and multiplication of Bacteriophages and viroids.

Unit- II Bacteria:

- History, classification, structure, nutrition and mode of reproduction in bacteria.
- Prokaryotic and eukaryotic cell structure (Bacteria, Mycoplasma and Yeast).
- Nitrogen cycle. Bacterial genome and plasmids.
- Bacterial cell division.
- Variability in bacteria i.e. mutation &, principles of genetic recombination.
- Techniques in sterilization, bacterial culture and staining.
- Economic importance of bacteria.

Unit- III Fungi:

- History, structure and nutrition of fungi.
- Outline classification of fungi with special reference to Ainsworth.
- Thallus organization and reproduction in fungi.
- Economic importance of fungi.

Unit- IV Life cycles of Fungi:

Systematic position, occurrence, structure ,mode of reproduction and life cycles of following genera:

- **Mastigomycotina:** *Albugo, Saprolegnia., phytophthora*

07-07-17

- **Ascomycotina:** *Aspergillus, Peziza.*
- **Basidiomycotina:** *Ustilago, Puccinia, Agaricus.*
- **Deuteromycotina:** *Alternaria, Fusarium.* and *cercospora*

Paper II – Diversity of Algae, Lichens and Bryophytes **(M.M.: 50)**

Unit- I Algae:

- General characters and Range of thallus organization in algae.
- Classification of algae with special reference to Fritch's classification.
- Ultrastructure of eukaryotic algal cell and cyanobacterial cell,
- Life cycle pattern of algae.
- Economic importance of algae.

Unit- II Life cycles of Algae:

Systematic position, occurrence, structure and mode of reproduction in following genera:

- **Cyanophyta:** *Nostoc, Microcystis, Oscillatoria.*
- **Chlorophyta:** *chlamydomonas , Volvox, Hydrodictyon, Oedogonium, and Chara.*
- **Bacillariophyta:** *Navicula.*
- **Xanthophyta:** *Vaucheria.*
- **Phaeophyta:** *Ectocarpus.*
- **Rhodophyta:** *Polysiphonia.*

Unit- III Lichens:

- General account of Lichens.
- Classification, thallus organization, reproduction & physiology of Lichens.
- Economic importance of Lichens & their role in environmental pollution,

Unit- IV Bryophytes:

- General characters, classification, reproduction and affinities of Bryophytes.
- Economic importance of Bryophytes.
- A general account of evolution of sporophyte in Bryophytes.
- Systematic position, occurrence, morphology, anatomy and reproductive structure of **Hepaticopsida:***Riccia,Marchantia;***Anthocerotopsida:***Anthoceros;***Bryopsida:** *Sphagnum.*

Paper III – Diversity of Pteridophytes, Gymnosperms and Elementary Palaeobotany (M.M.: 50)

Unit- I Pteridophytes:

- General features and classification of Pteridophytes given by Riemer.
- Stellar system and its evolution in Pteridophytes.
- Heterospory and seed habit.

Unit- II Life cycles of Pteridophytes:

Systematic position, occurrence, structure and mode of reproduction of following genera:

- **Psilopsida:** *Rhynia.*
- **Lycopsida:** *Lycopodium, Selaginella.*
- **Filcopsida:** *Pteridium, Nephrolepis, Marsilea.*

Unit- III Gymnosperms:

- General characteristics, classification and affinities of Gymnosperms.
- Economic importance of Gymnosperms.

07-07-17

- Systematic position, occurrence, structure and mode of reproduction of following genera: **Cycadales:** *Cycas*; **Coniferales:** *Pinus* and **Gnetales:** *Ephedra*.

Unit- IV Elementary Palaeobotany:

- General account of Palaeobotany.
- Type of fossils and process of fossilization.
- Geological time scale.
- Evolutionary significance.

B.Sc. II Year

There will be three theory papers and a practical examination as follows:
Paper I – Diversity of Angiosperms: Systematics , Development & Reproduction (M.M.: 50)
Paper II – Cytology, Genetics, Evolution and Ecology (M.M.: 50)
Paper III – Plant Physiology and Biochemistry (M.M.: 50)
Practical – Based on Paper I-III. (M.M.: 50)

Paper I – Diversity of Angiosperms: Systematics, Development & Reproduction (M.M.: 50)

Unit- I Systematics:

- Principles of classification & binomial system of nomenclature.
- Classification systems as proposed by Bentham & Hooker, Engler & Prantl and Hutchinson.
- Herbarium techniques, important herbaria of the world and important Botanical Gardens.

Unit- II Plant Taxonomy:

Taxonomic study of following families and their economic importance:

- **Dicots:** Ranunculaceae, Nymphaeaceae , Nelumbonaceae, Brassicaceae , Malvaceae, Bombacaceae, Rutaceae, Fabaceae ,Rosaceae , Myrtaceae , Cucurbitaceae , Apiaceae, Rubiaceae , Asteraceae, Apocynaceae , Convolvulaceae , Cuscutaceae, Solanaceae , Scrophulariaceae, Acanthaceae ,Lamiaceae , Amaranthaceae , Euphorbiaceae .
- **Monocots:** Liliaceae, Arecaceae, Cyperaceae, Poaceae
- **Unit- III Plant Anatomy and Morphology:**
- External morphology of vegetative and floral parts.
- Modifications- phyllodes, cladodes, and phylloclades.
- Organization of shoot and root apical meristem.
- Epidermal, ground and vascular tissue system.
- Anatomy of roots, stems, and leaves.
- Function and anomalies of cambium in root and stems.

