

**GOVT. HOLKAR (MODEL AUTONOMOUS)
SCIENCE COLLEGE, INDORE**



(An ISO 9001:2015 & ISO 14001:2015 Certified Institution)



SSR DOCUMENT

2017-18 TO 2021-22

CRITERION -2

Teaching - Learning and Evaluation

Metric No.: 2.3.3

Document Title:
Sample Teaching Plan

Govt. Holkar Science College, Indore
Teaching Plan Session 2021-22

Department **Botany**

Class **B.Sc.** **I Sem.** Paper **Paper -I Major paper - Applied Botany**

S.No.	Month	Topics/Units	No of Lectures	Method of Teaching
1	October- November	Unit -I 1.1 Introduction objectives and importance of Applied botany 1.2 History and evolution of botany 1.3 Relation of plants to man and relation with other services 1.4 Various disciplines of botany and their applications to human welfare Unit -II 1.1 Definition and types of pollution and pollutants 1.2 Phytoremediation: Air water Soil noise and thermal pollutants (Any 5 plants with botanical name, family) and their role in pollution control. 1.3 Bioremediation definition and types	30	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
2	December- January	Unit-III 1.1 Ancient agricultural practices 1.2 Modern agriculture practices Poly house. Drip irrigation hydroponics computer based agriculture. Terrace farming. 1.3 Organic farming: Introduction objective and brief technique. 1.4 Horticulture: Definition and role in human welfare 1.5 Forestry : Definition branches and role in human welfare 1.6 Silviculture: Definition and management practices Unit- IV 1.1 Role of Botany in Rural development. 1.2 Ethnobotany: Introduction and importance. 1.3 Ethnomedicine: Definition and examples. (Local name, Botanical name family and importance of Neem, Aloe, Clove, Ginger, Tulsi, Turmeric, Giloy, Emblica, Ashwagandha, Arandi) 1.4 Ethno- fibres: Definition and examples (Local name, Botanical name, family and importance of Ankara, Coconut, elephant grass, cotton) 1.5 Ethno –food crops: Definition and examples (Local name, Botanical name, family and importance of Garadu, Singada, Kutaki, Sama, Kodo, Bathua, Sehjan, Jowar, Makka, Bajra, Jau) Unit- V 1.1 Plant tissue culture: Definition, Types and Importance 1.2 DNA Recombinant Technique: Introduction, tools and importance 1.3 Role of recombination in present era 1.4 Bioinformatics: Definition, concept and tools 1.5 Introduction of bioinformatics software: Basic idea of BLAST and FASTA Importance of bioinformatics	48	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects

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Govt. Holkar Science College, Indore
Teaching Plan Session 2021-22

Department Botany

Class	B.Sc.	I Sem.	Paper	Paper -II	Minor Paper- Basic
S.No.	Month	Topics/Units	No of Lectures	Botany	Method of Teaching
1	October- November	Unit- I <i>History of Botany and Indian Contributions.</i> <i>1.2 Morphological characteristics of lower and higher plants(Angiosperms).</i> <i>1.3 Types of leaves, Inflorescence, Flowers and fruits.</i> <i>1.4 Structure of plants cell and cell organelles, Prokaryotic and Eukaryotic Cells, Types of cell division.</i> <i>1.5 Microscope structure and function of Light Microscope (magnification and resolving power).</i> <i>1.6 Various types of microscopes: Bright field, Phase Contrast, SEM and TEM.</i> Unit- II <i>1.1 General characteristics</i> <i>1.2 Range of thallus organization, reproduction.</i> <i>1.3 Types of life-cycles in algae</i> <i>1.4 Role of algae in nature and its economic importance.</i> 2- Bryophytes <i>2.1 General characteristics, Ecology.</i> <i>2.2 Range of thallus organization, morphology, anatomy(internal and external features) and reproduction of any one Bryophyte.</i> <i>2.3 Economic importance of Bryophytes</i>	30		Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
2	December- January	Unit-III Pteridophytes <i>1.1 General characteristics and morphology.</i> <i>1.2 Stelar organization and reproduction.</i> <i>1.3 Heterospory and seed habit.</i> <i>1.4 Economical importance</i> 2- Gymnosperms <i>2.1 General Description and their distribution.</i> <i>2.2 Economical importance of Gymnosperms.</i> 3- Paleobotany <i>3.1 Indian contribution in paleobotany.</i> <i>3.2 Brief knowledge of Fossils and Geological time scale.</i> Unit-IV 1- Fungi <i>1.1 General characteristics and cell wall composition.</i> <i>1.2 Mode of nutrition</i> <i>1.3 Types of reproduction</i> <i>1.4 Economic importance</i> <i>1.5 Parasexuality and Mycorrhiza</i> 2- Lichens: Brief Knowledge and their significance. Jau) Unit-V Microbes <i>1.1 Brief outline of various types of microbes</i> <i>1.2 Archaeobacteria, Eubacteria Cyanobacteria, Mycoplasma, Actinomycetes and Virus.</i> <i>1.3 Beneficial and harmful roles.</i>	48		Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects


Head of Department
Govt. Holkar Science College, Indore

Govt. Holkar Science College, Indore
Teaching Plan Session 2021-22

Department Botany

			Paper -II Open Elective Paper- Basic Botany	
Class	B.Sc.	I Sem.	Paper	
S.No.	Month	Topics/Units	No of Lectures	Method of Teaching
1	October- November	Unit- I 1.1 <i>Morphological characteristics of lower plants.</i> 1.2 <i>Structure of plants cell and cell organelles, Prokaryotic and Eukaryotic Cells, Types of cell division.</i> 1.3 <i>Microscope structure and function of Light Microscope (magnification and resolving power).</i> Unit- II 1- Algae 1.1 <i>General characteristics</i> 1.2 <i>Range of thallus organization, reproduction.</i> 1.3 <i>Role of algae in nature and its economic importance.</i> 2- <i>Bryophytes</i> 2.1 <i>General characteristics.</i> 2.2 <i>Range of thallus organization, morphology, anatomy(internal and external features) and reproduction of any one Bryophyte.</i> 2.3 <i>Economic importance of Bryophytes</i>	15	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
2	December- January	Unit-III Pteridophytes 1.1 <i>General characteristics and morphology.</i> 1.2 <i>Stelar organization and reproduction.</i> 1.3 <i>Economical importance</i> 2- <i>Gymnosperms</i> 2.1 <i>General characters & economic importance of Gymnosperms.</i> Unit-IV 1- Fungi 1.1 <i>General characteristics.</i> 1.2 <i>Mode of nutrition</i> 1.3 <i>Types of reproduction</i> 1.4 <i>Economic importance</i> 2- <i>Lichens: Brief Knowledge and their significance.</i> Unit-V 1- Microbes 1.1 <i>Archaeobacteria, Eubacteria Cyanobacteria, Mycoplasma, Actinomycetes and Virus.</i> 1.2 <i>Beneficial and harmful roles.</i>	24	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects


