

Department of Botany



**Learning Outcomes, Programme Outcomes,
Programme Specific Outcomes**

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Course Outcomes

VISION

- ❖ The vision of the department is to build a vibrant learning community that would promote social responsibility & patriotism.

MISSION

- ❖ Our mission is to provide unique learning experiences which enable the students to realize their potential & develop their overall personality.

Department of Botany

Programs: 1. Graduation: B.Sc. (Annual Pattern)

2. Post Graduation: M.Sc. (Semester Pattern)

OBJECTIVES

- To ensure adequate knowledge to identify and know the significance of microbial and plant diversity.
- To be able to harbour the potentiality of microbes to fulfill the needs of day to day life.
- To train the students to be able to know the potential uses of plants and the conservation methods to protect them for sustainable development.
- To provide the basic knowledge and significance of Paleobotany.
- To develop the better understanding towards recent trends in plant taxonomy.
- To ensure hands on training on different laboratories and herbarium techniques.
- To have adequate knowledge of morphology, anatomy and plant genetics.
- To achieve expertise in plant propagation methods along with the present days highly advance technique viz. plant tissue culture, genetic recombination etc.
- To have adequate knowledge of physiology and biochemistry of plants and microbes.
- To be able to identify the environmental issues / problems and become capable to find out the best solution of the problem for sustainability.

B.Sc. - Biology (with Botany as one subject)**LEARNING OUTCOMES (LOs)**

LO1. Deep Knowledge – Apply their broad knowledge of science across a range of fields.

LO2. Research Applications – Apply appropriate methods of research, investigation and design.

LO3. Proficiency in Technology – Recognize the need for information employ highly developed conceptual, analytic, qualitative and quantitative technical skills.

LO4. Team Work – Work effectively in groups to meet a shared goal with people whose disciplinary and cultural background differs from their own.

LO5. Professional Ethical Behavior – Demonstrative personal and professional integrity by respecting diverse point of view and intellectual contribution of other.

LO6.Environmental Sensitivity – To sensitize young ones towards environmental sustainability and significance of sustainable development.

PROGRAMME OUTCOMES (POs)

PO1. Basic Knowledge: Exposure to the range of plant diversity in terms of structure, function, reproduction, environmental relationships and its phylogenetic evaluation. Plants identification, classification and its importance in the global ecosystem.

PO2. Thinking capability: To assess plant diversity & its importance, legal & environmental issues and the consequent responsibilities relevant to the biodiversity conservation practice.

PO3. Problem resolving: Identify the systematic position & possible family of plants, formulate the taxonomic literature and analyze reported plants with substantiated conclusions using principles and methods of nomenclature and classification as per standard flora available in Botany.

PO4. Research activity Skills: Understand research-based knowledge and research methods including method of experiments, analysis and interpretation of data, development of the information and discussion to provide valid conclusions to the learners.

PO5. Practical Knowledge: Use of digital skills integrated to enhance understanding of fundamental concepts, execute assignments and standardize protocols for practical during their practical classes.

PO6. Communicative skills: Work effectively on complex activities with other community / society. Being able to comprehend and write effective reports and design documentation, make effective presentations and being able to decipher & receive clear instructions.

PO7. Work together: Function effectively as a member or leader in teams. Students will learn team workmanship and develop leadership qualities in order to serve efficiently in institutions and society

PO8. Environmental Awareness: Becomes aware of the role of positive human activities in nature, significance of sustainable development and conservation of flora.

PO9. Self-studying: Ability to work individually / independently, identify appropriate resources required for experiments, project and manage up to completion.

PO10. Long term learning: Acquire the skill to be an independent long term learner. Promoting continuous development & improvement of the knowledge and skills needed for employment and personal fulfillment.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1. Students will be capable to access the primary knowledge, identify desirable works for a specific topic and able to evaluate the scientific content.

PSO2. Students will be able to identify the major groups of plants and be able to classify them within a phylogenetic framework.

