

Old Syllabus V/s Revised Syllabus for U.G. & P.G.

Botany

C.S.J.M. University, Kanpur

(2018-19)

<u>Old Syllabus</u>	<u>New Syllabus</u>
B.Sc. I year	Proposed Syllabus for B.Sc. Botany B.Sc. I year
There will be Three theory papers and a practical examination as follows.	There will be Three theory papers and a practical examination as follows
Paper I - Diversity of Viruses, Bacteria & Fungi M M.: 50	Paper I - Diversity of Viruses, Bacteria & Fungi M. M.: 50
Paper II - Diversity of Algae, Lichens, & Bryophytes M. M.: 50	Paper II - Diversity of Algae, Lichens, & Bryophytes M. M.: 50
Paper III - Diversity of Pteridophytes & Gymnosperms 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 and of short answer type 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	Practicals: Based on papers I - III M. M.: 50
The course details are as follows:-	The course details are as follows:-
Paper I: Diversity of Viruses, Bacteria, & Fungi M.M. 50	Paper I: Diversity of Viruses, Bacteria, & Fungi M.M. 50
UNIT-I	UNIT-I
History, nature and classification of Viruses, Bacteria and Fungi Whittaker's 5 kingdom classification, History of virology and bacteriology, prokaryotic and eukaryotic cell structure, classification and nature of viruses; structure and classification (based on cell structure) of bacteria; classification, thallus organisation and reproduction in fungi; economic importance of fungi.	History, nature and classification of Viruses, Bacteria and Fungi Whittaker's 5 kingdom classification, History of virology and bacteriology; prokaryotic and eukaryotic cell structure, classification and nature of viruses, structure and classification (based on cell structure) of bacteria; classification, thallus organisation and reproduction in fungi, economic importance of fungi
UNIT-II	UNIT-II
Viruses: Symptoms of virus infection in plants; transmission of plant viruses; genome organisation, replication of plant virus (tobacco mosaic virus), structure and multiplication of bacteriophages; structure and multiplication of viroids and prions.	Viruses: Symptoms of virus infection in plants, transmission of plant viruses; genome organisation, replication of plant virus (tobacco mosaic virus), structure and multiplication of bacteriophages, structure and multiplication of viroids and prions.

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UNIT-III

Bacteria: Nutritional types of bacteria (based on carbon and energy sources), metabolism in different nutritional types, bacterial genome and plasmids, reproduction, variability in bacteria - mutation, staining; economic importance

UNIT-IV

Fungi: The characteristics and life cycles of the following:
Mastigomycotina: *Albugo, Pythium, Phytophthora* **Ascomycotina:** *Aspergillus, Morchella;* **Basidiomycotina :** *Ustilago, Puccinia, Agaricus;* **Deuteromycotina:** *Alternaria.*

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

Characteristics and life cycles of the following:- **Cyanophyta** *Microcystis, Oscillatoria* **Chlorophyta** *Chlamydomonas, Volvox, Hydrodictyon, Oedogonium, Coleochaete, Chara;* **Bacillariophyta** *Navicula;* **Xanthopyta** *Vaucheria;* **Phaeophyta;** *Ectocarpus, Sargassum*

Rhodophyta *Polysiphonia*

UNIT - III

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

Bryopsida: *Sphagnum* ; **Anthocerotopsida:** *Anthoceros*

UNIT - IV

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

UNIT-III

Bacteria: Nutritional types of bacteria (based on carbon and energy sources), metabolism in different nutritional types, bacterial genome and plasmids; reproduction, variability in bacteria - mutation, staining; economic importance.