Head, Indore Holkar Science College, Indore

Govt. Holkar Science College, Indore
Teaching Plan Session 2021-22

Department		Botany		Paper -I Major paper - Basic Botany	
Class	B.Sc.	II Sem.		Paper	
S.No.	Month	Topics/Units	No of Lectures	Method of Teaching	
1	March-April	<p>Unit -I 1.1 History of Botany and Indian Contributions. 1.2 Morphological characteristics of lower and higher plants(Angiosperms). 1.3 Types of leaves, Inflorescence, Flowers and fruits. 1.4 Structure of plants cell and cell organelles, Prokaryotic and Eukaryotic Cells, Types of cell division. 1.5 Microscope structure and function of Light Microscope (magnification and resolving power). Various types of microscopes: Bright field, Phase Contrast, SEM and TEM.</p> <p>Unit -II 1- Algae 1.1 General characteristics 1.2 Range of thallus organization, reproduction. 1.3 Types of life-cycles in algae 1.4 Role of algae in nature and its economic importance.</p> <p>2- Bryophytes 2.1 General characteristics, Ecology. 2.2 Range of thallus organization, morphology, anatomy(internal and external features) and reproduction of any one Bryophyte. 2.3 Economic importance of Bryophytes</p> <p>Unit-III 1- Pteridophytes 1.1 General characteristics and morphology. 1.2 Stelar organization and reproduction. 1.3 Heterospory and seed habit. 1.4 Economical importance</p> <p>2- Gymnosperms 2.1 General Description and their distribution. 2.2 Economical importance of Gymnosperms.</p> <p>3- Paleobotany 3.1 Indian contribution in paleobotany. 3.2 Brief knowledge of Fossils and Geological time scale.</p>	47	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects	
2	May-June	<p>Unit- IV 1- Fungi 1.1 General characteristics and cell wall composition. 1.2 Mode of nutrition 1.3 Types of reproduction 1.4 Economic importance 1.5 Parasexuality and Mycorrhiza Lichens: Brief Knowledge and their significance.</p> <p>Unit- V 1- Microbes 1.1 Brief outline of various types of microbes 1.2 Archaeobacteria, Eubacteria Cyanobacteria, Mycoplasma, Actinomycetes and Virus. Beneficial and harmful roles.</p>	35	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects	

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Teaching Plan Session 2021-22

Department Botany

Class		B.Sc.		II Sem.	Paper	Paper -II Minor Paper- Applied Botany
S.No.	Month	Topics/Units			No of Lectures	Method of Teaching
1	March-April	Unit- I 1.1 <i>Introduction objectives and importance of Applied botany</i> 1.2 <i>History and evolution of botany</i> 1.3 <i>Relation of plants to man and relation with other services</i> 1.4 <i>Various disciplines of botany and their applications to human welfare</i> Unit- II 1.1 <i>Definition and types of pollution and pollutants</i> 1.2 <i>Phytoremediation: Air water Soil noise and thermal pollutants (Any 5 plants with botanical name, family) and their role in pollution control.</i> 1.3 <i>Bioremediation definition and types</i> Unit-III 1.1 <i>Ancient agricultural practices</i> 1.2 <i>Modern agriculture practices Poly house. Drip irrigation hydroponics computer based agriculture. Terrace farming.</i> 1.3 <i>Organic farming: Introduction objective and brief technique.</i> 1.4 <i>Horticulture: Definition and role in human welfare</i> 1.5 <i>Forestry : Definition branches and role in human welfare</i> 1.6 <i>Silviculture: Definition and management practices</i>			47	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
2	May-June	Unit-IV 1.1 Role of Botany in Rural development. 1.2 Ethnobotany: Introduction and importance. 1.3 Ethnomedicine: Definition and examples. (Local name, Botanical name family and importance of Neem, Aloe, Clove, Ginger, Tulsi, Turmeric, Giloy, Emblica, Ashwagandha, Arandi) 1.4 Ethno- fibres: Definition and examples (Local name, Botanical name, family and importance of Ankara, Coconut, elephant grass, cotton) 1.5 Ethno –food crops: Definition and examples (Local name, Botanical name, family and importance of Garadu, Singada, Kutaki, Sama, Kodo, Bathua, Sehjan, Jowar, Makka, Bajra, Jau) Unit-V 1.1 Plant tissue culture: Definition, Types and Importance 1.2 DNA Recombinant Technique: Introduction, tools and importance 1.3 Role of recombination in present era 1.4 Bioinformatics: Definition, concept and tools 1.5 Introduction of bioinformatics software: Basic idea of BLAST and FASTA Importance of bioinformatics			35	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects

Dr. P. K. Mishra
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Teaching Plan Session 2021-22

Department Botany

			Paper -II Open Elective	
Class	B.Sc.	II Sem.	Paper	Paper- Functional Botany
S.No.	Month	Topics/Units	No of Lectures	Method of Teaching
1	March-April	Unit- I 1.1 Introduction objectives and importance of Applied botany 1.2 Relation of plant to man and relation with other services 1.3 Various disciplines of botany and their applications to human welfare Unit- II 1.1 Definition and types of pollution and pollutants 1.2 Phytoremediation: Air water Soil noise and thermal pollutants (Any 5 plants with botanical name, family) and their role in pollution control. Unit-III 1.1 Organic farming: Introduction objective and brief technique. 1.2 Horticulture: Definition and role in human welfare 1.3 Forestry : Definition branches and role in human welfare 1.4 Silviculture: Definition and management practices	23	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
2	May-June	Unit-IV 1.1 Ethnobotany: Introduction and importance. 1.2 Ethnomedicine: Definition and examples. (Local name, Botanical name family and importance of Neem, Aloe, Clove, Ginger, Tulsi, Turmeric, Giloy, Emblica, Ashwagandha, Arandi) 1.3 Ethno –food crops: Definition and examples (Local name, Botanical name, family and importance of Garadu, Singada, Kutaki, Sama, Kodo, Bathua, Sehjan, Jowar, Makka, Bajra, Jau) Unit-V 1.1 Plant tissue culture: Definition, Types and Importance 1.2 DNA Recombinant Technique: Introduction, tools and importance 1.3 Role of recombination in present era	17	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects

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Teaching Plan Session 2021-22

Department

Botany

**Paper -I Taxonomy and
Embryology of
Angiosperms**

Class B.Sc.