PSO3. Students will be able to compare and contrast the characteristics of plants that differentiate them from each other and from other forms of life.

PSO4. Students will be able to explicate the ecological interconnectedness of life on earth by tracing energy and nutrient flows / biogeochemical cycle in the environment.

PSO6. Students will be able to communicate the role of plant in the functioning of global ecosystem.

PSO7. Student will acquire various communicative skills and will be able to manage with institutions.

PSO8 Student will develop the concept of conservation and sustainable development.

PSO9 Students will develop the concept of Tissue culture and Instrumentation technique.

PSO10. Student will develop the art of analysis and interpretation of data.

SCHEME OF EXAMINATION

SUBJECT	PAPER	MAX. MARKS	TOTAL MARKS	MIN. MARKS
Environmental Studies	-	75	100	33
Field Work	-	25		
Foundation Course – Hindi Language	I	75	75	26
Foundation Course – English Language	I	75	75	26
Three Elective Subject:				
Botany	I	50	100	33
	II	50		
	Practical	50	50	17
Zoology	I	50	100	33
	II	50		
	Practical	50	50	17
Chemistry	I	33	100	33
	II	33		
	III	34		
	Practical	50	50	17
Microbiology	I	50	100	33
	II	50		
	Practical	50	50	17
Biotechnology	I	50	100	33
	II	50		
	Practical	50	50	17

COURSE PROFILE

CLASS	SUBJECT	PAPER	NAME OF PAPER
B. SC. PART - I	BOTANY	I	Bacteria, Viruses, Fungi, Lichens and Algae
		II	Bryophyta, Pteridophyta, Gymnosperms and Palaeobotany
B. SC. PART - II	BOTANY	I	Plant Taxonomy, Economic Botany, Plant Anatomy and Embryology
		II	Ecology and Plant Physiology

B. SC. PART - III	BOTANY	I	Analytic Technology, Plant Pathology, Experimental Embryology, Elementary Biostatistics, Environmental Pollution and Conservation
		II	Genetics, Molecular Biology, Biotechnology and Biochemistry

COURSE OUTCOMES (COs)

COURSE OUTCOMES		
PAPER	NAME OF PAPER/ CODE	OUTCOMES
After completion of the course the student should be able to		
<u>B.Sc. Part – I</u>		
PAPER - I	BACTERIA, VIRUSES, FUNGI, LICHENS AND ALGAE	CO1. To Understand: A brief account on general characteristics of lower plants i.e., <i>Viruses</i> , <i>Cyanophages</i> and <i>Mycorrhiza</i> and its economic importance.
		CO2. To Understand: General characters, classification, reproduction and economic importance of Bacteria, study of <i>Rhizobium</i> , <i>Azotobacter</i> & <i>Anabaena</i> and its role on Microbial biotechnology.
		CO3. To Understand: General account of habit & habitat, cell wall composition, nutrition and reproduction in fungi. VAM fungi, Parasexuality and Heterothallism and life cycle of various fungi.
		CO4. To Understand: General account, thallus organization, reproduction and life cycle patterns of Algae. Study of Gaidukov Phenomenon and life cycles of various algae.
		CO5. To Understand: General Account, types, nutrition, reproduction and economic importance of Lichen, Mycoplasma, role of Blue Green Algae and Mushroom Biotechnology.
PAPER - II	BRYOPHYTA, PTERIDOPHYTA, GYMNOSPERMS AND PALAEOBOTANY	CO1. To Understand: General account, thallus organization, classification, economic & ecological importance of Bryophyta. Evolution of sporophyte and reproduction of various Bryophytes.
		CO2. To Understand: General account, classification, economic importance of Pteridophyte. Heterospory and seed habit, Stellar system, Telome theory and role of <i>Azolla</i> as biofertilizers.
		CO3. To Understand: Morphology, anatomy and reproductive structure of <i>Psilotum</i> , <i>Lycopodium</i> , <i>Selaginella</i> , <i>Equisetum</i> and <i>Marsilea</i> .
		CO4. To Understand: General characters of Gymnosperms its affinity and economic importance and detailed study of <i>Cycas</i> , <i>Pinus</i> and <i>Ephedra</i> .
		CO5. To Understand: An account on Palaeobotany (Geological time scale & Types of fossils, process of fossilization) and study of some fossil of Pteridophyta & Gymnosperms.

