

**GOVT.D.B. GIRL'S P.G. AUTONOMOUS COLLEGE**

**RAIPUR CHHATTISGARH**

**DEPARTMENT OF BOTANY**

**SYLLABUS  
OF  
M.Sc. (BOTANY)  
2020-21**

# M. Sc. BOTANY

## 1<sup>st</sup> SEMESTER

### Theory

#### Part A

No.	Title							Total
		Theory		Test		Seminar		
		Max.	Mini.	Max.	Mini.	Max.	Mini.	
Paper -I	Cytology	80	16	10	2	10	2	100
Paper -II	Genetics	80	16	10	2	10	2	100
Paper -III	Microbiology, Phycology And Mycology	80	16	10	2	10	2	100
Paper -IV	Bryophyta, Pteridophyta And Gymnosperm	80	16	10	2	10	2	100

### Practical

#### Part B

	Name of the Practical	Marks	
		Max.	Mini.
Practical-I	Practical based on paper -I & III	100	36
Practical-II	Practical based on paper -II & IV	100	36

Signature of Chairman

Signature of Member (Subject)

**DEPARTMENT OF BOTANY**

**CLASS-M.Sc. I<sup>st</sup> SEMESTER**

**SESSION: 2020-21**

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**PAPER – 1**

**Cell Biology**

**MAXIMUM MARKS: 80**

**MINIMUM MARKS: 16**

**NUMBER OF UNIT: I V**

**Unit-I**

- ❖ **The dynamic cell:** Structural Organization of the plant cell, specialized plant cell type, chemical foundation and biochemical energetic.
- ❖ **Cell wall** – Structure and functions, biogenesis growth.
- ❖ **Plasma membrane:** Structure, models and functions, site for ATPases, ion carries, channels and pumps, receptors.

**Unit-II**

- ❖ **Chloroplast:** Structure, Genome organization, Gene expression, RNA editing
- ❖ **Mitochondria:** Structure, Genome organization, Biogenesis.
- ❖ **Plant Vacuole:** Tonoplast membrane, ATPases, transporters as a storage organelle.

**Unit-III**

- ❖ **Nucleus:** Structure, Nuclear Pore.
- ❖ **Ribosome:** Structure and functional significance
- ❖ **Cell cycle and Apoptosis:** Control mechanisms, Role of cyclins dependent kinases
- ❖ Retinoblastoma and E2F proteins, cytokinesis and cell plate formation, mechanism of programmed cell death.

#### **Unit-IV**

- ❖ **Other cell organelles:** Structure and functions of microtubules, Microfilaments, Golgi apparatus, Lysosome, Endoplasmic Reticulum.
- ❖ **Techniques in cell biology:** Immuno-techniques, in situ hybridization to locate transcripts in cell types FISH, GISH, Confocal microscopy, Flow Cytometry.

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Dr. B.M.Lall	MEMBER OF THE DEPARTMENT	
Dr. Neetu Harmukh	MEMBER OF THE DEPARTMENT	

**DEPARTMENT OF BOTANY**  
**CLASS-M.Sc.(Botany) 1<sup>st</sup> SEMESTER**  
**SESSION: 2020-21**

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**PAPER –II**

**Genetics**

**MAXIMUM MARKS: 80**

**NUMBER OF UNIT: I V**

**MINIMUM MARKS: 16**

**Unit-I**

- ❖ **Chromatic Organization:** Chromosome structure and packaging of DNA, Nucleosome organization, molecular organization of centromere and telomere, nucleolus and ribosomal RNA genes, Euchromatin and heterochromatin, karyotype, banding pattern specialized type of chromosomes, polytene, lamp brush, B chromosomes and sex chromosomes. Molecular basis of chromosome pairing, chromosomal aberration and polyploidy

**Unit- II.**

- ❖ Mapping of Bacteriophage genome, Phage phenotype, and recombination in phage, genetic transformation and transduction in bacteria.

**Unit-III**

- ❖ **Genetic recombination & genetic mapping:** Mechanism of crossing over, molecular mechanism of recombination, role of Rec-A and Rec-B, C, D enzyme, site specific recombination, linkage group, genetic marker.

## Unit – IV

- ❖ **Allien gene transfer through chromosome manipulation:** Transfer of whole genome, examples from Wheat, *Arachis* & *Brassica*. Transfer of individual chromosomes & chromosome segment, methods for detecting alien chromatin production.
- ❖ Characterization and utility of alien addition & substitution lines, genetic basis of breeding and heterosis, exploitation of hybrid vigour.

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**PAPER –III**

**Microbiology, Phycology and Mycology**

**MAXIMUM MARKS: 80**

**NUMBER OF UNIT: IV**

**MINIMUM MARKS: 16**

**Unit-I**

- ❖ **Archaeobacteria and Eubacteria:** General account, ultra structure nutrition and reproduction, biology and economic importance.
- ❖ **Cyanobacteria:** Salient features and biological importance.

**Unit-II**

- ❖ **Viruses:** Characteristics and ultra structure of virion, isolation and purification of viruses, chemical nature, replication, transmission of viruses, economic importance.
- ❖ **Phytoplasma:** General characteristic and role in causing plant diseases.