Unit- IV Plant Embryology:

- Microsporangium, microsporogenesis and development of male gametophyte.
- Megasporangium, megasporogenesis and development of female gametophyte.
- Fertilization, Double fertilization.
- Endosperm and embryo development.
- Parthenocarpy, Apomixis and Polyembryony.

Paper II – Cytology, Genetics, Evolution and Ecology (M.M.: 50)

Unit- I Cytology:

- Ultra structure of plant cell with their typical cell organelles.

07-07-17

- Chromosome structure (salivary gland, lampbrush, B chromosomes) and chromosomal abberations.
- Cell Cycle, Cell Division (Mitosis, Meiosis) and their significance.

Unit- II Genetics:

- Laws of inheritance.
- Gene interaction.
- Linkage and cytoplasmic inheritance.
- Sex determination.

Unit- III Evolution:

- Mutation : spontaneous, induced mutation.
- Molecular mechanism and evolutionary significance;
- Origin, types and role of Polyploidy in evolution.
- Evidences and theories of evolution.

Unit- IV Ecology:

- Basic principles of ecology and relation with other disciplines.
- Concept, types, components, and functioning of ecosystem.
- Ecological Adaptations , Hydrophytes (*Hydrilla, Eichhorina, Nympheaea, Typha*) and Xerophytes (*Nerium, Casuarina, Saccharum, Begnonia*).
- Plant succession : Xeroseres and Hydroseres.

Paper III – Plant Physiology and Biochemistry **(M.M.: 50)**

Unit- I Plant Physiology:

- Plant and water relationship :Diffusion, Osmosis, Permeability, Imbibition, Plasmolysis, Osmotic potential and Water potential.
- Absorption of water: Passive and active absorption.
- Water uptake : Ascent of Sap.
- Transpiration, opening and closing mechanism of stomata and its regulation by environmental variables.
- Mechanism of ion uptake and its translocation.
- Mineral nutrition of plants: Role of macro and micronutrients, deficiency and toxicity symptoms of nutrients, plant culture practices.

Unit- II

- **Photosynthesis and Chemosynthesis:** Structure of chloroplast, photosynthetic pigment, absorption of light, O_2 evolution, photophosphorylation, C_3, C_4 and CAM pathway of carbon fixation, photorespiration.
- **Respiration:** Structure of mitochondria, types of respiration, respiratory pathways-glycolysis, krebs cycle, electron transport, oxidative phosphorylation, pentose phosphate pathway, cyanide resistant respiration.
- Lipid biosynthesis and its oxidation.

Unit- III

- **Nitrogen metabolism:** Atmospheric nitrogen fixation, nitrogen cycle, nitrogen assimilation.
- **Phytohormones:** General aspects of phytohormones, Physiological role of auxins, gibberellins, cytokinins, abscisic acid and ethylene.
- Photoperiodism, vernalization, plant movement, abscission and senescence.

07-07-17

Unit- IV Biochemistry:

- Classification, properties and biological role of carbohydrates, protein and lipids.
- Chemistry of nucleic acids.
- Characteristics, nomenclature and classification of enzymes, concepts of holoenzyme, apoenzyme, coenzyme and cofactors. Regulation of enzyme activity, Mechanism of action.

B.Sc. III Year

There will be three theory papers and a practical examination as follows:
Paper I – Plant resource utilization, Palynology and Biostatistics (M.M.: 75)
Paper II – Molecular biology and biotechnology (M.M.: 75)
Paper III – Environmental Botany and Plant Pathology (M.M.: 75)
Practical – Based on Paper I-III. (M.M.: 75)

Paper I – Plant Resource Utilization, Palynology and Biostatistics **(M.M.: 75)**

Unit- I Plant Resource Utilization:

- Centers 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 and 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 plant resources for agriculture and forestry.
- *In situ* conservation: Sanctuaries, national parks, biosphere reserves, wetlands, mangroves.
- *Ex situ* conservation: Botanical gardens, field gene bank, seed bank, cryobanks.

Unit- IV Palynology and Biostatistics:

- 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 Molecular Biology:

- Nucleic acid: Structure and properties of different forms of DNA & RNA.
- Nucleic acid as genetic material.
- Concept of gene. Genetic code, mechanism of protein synthesis and its regulation.

Unit- II

- Structure and properties of 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.

07-07-17

Unit- III

- Replication of DNA in prokaryotes and eukaryotes.
- Gene expression and regulation.
- Hormonal control and second messengers Ca+, Cyclic AMP, IP_3 etc.

Unit- IV Biotechnology:

- Introduction, scope and significance of biotechnology.
- Recombinant DNA technology, vectors and restriction enzymes.
- Plant tissue culture.
- Transgenic plants and methods of gene transfer in them.
- Application of biotechnology in healthcare.
- Microbial and environmental biotechnology.

Paper III – Environmental Botany and Plant Pathology **(M.M.: 75)**

Unit- I

- Mineral resource of planet earth and its conservation.
- Structure, types and properties of soils in India.
- Physico-chemical and biological properties of water and its sustainable management.
- Energy resources in India.
- **Forests:** global forest wealth, importance of forest, deforestation.

Unit- II

- **Environmental pollution:** Air, water, soil, radioactive, thermal and noise pollutions, their sources, effects and control.
- Green house effect, ozone depletion and acid rain.
- CO_2 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

- History and Scope of plant pathology.
- Etiology of viral, bacterial, fungal and insect-pest diseases.
- General symptoms of fungal, bacterial and viral disease.
- Study of following diseases with reference to symptoms, causal organisms, disease cycle and control: Mosaic disease 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 and Red rot of sugarcane.
- Integrated pest disease management.

07-07-17