B.Sc. Part – II

PAPER - I	PLANT TAXONOMY, ECONOMIC BOTANY, PLANT ANATOMY AND EMBRYOLOGY	CO1. To Understand: Classification of Angiosperm, Binomial Nomenclature, IUCN, Typification, Numerical Taxonomy and Chemotaxonomy. Preservation of Plant material, Herbarium techniques, Botanical gardens and Herbaria of India and abroad.
		CO2. To Understand: Some important dicotyledonous (Polypetalae, Gamopetalae & Monochlamydeae) and monocotyledonous families.
		CO3. To Understand: Economically Important fiber yielding plants, Timber yielding plants, Food plants, Medicinal plants, Spices, Beverages, Cultivation of important flowers and Ethno-botany in context of Chhattisgarh State.
		CO4. To Understand: Meristem theories, Anatomical and Anomalous Primary and Secondary structure in Plants.
		CO5. To Understand: Embryological Study of Angiospermic plants, pollination mechanisms, self incompatibility, polyembryony, Parthenocarpy and fertilization.

COURSE OUTCOMES

PAPER	NAME OF PAPER/ CODE	OUTCOMES
		After completion of the course the student should be able to
B.Sc. Part – II		
PAPER - II	ECOLOGY AND PLANT PHYSIOLOGY	CO1. To Understand: Scope of ecology, morphological and anatomical adaptations in hydrophytes, xerophytes and epiphytes.
		CO2. To Understand: Population and community characteristics, Symbiosis Concept of ecosystem and Biogeochemical cycles.
		CO3. To Understand: Study of Plant water relations and potential, Types of soil water, water holding capacity, transpiration, Stomatal movement and guttation.
		CO4. To Understand: Physiological concept of Photosynthesis, ATP synthesis, C ₃ & C ₄ Plants, photorespiration, and Respiration, Factors affecting respiration, R.Q.
		CO5. To Understand: Plant growth hormones, Physiology of flowering, Photoperiodism and Vernalization. Seed Dormancy and germination, plant movement.
B.Sc. Part – III		
PAPER - I	ANALYTIC TECHNOLOGY, PLANT PATHOLOGY, EXPERIMENTAL EMBRYOLOGY, ELEMENTARY	CO1. To Understand: Structure, Principle and applications of analytical instrumentation.
		CO2. To Understand: Study of Plant Tissue culture techniques, Growth media, Totipotency, Protoplast Culture, Micro-propagation and Analytical techniques.
		CO3. To Understand: Principles of plant pathology, Symptoms of

	BIOSTATISTICS, ENVIRONMENTAL POLLUTION AND CONSERVATION	various diseases, Mode of infection and Control measures, plant quarantine. Epidemiology and etiology of various plant diseases. CO4. To Understand: Pollution, Plant indicators, Bio-geographical Zones of India, Concept of Biodiversity, IUCN threat categories, Invasive species, Endemic species and Concept of sustainable development. CO5. To Understand: Application of Elementary Biostatistics (Mean, Median, Mode), Standard deviation and Standard error.
PAPER - II	GENETICS, MOLECULAR BIOLOGY, BIOTECHNOLOGY AND BIOCHEMISTRY	CO1. To Understand: Cell and cell organelles, Mendel's laws, Gene interactions, Chromosomal aberration, Cytoplasmic inheritance and Gene concept. CO2. To Understand: Nucleic acids, Structure, forms and replication of DNA and RNA, Genetic code and its properties, Mechanism of transcription and translation in prokaryotes, Regulation of gene expression. CO3. To Understand: Detailed study of Recombinant DNA, Cloning vectors, PCR, GM plants and Application of Biotechnology. CO4. To Understand: Chemical composition and structure of Proteins, Carbohydrate and Fat. CO5. To Understand: Study of structure, components, Nomenclature and classification of enzymes.