**Unit-III**

- ❖ **Phycology:** Algae in diversified habitats (terrestrial, freshwater, marine), thallus organization, cell ultra structure, reproduction (vegetative, asexual, sexual)
- ❖ General account of Chlorophyta, Xanthophyta, Bacillariophyta, Phaeophyta and Rhodophyta.
- ❖ Economic importance of algae.

## Unit – IV

- ❖ **Mycology:** General character of fungi, substrate relationship in fungi, cell structure, unicellular and multicellular, organization, cell wall composition, nutrition (saprobic, biotrophic, symbiotic) reproduction, vegetative, asexual & sexual. heterothallism, heterokaryosis, Para sexuality, recent account of Mastigomycotina, Zygomycotina, Ascomycotina, Basidiomycotina, Deuteromycotina, Mycorrhiza, Fungi as biocontrol agent.

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**PAPER –IV**

**Bryophyta, Pteridophyta and Gymnosperm**

**MAXIMUM MARKS: 80**

**NUMBER OF UNIT: IV**

**MINIMUM MARKS: 16**

**Unit-I**

- ❖ . **Bryophyta:** General characters, distribution and classification.
- ❖ General account of following orders: - Marchantiales, Jungernanniales, Anthocerotales, Sphagnales, Funariales & Polytrichales.

**Unit-II**

- ❖ **Pteridophyta:** General characters and classification.
- ❖ Evolution of stele in Pteridophytes.
- ❖ General account of – Psilopsida, Lycopsida, Sphenopsida and Pteropsida.

**Unit-III**

- ❖ **Gymnosperms:** General characters and classification.
- ❖ Resemblances and difference between Gymnosperms, Pteridophyta and Angiosperms.
- ❖ Distribution of Gymnosperms in India and their economic importance.
- ❖ Brief account of following families: Lygenopteridaceae, Medullosaceae, Glossopteridaceae, Caytoniaceae
- ❖ General account of order Pentoxylales.

## Unit – IV

❖ General account of following orders:

Cycadales, Ginkgoales, Coniferales, Ephedrales, Gnetales, Welwitschiales.

Note : Life cycle of individual genera is not expected

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**Practical – I**

<b>S.No.</b>	<b>TITLE</b>	<b>MAX. MARKS</b>
1	Practical based on Cytology	15
2	Exercise based on Microbiology	10
3	Exercise based on Phycology	15
4	Exercise based on Mycology	15
5	Spotting	15
6	Viva-voce	10
7	Project work	10
8	Sessional	10
<b>Total Marks</b>		<b>100</b>

**Practical – II**

<b>S.No.</b>	<b>TITLE</b>	<b>MAX. MARKS</b>
1	Practical based on Genetics	20
2	Exercise based on Bryophyta	15
3	Exercise based on Pteridophyta	15
4	Exercise based on Gymnosperms	15
5	Spotting	15
6	Viva-voce	10
7	Sessional	10

<b>Total Marks</b>	<b>100</b>
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**M. Sc. BOTANY**  
**2<sup>nd</sup> SEMESTER (2020-21)**

**Theory**

**Part A**

No.	Title							Total
		Theory		Test		Seminar		
		Max.	Mini.	Max.	Mini.	Max.	Mini.	
Paper -I	Taxonomy & Diversity of Angiosperm	80	16	10	2	10	2	100
Paper -II	Molecular Biology	80	16	10	2	10	2	100
Paper – III	Plant Physiology	80	16	10	2	10	2	100
Paper – IV	Plant Metabolism	80	16	10	2	10	2	100

**Practical**

**Part B**

	Name of the Practical	Marks	
		Max.	Mini.
Practical-I	Practical based on paper -I & II	100	36
Practical-II	Practical based on paper –III & IV	100	36

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**DEPARTMENT OF BOTANY**  
**CLASS-M.Sc. (Botany) 2<sup>nd</sup> SEMESTER**  
**SESSION: 2020-21**

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**PAPER –I**

**Taxonomy and Diversity of Angiosperms**

**MAXIMUM MARKS: 80**

**NUMBER OF UNIT: IV**

**MINIMUM MARKS: 16**

**Unit-I**

- ❖ **.Origin of Intrapopulation Variations:** population and the environment, ecades and ecotypes;
- ❖ **Taxonomic hierarchy:** major and minor categories; the species concept.
- ❖ **Plant Nomenclature-** Salient features of international code of Botanical Nomenclature, Binomial Nomenclature.

**Unit-II**

- ❖ **Taxonomic evidence:** Morphology, Anatomy, Palynology, Embryology, Cytology, Photochemistry, Genome analysis and Nucleic acid hybridization.
- ❖ **Taxonomic tools-** Herbarium, Flora, Taxonomic Literature
- ❖ **GIS** (Geographical information system).

**Unit-III**

- ❖ **Systems of Angiosperm classification-** Bentham and Hooker, Hutchinson, Takhatjan & Cronquist.
- ❖ Fossil Angiosperms, Sustainable utilization of Bio- resources.

