



Masters of Science (Botany)

Course Outcome

SI. No.	Course Code	Course Name	Learning Outcomes
SEMESTER-I			
1.	CC 1	Phycology, Mycology and Bryology	<p>CO1. To discuss basic vegetative and reproductive aspects of algae, illustration of ultra - structure of cell. To Critically analyze the role of pigments, reserve food, Cell-wall, flagella, eye -spot and pyranoid in Classification and evolution of algae. To Explain the economic importance of Algae and contribution of Indian Phycologists.</p> <p>CO2. To discuss the salient features of different divisions of Algae included in syllabus.</p> <p>CO3. The chapter explains the important character of fungi, its cell organization, nutrition, and Reproduction, Also illustrate the process of Hetero thallism and Parasexuality. Discuss Classification of fungi with reference to Anisworth 1973 and Alexopolous and Mims (1979).</p> <p>CO4. The course describes the class Ascomycotina, Basidiomycotina, Deuteromycotina, Application of fungi in industry, medicines and food. Its uses as biocontrol agents.</p> <p>CO5. To discuss general features and classification of Bryophytes, To explain the salient features of Marchantiales, Jungermanniales, Anthocerotales Sphagnales and polytrichales. To discuss critically evolution of Sporophytes, Vegetative propagation and perennation in Bryophytes.</p>
2.	CC 2	Microbiology and Plant Pathology	<p>CO1. Explains general introduction including history and scope of microbiology, Discusses different types of sterilization, processes and diversity of microorganisms.</p> <p>CO2. This chapter includes illustration of ultrastructure, of cell reproduction, economic importance of bacteria, Nature and Characteristics of virions, ultrastructure of virions including multiplication and transmission of viruses.</p>



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			<p>CO3. This chapter deals with Agriculture Microbiology including Biological nitrogen fixation, and Biofertilizer. It also deals with industrial production of organic acid antibiotics and enzymes.</p> <p>CO4. It discusses classification of plant diseases, general symptoms due to different microbes and role of enzymes and toxins in pathogenesis together with Host defence mechanism.</p> <p>CO5. It involves detail discussion on various aspects of seed pathology with special reference to seed -borne mycoflor, mycotoxin and its hazard. Further, it also deals with Etiology, Symptoms and control measures of different plant diseases included in the syllabus.</p>
3.	CC 3	Pteridophyta, Gymnosperm and Paleobotany	<p>CO1. This chapter includes elaborate discussion on general characteristics, classification and vegetative reproductive features including development, Characterization detailed vegetative and protection of Spore producing organs of the sporophytes and sexuality of the gametophytes of the classes/orders mentioned in syllabus.</p> <p>CO2. To explain the distinction between Eusporangiate, protileptosporangiate and leptosporangiate, It also includes. The elaboration of structure, reproduction and Phylogenetic considerations of the Orders included in course contents.</p> <p>CO3. This chapter discusses. Characteristic features, economic importance and classification of Gymnosperms. It also includes critical comparative, account of morphology, anatomy, reproductive structure and interrelationships of the living orders included in course content.</p> <p>CO4. This chapter includes discussion on different aspects of coniferales and comparative account of reproductive features of Ephedrales, Gnetales, welwitschiales and also to throw light on phylogeny, angiospermic features and evolutionary significance of order Ephedrales and Gnetales.</p> <p>CO5. To discuss the type and nature of fossils, fossilization, process and geological timescale together with discussing the Principle and objective of fossil study. It also involves deliberations on Comparative morphology,</p>



