B.Sc. Botany Syllabus
Paper Titles

B. Sc. I Year

	Maximum Marks
Paper I: Algae, Fungi, Bacteria, Viruses and Lichens	50
Paper II: Bryophyta, Pteridophyta and Gymnosperm	50
Practical	50
Total	**150**

B. Sc. II Year

Paper I: Taxonomy, Plant Anatomy and Embryology	50
Paper II: Cytogenetics, Plant Breeding and Biotechnology	50
Practical	50
Total	**150**

B. Sc. III Year

Paper I Plant Physiology, Morphogenesis and Biochemistry	50
Paper II Ecology, Bio-Statistics and Economic Botany	50
Practical	50
Total	**150**

23.10.2015 (Convener)

23/10/19 23.10.19 23/10/19 23/X/2019

23/10/19 23.10.19 23.10.19

B. Sc. I Year

Paper I: Algae, Fungi, Bacteria, Viruses and Lichens

Max. Marks: 50

Unit-I: Algae

1. Introduction and salient features of algae and their place among the organism.
2. Classification of algae (Smith) up to class level and basis of classification.
3. Range of vegetative structure of algae. Cell structure of Prokaryotic and Eukaryotic algae.
4. Reproduction, types of lifecycles (haplontic, diplontic, diplohaplontic, haplodiplontic and diplobiontic) and alternation of generation in algae.
5. Ecology of algae-brief idea of fresh water and marine, terrestrial, epiphytic, parasitic, symbiotic algae and phytoplanktons.
6. Economic importance of algae as food, fodder, in agriculture, industry and public health.
7. Structure, reproduction and life cycles of the following genera-

   Nostoc, *Chlamydomonas, Volvox, Oedogonium, Chara, Vaucheria, Ectocarpus, Sargassum, Polysiphonia,* Diatoms.

Unit-II: Fungi

1. Introduction and salient features of Fungi. A brief history of the study of fungi and their place among the organisms.
2. A broad outline of classification of fungi (Ainsworth) up to the class level.
3. Somatic structure of fungi, nutritional and environmental needs of fungi.
4. Reproduction in fungi: asexual and sexual reproduction, heterothallism (two allelomorph heterothallism only), heterokaryosis, a general idea of parasexual cycle.
5. Pathology of fungal plant diseases: A brief idea about disease symptoms, control of plant diseases; brief idea about the exclusion, eradication and protection of plants.
6. Importance of fungi both beneficial and harmful.
7. Life history of the following genera in brief:
8. *Stemonitis, Synchytrium, Saprolegnia, Albugo, Rhizopus, Penicillium, Eryshiphe, Morchella, Ustilago, Puccinia, Agaricus, Alternaria.*

23.10.19 23/10/19 23/10/19 23.10.19 23/X/2019 23.10.19 23.10.19 Prachi 23/10/19 23.10.19

Unit-III: Bacteria, Viruses and Lichens

1. Microbial diversity: a general account.
2. Archaebacteria and Eubacteria: General account, Gram positive and Gram negative bacteria, nutrition, reproduction and economic importance.
3. Viruses: Characteristics, chemical nature, replication, transmission of viruses, economic importance.
4. Lichens: Characteristics, general structure, reproduction, economic importance, symbiotic relationship and habitats.

Paper II: Bryophyta, Pteridophyta and Gymnosperm

Max. Marks: 50

Unit-I: Bryophyta

1. Introduction, salient features, distribution, habit and habitat and economic importance of Bryophyta.
2. A brief account of alternation of generation in Bryophyta.
3. Classification of Bryophyta (Rothmaler and Schuster) upto order level giving the characteristic features of each class.
4. Study the following genera on the basis of morphology and anatomy of gametophyte, vegetative, sexual reproduction and sporophyte: *Riccià, Marchantia, Pellia, Anthoceros* and *Funaria*

Unit-II: Pteridophyta

1. Introduction and salient features of Pteridophyta and economic importance.
2. Alternation of generation in Pteridophyta.
3. Classification of Pteridophyta (Bierhorst) upto order level pointing out the features of special significance of each class.
4. Studies on *Rhynia, Lycopodium, Selaginella, Equisetum, Adiantum* on the basis of morphology and anatomy of vegetative plant body, spore producing organs and sexual reproduction.
5. Stelar system, heterospory, seed habit and telome theory.