M. Sc. – Botany**LEARNING OUTCOMES (LOs)****LO1. Mastery of the knowledge -**

- a. Fundamental knowledge of their fields & the ability to apply their expertise to novel as well as emerging problems.
- b. Communicate their research clearly and professionally in both written as well as oral forms appropriate to the field through publications, conference papers, seminars etc.

LO2. Effective researcher –

- a. Able to state research problems, apply various research methods/tools related to their topics or problem.
- b. Able to analyze/interpret research data.

LO3. Professional & ethical responsibilities –

- a. Expected to broaden their professional foundation through activities such as internships, fellowships, teaching and project works.
- b. Conduct original work in the field or complete a substantial project related to the field.

LO4. Skill development –

- a. Demonstrate critical thinking, apply analytical models and reasoning processes to evaluate evidences, select among alternatives and generate creative options.
- b. Possess effective communication skills in oral and written form.
- c. Demonstrate team work and leadership skills; specifically function in a variety of work groups.

LO5. Proficiency in using technology -

- a. Frequent use of internet/OHP/LCD projector during their seminar presentation.
- b. Use of various electronic/digital equipments during their class experiments.

PROGRAMME OUTCOMES (POs)

PO1. Basic knowledge: Role of plants in human life. Expose students to the diversity amongst plant life forms. Explanation and understanding of Botany and its applied branches.

PO2. Thinking Capability: Develop the capability for the application of acquired knowledge. Capability in statistical analyses of data for improved interpretations and problem resolving.

PO3: Research Activity Skills: Increase Ability to execute inventive research works. Consciousness to search the details of life forms at micro as well as macro level, cellular and molecular level.

PO4. Analytical Reasoning: Apply the knowledge of basic science, life sciences and fundamental process of plants to study and analyze any plant form.

PO5. Experimental Skills: Create, select, and apply appropriate techniques, resources, and use of instruments and equipments for Biochemical estimation, Molecular Biology, Biotechnology, Tissue culture experiments, cellular and physiological activities of plants with an understanding of the application and limitations.

PO6. Environment Awareness: Capacity to create awareness of natural resources and environment and the importance of conserving it. Motivation to spread the idea of environmental conservation.

PO7. Ethical standards: Appreciate and apply ethical principles to biological science research and studies.

PO8. Digital literacy: Develop skills in using technology to access, manage, manipulate and create information in an ethical and sustainable way, use information in appropriate ways and create new ideas and products.

PO9. Self-Studying: Ability to work individually, identify appropriate resources required for experiments and manage up to completion.

PO10. Long term learning: Acquire the skill to be an independent long term learner. Promoting continuous development and improvement of the knowledge and skills needed for employment and personal fulfillment.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1. Develop a clear understanding of Botany and its applied branches.

PSO2. Able to manage inventive research work.

PSO3. Able to save biodiversity and sustainable use of resources.

PSO4. Capable of self-study and learning from the social environment by acquiring digital skills.

PSO5. Proficient in the experimental techniques and methods of analysis appropriate for their area of specialization within biological science.

PSO6. Competent to apply fundamental statistics tools and principles to the analysis of relevant biological situations.

PSO7. Capable to understand physical environment, structure of populations, communities, and ecosystems.

PSO8. Students will be able to explain how organisms function at the level of the gene, genome, cell, tissue, organ and organ-system.

PSO9. To apply the scientific method to questions in biology by formulating hypotheses, gathering data and analyzing data to assess the degree to which their scientific work supports their hypotheses.