II Year

Paper

S.No.	Month	Topics/Units	No of Lectures	Method of Teaching
1	September-October	Unit-I Taxonomy : origin and Evolution of Angiosperms: Principles and rules of Botanical Nomenclature, Museum, Herbarium and Botanical Gardens; Comparative account of various systems of Classification of Angiosperms: Bentham and Hooker, and Modern trends in Taxonomy including Molecular taxonomy. APG IV System.	23	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
2	November-December	Unit-II Taxonomy : Terminology for plant description in Semi technical language: Diagnostic characteristics and Economic Importance of Families Ranunculaceae, Brassicaceae, Malvaceae, Rutaceae, Fabaceae, and Apiaceae, Magnoliaceae, Rosaceae, Dipterocarpaceae and Cucurbitaceae. Unit-III Taxonomy: Diagnostic Characteristics & Economic Importance to Families - Rubiaceae, Asteraceae, Apocynaceae, Solanaceae, Lamiaceae, Euphorbiaceae, Liliaceae, and Poaceae, Asclpiadaceae, Verbenaceae, Arecaceae, Musaceae and Orchidoceae.	23	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
3	January-February	Unit-IV Embryology: Concept of flower as a modified shoot. Structure of Anther, Microsporogenesis and Male Gametophyte. Structure of pistil, Ovules, Megasporogenesis and Development of Female Gametophyte (Embryo Sac) and its types. Pollination- Mechanism and agencies of pollination, Pollen Pistil interactions and Self incompatibility. Unit-V Embryology: Double fertilization and triple fusion. Development and types of endosperm and its morphological nature, Development of Embryo in Monocot and Dicot plants,	24	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
4	March-April	Unit-V Polyembryony and Apomixis, Application of Palynology, Experimental Embryology including pollen storage and test tube fertilization. Fruit development and maturation, seed structure and dispersal. Mode of vegetative Propagation.	12	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects


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Govt. Holkar Science College, Indore
Teaching Plan Session 2020-21

Department

Botany

**Paper -II Plant Ecology,
Biodiversity and
Phytogeography**

Class	B.Sc.	II Year	Paper	
S.No.	Month	Topics/Units	No of Lectures	Method of Teaching
1	September-October	Unit-I Ecosystems: Structure and Types, Biotic and Abiotic components, Trophic levels, Food chain, Food web, Ecological pyramids, Energy flow, Concept of Biogeochemical cycles: Gaseous Liquid and Sedimentary cycles: Carbon, Nitrogen, Water, Phosphorous and Sulphur cycles.	23	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
2	November-December	Unit-II Ecological Adaptations: Morphological, Anatomical, Physiological responses. water adaptations (Hydrophytes and Xerophytes). Temperature adaptation (Thermoperiodism and Vernalization). Light adaptation (Heliophytes and Sciophytes). Photoperiodism, Plant succession: causes, trends and processes, Types of succession: Hydrosere and Xerosere. Unit-III Biodiversity and Population Ecology: Distribution patterns, Density, Natalty, Mortality, Growth curves, Ecotypes and Ecades. Community Ecology: Frequency, Density, Abundance, Cover and life forms. Biodiversity: Basic concept, Importance, Biodiversity of India, Hotspots, In situ and Ex situ Conservation. Biosphere reserves, Santuries and National parks of Madhya Pradesh. Endangered and Threatened species, Red data book.	23	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
3	January-February	Unit-IV Soil and Pollution: Physical and Chemical properties, soil formation, Development of Soil Profile, Soil classification, Soil composition, Soil factors. Pollution: Types and Causes, Global warming, Acid rain, Climate Change and Ozone Layer and Ozone Hole. Plant Indicators, Environmental Protection Act. Farmer's Right and Intellectual Property Right. Unit-V Phytogeography: Phytogeographical regions of India. Vegetation types of Madhya Pradesh. Natural resources: definition and classification.	24	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
4	March-April	Unit-V Conservation and management of Natural resources, Land resource management, Water and Wet land resource management. Economic and Ethnobotany.	12	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects

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Govt. Holkar Science College, Indore
Teaching Plan Session 2021-22

Department

Boany

**Paper -I Plant Physiology
and Biochemistry**

Class	B.Sc.	III Year	Paper	
S.No.	Month	Topics/Units	No of Lectures	Method of Teaching
1	September-October	Unit-I Plant Water Relations: Properties of water, Importance of water in plant life, Diffusion, Osmosis & Osmotic relation to plant cell. Water Absorption. Ascent of Sap. Transpiration: Structure & Physiology of Stomata, Mechanism of Transpiration, Factors affecting the rate of Transpiration.	23	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
2	November-December	Unit-II Plant Nutrition & Biomolecules : Mineral Nutrition, Essential Macro and Micro Nutrients and their role, absorption of mineral nutrients and hydroponics, Translocation of organic solutes. Biomolecules : structure classification and functions of Carbohydrates Amino Acids, Proteins and Lipids. Unit-III Photosynthesis : Chloroplast, Photosynthetic pigments, Concept of two photosystems, Light reaction, Red drop, Emerson's effect, Dark reaction- Calvin cycle, Hatch & Slack cycle, CAM cycle, Factors affecting rate of photosynthesis & Photorespiration.	23	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
3	January-February	Unit-IV Respiration : Mitochondria, aerobic and anaerobic respiration, fermentation, Respiratory coefficient, mechanism of respiration – Glycolysis, Krebs's cycle, Pentose Phosphate Pathway, Electron Transport system, Factors affecting rate of respiration, Redox potential and theories of ATP Synthesis. Unit-V Enzymology & Plant Hormones: Classification nomenclature and characteristics of Enzymes. Concept of holoenzyme, apoenzyme, co-enzyme and co-factors, mode & mechanism of enzyme action, Factors affecting enzyme activity.	24	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
4	March-April	Unit-V Plant Hormones- Discovery structure mode of action & role of auxins, Gibberellins, Cytokinin, Abscissic acid & ethylene.	12	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects

Boany
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Teaching Plan Session 2021-22

Department

Boany

Paper -II Cell Biology
Genetics and
Biotechnology

Class	B.Sc.	III Year	Paper	
S.No.	Month	Topics/Units	No of Lectures	Method of Teaching
1	September-October	Unit-I The cell envelops and organelles plasma membrane, lipid bilayer structure, functions of the cell wall. Structure and function of cell organelles: Nucleus Chloroplast Mitochondria, Golgibodies ER. Peroxisome and Vacuole.	23	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
2	Novermber-December	Unit-II Chromosomal organization : Sturcture and functions of Chromosome centromere and telomere. Nucleosome model special types of chromosome, Mitosis and Meiosis. Variation in Chromosome Structure : Deletion, Duplication, Translocation and Inversion; Variation in Chromosome number, Euploidy Aneuploidy, DNA: The genetic material, DNA Structure and replication. Unit-III Genetic inheritance Mendelism: laws of Segregation and independent assortment; Linkage analysis; Interactions of genes. Cytoplasmic inheritance, Mutations: spontaneous and induced: Transposable elements: DNA damage and repair.	23	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
3	January-February	Unit-IV Gene : Structure of gene, genetic code, Transfer of genetic information; Transcription, translation, protein synthesis, tRNA, and ribosomes. Regulation of gene expression in prokaryotes and eukaryotes. Unit-V Biotechnology : Definition; basic aspects of plant tussue culture; cellular totipotency, differentiation and morphogenesis. Important achievements of biotechnology in agriculture.	24	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
4	March-April	Unit-V Genetic engineering: Tools & techniques of recombinant DNA technology: cloning vectors, biology of Agrobacterium : Vectors of gene delivery and marker genes. Genomic & cDNA library, Gene mapping & chromosome walking.	12	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects