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			anatomy, reproductive structure and affinities of fossil groups mentioned in syllabus.
4.	CC 4	Practical 1	CO1. To instruct and demonstrate the Principles, Practices and Procedures of Practical based on Unit I, II and III.
5.	AECC 1	Environmental Sustainability and Swachha Bharat Abhiyaan Activities	CO1. Students will get the knowledge about the environment and its components in which one survives. CO2. Students will learn how to take care of the surroundings in general. The field work during the completion of the course will make student responsible for their ecosystem. CO3. During the course, students will get to know about so many elements of general studies that can really help them in competitive examinations as well as in day to day activities.
SEMESTER-II			
6.	CC 5	Bio fertilizer Technology	CO1. To introduce bio fertilizer and to explain structure and characteristic features of different types of biofertilizing organisms included in course content. CO2. To discuss the isolation, purification, mass multiplication of different types of Nitrogenous Bio fertilizers e.g. Azospirillum, Azotobacter And Rhizobium. To analyze the methods of application of inoculants (Rhizobium & Azospirillum and Azotobacter. CO3. To illustrate the isolation, purification, and mass multiplication of Cyanobacteria. To discuss the different methods of application of cyanobacterial inoculants and its explaining mass cultivation of Azolla 'and application in rice fields,. CO4. To discuss the details of Mycorrhiza and their importance in agriculture To explain the different methods of Isolation of AM Fungi, their mass production and field applications. To illustrate isolation, purification, mass multiplication and field application s of PhosphateSolubilizer (Pseudomonas striata). CO5. To discuss different types of. Bio fertilization processes and explaining their storage, quality control and



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			marketing.
7.	CC 6	Taxonomy & Anatomy & Embryology	<p>CO1. To elaborate historical account of classification from Pre Linnaean to Arthur conquest- and' ArmenTakhtajanViz Natural and Phylogenetic systems.</p> <p>CO2. To interpret the Concept of taxa by giving examples of species, genus, family and higher Categories, To know specific concept of'good and Bad' characters, To give an idea of Binomial system and ICBN.</p> <p>CO3. To explain Knowledge of Post- Mendelian approaches, To integrate ideas of genecology, Experimental taxonomy, Cytotaxonomy, Biosystematics, Palynotaxonomy, and chemotaxonomy.</p> <p>CO4. To Compare and explain differentiation, dedifferentiation, redifferentiation, Polarity and Symmetry of meristems. To discuss the organizational structure of shoot apical meristim and Root apical meristem. To locate differentiation of Epidermal tissue with reference to stomata and appendeges. To compare the anatomical features and significance of nodal and fioral anatomy.</p> <p>CO5. To discuss the development of ovule, To integrate Concepts of megasporogenesis and organization of female gametophytes (emryo Sac), Double fertilization and Posl- fertilization chengesleading to the formation of seed. To explain the development of embryo endosperm. To distinguish the process of Polyembryoiyg and Apomixis. To give an idea of taxonomy in relation to embryogy.</p>
8.	CC 7		<p>CO1. To explain osmotic relation and other topics related to water relations such as transport of water and solutes and their mechanisms.</p> <p>CO2. To illustrate the details of photosynthesis and nitrogen fixation.</p>



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		Physiology and Biochemistry	<p>CO3. To discuss plant growth and development. To explain the physiological role and mode of action of growth regulators included in course content.</p> <p>CO4. This Unit involves explaining enzyme structure, types, Classification, Properties and mechanism of enzyme action.</p> <p>CO5. To explain the details of respiration including biochemical mechanism and its importance.</p>
9.	CC 8	Plant Tissue Culture, Ethanobotany, Biodiversity	<p>CO1. To Know the Laboratory equipment, general techniques of aseptic manipulation. To demonstrate the preparation of different types of Culture media and explaining callus culture, Suspension culture, Plant Protoplast isolation and culture methods, To illustrate the role of tissue culture in crop improvement.</p> <p>CO2. This unit includes the ethanobotanical Knowledge base, traditional Knowledge base of Indian ethnic and local communities and their Practices. To explain the medical and paramedical use of plant by the local ethnic people To discuss the use of local biodiversity by the local tribe/Schedule caste.</p> <p>CO3. To discuss different aspects of biodiversity in detail.</p> <p>CO4. To discuss the different conservation practius in situ and ex- situ. To explain patenting, Intellectual property right and Biosafety protocols.</p> <p>CO5. To discuss distribution and measurement of variation, Mean, Medium, Mode and explaining standard deviation, Standard error, analysis of variants and applications of chi Squere test for testing hypothesis.</p>
10.	CC 9	Practical 2	<p>CO1. To explain and demonstrate the Principle and Processes of Practical included in course contents.</p>
11.	SEC 1	Skill Enhancement Course: Yogic Science	<p>CO1. Students will learn the theoretical foundations of Yoga philosophy.</p> <p>CO2. Students will equip themselves with a fair number of yogic practices including meditative techniques.</p>