UNIT-IV

Fungi: The characteristics and life cycles of the following:
Mastigomycotina: *Albugo, Pythium, Synchytrium* **Ascomycotina:** *Aspergillus; Morchella;* **Basidiomycotina :** *Ustilago, Puccinia, Agaricus;* **Deuteromycotina:** *Alternaria.*

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

Characteristics and life cycles of the following:- **Cyanophyta** *Microcystis, Oscillatoria* . **Chlorophyta** *Chlamydomonas Volvox, Hydrodictyon, Oedogonium, Coleochaete, Chara;* **Bacillariophyta** *Navicula.* **Xanthopyta** *Vaucheria;* **Phaeophyta;** *Ectocarpus, Sargassum*

Rhodophyta *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, Frullania, Pellia*

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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 sprophytic system in **Filicopsida** - *Pteridium, 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*, **Conferales** : *Pinus*

UNIT - IV

Study of morphology, anatomy, development and reproductive parts in:
Conferales : *Pinus* **Gnetales:** *Ephedra*
Affinities and relationship of Gymnosperms, evolutionary significance.
Elementary Palaeobotany; general account, types of fossils, methods of fossilization and geological time scale

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 sprophytic system in **Sphenopsida** - *Equisetum*
Filicopsida - *Pteridium, 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*, **Conferales** : *Pinus*, **Gnetales:** *Ephedra*

UNIT - IV

Affinities and relationship of Gymnosperms, evolutionary significance
Elementary Palaeobotany; general account, types of fossils, methods of fossilization and geological time scale.

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B.Sc. II year

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

Paper II. Cytology, Genetics, Evolution & Plant Breeding 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. 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, Fabaceae, Rutaceae, Apiaceae, Apocynaceae, Solanaceae, Convolvulaceae, Acanthaceae, Lamiaceae, Asteraceae, Rubiaceae and Euphorbiaceae, **Monocots**: Poaceae, 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 (SAM) and (RAM). 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.

B.Sc. II year

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

Paper II: Cytology, Genetics, Evolution & Plant Breeding M M. 50

Paper III: Plant Physiology and Biochemistry M.M 50

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. 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, Fabaceae, Rutaceae, Apiaceae, Apocynaceae, Solanaceae, Convolvulaceae, Acanthaceae, Verbenaceae, Lamiaceae, Asteraceae, Rubiaceae, Amaranthaceae and Euphorbiaceae, **Monocots**: Poaceae, Liliaceae.

A general account of following plants and their uses: Mustard, Ground nut, Coriander, Turmeric, Cotton, Jute, Tea, Rauwolfia, Neem, Jatropha and Teak.

UNIT - III

External morphology of vegetative and floral parts Meristems-kinds, study of tissue system - epidermal, ground, and vascular (SAM) and (RAM) 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

Handwritten signatures and initials: Gulam, Gul, Shafiq, Arshad, Adnan

Paper II: Cytology, Genetics, Evolution & Plant Breeding 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; and their significance, chromosome: structural aberrations

UNIT- II

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

UNIT-III

Mutation- spontaneous, induced, molecular mechanism and evolutionary significance, polyploidy- origin, kinds and role in evolution.

UNIT - IV

Evidences and theories of evolution, Methods in Plant Breeding.

Paper III - Plant Physiology and Biochemistry. M.M. 50

UNIT - I

Plant and water relationship, properties of water. Water uptake, conduction, transpiration, mechanism and its regulation by environmental variables Guttation. Mineral nutrition . Macro, and micronutrients, their role, deficiency and toxicity symptoms, mechanism of ion uptake and translocation.

UNIT - II

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

Paper II: Cytology, Genetics, Plant Breeding & Biostatistics 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; and their significance, chromosome: structural aberrations

UNIT- II

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

Mutation- spontaneous, induced, molecular mechanism and evolutionary significance, polyploidy- origin, kinds and role in evolution.

UNIT - III

Principles & Methods in Plant Breeding

UNIT - IV

Classification of data, mean, median and mode. Standard deviation, standard error, variance, co-relation, X² test

Paper III - Plant Physiology and Biochemistry. M.M. 50

UNIT - I

Plant and water relationship, properties of water Water uptake, conduction, transpiration, mechanism and its regulation by environmental variables Guttation. Mineral nutrition : Macro, and micronutrients, their role, deficiency and toxicity symptoms, mechanism of ion uptake and translocation

UNIT - II

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

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UNIT - III

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

Growth: general aspects of phytohormones, auxins, cytokinin, gibberellins, and ethylene: action and their application; photoperiodism and vernalization. Seed germination. Plant movements, parthenocarp, abscission and senescence.