Boany, Indore
Govt. Holkar Science College, Indore

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Teaching Plan Session 2021-22

Department Botany

Class M.Sc. I Semester

Paper

**Paper 1 Biology &
Diversity of Viruses,
Bacteria and Fungi**

S.No.	Month	Topics/Units	No of Lectures	Method of Teaching
1	October- November	UNIT- I Viruses: - Characteristics and ultra-structure of virions; isolation and purification of viruses; chemical nature of viruses; replication and transmission of viruses; economic importance of viruses. UNIT- II Prokaryotes:-/Archaea bacteria and Eubacteria: - General account of archaeobacteria, Eubacteria: general characters, ultra structure, nutrition, classification, reproduction and economic importance. General account of Actinomycetes. Mycoplasma:- Salient features, cell structure, reproduction, transmission, plant and animal diseases and their control measures. Cyanobacteria: salient features, ultra structure, reproduction and biological importance.	30	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
2	December- January	UNIT-III Mycology: - General characters, substrate relationship of fungi, cell ultra structure, thallus- organization, mode of nutrition (saprophytic, parasitic, and symbiotic) and reproduction. Economic importance of fungi. UNIT- IV Mycology:- Recent trends in classification, (Alexopoulos, Ainsworth), Heterothallism. General account of Mastigomycotina(Saprolegnia, Phytophthora, Pythium, Peronospora, Albugo) and Zygomycotina(Mucor, Rhizopus, Pilobolus). UNIT-V Mycology: Diagnostic features and general account of Ascomycotina (Penicillium, Neurospora and Peziza, Protomyces Basidiomycotina (Puccinia, Ustilago), and Deuteromycotina (Alternaria, Fusarium, Cercospora). Para-sexuality. Diseases in plants and Humans. Mycorrhizal association, symbiosis and Fungi as biocontrol agent.	48	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects


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Govt. Holkar Science College, Indore
Teaching Plan Session 2021-22

Department

Botany

**Paper 2 Biology &
Diversity of Algae &
Bryophytes**

Class	M.Sc.	I Semester	Paper	
S.No.	Month	Topics/Units	No of Lectures	Method of Teaching
1	October- November	UNIT I: Algae: - General characters, diversified habitats, thallus organization. Criteria of classification (pigments, reserve foods, flagella). Economic importance; algal bloom and biofertilizer). UNIT II: Algae: - Salient features, classification, reproduction and economic importance of Chlorophyta (Ulothrix, Spirogyra, Oedogonium, Pithophora, Cladophora, Coleochaete Hydrodictyon and Ulva), Charophyta (Chara and Nitella) and Xanthophyta (Vaucheria and Botrychium).	30	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
2	December- January	UNIT III: Algae: - Salient features, classification, reproduction and economic importance of Phaeophyta (Ectocarpus, Laminaria, Fucus and Sargassum) and Rhodophyta (Batrachospermum, Polysiphonia). General account of Bacillariophyta (Pinularia). UNIT IV: Bryophyta: General characters, classification, vegetative propagation and sexual reproduction of bryophytes. Life cycle and alternation of generation in bryophytes. Economic importance of bryophytes. General account of Sphaerocarpales (Sphaerocarpus); Marchantiales (Riccia, Marchantia) and Jungermanniales (Pellia, Porella). UNIT V: Bryophyta: General account of Anthocerotales (Anthoceros and Notothylus), Funariales (Funaria), Sphagnales (Sphagnum), Andreaeales (Andreaea) and Polytrichales (Polytrichum).	48	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects


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Govt. Holkar Science College, Indore

Govt. Holkar Science College, Indore
Teaching Plan Session 2021-22

Department

Botany

**Paper 3 Biology &
Diversity of
Pteridophytes &
Gymnosperms**

Class	M.Sc.	I Semester	Paper	
S.No.	Month	Topics/Units	No of Lectures	Method of Teaching
1	October- November	UNIT I: Pteridophyta: General characters and life history of pteridophytes. Classification of Pteridophyta. Evolution of stele. Heterospory and origin of seed habit. Basic idea about paleobotany Fossilization and Types of Fossils. UNIT II: Pteridophyta: General account of Psilopsida-(Rhynia,Psilotum); Morphology, anatomy, reproduction and life history of 1- Lycopsidea (Lycopodium,Sellaginella): 2-Sphenosida(Equisetum):3- Pteropsida (Pteridium, Adiantum)	30	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
2	December- January	UNIT III: Gymnosperms:General Characters and life history of gymnosperms. Classification of gymnosperms (Pant and Raizada; Bierhort).Economic importance of gymnosperms. General account of Pteridospermales. UNIT IV: Gymnosperms: (1) General account of Cycadeoidales (Williamsonia) (2) Pentoxylales (Pentoxylon) (3) General account of Cordaitales(Cordaitea, Mesoxylon) (4) General account of Cycadales(Cycas) (5) General account of Ginkgoales(Ginkgo) UNIT V: Gymnosperms: (1) Morphology, structure and reproduction of Coniferales (Pinus,Thuja) (2) Morphology, structure and reproduction of Ephedrales (Ephedra) (3) Morphology, structure and reproduction of Welwitschiales (Welwitschia) (4) Morphology,structure and reproduction of Gnetales (Gnetum).	48	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects


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Teaching Plan Session 2021-22

Department
Class M.Sc.

Botany
I Semester

Paper

Paper 4 Plant Ecology

S.No.	Month	Topics/Units	No of Lectures	Method of Teaching
1	October-November	UNIT I: Ecology and Ecosystem: Definition; Tropic organization and structure; Food chains & webs; Energy flow pathways; Ecological efficiencies, consumption, assimilation and production; Primary production; Methods of measurement of primary production, Limiting factors. UNIT II: Ecosystem: Fate of matter in ecosystems: Recycling pathway; Relationship between energy flow and recycling pathways; Nutrient exchange and cycling; Biogeochemical cycles, (C, N, P and S); Physical, chemical and biological characteristics of soil, Soil Carbon Sequestration.	30	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
2	December-January	UNITIII: Ecosystem: Ecosystem development and stability: Temporal changes cyclic and non cyclic; Succession processes & types; Mechanism of succession facilitation; Tolerance and inhibition models; Concept of climax community. Ecological perturbation (Natural and Anthropogenic); Ecosystem restoration. UNIT IV: Ecosystem: Community organization: Concepts of community and continuum; Analysis of community (analytical and synthetic characters); Community coefficients. Indices of diversity; inter-specific association; negative and positive inter action concept of ecological niche; Concepts of biodiversity; evolution and differentiation of species. allopathric & sympatric speciation; Ecads and Ecotypes . UNIT V: Population Ecology: Population & Environment; Density & distribution; Natalty; Mortality; Survivorship curves, Age structure & pyramids; Fecundity schedules, Life tables; Population growth. Exponential and logistic curves; Intra specific competition and self regulation; r-and k-strategies.	48	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects

