

**J.S. UNIVERSITY
MAINPURI ROAD, SHIKOHABAD (FIROZABAD)**



REVISED SYLLABUS

SESSION-2018-2019

B. Sc.

DEPARTMENT OF BOTANY

Vision of Department

Students are able to reach on top position after completing B.Sc., M.Sc. and research work in the field of Botany and play important role in development of country.

Mission of Department

To offer basic, competitive, modern, wide, skill oriented, quality education of theoretical and practical field of diversity of morphology, anatomy of reproductive and vegetative parts of plants, cytology, genetics, physiology, ecology, economic botany, biotechnology, genetic engineering, taxonomy and molecular pathology of plants and develop quality of social awareness, faithfulness, honesty and uplift to scholar for facing challenges in life easily and carve their own future. Efforts for research in taxonomical and ecological and other fields are also done.

Program Education Objectives (PEOs)

The graduate will

PEO-1: Be trained in basic knowledge, scientific temper, research potential and advanced techniques.

PEO-2: Be able to pursue higher studies and research.

PEO-3: Have leadership quality to handle all kind of circumstances in diversities by providing interdisciplinary and multidisciplinary learning environment.

PEO-4: Be a continuous learner and adopt new skills and techniques to overcome the problems related with new technologies.

PEO-5: Be able to formulate, investigate and analyze scientifically real life problems along with ethical attitude.

Program Outcomes (POs)

Students will be able to

PO-1: Apply knowledge of sciences to become competent professionals at global level.

PO-2: Identify and solve scientific problems for higher studies at national and international levels.

PO-3: Investigate problems related to sciences using knowledge for analysis and interpretation of data.

PO-4: Select, design and apply appropriate experimental techniques along with IT tools to solve problems related to sciences.

PO-5: Apply contextual knowledge to assess societal, health, safety, and cultural issues relevant to the science practices.

PO-6: Investigate and demonstrate the scientific knowledge in environmental contexts for sustainable development.

PO-7: Apply ethical principles and responsibilities of a science graduate to serve the society.

PO-8: Communicate effectively through soft skills, report writing, documentation and effective presentations.

PO-9: Perform effectively as an individual and as a member or leader in diverse teams in multidisciplinary settings.

PO-10: Engage in independent and lifelong learning in the broadest context of science and technological changes.

PO-11: Enhance skills for future employability through activities such as internship, MOOC courses, seminars, summer trainings and project work.

PO-12: Learn and perform experiments to apply their knowledge in learning of advances in sciences for job opportunities.

Programme Specific Outcomes of B.Sc. with Botany– After completing the graduation with Bachelor of Science, the students are able to;

PSO1 – Describe effectively the fundamentals and uses of chemical Biological Science.

PSO2 – Detail knowledge of natural laws, accuracy and validity of both theoretical and practical understanding.

PSO3 – Communicate ecological interconnectedness of life by tracing energy and nutrient flows through the environment.

PSO4 – Determine the avenues and remedies for burning environmental issues.

PSO5 – Enhance, pursues and appreciate conservation practices for sustainable use of plants and development.

PSO6 – Interact with the social activities with ethical approach due to collaborative field visits, Botanical tours and academic trips.

B.Sc. Ist Year

Class – B.Sc. I (Bio)

Subject Name – Botany

Subject Code – 05

Paper Number – I

Paper Name – Diversity of Viruses, Bacteria & Fungi

Paper Code –BSBO - 101

Course Outcomes (COs): After completion of this course students will be able to;

CO-1: Understand the basic microbial structure and function and study the comparative characteristics of prokaryotes and eukaryotes and also understand the structural similarities and differences among various physiological groups of viruses, bacteria and fungi.

CO-2: Know how viruses can be used as tools to study biological processes, as cloning vectors and for gene transfer.

CO-3: Know General bacteriology and microbial techniques for isolation of pure cultures of bacteria.

CO-4: Know General mycology and microbial techniques for isolation of pure cultures of fungi.

SYLLABUS

Unit-I

History and scope of Microbiology, prokaryotic and eukaryotic cell. Structure, classification and nature of viruses. Structure and classification (based on cell structure) of bacteria, gram positive and gram negative bacteria. Classification, thallus organization and reproduction in fungi, economic importance of fungi. Current trends in microbiology.

Unit-II

Viruses: Chemistry of virus and genome organization, common symptoms of viral infection in plants, transmission of plant viruses, Tobacco Mosaic Virus (TMV), Techniques in plant viruses: purification, serology and electron microscopy. Structure and multiplication of bacteriophages and viroids.

Unit-III

Bacteria: Distribution and shape of bacteria, nutrition of bacteria, flagellation in bacteria. Plasmids and Endospores. Bacterial cell division; principles of genetic recombination (transformation, conjugation and transduction). Techniques in sterilization, bacterial culture and staining. Economic importance of bacteria.

Unit-IV

Fungi: The characteristics and life cycles of the following:

Mastigomycotina: Albugo, Zygomycotina – Rhizopus, Ascomycotina: Saccharomyces, Aspergillus; Basidiomycotina: Ustilago, Puccinia, Agaricus; Deuteromycotina: Alternaria.