Unit-III: Gymnosperm

1. Introduction and salient features of Gymnosperms and their place among the plant kingdom.
2. Classification of gymnosperms upto order level pointing out the features of special significance of each class.
3. Alternation of generation in Gymnosperms.
4. Comparative study of *Cycas, Pinus* and *Ephedra* on the basis of morphology and anatomy of the vegetative plant body, sporophylls (their arrangement) and sporangia, spores, male and female gametophytes, pollination, fertilization, embryology and seed germination.
5. Fossils, their types and process of fossilization.

B. Sc. II Year

Paper I: Taxonomy, Plant Anatomy and Embryology

Max. Marks: 50

Unit-I: Taxonomy

1. Basic principles and broad outline of the classification proposal by Bentham and Hooker and Hutchinson.
2. International Code of Botanical Nomenclature
3. Botanical gardens and Herbaria and Botanical Survey of India
4. Distinguishing features of the following families Ranunculaceae, Brassicaceae, Caryophyllaceae, Rutaceae, Fabaceae, Rosaceae, Apiaceae, Asteraceae, Solanaceae, Apocynaceae, Lamiaceae, Orchidaceae, Liliaceae, Poaceae.

Unit-II: Plant Anatomy

1. Meristematic tissues: Root and Shoot apical meristems and their function; Permanent tissues: Simple, Complex and Special types of tissues.
2. Epidermal tissue system: stomata and epidermal outgrowth.
3. Anatomy of dicot root, stem and leaf.
4. Anatomy of monocot root, stem and leaf.

5. Root-stem transition.
6. Secondary growth: vascular cambium, structure and function.
7. Secondary growth in root and stem: seasonal activity, annual ring, sapwood, heart wood.
8. Anomalous secondary growth in dicot and monocot stem and root.

Unit-III: Embryology

1. Morphology of Flower.
2. Structure of anther and pollen grain, microsporogenesis and male gametophyte.
3. Structure and types of ovules, megasporogenesis and female gametophyte.
4. Pollination, fertilization and double fertilization.
5. Endosperm: types, structure and function.
6. Embryo and its development in dicot and monocot.

Paper II: Cytogenetics, Plant Breeding and Biotechnology

Max. Marks: 50

Unit-I: Cytology

1. Cell structure: Prokaryotic and eukaryotic cells; ultrastructure of eukaryotic cell, cell wall and plasma membrane (Ultrastructure, chemical composition and models of plasma membrane).
2. Structure and functions of cell organelles: Mitochondria, Chloroplast, Endoplasmic reticulum, Golgi complex, Ribosome, Microbodies (Lysosomes, Peroxisomes, Glyoxisomes); structure and function of Nucleus and Nucleolus.
3. Cell division: cell cycle, process and significance of mitosis and meiosis and crossing over.
4. Eukaryotic chromosome: structure, chemical composition, Karyotype analysis, Ideogram; structure and functions of Polytene and Lampbrush chromosomes.
5. DNA chemistry and DNA replication; replication error and repair mechanism.
6. Structure and function of nucleic acid: Structure of DNA & RNA, different forms of DNA (A, B, Z).
7. Genetic code: properties of genetic code, classical and modern concept of gene.

Unit-II: Genetics and Plant Breeding

1. Law of inheritance: Mendel's experiments, principle of segregation, independent assortment, incomplete dominance.
2. Gene Interaction- Complementary, Epistasis (Dominant & Recessive), Supplementary
3. Sex determination: sex chromosomes, sex determination in *Drosophila*, and *Melandrium*.
4. Sex linked inheritance.
5. Chromosomal aberration: (deficiency, duplication, inversion and translocation); euploidy and aneuploidy.
6. Plant breeding: aims and objectives, basic techniques of plant breeding (selection, plant introduction and acclimatization, hybridization and mutational breeding), hybrid vigour.

Unit-III: Biotechnology

1. Introduction to Biotechnology: Role in modern life, history and ethical issues connected with Biotechnology.
2. Genetic Engineering: Recombinant DNA Technology, Enzymes and vectors involved in genetic engineering, Gene cloning steps and uses.
3. Molecular markers: A general idea of PCR and non PCR based markers.
4. Polymerase chain reaction techniques (PCR), A brief idea of DNA finger printing.
5. Plant tissue culture: Basic requirements of tissue culture, different types of media, general account of micro-propagation, organogenesis, somatic embryogenesis and cryopreservation, protoplast isolation and fusion, somatic hybridization.
6. General account of Industrial Biotechnology.
7. Role of microorganisms in Biotechnology.

