

**COURSE OUTCOME (CO):: DEPARTMENT OF BOTANY
FOR THE YEAR 2020-2021**

PAPER NAME	COURSE	OUTCOMES
1 st Sem Paper CC1 (Phycology and Microbiology)	Unit 1-3 Microbiology	CO1.1: Basic idea about microorganisms. CO1.2: Preliminary concept Viruses. CO1.3: Preliminary concept about Bacteria.
	Unit 4-7 Algae	CO1.4 Basic idea about Algae and Phycologists. CO1.5 Preliminary concept of Cyanophyta and Xanthophyta . CO1.6 Preliminary concept of Chlorophyta and Charophyta . CO1.7 Preliminary concept of Phaeophyta and Rhodophyta
1 st Sem Paper CC2(Biomolecules and Cell Biology)	Unit 1-3 Biomolecules	CO2.1: Fundamental idea of chemical bonds; Carbohydrates, Lipids, Proteins and nucleic acids. CO2.2: Brief concept of bioenergetics and ATP. CO2.3: Fundamental idea of enzymes and enzyme inhibition.
	Unit 4-7 Cell Biology	CO2.4: Brief idea about Prokaryotic and Eukaryotic Cells. CO2.5: Brief idea about cell wall; membrane transport. CO2.6: Idea about cell organelles. Semiautonomous nature. CO2.7: Brief idea about cell cycle and its regulation.

PAPER NAME	COURSE	OUTCOMES
2 nd Sem Paper CC3(Mycology and Phytopathology)	Unit 1-8 Mycology	CO3.1: Brief idea of thallus organization, Cell wall composition, Nutrition and Classification of Fungi. CO3.2: Brief idea of Chytridiomycota and Zygomycota . CO3.3: Brief idea of Ascomycota . Idea about heterokaryosis and parasexuality. CO3.4: Brief idea of Basidiomycota . Basics of Mushroom cultivation. CO3.5: Brief idea about of Slime Molds. CO3.6: Brief idea of Oomycota. CO3.7: Brief idea of fungi – Lichen and Mycorrhiza. CO3.8: Brief idea of application of fungi in biotechnology.
	Unit 9	CO3.8: Brief idea of Phytopathology . Idea of plant disease. Brief idea of some bacterial, viral and fungal disease.
2 nd Sem Paper CC4(Archegoniate)	Unit 1-6	CO4.1: Concept about Archegoniate. CO4.2: Brief idea of land adaptation of Bryophytes. Thallus structure and classification. CO4.3: Brief idea about Anatomy, reproduction and life history of bryophytes. CO4.4: General idea about early vascular plants. CO4.5: Brief idea about Anatomy, reproduction and life history of pteridophytes. CO4.6: Brief idea about Anatomy, reproduction and life history of Gymnosperms.

PAPER NAME	COURSE	OUTCOMES
3 rd Sem Paper CC5(Anatomy of Angiosperms)	Unit 1-6	CO5.1: Idea about scope of Plant Anatomy . CO5.2: Concepts about Structure and Development of Plant Body. CO5.3: Brief idea of Tissues. CO5.4: Brief idea about apical meristem, and the tissues formed from apical meristem. CO5.5: Concepts about Structure and function of Vascular Cambium. CO5.6: Concepts about Adaptive and Protective Systems of plants.
3 rd Sem Paper CC6(Economic Botany)	Unit 1-11	CO6.1: Brief idea about Origin of Cultivated Plants . CO6.2: Brief idea about origin, morphology, processing & uses of cereals and millets. CO6.3: Brief idea about origin, morphology uses and ecological significance of Legumes . CO6.4: Brief idea about origin, morphology, processing & uses of sugarcane and potato . CO6.5: Brief idea about morphology and uses of Spices . CO6.6: Brief idea about morphology, processing & uses of tea and coffee . CO6.7: Brief idea about morphology, extraction, uses and health benefits of vegetable oil and fat sources . CO6.8: Brief idea about tapping, processing & uses of para-rubber. CO6.9: Brief idea about morphology, processing and therapeutic properties of drug plants. CO6.10: Brief idea about common Timber yielding plants . CO6.11: Brief idea about fiber yielding plants.
3 rd Sem Paper CC7 (Genetics)	Unit 1-7	CO7.1: Brief idea about Mendelian genetics and its extension . CO7.2: Brief idea about Extrachromosomal Inheritance CO7.3: Idea about Linkage, crossing over and chromosome mapping CO7.4: Brief idea about Variation in chromosome number and structure CO7.5: Basic concepts of Gene mutations, mutagens and DNA repair . CO7.6: Brief idea about classical and molecular structure of gene CO7.7: Brief idea about Population and Evolutionary Genetics
3 rd Sem SEC – 1 Skill Enhancement Course	CO11	CO.SEC-1.1: Understanding the use of microbes as biofertilizer. CO.SEC-1.2: Understanding <i>Azospirillum</i> : isolation and mass multiplication, transport and use. CO.SEC-1.3: Understanding Cyanobacteria as biofertilizer, application. CO.SEC-1.4: Understanding Mycorrhiza as biofertilizer, application. Concept