## Unit – IV

- ❖ Study of following families with particular reference to systematic position, phylogeny, Evolutionary trends and economic importance.
- ❖ **Dicot families:** Ranunculaceae, Magnoliaceae, Nymphaeaceae, Capparidaceae, Meliaceae, Tiliaceae, Cucurbitaceae, Leguminosae (Fabaceae) (Caesalpinoideae, Mimosoideae, Papilionateae), Umbelliferae (Apiaceae), Lythraceae, Myraceae, Rubiaceae, Apocynaceae, Asclepiadaceae, Solanaceae, Labiateae (Lamiaceae), Verbinaceae, Euphorbiaceae; Compositeae.
- ❖ **Monocot families-** Orchidaceae, Zingiberaceae, Liliaceae, Cyperaceae, Gramineae (Poaceae), Museaceae.

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**PAPER –II**

**Molecular Biology**

**MAXIMUM MARKS: 80**

**NUMBER OF UNIT: IV**

**MINIMUM MARKS: 16**

**Unit-I**

- ❖ RNA and DNA structure A, B and Z Forms, replication, transcription, translation, DNA damage and repair mechanism, Inherited human diseases –causes.

**Unit-II**

- ❖ **Molecular cytogenetics** : Nuclear DNA concept, C-value paradox, Cot curve and its significance, restriction mapping – concept and techniques, multi-gene families and their evolution, in situ hybridization and techniques, chromosome, microdissection and microcloning.

**Unit-III**

- ❖ **Gene structure and expression**: Fine structure of gene, cis-trans test, fine structure analysis of eukaryotes introns and their significance, RNA splicing, regulation of gene expression in prokaryotes and eukaryotes.
- ❖ **Protein sorting**: Targeting of proteins to organelles.



## Unit – IV

- ❖ **Mutation:** Spontaneous and induced mutation, physical and chemical mutagens, molecular basis of gene, transposable elements in prokaryotes and eukaryotes, mutation induced by transposones, site-directed mutagenesis, translocation tester sets, Robertsonian translocation, B-A translocation.

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**SESSION: 2020-21**

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**PAPER –III**

**Plant Physiology**

**MAXIMUM MARKS: 80**

**NUMBER OF UNIT: IV**

**MINIMUM MARKS: 16**

**Unit-I**

- ❖ **Membrane transport and translocation of water and solutes:** Plant- water relation, mechanism of water transport through xylem, root microbe interactions in facilitating nutrient uptake, comparison of xylem and phloem transport, phloem loading and unloading, passive and active solute transport, membrane transport system.

**Unit-II**

- ❖ Structure and Mechanism of opening & closing of stomata, factors affecting transpiration.
- ❖ **Signal transduction:** Overview, receptors and G proteins, Phospholipids signaling, role of cyclic nucleotides, calcium-calmodulin cascade, diversity in protein kinases and phosphatases, specific signaling mechanism, two component sensor regulator system in bacteria.

**Unit-III**

- ❖ **Stress Physiology:** Plant responses to biotic and a-biotic stress, mechanisms of biotic and abiotic stress tolerance, HR fundamental and SAR, water deficit and drought resistance, salinity stress, metal toxicity, freezing and heat stress, oxidative stress.

## Unit – IV

- ❖ **Fundamentals of enzymology:** General aspect, allosteric mechanism regulatory and active sites, isozymes, kinetics of enzymatic catalysis, Michaelis-Menton equation and its significance.
- ❖ **Sensory Photobiology:** History of discovery of phytochromes and cryptochroms and their photochemical and biochemical properties, photophysiology of light induced responses, cellular localization, and molecular mechanism of action of photomorphogenic receptors.

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**PAPER –IV**

**Plant Metabolism**

**MAXIMUM MARKS: 80**

**NUMBER OF UNIT: IV**

**MINIMUM MARKS: 16**

**Unit-I**

- ❖ **Photosynthesis:** General concepts and historical background, evolution of photosynthetic apparatus, photosynthetic pigments and light harvesting complexes, photo-oxidation of water mechanism of electron and proton transport, carbon assimilation – The Calvin cycle, photorespiration and its significance, the C<sub>4</sub> cycle, the CAM pathway, biosynthesis of starch and sucrose, physiological and ecological considerations.

**Unit-II**

- ❖ **Respiration and Lipid Metabolism:** Overview of plant respiration, glycolysis, the TCA cycle, electron transport and ATP synthesis, Pentose phosphate pathway, glyoxylate cycle, alternative oxidase system, structure and function of lipids, fatty acid biosynthesis, synthesis of membrane lipid and storage lipids and their catabolism.

**Unit-III**

- ❖ **Nitrogen and Sulphur Metabolism:** Overview, biological nitrogen fixation, nodule formation and nod factors, mechanism of nitrate uptake and reduction, ammonium assimilation, sulphur uptake, transport and assimilation.