Class – B.Sc. I (Bio)

Subject Name – Botany

Subject Code – 05

Paper Number – II

Paper Name – Diversity of Algae, Lichens and Bryophytes

Paper Code –BSBO-102

Course Outcomes (COs): After completion of this course students will be able to;

CO-1: Understand general characters and Classification of algae, range of thallus organization.

CO-2: Know ultrastructure of eukaryotic algal cell and cyanobacterial cell.

CO-3: Present classification and distribution of lichens, nature of association of phycobiont and mycobiont.

CO-4: Describe general characteristics and life cycles of mentioned algae.

CO-5: Explain general characters, classification and reproduction of bryophytes.

CO-6: Express gametophytic and sporophytic organization of given bryophytes.

CO-7: Identify different bryophytes and algae.

SYLLABUS

Unit-I

General characters and Classification of algae, range of thallus organization, ultrastructure of eukaryotic algal cell and cyanobacterial cell, economic importance of algae. Lichens: Classification and distribution of lichens, nature of association of phycobiont and mycobiont in lichens, role in environmental pollution of lichens.

Unit-II

The characteristics and life cycles of the following:-

Cyanophyceae: *Nostoc*

Chlorophyceae: *Volvox, Oedogonium*

Xanthophyceae: *Vaucharia*

Phaeophyceae: *Ectocarpus, Sargassum*

Rhodophyceae: *Polysiphonia*

Unit-III

Bryophytes: General characters, classification, reproduction and affinities. Gametophytic and sporophytic organization of: Bryopsida: *Funaria*, Anthocerotopsida: *Anthoceros*

Unit – IV

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

Class – B.Sc. I (Bio)

Subject Name: Botany

Subject code – 05

Paper number - III

Paper Name: Diversity of pteridophytes & Gymnosperms & elementary palaeobotany.

Paper Code – BSBO -103

Course Outcomes (COs): After completion of this course students will be able to;

CO-1: To understand evolution from pteridophytes to gymnosperms.

CO-2: To know stellar evolution and seed formation habit in pteridophytes.

CO-3: To gain knowledge about life cycle of pteridophytes.

CO-4: To understand life cycle of gymnosperm.

CO-5: To describe about fossils and fossilization.

CO-6: To explain about geological time scale.

SYLLABUS

Unit-1

Pteridophytes: General features, affinities, classification, stellar system & its evolution. Comparative study of morphology, anatomy of vegetative and reproductive parts, reproduction and life cycle of following: Lycopsida- *Lycopodium*, *Selaginella*: Psilopsida- *Rhynia*

Unit-II

General & comparative account of gametophytic and sporophytic system in Filicopsida – Sphenopsida - *Equisetum*, *Marsilea*. Heterospory and seed habit

Unit-III

Gymnosperms: General characters, classification, affinities, origin and evolution of ovule, vesselless and fruitless gymnospermic plants.

Unit-IV

Comparative study of morphology, anatomy of vegetative parts and reproductive parts, reproduction and life cycle in : Cycadales : *Cycas*, Coniferales – *Pinus* , Gnetales – *Ephedra* . Palaobotany, general accounts of Pro. Birbal Sahni and *Williamsonia*, *Glossopteris*, *Lygnopteris*. Types of fossils, methods of fossilization and geological time scale

B.Sc. 2 year

Class – B.Sc. II (Bio)

Subject Name – Botany

Subject Code – 05

Paper Number – I

Paper Name – Diversity of Angiosperms: Systematics, Development & Reproduction

Paper Code –BSBO – 201

Course Outcomes (COs): After completion of this course students will be able to;

CO-1: Know basic concepts of classification, nomenclature.

CO-2: Understand herbarium ancient and modern techniques with important Botanic Gardens.

CO-3: Explain taxonomic concepts of mentioned families.

CO-4: Describe external and internal morphology of vegetative and floral parts of angiosperms.

CO-5: Present structure and development of male and female gametophytes.

CO-6: Have deep knowledge of double fertilization, development of embryo and endosperm of angiospermic plants.

SYLLABUS

Unit - I

Systematics: Basic concepts of classification, nomenclature; comparative study of different classification systems, viz. Linnaeus, Bentham & Hooker, Engler & Prantl, Hutchinson. Herbarium ancient and modern techniques with important Botanic Gardens.

Unit – II

Taxonomic study of following families and their medicinal importance: Dicots; Ranunculaceae, Papaveraceae, Malvaceae, Brassicaceae, Cucurbitaceae, Rosaceae, Leguminosaceae, Rutaceae, Apiaceae, Apocynaceae, Solanaceae, Convolvulaceae, Acanthaceae, Lamiaceae, Asteraceae, Rubiaceae, Euphorbiaceae, and Amaranthaceae. Monocots: Poaceae, Liliaceae.

Unit - III

External and internal morphology of vegetative and floral parts; modifications – phyllodes, cladodes, and phylloclades. Meristems- Kinds study of tissue system - epidermal, ground, and vascular. Anatomy of monocot and Dicot 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.