(Biofertilizers)		of VAM. CO.SEC-1.5: Basic idea of Organic farming and its field application.
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PAPER NAME	COURSE	OUTCOMES
4th Sem Paper CC8 (Molecular Biology)	CO8	CO8.1: Concept of Experiments of Griffith, Hershey & Chase, Avery, McLeod & McCarty, Fraenkel-Conrat. CO8.2: Structures of DNA and RNA, Nucleosome Chromatin structure. CO8.3: Replication of DNA, Kornberg's discovery, models. CO8.4: Central dogma, genetic code. Deciphering of genetic code. CO8.5: Transcription in prokaryotes and eukaryotes, regulation. CO8.6: Processing and modification RNA, editing, splicing and mRNA transport. CO8.7: Translation, ribosome assembly, post-translational modifications of proteins.
4th Sem Paper CC9(Plant Ecology and Phytogeogra phy)	CO9	CO9.1: Inter-relationships between living world and environment. CO9.2: Properties and development of soil. CO9.3: Basic concepts, States of water and hydrological cycle. CO9.4: Basic concepts about Light, temperature, wind and fire factors of ecology. CO9.5: Basic concepts about Biotic interactions, ecological pyramid CO9.6: Basic concepts about population dynamics and speciation. CO9.7: Basic concepts about plant communities, succession and climax. CO9.8: Basic concepts about trophic organisation; food chains and food webs of ecosystem. CO9.9: Basic concepts about production and productivity, ecological efficiencies, biogeochemical cycles of ecology. CO9.10: Basic concepts about principles of Phytogeography and special reference to India.
4th Sem Paper CC10 (Plant Systematics)	CO10	CO10.1: Overview of plant systematic, Plant identification, classification, nomenclature and keys. CO10.2: Overview of Taxonomic hierarchy. CO10.3: Overview of Botanical nomenclature, (ICN), Ranks and names, Typification, author citation, botanical publication. Priority. CO10.4: Overview of systems of classification. CO10.5: Overview of numerical taxonomy and cladistics. CO10.6: Overview of phylogeny of Angiosperms.
4th Sem SEC – 2 Skill Enhancement Course(Mushroo m	SEC – 2	CO.SEC-2.1: Introduction, history. Nutritional and medicinal value of edible mushrooms; Poisonous mushrooms. CO.SEC-2.2: Introduction to Cultivation Technology of mushrooms. CO.SEC-2.3: Introduction to Storage and nutrition of mushrooms. CO.SEC-2.4: Mushrooms in food preparation