## Unit – IV

- ❖ **Plant growth regulator and elicitors:** Physiological effect and mechanism of action of auxins, gibberellins cytokinins, ethylenes, abscissic acid, brassinosteroids, polyamines, jasmonic acid and hormone receptors.
- ❖ **The Flowering Process:** Photoperiodism and its significance, endogenous clock and its regulation, floral induction and development – Genetic molecular analysis, role of vernalization.

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**CLASS-M.Sc.(Botany) 2<sup>nd</sup> SEMESTER**  
**SESSION: 2020-21**

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**Practical – I**

<b>S.No.</b>	<b>TITLE</b>	<b>MAX. MARKS</b>
1	Practical based on Molecular Biology	25
2	Exercise based on Plant description (02 Plant)	40
3	Spotting	15
4	Viva-voce	10
5	Sessional	10
<b>Total Marks</b>		<b>100</b>

**Practical – II**

<b>S.No.</b>	<b>TITLE</b>	<b>MAX. MARKS</b>
1	Major physiology experiment	35
2	Minor physiology experiment	15
3	Biochemical analysis	15
4	Spotting	15
5	Viva-voce	10
6	Sessional	10
<b>Total Marks</b>		<b>100</b>

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**M.Sc. BOTANY**  
**3<sup>rd</sup> SEMESTER (2020-21)**

**Theory**

**Part A**

No.	Title							Total
		Theory		Test		Seminar		
		Max.	Mini.	Max.	Mini.	Max.	Mini.	
Paper -I	Plant Development & Resource Utilization	80	16	10	2	10	2	100
Paper -II	Plant Ecology, Diversity	80	16	10	2	10	2	100
Paper -III	Biotechnology-I Genetic Engineering of Plants & Microbes	80	16	10	2	10	2	100
Paper -IV	Elective Paper- a. Microbial ecology b. Ethnobotany	80	16	10	2	10	2	100

**Practical**

**Part B**

	Name of the Practical	Marks	
		Max.	Mini.
Practical-I	Practical based on paper -I ,II & III	150	54
Practical-II	Practical based on paper – IV(Elective Paper <b>a.</b> Microbial ecology <b>b.</b> Ethnobotany)	50	18

Signature of Chairman

Signature of Member (Subject)



**DEPARTMENT OF BOTANY**  
**CLASS-M.Sc.(Botany) 3<sup>rd</sup> SEMESTER**  
**SESSION: 2020-21**

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**PAPER –I**

**Plant Development and Resource Utilization**

**MAXIMUM MARKS: 80**

**NUMBER OF UNIT: IV**

**MINIMUM MARKS: 16**

**Unit – I**

- ❖ **Introduction:** Unique features of plant development
- ❖ **Seed germination and seedling growth:** Metabolism of nucleic acids, proteins and mobilization of food reserves; tropisms; hormonal control of seedling growth; gene expression; use of mutants in understanding seedling development.

**Unit – II**

- ❖ **Leaf growth and differentiation:** Determination, Phyllotaxy; control of leaf form; differentiation of epidermis (with special reference to stomata and trichomes) and mesophyll.
- ❖ **Root development:** Organization of the Root Apical Meristem (RAM); lateral roots; root hairs; root-microbe interactions.

**Unit – III**

- ❖ **Shoot development:** Organization of the Shoot Apical Meristem (SAM); cytological and

molecular analysis of SAM; control of cell division and cell to cell communication; control of tissue differentiation, especially xylem and phloem; secretory ducts and laticifers; wood development in relation to environmental factors.

### **Unit – IV**

- ❖ **Origin of Agriculture:** Origin and evolution of Botany, cultivation and uses of (i) Food, Forage and Fodder crops, (ii) Fiber crops, (iii) Medicinal and Aromatic Plants & (iv) Vegetable oil-yielding crops. Important fire-wood and timber-yielding plants and Non-wood Forest Products (NTFPs) such as bamboos, rattans, raw materials for paper-making, gums, tannins, dyes, resins and fruits.

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**CLASS-M.Sc.(Botany) 3<sup>rd</sup> SEMESTER**  
**SESSION: 2020-21**

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**PAPER –II**

**Plant Ecology and Diversity**

**MAXIMUM MARKS: 80**

**NUMBER OF UNIT: IV**

**MINIMUM MARKS: 16**

**Unit – I**

- ❖ **Ecosystem Organization:** Structure and functions; primary production (methods of measurement, global pattern, controlling factors); energy dynamics (trophic organization energy flow pathways, ecological efficiencies); litter fall and decomposition (mechanism, substrate quality and climatic factors) global biogeochemical cycles of C, N, P and S; mineral cycles (pathways, processes, budgets) in terrestrial and aquatic ecosystems.

**Unit –II**

- ❖ **Vegetation organization:** Concepts of community and continuum; analysis of communities (analytical and synthetic characters); community coefficients, inter-specific associations, ordination, concept of ecological niche.
- ❖ **Vegetation development:** Temporal changes (cyclic and non-cyclic); mechanism of ecological succession (relay floristic and initial floristic composition; facilitation, tolerance and inhibition models); changes in ecosystem properties during succession.