SCHEME OF EXAMINATION

SEMESTER	TYPE OF EXAM	PAPER	MAX. MARKS	INTERNAL ASSESSMENT/ SEMINAR	TOTAL MARKS
I	THEORY	I	80	20	100
		II	80	20	100
		III	80	20	100
		IV	80	20	100
	PRACTICAL	LC - I	80	20	100
		LC - II	80	20	100
TOTAL MARKS (THEORY & PRACTICAL)			600		
II	THEORY	I	80	20	100
		II	80	20	100
		III	80	20	100
		IV	80	20	100
	PRACTICAL	LC - I	80	20	100
		LC - II	80	20	100
TOTAL MARKS (THEORY & PRACTICAL)			600		
TOTAL MARKS (SEMESTER I & II)			1200		
NOTE: Botanical excursion (within or outside Chhattisgarh) is compulsory for the students of M.Sc.					
III	THEORY	I	80	20	100
		II	80	20	100
		III	80	20	100
		IV (Elective)	80	20	100
	PRACTICAL	LC - I	80	20	100
		LC - II	80	20	100
TOTAL MARKS (THEORY & PRACTICAL)			600		
IV	THEORY	I	80	20	100
		II	80	20	100
		III	80	20	100
		IV (Elective)	80	20	100
	PRACTICAL	LC - I	80	20	100
		LC - II	80	20	100
TOTAL MARKS (THEORY & PRACTICAL)			600		
TOTAL MARKS (SEMESTER III & IV)			1200		
TOTAL MARKS (ALL SEMESTER)			2400		
NOTE: 1. Botanical excursion (within or outside Chhattisgarh) is compulsory for the students of M.Sc.					
2. In each semester, each theory paper there will be five questions of equal marks. First question will be based on complete syllabus with no internal choice whereas rest question will be unit wise.					
3. The respective teachers on each paper will ensure the internal evaluation by a class test and a seminar /poster presentation of 20 marks each and submit the foil and counter foil to the HOD by the end of the activity.					

COURSE PROFILE

SEMESTER	EXAM TYPE	PAPER	NAME OF PAPER
SEMESTER I	THEORY	I	Cytology
		II	Genetics
		III	Microbiology, Phycology and Mycology
		IV	Bryophyta, Pteridophyta and Gymnosperm
	PRACTICAL	LC- I	Based on Paper I & III
		LC - II	Based on Paper II & IV
SEMESTER II	THEORY	I	Taxonomy and Diversity of Plants
		II	Molecular Biology
		III	Plant Physiology
		IV	Plant Metabolism
	PRACTICAL	LC- I	Based on Paper I & II
		LC - II	Based on Paper III & IV
SEMESTER III	THEORY	I	Plant Development and Plant Resources
		II	Plant Ecology – I (Ecosystem & Vegetation Ecology)
		III	Biotechnology – I (Biotechnology & Genetic Engineering of Plants and Microbes)
		IV (Elective)	Molecular Plant Pathology - I
	PRACTICAL	LC- I	Based on Paper I & II
		LC - II	Based on Paper III & IV
SEMESTER IV	THEORY	I	Plant Reproduction and Utilization of Resources
		II	Plant Ecology – II (Pollution & Biodiversity Conservation)
		III	Biotechnology – II (Plant cell, Tissue Culture and Organ Culture)
		IV (Elective)	Molecular Plant Pathology - II
	PRACTICAL	LC- I	Based on Paper I & II
		LC - II	Based on Paper III & IV

COURSE OUTCOMES (COs)