Class – B.Sc. II (Bio)

Subject Name – Botany

Subject Code – 05

Paper Number – II

Paper Name – Cytology, Genetics, Evolution & Ecology

Paper Code –BSBO – 202

Course Outcomes (COs): After completion of this course students will be able to;

CO-1: Understand ultrastructure of plant cell, cell organelles, nucleus and chromosome structure.

CO-2: Write cell division: mitosis, meiosis and their significance

CO-3: Explain Mendel's laws of inheritance and interaction of genes

CO-4: Describe spontaneous and induced mutations.

CO-5: Present evidences and theories of organic evolution.

CO-6: Express concept, basic types, components and functioning of ecosystem, food web and ecological pyramids

CO-7: Describe biodiversity and its conservation.

SYLLABUS

Unit-I

Cytology: Ultrastructure of plant cell, cell organelles, nucleus, chromosome structure,

euchromatin and heterochromatin, nucleosome and solenoid model. Cell division: mitosis, meiosis and their significance.

Unit-II

Genetics: Mendel's laws of inheritance, interaction of genes, linkage and crossing over, sex determination.

Unit-III

Mutation: Spontaneous and induced mutations, molecular mechanism and evolutionary significance. Polyploidy: Origin, kinds and role in evolution. Evidences and theories of organic evolution.

Unit-IV

Ecology and Ecosystems: Concept, basic types, components and functioning of ecosystem, food chain, food web and ecological pyramids, energy flow and ecological succession. Biodiversity and its conservation: Definition, types and importance of biodiversity.

Class – B.Sc. II (Bio)

Subject Name – Botany

Subject Code – 05

Paper Number – III

Paper Name – Plant Physiology and Biochemistry

Paper Code – BSBO – 203

Course Outcomes (COs): After completion of this course students will be able to;

CO-1: Understand the plant and water relationship.

CO-2: Understand nitrogen fixation, nitrogen cycle photoperiodism, vernalization, parthenocarpy, abscission and senescence.

CO-3: Identify different molecules.

CO-4: Knows characteristic of enzyme and clear the concept of apoenzyme and holoenzyme.

SYLLABUS

Unit – I

Plant – Water relations . Physical properties of water, Importance of water to plant life. . Diffusion, imbibition and osmosis; concept & components of Water potential. Absorption and transport of water and ascent of sap. Transpiration –Definition, types of transpiration, structure and opening and closing mechanism of stomata.

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.

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. 3 year

Class – B.Sc. III (Bio)

Subject Name – Botany

Subject Code – 05

Paper Number – I

Paper Name – Plant Resource utilization, Palynology and Biostatistics

Paper Code –BSBO – 301

Course Outcomes (COs): After completion of this course students will be able to;

CO-1: Understand centers of diversity of plants, origin of crop plants.

CO-2: Know general account of plants which gives oils, spices, beverages.

CO-3: Explain the account of major fiber, medicinal, petro, plants.s

CO-4: Present conservation of plants resources *in situ* and *ex situ*.

CO-5: Have introductory knowledge to palynology.

CO-6: Understand basic tests of statistical analysis .

SYLLABUS

Unit-I

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, Spore-pollen morphology: units, polarity, symmetry, shape, size, aperture; NPC system for numerical expression of apertural details; evolution of aperture types. Classification of data, mean, median and mode. Standard deviation, standard error, variance, co-relation, X^2 test and experimental designs

Class – B.Sc. III (Bio)

Subject Name – Botany

Subject Code – 05

Paper Number – II

Paper Name – Molecular biology and Biotechnology

Paper Code –BSBO – 302

Course Outcomes (COs): After completion of this course students will be able to;

CO-1: Understand the Nucleic acid as genetic material.

CO-2: Apply general concepts of cell and molecular biology.

CO-3: Explain DNA Replication in Prokaryotes and Eukaryotes.

CO-4: Describe introduction and history of biotechnology.

SYLLABUS

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.

Class – B.Sc. III (Bio)

Subject Name – Botany

Subject code – 05

Paper number - III

Paper Name – Environmental Botany & Plant Pathology

Paper code –BSBO – 303

Course Outcomes (COs): After completion of this course students will be able to;

CO-1: Know the environmental botany.

CO-2: Understand the nature & its co-relation with human society.

CO-3: Realize the impact of human activities on environment.

CO-4: Understand global issues concerned with environment.

CO-5: Know the sustainable development & care of environment.

CO-6: Know the terminologies in plant pathology.

CO-7: Understand the scope & importance of plant pathology.

CO-8: Understand the control measures of plant diseases.

SYLLABUS

Unit – 1

Soil and soil profile, soil composition, soil formation, classification of soil, nutrient of soil, radiation and fire, beneficial and adverse effects of fire, soil erosion, soil conservation and its principles, methods, water erosion, water conservation, biological oxygen demand (BOD), chemical oxygen demand (COD), ex-situ conservation, in-situ conservation, problem of population growth and environmental management.

Unit -2

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

Unit-3

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-4

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 seedlings, late blight of potato, red rot of sugarcane. Integrated pest disease management.