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			CO3. Yogic knowledge and practices will help the students to revitalise themselves and work with more attention.
SEMESTER-III			
12.	CC 10	Cell Biology & Cytogenetics	<p>CO1. This chapter deals with the organization of cell together with ultrastructure and chemical composition of cell organelles.</p> <p>CO2. To discuss the details of nuclear structure and cell - division.</p> <p>CO3. Starting with chromosome structure and organization, this chapter deals with mandolin genetics, gene interaction, and sex-determination.</p> <p>CO4. Explaining the extra nuclear inheritance, chromosomal aberration, polyploidy types and role in speciation, molecular mechanism of mutation accompanied by induction of mutation by chemical and physical mutagens.</p> <p>CO5. This chapter deals with details of Population genetics and also microscopy.</p>
13.	CC 11	Molecular Biology	<p>CO1. Discussing The details about DNA including DNA as hereditary material, organization of DNA, Structure and forms of DNA and RNA and supercoiling of DNA.</p> <p>CO2. To explain the mechanism of replication of DNA, DNA Repeication model, Mechanism of DNA damage and repair, types of DNA damage and repair, Also to elaborate about diseases Caused due to impairment repair mechanism.</p> <p>CO3. This chapter discusses in detail the mechanism of transcription in prokaryotes and Eukaryotes.</p> <p>CO4. This chapter involves details of mechanism of translation in prokaryotes and Eukeystes and role of RNA & ribosome. To discuss further the Post translation modification of Protein Such as Phosphorylation, adenylation, acylation and glycosylation.</p> <p>CO5. To explain The various aspects of regulation of gene expression in prokaryotes and Eukaryotes including</p>



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			Positive and negative control, inducible and repressible operon, Lac operon, trp operon in prokaryotes and in Eukaryotes Refutations an DNA transcription, translation 'and post traslationlewel. To discuss the mechanism of antisense molecules and its application.
14.	CC 12	Recombinant DNA Technology	<p>CO1. To discuss specific Techniques regarding rDNatechorlogy by using RDT: Polyacrylamidae and gel electrophoresis , three types of blotting techniques. Explain the Process of Polymerare chain reaction and its applications, Various methods of DNA. Sequencing.</p> <p>CO2. To summarize Core techniques and essential enzymes, Specifically Restriction enzymes - Types and cleavage pattern. To explain DNA ligase type and ligadton of DNA molecule in vitro. To discuss the different types of cloning vectors such as Plasmid, Phages, Cosmic, shuttle vectors; Expression Vector.</p> <p>CO3. To integrates ideas of Passenger DNA: illustrate the Different strategies of gene by using isolation / Synthesis proasseschemical Synthesis of gene, To explain the concept- of c DNA Library and different strategies for construction of r DNA by using Restriction and Linker enzymes.</p> <p>CO4. To Give new ideas of selection strategies, To discuss the selection of Clone by using antibiotic resistant markers, Colony hybridization, Plaque hybridization, and immune Screening. To discuss methods of DNA Transfer in Suitable host by giving ideas of electroporation, electro fusion, microinjection and particle gun method. Expression of foreign gene.</p> <p>CO5. To Apply rDNatechlogy in medicine, agriculture and environment-protection To give new ideas of DNA finger printing: Methodology and its application, To discuss safety of recombinant DNA technology for releasing Genetically modified organisms, and discuss social and ethical issue.</p>