B. Sc. III Year

Paper I: Plant Physiology, Morphogenesis and Biochemistry

Max. Marks: 50

Unit-I: Plant Physiology

1. Diffusion, osmosis, water potential and its components, Plasmolysis, Imbibition and Absorption of water, root pressure and guttation.
2. Transpiration and its significance, Factors affecting transpiration, mechanism of stomatal opening and closing.
3. Mineral nutrition: Essential elements, macro and micro nutrients, criteria of essentiality of elements, role of essential elements, minerals deficiency symptoms, Transport of ions across cell membrane, active and passive transport, carriers, channels and pumps.
4. Translocation in phloem: composition of phloem sap, girdling experiment, pressure flow model, phloem loading and unloading
5. Respiration: ATP- The biological currency, redox potential, aerobic and anaerobic respiration. Oxidative phosphorylation, Electron transport system, Pentose phosphate pathway fermentation, R.Q and factors affecting respiration.
6. Photosynthesis: photosynthetic pigments, mechanism of photosynthesis, light phase (excitation of chlorophyll, ATP and NADPH formation, PS I and PS II), Dark phase, Path of carbon in C_3 plants (C_3 cycle), C_4 plants (C_4 cycle), CAM pathway, photorespiration, factors affecting rate of photosynthesis.

Unit-II: Morphogenesis

1. General concept of morphogenesis.
2. Seed germination and dormancy.
3. Plant growth movements.
4. Plant Growth Regulators: Auxins, Kinetins, Gibberellins, Ethylene, Abscisic acid
5. Physiology of Flowering- Photoperiodism and Vernalization.

Unit-III: Biochemistry

1. Basic concepts of Biochemistry: Forces and interaction of biomolecules; chemical bonds-covalent and ionic bond; stabilizing interaction (Van der Walls, electrostatic, hydrogen bonding, hydrophobic interaction, concept of pH, pKa, titration curve, acid, bases and buffers, Henderson Hasselbalch equation).
2. Carbohydrate: Classification, Structure and Function
3. Protein: Basic aspects of protein conformation; protein synthesis (activation of amino acid, initiation, elongation, termination).
4. Fats and Lipids: Structure and function of lipids, saturated and unsaturated fatty acids; β-oxidation.
5. Enzymes: Classification; mechanism of action; factors affecting enzymes activities; concept of holoenzymes, apoenzyme and co-factors.

Paper II: Ecology, Bio-Statistics and Economic Botany

Max. Marks: 50

Unit-I: Ecology

1. General concept of Ecology and Environment: Principles of environment, atmosphere, light, temperature, water, soil.
2. Morphological, anatomical and physiological responses of plants to water (Hydrophytes and Xerophytes): temperature (thermoperiodism and vernalization): light (heliophytes and sciophytes).
3. Population: Growth curves, ecotype and ecads.
4. Definition of community, Structure and attributes of community: frequency, density, cover, life forms and biological spectrum, ecological succession.
5. Ecosystem concept, energy flow, food chain, food web and ecological pyramids.
6. Biogeochemical cycles with emphasis on nitrogen and phosphorus cycles.
7. Preliminary idea of environmental pollution-air, water, soil, noise and radioactive pollution.

Unit-II Bio-Statistics

1. Definition, scope and importance of statistics in Biosciences.
2. Sampling: aims, simple random sampling, stratified random sampling and systematic sampling.
3. Measures of central tendency: mean, median and mode.
4. Classification, tabulation and graphic presentation of data.
5. Measures of dispersion-range, variance, standard deviation, standard error, Chi-square test.
6. Correlation: correlation coefficient.

Unit-III Economic Botany

1. A brief knowledge of economically important plants and their utilization:

a) Cereals and millets- Wheat, Rice and Maize, Ragi, Pearl millet
b) Sugar yielding plants- Sugarcane and Sugar beet
c) Fruits- Mango, Apple, Banana, Citrus and Litchi.
d) Fibers- Cotton, Jute, Hemp, Coir, Agave and Semal.
e) Vegetables- Root vegetables stem vegetables and fruit vegetables.
f) Timbers- Teak, Shisham, Sal, Chir and Deodar.
g) Medicinal plants- *Aconitum, Atropa, Cinchona, Rauwolfia, Ephedra* and *Withania.*
h) Oils, Beverages, Fumicatories, Masticatories, Spices and Condiments.

23/10/19 23/10/19 23.10.19 23/X/2019

23/10/19 23.10.19 23/10/19 23.10.19 23.10.19

23.10.2019 (Convener)