**Unit- III**

- ❖ **Biological diversity:** Concept and levels; role of biodiversity in ecosystem functions and stability; speciation and extinction; IUCN categories of threat; distribution and global patterns; terrestrial biodiversity hot spots; inventory.
- ❖ **World centers of primary diversity of domesticated plants:** The Indo-Burmese center, plant introductions and secondary centers.

## Unit – IV

- ❖ **Climate, Soil and Vegetation patterns of the world:** Life zones, major biomes and major vegetation and soil types of the world.
- ❖ **Climate, Soil and Vegetation patterns of India:** Life zones, major biomes and major vegetation and soil types of India.

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**DEPARTMENT OF BOTANY**  
**CLASS-M.Sc. (Botany) 3<sup>rd</sup> SEMESTER**  
**SESSION: 2020-21**

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**PAPER –III**

**Biotechnology I- Genetic Engineering of Plants and Microbes**

**MAXIMUM MARKS: 80**

**NUMBER OF UNIT: IV**

**MINIMUM MARKS: 16**

**Unit – I**

- ❖ **Biotechnology:** Basic concepts, Principles and scope.
- ❖ **Recombinant DNA technology:** Gene cloning, Principles and Techniques.  
Construction of Genomics/ cDNA libraries, choice of vectors, DNA synthesis and sequencing.

**Unit – II**

- ❖ Polymerase chain reaction, DNA fingerprinting, Basic concepts of Bioinformatics, functional genomic, micro array, Protein profiling and its significance.

**Unit – III**

- ❖ **Genetic Engineering of plants:** Aims, strategies for development of transgenics (with suitable examples).
- ❖ **Agro Bacterium:** The Natural Genetic Engineer
- ❖ T-DNA and transposon mediated gene tagging, Chloroplast transformation and its utility, Intellectual Property Rights (IPR).

## Unit – IV

- ❖ **Microbial Genetic Manipulation:** Bacterial transformation, selection of recombinants and transformation, genetic improvement of industrial microbes and nitrogen fixers, Types and design of fermenters, immobilization of enzymes.

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**PAPER –IV**

**Elective Course –Microbial Ecology**

**MAXI MARKS: 80**

**NUMBER OF UNIT: IV**

**MINIMUM MARKS: 16**

**Unit – I**

- ❖ **Ecological Groups:** Ecological groups of microorganism.
- ❖ Microbial growth.
- ❖ Effect of the environment on microbial growth.
- ❖ Gram positive and Gram negative bacteria, Cyanobacteria, sulphur and iron oxidizing bacteria, Methanotrophs, Mycobacterium, Spore forming bacteria

**Unit – II**

- ❖ **Microbial interaction and industrial Microbiology:** A. Plant-microbe (Phyllosphere and phylloplane) B. Microbe-microbe.
- ❖ Animal microbe interaction.
- ❖ Microbes in Industry:
  - Acid production
  - Alcohol production
  - Antibiotic production

**Unit – III**

- ❖ **Soil Microbiology:** Soil as a habitat for micro-organisms
- ❖ Rhizosphere and Rhizoplane microorganisms.
- ❖ Organic matter decomposition.
- ❖ Role of micro-organisms in Biogeochemical Cycles, Nitrogen fixation by microorganisms

## Unit – IV

- ❖ **Water Microbiology:** Types of water and water micro-organisms
- ❖ Microbial Water Pollution, Water Treatment, Bacteriological analysis of water.
- ❖ **Air Microbiology:** Distribution of microbes in air
- ❖ Indoor aeromicrobiology, Aeroallergens and allergic disorders by air microflora.
- ❖ Collection and enumeration of aeroallergen.

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**PAPER –IV**

**Elective Course –Ethnobotany**

**MAX. MARKS: 80**

**NUMBER OF UNIT: IV**

**MINIMUM MARKS: 16**

**Unit I**

- **Ethnobotany** : History, general account and its sub disciplines.
- Interdisciplinary approaches & aim of ethno botany.
- Main world centers of Ethnobotanical studies, workers & literature of Ethno botany
- Ethnobotany with special reference to Chhattisgarh.
- Ethnobotanical Research done in India:
- Ethnobotany in relation to national priorities and health care programme.
- Practical application of ethnobotany for tribal development programme.

**Unit II**

- Methods and techniques in ethnobotany.
- General account of major and minor tribes of Chhattisgarh with special reference to Gond ,Kamar ,Baiga , Abujhmaria .
- Ethnobotanical aspect of Art & literature.
- Abstract ethnobotany with special reference to folklore, Taboos, Majico-religious beliefs.

### Unit –III

- Ethnobotanical importance of Bacteria, Algae, Fungi, Bryophyta, Pteridophyta and Gymnosperm.
- Ethnoveterinary medicines from plants.
- Major & Minor Forest Products (NWFPs) of Chhattisgarh.
- Ethnobotany in relation to livelihood security reference to tribes.