Cultivation)		
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PAPER NAME	COURSE	OUTCOMES
5 th Sem Paper CC11 (Reproductive Biology of Angiosperms)	CO11	CO11.1: To Know the history, contribution of concerned scientists and scope. CO11.2: Understand the origin and development of flowering and its genetic control. CO11.3: Understand microsporogenesis, microgametogenesis, structure of pollen. CO11.4: Understand structure of ovule, megasporogenesis, megagametogenesis, embryo sac. CO11.5: Understand process and various types of adaptations for pollination, double fertilization. CO11.6: Understand self- incompatibility and various methods to overcome self- incompatibility. CO11.7: Understand Structure and development of Embryo, Endosperm and Seed. CO11.8: Understand Polyembryony and apomixes.
5 th Sem Paper CC12 (Plant Physiology)	CO12	CO12.1: Understand about Plant-water relations, pathways of water movement, transpiration and stomatal movement. CO12.2: Understand about macro and micronutrients, essentiality and deficiency of minerals. CO12.3: CO12.3: Understand about Nutrient Uptake and transport across membrane. CO12.4: Understand Translocation in the phloem, related theories, phloem loading and unloading. CO12.5: Understand Plant growth regulators, bioassay and physiological roles. CO12.6: Photoperiodism, vernalization and seed dormancy. CO12.7: Role and mode of action of Phytochrome, cryptochromes and phototropins in photomorphogenesis.
5 th Sem Discipline Specific Elective-1 (Biostatistics)	DSE-1	CO.DSE-1.1: Brief idea of Biostatistics. CO.DSE-1.2: Brief idea, Collection of primary and secondary data. CO.DSE-1.3: Brief idea of Measures of central tendency . CO.DSE-1.4: Brief idea of Correlation CO.DSE-1.5: Statistical inference.
5 th Sem Discipline Specific Elective-2 (Plant Breeding)	DSE-2	CO.DSE-2.1: Introductory idea about Plant Breeding. CO.DSE-2.2: .Study and Understand the Methods of crop improvement. CO.DSE-2.3: Concept of Quantitative inheritance. CO.DSE-2.4: Concept of Inbreeding depression and heterosis. CO.DSE-2.5: Brief idea of Crop improvement and breeding.

PAPER NAME	COURSE	OUTCOMES
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6th Sem Paper CC13 (Plant Metabolism)	CO13	CO13.1: To Know the Concept of metabolism. CO13.2: Understand the process and outcome of Carbon assimilation in photosynthesis. CO13.3: Understand how Carbohydrate metabolism takes place and what are the products. CO13.4: Understand Carbon Oxidation process and sequences. CO13.5: Understand process and steps of ATP-Synthesis. CO13.6: Understand Lipid metabolism, its process and role in various stages of plant life like seed germination. CO13.7: Understand Nitrogen metabolism, its process and role in bioprocesses. CO13.8: Understand Mechanisms of signal transduction.
6th Sem Paper CC14 (Plant Biotechnology)	CO14	CO14.1: Understand process and application of Plant Tissue Culture . CO14.2: Understand Recombinant DNA technology, enzymes and vectors used. CO14.3: CO12.3: Gene Cloning, transformations and hybridization. CO14.4: Understand Methods of gene transfer, media and process . CO14.5: Understand various applications of Biotechnology.
6th Sem Discipline Specific Elective-3 (Industrial and Environmental Microbiology)	DSE-3	CO.DSE-3.1: Scope of microbes in industry and environment. CO.DSE-3.2: Brief idea Bioreactors / Fermenters and fermentation processes. CO.DSE-3.3: Brief idea about Microbial production of industrial products. CO.DSE-3.4: Brief idea of Microbial enzymes of industrial interest and enzyme immobilization . CO.DSE-3.5: Brief idea of Microbes and quality of environment. CO.DSE-3.6: Idea about Microbial flora of water. CO.DSE-3.7: Idea about Microbes in agriculture and remediation of contaminated soils
6th Sem Discipline Specific Elective-4 (Analytical Techniques in Plant Sciences)	DSE-4	CO.DSE-4.1: Introductory idea about Imaging and related techniques. CO.DSE-4.2: .Study and Understand the Methods of Cell fractionation. CO.DSE-4.3: Concept of Radioisotopes in biological research. CO.DSE-4.4: Concept of Spectrophotometry Principle and its application. CO.DSE-4.5: Brief idea of Chromatography. CO.DSE-4.6: Characterization of proteins and nucleic acids CO.DSE-4.7: Biostatistics

**PROGRAMME OUTCOME (PO): BACHELOR OF SCIENCE:
BOTANY HONOURS**

PO	Summary	Description
PO1	Idea of Plant Science	Students learnt fundamental knowledge about overall plant science and variation of alternation of generations or other types of multiplication process.
PO2	Relationship with the environment	Students are now able to understand different groups of plants, their habitat specificity and range of environmental tolerance.
PO3	Understanding morphology and anatomy of plants	Students are able to understand differences in morphological as well as anatomical characters of different groups of plants.
PO4	Understanding physiology and cell structure	Students now able to understand internal cell structure, cell organells and cellular physiology.
PO5	About evolution of plants	Students now know when and in which form plants originated on earth and how they migrated to land from water and evolved into various groups of plants with gradual advancement.
PO6	Impact on society	Students are now able to apply their acquired knowledge in the fields of agriculture, horticulture, medicine and somehow to eradicate some superstition prevailing as common practice in the society.
PO7	In Sustainable development	Students now know the science behind interdependency of various organisms on one another in our environment. So, they now understand the need for conservation of ecological resources and sustainable development
PO8	Fields of Application	Students are now able to apply their knowledge in practical fields