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15.	CC 13	Plant Ecology & Environmental Science	<p>CO1. To explain the various aspects of population, plant adaptation and to discuss Symbiosis, Predation and parasitism. Elaborate the intraspecific and interspecific competition.</p> <p>CO2. This Chapter deals with Various aspects of community structure and community dynamics.</p> <p>CO3. To discuss the details of Ecosystem types, and structure of Ecosystem, energetics.</p> <p>CO4. To disuso different types of environmental pollutions, Climate changes, ozone depletion, Green house effect, Global warming.</p> <p>CO5. The chapter involves discussion on different topics relating to environment awareness like Man and Biosphere, IUCN, United Nations Environment Program. To elaborate the discussion on wildlife preservation Act (1972), Indian Forest conservation Act (1989).</p>
16.	CC 14	Practical 3	CO1. To explain the principles and procedures of each practical mentioned in the Course content.
17.	AECC 2	Human values and professional ethics and gender sensitisation	<p>CO1. Students will get the knowledge about values regarding humanity, gender equality and professionalism.</p> <p>CO2. Students will learn how to work together in an empathetic and unbiased way. The field work during the completion about the dignity of a human being.</p> <p>CO3. During the course, students will acquaint themselves with such notions of morality that they will find it easier to work together in a group in a co-operative and productive way.</p>
SEMESTER-IV			
18.	EC 1	Subject specific elective Cytogenetics and crop improvement	<p>CO1. To explain origin, production, cytological behavior and genetic uses of haploidy, Aneuploidy and polyploidy. To illustrate role of polyploidy in evolution and speciation. To discuss evolution of Karyotypes and chromosome banding patterns in detail.</p> <p>CO2. To discuss different aspects of mutation, molecular basis of gene mutation, mutagenesis and role of mutation in crop improvement. To explain Cytrplasmic intertance</p>



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			<p>and maternal effect. To illustrate structure and types of transposons in prokaryotes and eukaryotes, mechanism of transposition, Retroposons and application of transposons.</p> <p>CO3. To explain role of cytogenetic in crop improvement. To collaborate the different aspects of epigenetics.</p> <p>CO4. To discuss the role of cytogenetic in crop improvement. To describe the genetic basis of evolution and speciation and to explain incompatibility. To discuss the centre of origin of cultivated crops.</p> <p>CO5. To discuss the various aspects of classical methods of plant breeding. To elaborate modern techniques of plant breeding. To explain protoplast fusion and Somatic hybridization (Para sexual hybridization techniques) and terminator gene technology To discuss heterosis and heterocyst breeding and also explaining the methods of breeding for disease and drought resistance.</p>
19.	EC 2	Subject specific elective Cytogenetics and crop improvement	<p>CO1. To explain and demonstrate the principle and processes of practical included in Syllabus.</p>
20.	EC 1	Subject specific elective Applied Microbiology and Plant pathology	<p>CO1. To give the concept of Fermentation technology their scope and prospects. To explain Primary and Secondary microbial metabolites, Production of organic acids , Vitamin antibiotics enzymes and their commercial applications such as Amylases, Proteases, Renin.</p> <p>CO2. To interpret Biochemical activity of microorganisms in milk; Fermented dairy products and beverage. To Know specific facts of micro organisms as food, Single cell proteins and Edible mushroom.</p> <p>CO3. To use solid wastes by applying the process of composting and Land filling. To give an idea of wastewater treatment methods by oxidation pond, Trickling filter, To explain activated sludge methods examples - Anaerobic treatment of waste water and its treatment by plants. To illustrate Bioremediation and biogas production.</p> <p>CO4. To explain History, classification and importance of plant-Pathology, chemical and biological management of</p>



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			plant-diseases control. To discuss inventory aspects of Integrated waste management, Bacterial, Viral and fungal biopesticides and their application. CO5. To describe selected plant diseases with special reference to symptoms, etiology and disease management of Selected cereals, Fruits & vegetables, Pulses, spices & condiments and Beverages.
21.	EC 2	Subject specific elective	CO1. To explain and demonstrate the principle and processes of Practical included in course contents.
22.	GE	Generic Electives: Human Rights	CO1. Students will get themselves familiar with the various aspects of human rights, their importance and the contribution of various thinkers in the conceptual development of the Human Rights. CO2. Students are expected to emulate whatever they have learned in the course in their daily lives. CO3. This course of human rights is almost inevitable to appear in the question paper of any competitive exams and interviews.