UNIT - IV

Biomolecules : Classification, properties and biological role of carbohydrates, Protein and lipids, nucleic acids. Discovery and nomenclature. Characteristics of enzymes, concepts of holoenzyme, apoenzyme, coenzyme and cofactors and Mechanism of action.

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UNIT - III

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

Growth, general aspects of phytohormones, auxins, cytokinin, gibberellins, and ethylene: action and their application; photoperiodism and vernalization. Seed germination, Plant movements, parthenocarp, abscission and senescence.

UNIT - IV

Biomolecules : Classification, properties and biological role of carbohydrates, Protein and lipids, nucleic acids. Characteristics of enzymes, nomenclature, concepts of holoenzyme, apoenzyme, coenzyme and cofactors and Mechanism of action.

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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: Environmental 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 and origin of crop plants Domestication and uses of - wheat, rice, legumes, sugarcane and potato.

UNIT II

A general account of following plants and their uses: Mustard, Ground nut, Coriander, Turmeric, Cotton, Jute, Tea, Rauwolfia, Neem, Jatropha and Teak.

UNIT III

Conservation of plants. 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, X2 test

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, Mechanism of Protein synthesis

UNIT - II

Enzymes active sites, specificity, mechanisms, factors, general aspects of

B.Sc. III year

Paper I: Ecology, Soil-Science, Environmental Botany, Ethnobotany & Conservation of Plants. M.M. 75

Paper II. Molecular biology, Biotechnology & Palynology M.M. 75

Paper III: Microbiology and Plant Pathology M.M. 75

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

Paper-I : Ecology, Soil-Science, Environmental Botany, Ethnobotany Conservation of Plants

UNIT-I

Ecology : Ecosystem (structure & functions), Ecological factors, Ecological adaptations, Plant Succession.

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-II

Soil- Science : Soil formation, Soil characteristics, different type of soils, soil degradation and soil conservation.

UNIT-III

Environmental Pollution : Air, water, soil, radioactive, thermal and noise pollutions, their sources, effects and control. Green house effect. Ozone depletion. Acid rain. CO2 enrichment, climate change, El Nino effect.

UNIT-IV

An introductory knowledge of Ethnobotany, Development and Importance.

Conservation of plants : *in situ*, *ex situ* conservation, sanctuaries, natural parks biosphere reserve, wet land, mangroves, botanical gardens, filed gene banks, seed banks, cryobanks.

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enzyme kinetics. Bioenergetics: Laws of thermodynamics

UNIT - III

Different types of RNA's, and their transcription replication of DNA in prokaryotes and eukaryotes

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 and plant pathology M.M. 75

UNIT - I

Ecology: Environmental factors, Ecological adaptations, Plant Succession, Ecosystem (Structure and functions).

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 and fungal diseases mosaic diseases on tobacco, yellow vein mosaic of bhindi, citrus canker, little leaf of brinjal; damping off of seedlings late blight of potato, red rot of sugarcane, white rust of crucifers, Wheat rust and linseed rust.

Integrated pest disease management

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

UNIT - I

Nucleic acid as genetic material, nucleotides, structure of nucleic acids, properties of genetic code, Mechanism of Protein synthesis.

UNIT - II

Different types of RNA's, and their transcription replication of DNA in prokaryotes and eukaryotes.

UNIT- III

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

UNIT- IV

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

Paper III- Microbiology and plant pathology M.M. 75

UNIT - I

Discovery of microorganism in biological world ; classification of microorganism (Bergey' manual) and characteristic features & different groups.

Gram Staining. Sterilization methods, culture media.

Soil Microbiology – Types of Microorganism in soil & their role in soil fertility and reclamation of soil. Biopesticide (*Bacillus thuringiensis*, *Trichoderma* Sp.). Biofertilizers : Nitrogen fixer (*Azotocet*, *Rhizobium* & *Azospirillum*), and Phosphate Solubilizing, Microorganism

Sewage microbiology : Physico- chemical & Biological characteristics of sewage, microflora. Biological & Chemical treatment of sewage.

UNIT - II

Plant Disease : Definition, classification and symptoms.

Etiology of viral, bacterial and fungal diseases: mosaic diseases on tobacco, yellow vein mosaic of bhindi; citrus canker, little leaf of brinjal; damping

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