### Unit- IV

- Ethnobotanical study of following plants with special reference to their medicinal importance  
1. *Azadirachta indica* (Neem) 2. *Emblica officinalis* (Amla) 3. *Ricinus communis* (Andi) 4. *Madhuca indica* (Mahuaa) 5. *Cassia fistula* (Amaltash) 6. *Ficus religiosa* (Pipal) 7. *Oscimum sanctum* (Tulsi) 8. *Asparagus racemosus* (Satavar) 9. *Aloe vera* (Ghrit 34umara) 10. *Andographis paniculata* (Bhui neem).

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**SESSION: 2020-21**

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**Practical – I**

**Time – 6 hours**

<b>S.No.</b>	<b>TITLE</b>	<b>MARKS</b>
1	Study of Root/Shoot /leaf: Anatomical study	15
2	Morphological study and economic importance of Food crop/Fodder/Fiber/Medicinal plants	20
3	Ecological exercise	25
4	Protocols related to biotechnology and genetic engineering of plants and microbes.	30
5	Spotting (1-5)	15
6	Viva-voce	10
7	Field visit and project report	20
8	Sessional	15
<b>Total Marks</b>		<b>150</b>

**Time – 4 hours**

**Practical – II –Elective Paper**

**(Ethnobotany )**

<b>S.No.</b>	<b>TITLE</b>	<b>MARKS</b>
1	Taxonomic description, identification and Ethnobotanical importance of the given plant	10
2	Preparation and uses of herbal drug.	10
3	Comment upon the spots (1-5)	10
4	Report of field study & Herbarium preparation	10
6	Viva-voce	5
7	Sessional	5

<b>Total Marks</b>	<b>50</b>
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**(Microbial Ecology)**

<b>S.NO</b>	<b>TITLE</b>	<b>MARKS</b>
1.	Study of distribution pattern	07
2.	Identification of any two organisms from the pre-exposed plates	08
3.	Pure culture technique and Staining	10
4.	Spotting	10
5.	Viva-Voce	05
6.	Project	05
7.	Sessional	05
<b>Total Marks</b>		<b>50</b>

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**M.Sc. BOTANY**  
**4<sup>th</sup> SEMESTER (2020-21)**

**Theory**

**Part A**

No.	Title							Total
		Theory		Test		Seminar		
		Max.	Mini.	Max.	Mini.	Max.	Mini.	
Paper -I	Plant Reproduction	80	16	10	2	10	2	100
Paper – II	Plant Ecology & Conservation	80	16	10	2	10	2	100
Paper – III	Biotechnology Plant Cell, Tissue & Organ culture	80	16	10	2	10	2	100
Paper – IV	Microbial Ecology/Ethnobotany	80	16	10	2	10	2	100

**Practical**

**Part B**

	Name of the Practical	Marks	
		Max.	Mini.
Practical-I	Practical based on paper -I & II,III	150	50
Practical-II	Practical based on paper – IV	50	18

Signature of Chairman

Signature of Member (Subject)

**DEPARTMENT OF BOTANY**  
**CLASS-M.Sc. (Botany) 4<sup>th</sup> SEMESTER**  
**SESSION: 2020-21**

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**PAPER –I**

**Plant Reproduction**

**MAXIMUM MARKS: 80**

**NUMBER OF UNIT: IV**

**MINIMUM MARKS: 16**

**Unit – I**

- ❖ **Reproduction:** Vegetative options and sexual reproduction; flower development; genetics of floral organ differentiation; homeotic mutant in *Arabidopsis* and *Antirrhinum*; sex determination.
- ❖ **Male Gametophyte:** Structure of anthers; microsporogenesis, role of Tapetum; Pollen development and Gene expression; Male sterility; Sperm dimorphism pollen germination, Pollen storage; Pollen allergy.

**Unit -II**

- ❖ **Female Gametophyte:** Ovule development; megasporogenesis; organization of the embryo sac, structure of the embryo sac cells.
- ❖ **Pollination, Pollen-pistil interaction and Fertilization:** Global Characteristics, Pollination mechanisms ; breeding systems; commercial considerations; structure of the pistil; Pollen-stigma interactions, Sporophytic and Gametophytic self compatibility (cytological, biochemical and molecular aspects); double fertilization, in-vitro fertilization.

**Unit – III**

- ❖ **Seed development and Fruit growth:** Endosperm development during early, maturation and desiccation stages; embryogenesis, ultra structure and nuclear cytology; cell lineages during late embryo development; storage proteins of endosperm and embryo;

Polyembryony; Apomixis; Embryo culture; Dynamics of fruit growth; Biochemistry and Molecular biology of fruit maturation.

### Unit – IV

- ❖ **Latent life-dormancy:** Importance and types of dormancy; Seed dormancy; overcoming seed dormancy; Bud dormancy;
- ❖ **Senescence and programmed Cell death (PCD):** Basic concepts, types of cell death, PAD in the life cycle of plants, metabolic changes associated with senescence and its regulation; influence of hormones and environmental factors on Senescence.