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Department Botany

Class M.Sc. III Semester

Paper

Paper 1 Plant Physiology

S.No.	Month	Topics/Units	No of Lectures	Method of Teaching
1	October-November	UNIT I: Osmotic relation of plant cells-osmosis and diffusion, Osmotic pressure, Wall pressure, turgor pressure, DPD, water potential, Absorption of water, Ascent of sapTranspiration, Mechanism of water transport through xylem. UNIT II: Phloem transport, loading and unloading. Passive and active solute transport. Signal transduction over view, receptors, Proteins, phospholipids signaling, role of cyclic nucleotides Calcium calmodulin cascade	30	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
2	December-January	UNITIII: Plant growth regulator and elicitors; physiological effects and mechanism of action of auxins, gibberellins, cytokinins, ethylene, abscisic acid, brassinosteroids, polyamines jasmonic acid and salicylic acid. Hormone receptors. UNIT IV: Flowering process- Photoperiodism and its significance. Endogenous clock and its regulation. Floral induction and development Phytochrome and cytocrome, their photochemical and biochemical properties Vernalization UNIT V- Stress physiology Plant responses to biotic and abiotic stress, Water deficit and drought resistance. Salinity stress and resistance, Concept of freezing, heat and oxidative stresses.	48	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects


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Class M.Sc. **III Semester** **Paper** **Paper 2 Plant Biochemistry and Metabolism**

S.No.	Month	Topics/Units	No of Lectures	Method of Teaching
1	October- November	UNIT I: Fundamental Enzymology Characters and classification of Enzymes.; Factors affecting enzymetic activities. Allosteric mechanism, Regulatory and active site, isoenzymes. Mechanism of enzyme action Michalis Menton equation and its significance. Inhibition of enzymes- competitive ,noncompetitive and mixed inhibition. UNIT II: Photochemistry and photosynthesis. General concept, evolution of photosynthetic apparatus, Photosynthetic pigments and photosystem, Photo-oxidation of water, mechanism of electron and proton transport. Carbon assimilation- calvin cycle, photorespiration and its significance, C4 cycle. Factors affecting photosynthesis.	30	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
2	December- January	UNITIII: Respiration- general Concept. Overview of plant respiration, Glycolysis, TCA cycle Electron transport and ATP synthesis, Oxidative Pentose phosphate Pathway. Glyoxalate cycle, alternative oxidase system, Structure and function of ATP. UNIT IV: Lipid and Sulphate Metabolism Structure and function of lipids. Fatty acid biosynthesis and oxidation Ketone bodies. Sulphate uptake, transport and assimilation. UNIT V: Nitrogen Metabolism Nitrogen metabolism over view Nitrogen fixation mechanism Nodule formation Ammonium assimilation	48	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects


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ELECTIVE- 1 Paper 3- A
Cytology and Genetics

Class	M.Sc.	III Semester	Paper	
S.No.	Month	Topics/Units	No of Lectures	Method of Teaching
1	October-November	<p>UNIT- I Cell wall: Structure; function; growth and cell differentiation. Plasma membrane: Membrane architecture (fluid mosaic model); sites for ATPases; membrane transport - ion carriers.. Plasmodesmata: Structure, role in movement of molecules and macromolecules; Cellular organelles: Ultra-structure and function of golgi complex, lysosomes, peroxisomes, endoplasmic reticulum, mitochondria, chloroplast and plant vacuoles. Cell shape and motility: The cytoskeleton; organization and role of microtubules and microfilaments; motor movements, implications in flagellar & other movements, cell division. Nucleus: Ultrastructure, nuclear pores, nucleolus, DNA structure A, B and Z forms, replication in prokaryotic and eukaryotic cells, DNA replication proteins, damage and repair.</p> <p>UNIT- II Chromatin organization: Chromosome structure and packaging of DNA; molecular organization of centromere and telomere, rRNA genes, euchromatin and heterochromatin; Karyotype analysis and evolution, banding patterns; specialized types of chromosomes: polytene, lampbrush, B-chromosome, sex chromosome; molecular basis of chromosome pairing, C- value paradox, Cot curve and its significance.</p>	30	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
2	December-January	<p>UNIT- III Structural and numerical changes in chromosomes; origin, breeding behavior of 1duplications, deficiency, inversion and translocation heterozygotes; effect of aneuploidy on plants; transmission of trisomics and monosomics and their use in chromosome mapping; complex translocation heterozygotes, translocation tester sets; Robertsonian translocation.</p> <p>UNIT- IV Mutations: Spontaneous and induced; physical and chemical mutagens; molecular basis; transposable genetic elements; site directed mutagenesis; role of mutations in crop improvement; induction of polyploidy</p> <p>Epigenetics: Introduction; paramutations in maize; Epigenetics and Lamarckism; Epigenome and epigenomics.</p>	48	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects


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ELECTIVE- 1 Paper 3-B
Economic Botany

Class	M.Sc.	III Semester	Paper	
S.No.	Month	Topics/Units	No of Lectures	Method of Teaching
1	October- November	Unit-I Plants, energy and global warming (15) <ul style="list-style-type: none"> • Introduction to plants, plant resources and their importance I to human race and survival (5) • Plants as key solution for major global problems viz. Energy, pollution control, agricultural productivity, global warming, climate change, soil fertility and conservation etc. (10) Unit-II Plants and Industries (15) <ul style="list-style-type: none"> • Medicinal plants of India, Importance and uses.(3) • Plants as Ayurvedic, Allopathy and Unani medicines (3) • Cottage Industries • Fermentation, Ethyl Alcohol Fermentation (2) • Citric acid Fermentation (2) • Mushroom Cultivation (4) 	30	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
2	December- January	Unit-III Plants and plant products (15) <ul style="list-style-type: none"> • Vegetables, oil yielding plants, wild edible plants, food crops, spices and condiments, Forage- fodder plants (5) • Fibre yielding plants, textile fibres, cordage fibres, fibres for stuffing (3) • Important timber yielding plants and non-wood forest products (2) Unit-IV Plant products and production (15) <ul style="list-style-type: none"> • Resin, dye, tannin and gum yielding plants and their applications(2) • Grasses, their economic importance (3), Organic farming (3), Mushroom cultivation (3), Vine production(2), and Beer production(2) Unit-V Soil Biology and Organic farming <ul style="list-style-type: none"> • Soil: Definition and Composition, mode of origin of soil, formation of soil, factors affecting soil formation. • Soil profile, soil types soil components. • Soil organisms, soil micro organisms, rhizosphere and rhizoplane micro-organisms. • Organic farming, and bio-fertilizers. 	48	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects

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Class M.Sc. **III Semester**