COURSE OUTCOMES		
PAPER	NAME OF PAPER/ CODE	OUTCOMES
		After completion of the course the student should be able to
<u>M.Sc. Botany – Ist Semester</u>		
PAPER - I	CYTOLOGY	CO1. To Understand: Structure and Function of Cell, Cell Wall biogenesis and Plasma membrane.
		CO2. To Understand: Structure and Function of Cell organelles, Genome organization.
		CO3. To Understand: Nucleus, Cell cycle and apoptosis, amitosis, mitosis and meiosis.
		CO4. To Understand: Techniques in cell biology, electron microscope, Micrometry and Camera lucida.
PAPER - II	GENETICS	CO1. To Understand: Chromatin organization, Packaging of DNA, Karyotype & ideogram, specialized type of chromosomes and sex chromosomes.
		CO2. To Understand: Mapping of bacteriophage genome, molecular basis of chromosomal pairing.
		CO3. To Understand: Genetic recombination, genetic mapping and Tetrad analysis.
		CO4. To Understand: Plant breeding technique, Hybridization, Alien gene transfer through chromosome manipulation.
PAPER - III	MICROBIOLOGY, PHYCOLOGY AND MYCOLOGY	CO1. To Understand: <i>Archaeobacteria, Eubacteria, Cynobacteria</i> .
		CO2. To Understand: Viruses, Phytoplasmata and Mycoplasma.
		CO3. To Understand: Phycology: classification, account of various members, economic importance, pigmentation, Perennation, evolution and development of sex in algae.
		CO4. To Understand: Mycology: Characteristic feature, classification, reproduction. Recent account of all groups. Mycorrhiza: VAM fungus.
PAPER - IV	BRYOPHYTA, PTERIDOPHYTA AND GYMNOSPERM	CO1. To Understand: Bryophyta: General account, progressive sterilization of sporogenous tissue, spore dispersal mechanism, thallus organization, theory of origin and development.
		CO2. To Understand: Pteridophyta: Introduction, homosporous, heterosporous and origin of seed habit, fossil pteridophyte, prothallus organization.
		CO3. To Understand: Gymnosperm: classification of gymnosperm, affinities, gymnosperm: distribution in India, biotechnology, economic importance, structure and theories regarding origin of Paleozoic ovule.
		CO4. To Understand: Extinct and extant genera of Gymnosperm.

COURSE OUTCOMES		
PAPER	NAME OF PAPER/ CODE	OUTCOMES
		After completion of the course the student should be able to
<u>M.Sc. Botany – IInd Semester</u>		
PAPER - I	TAXONOMY AND DIVERSITY OF PLANTS	CO1. To Understand: Plant nomenclature, plant identification, taxonomic hierarchy, taxonomic evidences.
		CO2. To Understand: Pre and Post Darwinian classifications, recent modifications, fossil angiosperm.
		CO3. To Understand: Study of Dicotyledons families of both Polypetalae and Gamopetalae.
		CO4. To Understand: Study of Monochlamydeae and monocotyledon families.
PAPER - II	MOLECULAR BIOLOGY	CO1. To Understand: RNA and DNA structure, DNA replication.
		CO2. To Understand: Transcription, translation in prokaryotes and eukaryotes, molecular cytogenetic, restriction mapping, multigene families and their evolution.
		CO3. To Understand: Gene structure and expression, protein sorting.
		CO4. To Understand: Mutation: Types, Mutagens, Mutagenesis, Inherited human disease and defects.
PAPER - III	PLANT PHYSIOLOGY	CO1. To Understand: Membrane transport and translocation of water and solutes.
		CO2. To Understand: Signals transduction: G proteins, C-AMP, Calmodulin, Protein kinases, signaling Mechanisms.
		CO3. To Understand: Stress physiology: Mineral nutrition in plants (excess and deficiency).
		CO4. To Understand: Sensory photobiology, the flowering process: Photoperiodism and vernalisation.
PAPER - IV	PLANT METABOLISM	CO1. To Understand: Photosynthesis, Photorespiration, Biosynthesis of starch and sucrose, Physiological and ecological considerations.
		CO2. To Understand: Respiration and Lipid metabolism.
		CO3. To Understand: Nitrogen and Sulphur metabolism.
		CO4. To Understand: Plant growth regulators and elicitors, movements in plants, fundamentals of enzymology.