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**SESSION: 2020-21**

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**PAPER –II**

**Plant Ecology & Conservation**

MAXIMUM MARKS: 80  
MINIMUM MARKS : 16

NUMBER OF UNIT: IV

**Unit – I**

- ❖ **Air Pollution:** Kinds, sources, quality parameters; Effects on plants and ecosystems. Climate change, Green house gases (CO<sub>2</sub>, CH<sub>4</sub>, NO<sub>2</sub>, CFCs: sources, trends and role) Ozone layer and Ozone hole, consequences of climate change (CO<sub>2</sub> fertilization, Global Warming, Sea level rise, UV radiation).

**Unit – II**

- ❖ **Water Pollution & Soil Pollution:** Kinds, source, quality parameters, effects on plants and ecosystems.
- ❖ Radioactive pollution.
- ❖ Noise Pollution.

**Unit – III**

- ❖ Plant used in Social forestry, Agro forestry and in pollution control, Extinction, Environmental status of plants based on International Union for Conservation of Nature (IUCN), Air conditioning by plants.
- ❖ **Ecosystem Stability:** Concept (resistance and resilience), Ecological perturbation (natural and anthropogenic) and their impact on plants and ecosystems, Plant invasion, Environmental impact assessment, Ecosystem restoration.



## Unit – IV

- ❖ **Ecological Management:** Concepts, Conservation and management of natural resources, Principles of Conservation Sustainable development & Sustainability Bio-indicators
- ❖ **Strategies for conservation, *in-situ conservation*** :International efforts and Indian initiatives; protected areas in India-sanctuaries, national parks, biospheres reserves, wetlands, mangroves and coral reefs for conservation of wild biodiversity.
- ❖ **Strategies for conservation, *Ex-situ conservation***: Principles and practices, botanical garden, field gene banks, seed banks, in vitro repositories, cryobanks and general account of the activities of botanical survey of India {BSI} National bureau of plant genetic resources {NBPGR} Indian council of agriculture research {ICAR} Council of scientific and industrial research {CSIR} and the department of biotechnology {DBT} for conservation, non formal conservation efforts.

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**CLASS-M.Sc. (Botany) 4<sup>th</sup> SEMESTER**  
**SESSION: 2020-21**

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**PAPER –III**

**Plant Cell, Tissue and Organ Culture**

**MAXIMUM MARKS: 80**

**NUMBER OF UNIT: IV**

**MINIMUM MARKS: 16**

**Unit – I**

- ❖ **PLANTS CELL AND TISSUE CULTURE** : General introduction, history, scope, concept of cellular differentiation totipotency.
- ❖ **TISSUE CULTURE MEDIA**: Media constituents, Media selection, Media preparation.
- ❖ **CELL CULTURE** : Isolation of single cells, Suspension cultures, Culture of Single cell, Plant cell reactors, application of cell culture.
- ❖ **CLONAL PROPAGATION**- Auxillary bud proliferation, Meristem and shoot tip culture, bud culture.
- ❖ **ORGANOGENESIS AND ADVENTIVE EMBRYOGENESIS**: Fundamental aspects of morphogenesis via callus formation, direct adventitive organ formation.

**Unit – II**

- ❖ **SOMATIC EMBRYOGENESIS AND ANDROGENESIS**: Mechanism, techniques and utility.
- ❖ **SOMATIC HYBRIDIZATION**: Methods of Protoplast isolation, Spontaneous and induced methods of protoplasm fusion, identification and selection of hybrid cells, Regeneration of hybrid plants, Vetrification and Characterization of somatic hybrids, Cybrids, Possibilities achievements and limitation of protoplast research.

**Unit – III**

- ❖ **CRYOPRESERVATION AND GERMLASM STORAGE**: Raising sterile tissue cultures, Addition of cryoprotectants and pre-treatment, freezing, storage, thawing, determination

of survival viability. Plant growth and generation, verification, encapsulation and dehydration, slow growth method.

### **Unit – IV**

- ❖ **APPLICATION OF PLANT TISSUE CULTURE:** artificial seeds, Production of hybrids and somaclones.
- ❖ **PRODUCTION OF SECONDARY METABOLITES/ NATURAL PRODUCTS:** Morphological and chemical differentiation, medium composition for secondary product formation, Growth production patterns, Environmental factors, Selection of cell lines producing high amounts of a useful metabolite, Problems associated with secondary metabolite production, Immobilized cell system.
- ❖ **TRANSGENICS IN CROP IMPROVEMENT:** Transgenic for Resistance of biotic and a biotic stresses, Transgenic for quality modification, Terminator seed technology.

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**SESSION: 2020-21**

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**PAPER –IV**

**Elective Course Microbial Ecology**

**MAXIMUM MARKS: 80**

**NUMBER OF UNIT: IV**

**MINIMUM MARKS: 16**

**UNIT I**

**Environmental Microbiology:** Waste as a resource, Biogas production. Sewage Treatment.

- ❖ Heavy metal tolerance in microbes & mechanism of heavy metal resistance
- ❖ Biodegradation. Biodeterioration, Bioremediation, Biofertilizers , Biopesticides.