Paper **ELECTIVE- 2 Paper 4- A**
Molecular Biology

S.No.	Month	Topics/Units	No of Lectures	Method of Teaching
1	October- November	UNIT I: DNA structure, A,B and Z form DNA replication in prokaryotes and eukaryotes Satellite and repetitive DNA. Plant promoters Structure of t-RNA, m-RNA and r-RNA. DNA damage and repair UNIT II: Fine structure of gene., split gene, overlapping gene Cis trans test , Gene expression in prokaryotes and eukaryotes and their regulation. Gene interaction.	30	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
2	December- January	UNITIII: Mechanisms of transcription, translation, initiation, elongation and termination in prokaryotes and eukaryotes, transcription factors., m-RNA splicing. Protein sorting and protein targeting, physical mapping – restriction mapping , Sequenced tagged site(STS) mapping, Chromosome walking. UNIT IV: Molecular techniques- basic concept, principles, technique and application Gel electrophoresis. In situ hybridization, Southern blotting technique, Northern blotting technique, Western blotting technique. Dot blot technique UNIT V: Immuno techniques- precipitin test, agglutination, complement fixation test, radio immune assay, immunosorbent assay, ELISA, Florescent antibody technique-Flow cytometry Florescent in situ hybridization (FISH) Genomic in situ hybridation (GISH)	48	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects


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ELECTIVE- 2 Paper 4- B
Advance-Taxonomy,
Embryology and Anatomy
of Angiosperms

Class M.Sc. **III Semester**

Paper

S.No.	Month	Topics/Units	No of Lectures	Method of Teaching
1	October- November	Unit I Taxonomy History of plants taxonomy: Modern systems of classification in the light of New Concepts of classification (Hutchinson's and Cronquist's classifications). The principles of taxonomy: Rules of Nomenclature (ICBN). Tools of Taxonomy: Preservation, documentation (Flora and Monographs), Botanical gardens and Herbaria. Unit II Fossil history, phylogeny and evolution of Angiosperms. Phylogeny and floral evolution in Amentiferae, Tubifloerae, Helobiales and Glumales. Families of heterotrophic angiosperms (Parasitic, saprophytic and Insectivorous) Orobanchaceae, Balanophoraceae, Loranthaceae, Convolvulaceae, Rafflesiaceae, Santalaceae, and Nepenthaceae. Origin of Flower: New concept.	30	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
2	December- January	Unit III Anatomy: Techniques used in the study of anatomy and histology. Primary and secondary meristems, Tissues and Tissues systems. Seedling anatomy and their evolutionary significance. Structure and classification of Stomata. Wood anatomy- porous and nonporous timber. The cambium and its derivatives. The Cork Cambium and its derivatives: Morphology and economic aspects of cork. Unit IV Embryology History and present status of plant embryology. Embryology and its prospects. Development of male reproductive structure in Angiosperms. Development of female reproductive structure in Angiosperms. Post fertilization changes in the embryo of monocot and dicot plants, nutritive tissue, and apomixes. Xenia and meta- xenia. Unit V Induced polyembryony, artificial induction of adventitive embryos. Control of fertilization, embryo culture, culture of ovaries and ovules, induced parthenogenesis Seed and seed germination, dynamics of seed growth. Biochemical changes during seed germination Induced parthenocarpy. Merits and demerits of Artificial and Terminator seeds.	48	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects


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Class M.Sc. **III Semester** Paper **Open Elective -Inter-disciplinary Paper 5 Environmental Biology**

S.No.	Month	Topics/Units	No of Lectures	Method of Teaching
1	October-November	UNIT I: Concept and scope of environmental biology; environmental ethics, Ecosystem: concept, structure, functions and types of ecosystem; Food chains and Food web; Ecological pyramids. UNIT II: Biogeochemical cycles: concept; gaseous and sedimentary cycles (C, N, S, H ₂ O Cycles); Soil: classification of soils, soil formation, Physical, biological, and chemical characters of soil.	30	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
2	December-January	UNIT III: Concept of population: population growth forms; basic concept of growth rate, Inter-specific and intra-specific interaction; Commensalisms, Mutualism, Predation, Parasitism, Competition, Ecological niche. UNIT IV Concept of Biodiversity: definition and importance; species diversity, generic diversity, Hot spots of biodiversity; Threats to biodiversity, biodiversity conservation. In-situ and ex-situ conservation; Botanical garden and Zoological Park. UNIT V Concept of Pollution: definition, sources effect and Control of:- (i) Air pollution; (ii) Noise pollution; (iii) Water pollution; (iv) Soil pollution; (v) Thermal pollution. e-Waste; Green house gases; Global warming; Ozone depletion; Role of individual in pollution control.	48	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects


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Department Botany

Class M.Sc.

II Semester

Paper

**Paper 1 Plant
Development &
Reproduction**

S.No.	Month	Topics/Units	No of Lectures	Method of Teaching
1	March-April	<p>UNIT-I Plant Development: Unique features of plant development; Organization of root and shoot apical meristems. Leaf- leaf growth and differentiation. Root-stem organization; Nodal anatomy.</p> <p>UNIT-II Plant Development: Cell fates and lineages; Tissue differentiation specially xylem and phloem, Secretory Ducts and laticifers; Secondary growth; Primary and secondary anomalies. Wood development in relation to environmental factors.</p> <p>UNIT-III Reproduction: Vegetative propagations and sexual reproduction. Flower is a modified shoot ; Flower development (A,B,C models) and genetics of floral-organ differentiation; Homeotic mutants in Arabidopsis and Antirrhinum; Androecium; Structure of anther; Microsporogenesis; Role of tapetum; Pollen development; Male sterility.</p>	47	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
2	May-June	<p>UNIT-IV Reproduction: Structure of Pistil; Ovule development; Megasporogenesis and megagametogenesis; Monosporic, bisporic and tetrasporic embryo sacs; Pollination; Pollen tube growth and guidance; Pollen stigma interaction; Parthenocarpy.</p> <p>UNIT-V Reproduction: Sporophytic and gametophytic-self-incompatibility; Double fertilization and triple fusion; Endosperm development; Embryogenesis, Development of monocot & dicot embryo; Polyembryony; Apomixes. Dynamics of fruit growth. Fruit maturation.</p>	35	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects

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**Paper 2 Morphology &
Taxonomy of
Angiosperms**

Class M.Sc.

II Semester

Paper

S.No.	Month	Topics/Units	No of Lectures	Method of Teaching
1	March-April	UNIT I: Morphology: Morphology of stamens, Morphology of carpel, carpel evolution, Morphology of inferior ovary; Placentation -types and their origin. UNIT II: Taxonomy: The species concept; Taxonomic hierarchy, Binomial nomenclature & ICBN; Modern trends in taxonomy; Morphology, Anatomy, Palynology, Embryology, Cytology, and Phytochemistry in relation to taxonomy. UNIT III: Taxonomy: Systems of angiospermic classifications - Phenetic versus Phylogenetic systems: Classifications proposed by 1- Bentham and Hooker Taxonomy: Systems of angiospermic classifications - Phenetic versus Phylogenetic systems: Classifications proposed by 2- Takhtajan 3- Dahlgren; Merits & demerits of above classifications; Taxonomic tools- herbarium and floras.	47	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
2	May-June	UNIT IV: Taxonomy: Floral structure and phylogeny of – a- Ranales b- Caryophyllales c- Rosales d- Euphorbiales UNIT V: Taxonomy: Floral structure and phylogeny of – a- Asterales b- Lamiales c- Orchidales d- Greminales	35	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects


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Class M.Sc.