COURSE OUTCOMES		
PAPER	NAME OF PAPER/ CODE	OUTCOMES
		After completion of the course the student should be able to
<u>M.Sc. Botany – IIIrd Semester</u>		
PAPER - I	PLANT DEVELOPMENT AND PLANT RESOURCES	CO1. To Understand: Introduction of unique feature of plant development, root development.
		CO2. To Understand: Shoot development, Secretary Ducts and laticifers, wood development in relation to environmental factors.
		CO3. To Understand: Leaf development, flower development.
		CO4. To Understand: Plant resources.
PAPER - II	PLANT ECOLOGY-I: ECOSYSTEM AND VEGETATION ECOLOGY	CO1. To Understand: Ecosystem organization, biogeochemical cycles.
		CO2. To Understand: Ecosystem stability and management, Concept of sustainable development.
		CO3. To Understand: Vegetation organization: Concept and analysis of community, coefficients, ecological niche.
		CO4. To Understand: Vegetation development: Temporal changes, ecological succession.
PAPER - III	BIOTECHNOLOGY-I: BIOTECHNOLOGY AND GENETIC ENGINEERING OF PLANTS AND MICROBES	CO1. To Understand: Biotechnology, recombinant DNA technology.
		CO2. To Understand: Microbial genetics manipulations, genetic engineering of plants.
		CO3. To Understand: DNA synthesis and sequencing.
		CO4. To Understand: Genomics and proteomics.
PAPER - IV	ELECTIVE - MOLECULAR PLANT PATHOLOGY - I	CO1. To Understand: Introduction, history and general principle of plant pathology, disease inciting organisms.
		CO2. To Understand: Diseases syndrome and general symptoms of plant disease, sources of infection, pathogenesis.
		CO3. To Understand: Effect of environment on disease development, host parasitic relationship, physiological specialization.
		CO4. To Understand: Recurrence of disease, methods of studying plant disease.

COURSE OUTCOMES		
PAPER	NAME OF PAPER/ CODE	OUTCOMES
		After completion of the course the student should be able to
<u>M.Sc. Botany – IVth Semester</u>		
PAPER - I	PLANT REPRODUCTION AND UTILIZATION OF RESOURCES	CO1. To Understand: Reproduction: Vegetative reproduction, Pollination, Fertilization.
		CO2. To Understand: Male gametophyte: Microsporogenesis, Pollen germination, Pollen allergy, Female gametophyte: Ovule, embryo sac.
		CO3. To Understand: Seed, Polyembryony, apomixes and fruit development, maturation.
		CO4.- To Understand: Utilization of resources, Origin of agriculture, green revolution, ethnobotanical and centre for domesticated plants.
PAPER - II	PLANT ECOLOGY-II: POLLUTION AND BIODIVERSITY CONSERVATION	CO1. To Understand: Climate, soil and vegetation pattern of the world.
		CO2. To Understand: Pollution, climate change and ecosystems.
		CO3. To Understand: Biological diversity, biodiversity hotspots, IUCN categories of threat.
		CO4. To Understand: Conservation strategies: In-situ and Ex-situ conservation.
PAPER - III	BIOTECHNOLOGY-II: PLANT CELL, TISSUE CULTURE AND ORGAN CULTURE	CO1. To Understand: Plant cell and tissue culture, clonal propagation, organogenesis.
		CO2. To Understand: Somatic embryogenesis, androgenesis and somatic hybridization.
		CO3. To Understand: Cryopreservation and germplasm storage, intellectual property rights.
		CO4. To Understand: Application of plant tissue culture, production of secondary metabolites/natural products, transgenic in crop improvement.
PAPER - IV	ELECTIVE - MOLECULAR PLANT PATHOLOGY - II	CO1. To Understand: Epidemiology and disease forecasting, general principle of plant disease control.
		CO2. To Understand: Defense mechanism, resistant and susceptibility.
		CO3. To Understand: Wilt disease, disease due to fungi, disease due to bacteria.
		CO4. To Understand: Disease due to viruses, mycoplasma and nematodes.



Bucessed
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Bhilai Nagar (C.G.)