**UNIT – II**

- ❖ **Diseases:** symptoms and types of bacterial disease- citrus canker, bacterial blight of rice, scab of potato, angular leaf spot of cotton, leaf spot of mango.
- ❖ **Etiology of Nematodal diseases**-ear cockle of wheat, molyar disease of barley, root knot of vegetable crops.
- ❖ **Etiology transmission of viral diseases**-Leaf curl of papaya, mosaic of bhindi, yellow mosaic of legumes, bunchy top of banana.
- ❖ **Etiology mycoplasmal diseases**-grassy shoot of sugarcane, mycoplasmal disease of potato, citrus greening, little leaf of brinjal.
- ❖ **Etiology of fungal diseases**- Downey mildews, powdery mildews, rusts, smuts & wilt.

**UNIT – III**

**Medical Microbiology:**

- ❖ **Protozoan Disease:** Name of diseases-Malaria, Giardiasis, Trypanosomiasis, Amoebiasis.

- ❖ **Fungal Disease:** Phycomycosis, Candidiasis, Actinomycosis, Dermatophytosis, Aspergillosis, Penicillinosis.
- ❖ **Bacterial Disease:** Tuberculosis, Diphtheria, Cholera, Shigellosis, Typhoid, and Tetanus.
- ❖ **Viral Disease:** Influenza, Polio

#### UNIT – IV

##### **Instrumentation & Techniques:-**

- ❖ **Microscopy:** Light microscope, Electron Microscope (Transmission & Scanning), Colorimeter, Spectrophotometry, Chromatography, Electrophoresis, Laminar air flow, Collection sampling and identification of indoor microflora special reference to Library and Class rooms.

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**CLASS-M.Sc.(Botany) 4<sup>th</sup> SEMESTER**

**SESSION: 2020-21**

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**PAPER –IV**

**Elective Course – Ethno botany**

**MAXIMUM MARKS: 80**

**NUMBER OF UNIT: IV**

**MINIMUM MARKS: 16**

**Unit- I**

- Plant Conservation by Tribes & role of Joint Forest Management Programme in Plant Conservation specially People's Protected Area
- Ethnobotany and its role in domestication and conservation of native plant and genetic resources.
- The protection of plant varieties and Intellectual Properties Rights.
- General account of conservation of medicinal plants.
- General role of Aromatic plants.

**Unit-II**

- General ideas of various system of medicine using plants.
- Basic knowledge of Ayurvedic, Homeopathic, Allopathic system of medicine.
- General idea of active principles of Plants.
- Herbal Cosmetics.
- General account of toxic plants and Harmful effect of plants on human society with special reference to allergic plants of Chhattisgarh.

**Unit –III**

- Endemic plants of Chhattisgarh.
- Endangered plants of Chhattisgarh.
- Techniques of cultivation and marketing of Aromatic plants –Podina, Lemon grass Kasturi bhindi, Palm rose.
- Techniques of cultivation, marketing and importance of mushroom
- Techniques of cultivation, extraction of juice and importance of wheat grass.

## Unit-IV

- Ethnobotanical study of the following plants with special reference to their medicinal importance-

- Allium sativum* (Lahsun)
- Aegle marmelos* (Bel)
- Terminallia arjuna* (Arjun)
- T. bellerica* (Bahera)
- T. chebula* (Harra)
- Calendula officianallis* (Calendula)
- Thuja occidentalis* (Vidhya)
- Datura alba* (Datura)
- Argemone maxicana* (Pili kateli)
- Ephedra* sps. (Ephedra).

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**DEPARTMENT OF BOTANY**

**CLASS-M.Sc. (Botany) 4<sup>th</sup> SEMESTER**

**SESSION: 2020-21**

**Time- 8 hours**

**Practical – I**

**Max. Marks- 75**

<b>S.NO.</b>	<b>TITLE</b>	<b>MAX. MARKS</b>
1	Study of Anther/Ovules seed	10
2	Ecological exercise	30
3	Social Forestry	20
4	Tissue culture technique	20
5	Spotting (1-10)	30
6.	Viva-voce	10
7	Herbarium preparation	15
8	Sessional	15
<b>Total Marks</b>		<b>150</b>

**Elective Course – Ethnobotany (2020-21)**

**Time- 4 hours**

**Practical – II**

**Max. Marks- 50**

<b>S.No.</b>	<b>TITLE</b>	<b>MAX. MARKS</b>
1	Taxonomic description, identification and Ethnobotanical importance of the given plant	10
2	Prepare the herbal drug as sign to you, Give the procedure of preparation and its uses	10
3	Comment upon the spots	10
4	Report of field study/Herbarium	10
5	Viva-voce	5
6	Sessional	5
<b>Total Marks</b>		<b>50</b>



## Microbial Ecology

**Time-4 Hrs.**

**M.M. 25**

<b>S.NO.</b>	<b>TITLE</b>	<b>MAX. MARKS</b>
1	Pathological study of plant diseases.	10
2	Study of pathogenic microbes in relation to human.	05
3	Comment on the Experiment	05
4	Spotting	10
5	Instrumentation	05
6	Viva-voce	05
7	Sessional	10
<b>Total Marks</b>		<b>50</b>

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