II Semester

Paper

**Paper 3 Utilization &
Conservation of Plant
Resources**

S.No.	Month	Topics/Units	No of Lectures	Method of Teaching
1	March-April	<p>UNIT I: Major Biomes of the world- Tropical, Temperate(Boreal and Seasonal forests, rain) & Seasonal Forests; Grasslands, Deserts; Aquatic Ecosystems(wetlands, Lake ,Pond, River, Stream, Estuarine), Marine-habitats.</p> <p>UNIT II: Organization of Resources- utilization of Resources from forest, grassland and aquatic habitat ; Food forage, Fodder, Timber & Non-wood forest products; Threats to quality & quantity of resources due to over exploitation.</p> <p>UNITIII: Conservation of resources: Classifications of resources; Principles of conservation; In-situ conservation, sanctuaries, National parks, Biosphere reserves for wildlife conservation; Habitat conservation practices of conservation for forests, ranges, soil and water; Ex-situ conservation- Botanical gardens, field gene banks, seed banks, Cryobank, Microbial repositories and Medicinal plant repositories.</p>	47	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
2	May-June	<p>UNIT IV: Pollution & Climate Change: Air, Water and Soil pollution, Kinds, Sources, Quality parameters, Effects on structure & function of ecosystems; Management of pollution; Bioremediation; Climate changes sources, Trends & role of greenhouse gases, Effect of global warming on climate, Ecosystem processes & Biodiversity; Ozone layer & Ozone hole.</p> <p>UNIT V: Resource monitoring: Remote sensing concepts & Tools, Satellite remote sensing basics sensors, Visual & digital interpretation, EMR bands and their applications; Indian remote sensing programme; thematic mapping of resources Application of remote sensing in Ecology & Forestry.GIS</p>	35	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects


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Department
Class M.Sc.

Botany
II Semester

Paper

Paper 4 Cell Biology

S.No.	Month	Topics/Units	No of Lectures	Method of Teaching
1	March-April	UNIT I: Structural organization of the plant cell; specialized plant cell types. Biogenesis, structure and functions of cell wall. Cytoskeleton: organization and role of microtubules and microfilaments. Chemical composition of cell wall. UNIT II: Plasma membrane: structure, models and functions; sites for ATPases; ion carriers, channels and pumps; receptors. Structure of plasmodesmata, role in movement of molecules; comparison with gap junctions. vacuoles: tonoplast membrane, UNIT III: Chloroplast: structure, genome organization, gene expression, nucleo-chloroplastic interactions; Mitochondria: structure, genome organization, biogenesis. Plant ATPases, transporters, as storage organelle. Other cell organelles: golgi apparatus, lysosomes, endoplasmic reticulum.	47	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
2	May-June	UNIT IV: Nucleus: structure. Cell cycle: control mechanisms; role of cyclins and cyclin-dependent kinases; mechanisms of programmed cell death. Chromosome structure and packaging of DNA; euchromatin and heterochromatin; karyotype analysis and evolution; banding patterns; specialized types of chromosomes. UNIT V: Origin, meiosis and breeding behaviour of duplication, deficiency, inversion and translocation heterozygotes; origin, occurrence, production and meiosis of haploids, aneuploids and euploids; Origin and production of autopolyploids. Allopolyploids; types, genome constitution and analysis.	35	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects


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**Paper 1 Plant Cell,
Tissue and Organ
Culture**

Class M.Sc. **IV Semester**

Paper

S.No.	Month	Topics/Units	No of Lectures	Method of Teaching
1	March-April	UNIT I: Plant tissue culture-General introduction and Scope. Concept of Totipotency and importance of totipotency in plant science. Concept of cytodifferentiation and organogenesis. General technique of plant tissue culture. Callus and suspension. UNIT II: Somatic embryogenesis. Organ culture-Meristem, anther and embryo culture-Principle, technique and significance. UNIT III: Protoplast culture- Principle, technique of isolation of protoplast and its significance. Viability testing of protoplast Protoplast fusion-methods and importance Hybrid selection and regeneration. Somatic hybridization.	47	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
2	May-June	UNIT IV: Somoclonal variation and role of tissue culture in Agriculture. Production of disease resistant plants, virus free plants. Stress resistant plants, Herbicide resistant plants. UNIT V: Application of plant tissue culture-clonal propagation Artificial seeds Production of secondary metabolites/natural products. Cryopresevation and Germ plasm storage.	35	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects


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Department Botany

**Paper 2 Biotechnology
and Genetic
Engineering**

Class M.Sc. **IV Semester** **Paper**

S.No.	Month	Topics/Units	No of Lectures	Method of Teaching
1	March-April	UNIT I: Biotechnology- basic concept, principle and scope. Recombinant DNA technology. Tools (Vectors and enzymes) and techniques cDNA and genomic Libraries. UNIT II: Agrobacterium mediated gene transfer. Transposon tagging direct gene transfer techniques DNA finger printing. Polymerase chain reaction. UNITIII: Strategies for development of transgenic plants Transgenic plants –Ecological risk and ethical concern. Intellectual property rights	47	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
2	May-June	UNIT IV: Genetic improvement of industrial microbes, Nitrogen fixers. Fermentation technology- Basic concept, characteristic of ideal ferment or, Types of ferment or. Up stream and down stream processing Genomics-Basic concept, types and strategies for genome analysis. UNIT V: Protein profiling technology and its application. Bioinformatics-Basic concept and its application in biological science. Genomic projects-basic concept. High through put sequencing (bioinformatics) Microarrays.	35	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects


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**ELECTIVE- 3 Paper 3-
A Plant Pathology**

Class	M.Sc.	IV Semester	Paper	
S.No.	Month	Topics/Units	No of Lectures	Method of Teaching
1	March-April	Unit I (1) Nature and concept of plant disease, impact of plant disease pathological terms and definitions. (2) History and progress of plant pathology. (3) Agents of infectious disease: Fungi Bacteria Mycoplasma and Viruses. (4) Classification of plant disease. (5) Symptoms of plant disease (6) Methods of studying plant disease Unit II (1) Phenomenon of infection prepenetration, penetration and development of pathogen inside the host. (2) Role of enzyme, Toxins and hormones in pathogenesis. (3) Defense mechanisms in plants: Structural defense, Biochemical defence. (4) Effect of infection on physiology of the host plant. Unit III (1) Genetics of Virulence in pathogen and of resistance in host plant, physiological specialization and its significance. (2) Effect of environment on pathogenesis. (3) Survival of plant pathogens. (4) Dispersal of plant pathogens.	47	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
2	May-June	Unit IV (1) General principles of disease control. (2) Chemical methods for plant disease control. (3) Biological control. (4) Breeding for disease resistance Unit V (1) Important disease of main crops of M.P. such as Wheat Barley, Jowar, Bajra, Potato, Pulses, Sugarcane, Oil-Seeds (Ground nut, Til and Lin seed). Vegetables, Fruits (Papaya, Mango, Guava, Lemon and Banana) and Cotton.	35	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects


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Department Botany

Class M.Sc.