		related to their subject of study like Agriculture, Forestry, Gardening Biofertilizer, Mushroom cultivation, Microbial biotechnology and related disciplines.
PO9	Placement ability	Students studied overall syllabus. Thus they are able to appear in competitive exams where their subject is included partly or as an entire paper.
PO10	Human health	Students studied medicinal properties of local and most common medicinal plants. Thus they can apply them safely in emergency.
PO11	Food for Human beings	Nutrition values of cultivated and otherwise consumed plants are now known to students. Thus, they can now apply the knowledge to get dietary benefits for self or for the society.
PO12	Ethical principles	They can now apply ethical principles and commit to professional ethics and responsibilities in delivering his duties
PO13	Botany to one's own life and work	Learnt knowledge help the students understand the values of conservation of plants and so, to make it one of the most important habit of life to protect plants.
PO14	Empathy	Develops empathy and love towards the plants

Programme Specific Outcome (PSO):: B.Sc.:
Botany Honours

- PSO1:** Students are now able to apply the acquired knowledge to easily understand and identify new observations in their related field area as well as can apprehend those related to closely associated fields.
- PSO2.** Students are now able to co-relate different groups of plants to their habitat preference which they can apply in practical fields like Agriculture.
- PSO3.** Students will be able to identify the major groups of organisms with an emphasis on Plants and be able to classify them within a phylogenetic framework. Students will be able to compare and contrast the characteristics of Plants that differentiate them from other forms of life.
- PSO4.** Students will be able to use the evidence of comparative biology to explain how the theory of evolution offers the only scientific explanation for the unity and diversity of life on earth. They will be able to use specific examples to explicate how descent with modification has shaped animal morphology, physiology, life history, and behavior.
- PSO5.** Students are now able to understand and classify any abnormalities in plant external or internal organs and can relate to their probable cause which is specifically helpful in study of pathology of economic plants.
- PSO6.** Students will be able to apply fundamental mathematical tools (statistics, calculus) and physical principles (physics, chemistry) to the analysis of relevant biological situations.

PSO7. Students will be able to explain how organisms function at the level of the gene, genome, cell, tissue, organ and organ-system. Drawing upon this knowledge, they will be able to give specific examples of the physiological adaptations, development, reproduction and behavior of different forms of life.

PSO8. Students will be able to explicate the ecological interconnectedness of life on earth by tracing energy and nutrient flows through the environment. They will be able to relate the physical features of the environment to the structure of populations, communities, and ecosystems.

PSO9. Students will be able to demonstrate proficiency in the experimental techniques and methods of analysis appropriate for their area of specialization within biology.

PSO10. Employable candidates in careers related to teaching in Botany, especially in schools colleges and universities.

MAPPING OF PO AND CO

PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14
CC1	CC1	CC1	CC1	CC1	CC1	CC9	CC1	CC1	CC1	CC1	CC3	CC1	CC3
CC2	CC3	CC4	CC2	CC3	CC2	SEC2	CC3	CC2	CC3	CC3	CC6	CC2	CC5
CC3	CC4	CC5	CC5	CC4	CC3	SEC2	CC6	CC3	CC4	CC6	CC9	CC6	CC6
CC4	CC5	CC6	DSE2	CC7	CC6	DSE2	CC9	CC5	CC6	CC9	CC10	CC7	CC9
CC5	CC6	CC10			CC7		CC10	CC6	CC7	CC12	CC11	CC9	CC10
CC6	CC9	SEC1			CC9		CC11	CC7	CC8	SEC1	SEC1	SEC1	CC11
CC7	CC10	DSE1			CC10		SEC1	CC8	CC10	DSE2	SEC2	SEC2	CC12
CC8	SEC2				CC12		SEC2	CC9	SEC1		DSE1	DSE2	SEC1
CC9	DSE2				SEC1		DSE2	CC10	SEC2				SEC2
CC10					SEC2			CC11	DSE1				DSE2
CC11					DSE2			CC12					
CC12								SEC1					
SEC1								SEC2					
SEC2								DSE1					
DSE1								DSE2					

DSE2													
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