IV Semester

Paper

ELECTIVE- 3 Paper 3-B
Plants & Society

S.No.	Month	Topics/Units	No of Lectures	Method of Teaching
1	March-April	Unit I History of plants and development of society, Role of plants in tracing human history, green revolution:- benefits and adverse consequences. Innovations for meeting world food demands. Early domestication centers of major cultivated plants, Plants in Mythology, folklores Role of Ethnobotany in relation to development of society. Unit II Plants & Human Health, Usage of plants in different systems of medicine allopathic, Homeopathic Aurvedic, Herbal Medicine, and concept of Herbal Cosmetic. Plants as health hazards. Food spoilage. Viral, Bacterial and fungal diseases of human beings. Unit III Plants in Enterprenural Areas-A: Techniques of cultivation and marketing of few Chlorophytum, Plants in Enterprenural Areas-A: Techniques of cultivation and marketing of few Guggul, Commiphora wightii, Rauwolfia serpentina. Plants and other uses : Agriculture & Horticulture.	47	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
2	May-June	Unit IV Plants in Enterprenural Areas - B: Use of plants in earning livelihood - Such as Bamboos, Rattans, Raw Materials of papermakings, Gums tannins, dyes, resins and fruits. Techniques of cultivation and marketing of - Aromatic Plants - Lemon grass, plasma Rosa, Floriculture - rose and gladioli. Unit V Plants in Enterprenural Areas - C: Techniques of cultivation and marketing of - Mushroom Cultivation, Nursery management, Vermiculture & Vermicompost. Mass cultivation of few plants using tissue culture techniques. Bonsai Techniques.	35	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects


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Class M.Sc. **IV Semester** Paper **ELECTIVE -4 Paper 4-A
Industrial Microbiology**

S.No.	Month	Topics/Units	No of Lectures	Method of Teaching
1	March-April	<p>Unit I Basic techniques in microbiology - Microscopy, staining techniques, Culture, Nutrition and growth of microorganisms. Replication and structure of viruses & other a cellular microorganisms, prokaryotic microorganisms, classification and diversity of Bacteria, Eukaryotic microorganisms.</p> <p>Unit II Food Microbiology: Food spoilage, Food preservation methods, Microbiological production of food such as fermented products, alcoholic beverages, vinegar. Fermented vegetables. Single cell protein production in industry, fermented dairy products and uses.</p> <p>Unit III Fermentation Industry: Selection of micro-organisms, Techniques and quality control, Production of antibiotics, steroids, Human proteins, Vaccines and vitamins. Survey of microorganisms of industrial uses. Production of organic acids, amino acids, Enzymes, Solvents and fuels.</p>	47	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
2	May-June	<p>Unit IV Recovery of minerals by using microbes, Oil recovery, Biodeterioration, Mushroom culture, Biotech products including human insulin, Microbial Growth-Environmental influences, Physical control, Chemical control & Antibiotic controls.</p> <p>Unit V Water quality in industry: Bacteriological safety of potable water, water quality analysis, importance of BOD. Biodegradation of wastes and pollutants, Primary, Secondary and Tertiary Sewage treatments. Water quality in industry: Bacteriological safety of potable water, water quality analysis, importance of BOD. Biodegradation of wastes and pollutants, Primary, Secondary and Tertiary Sewage treatments.</p>	35	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects

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Department Botany

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IV Semester

Paper

ELECTIVE -4 Paper 4-B
Pollution Ecology

S.No.	Month	Topics/Units	No of Lectures	Method of Teaching
1	March-April	Unit I Pollution: Status and Concerns Classification of contaminants and pollutants. Brief account of major environmental disasters of the past. Indicator concept-biological indicators of pollution. Unit II Air pollution Sources and causes of air pollution. Effects of air pollution on flora and fauna, materials and structures, soil atmosphere, water bodies and on human health. Transport and dispersion of pollutants. Unit III Water Pollution Sources and causes of water pollution Status of water pollution in India and M.P Water harvesting and recharging of water resources-concerns and remedies.	47	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
2	May-June	Unit IV Soil pollution and other pollution types Causes and sources of soil pollution. Pesticidal and heavy metal pollution-sources, causes and effects Nuclear, thermal and noise pollution-sources, causes and effects Unit V Pollution: Monitoring and Control Monitoring systems and analytical methods for air, water and soil pollution. Control and abatement measures for air, water and soil pollution. Brief account of legislation and environmental protection acts in India.	35	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects


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Paper

Applied Botany

S.No.	Month	Topics/Units	No of Lectures	Method of Teaching
1	March-April	<p>Unit I: Entrepreneurship Entrepreneurship - meaning, nature, importance, Traits of Entrepreneurs, Preparing for business plan legal requirements for establishing of a new unit procedure for registering business, market assessment, survey of local market, product designing branding, Research and development. DIC and various government policies for the development of entrepreneurship. Government schemes, subsidies, role of lead banks.</p> <p>Unit II: Protected Cultivation 1- Open cultivation: Merits and demerits. 2- Protected cultivation useful for floriculture, vegetables, nursery development and fruit crops. 3- Construction & Design of polyhouse/ green house: site selection orientation, size, cost, height, ventilation, temp, humidity maintenance. 4- Technical standards for poly house, net house. 5- Cultivation & marketing of some flowers & vegetables in polyhouse. 1- Floriculture: Rose and Gladiolus. 2- Vegetables: Tomato, Capsicum Spp. 3- Nursery management in polyhouse. 6- Shade /Net house : structure, design, specification and importance.</p> <p>Unit III: Organic Farming 1- Concept & definition, socio economic impact, organic farming and national economy. 2- Relevance of organic farming to India and global agriculture with future prospects. Organic Farming 3- Farming systems and crop rotation. 4- Management of available water for organic farming. 5- Earthworms, vermicompost, green manures & biofertilizers. 6- liquid organic manures, panchgavya, jeevamrut & beejamrut.</p>	47	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects
2	May-June	<p>Unit IV: Water management 1- Introduction 2- Techniques of water management. 3- Water management strategies. 4- Water management in India. 5- Water management projects. 6- Rain water harvesting.</p> <p>Unit V: Medicinal plants and their use for welfare of human beings. The use of plant parts for medicinal purpose. Azadirachta indica (Neem), Ocimum sanctum (Tulsi), Phyllanthus emblica (Awala), Zingiber officinale (Adrak), Withania somnifera (Ashwagandha), Tinospora cordifolia (Giloy), Raulvolfia serpentina (Sarphgandha), Curcuma longa (Haldi) Glycyrrhiza glabra (Mulathi), Syzygium aromaticum (laung), Chlorophytum borivilianum (Safed musli) and Aloe vera (Guarpatha).</p>	35	Chalk Duster, Projector and PPT, Through LMS and Google Classes, Classroom Discussion, Students Seminar, Group Assignments and Projects


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