

GOVT. POSTGRADUATE COLLEGE, GUNA

Affiliated to Jiwaji University, Gwalior (M.P.)

Phone No.: 07542-251641

Email : hegpgcgun@mp.gov.in

Website : <https://highereducation.mp.gov.in/?orgid=179>



Bachelor of Science Subject: Botany

Program Specific Outcomes

After completion of B.Sc. Botany students will be able to-

1. Learn the significance and role of Botany
2. Compare and contrast the characteristics of plants, algae and fungi
3. Learn diversity of plants and evolutionary process in plant kingdom
4. Acquire the knowledge of economically important plants and their significance
5. Learn about plants and human diseases covered by microbes
6. Learn about the important physiological phenomenon like, photosynthesis, respiration, nutrient cycles etc
7. Understand about the emerging plant tissue culture technology, and genetic engineering



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I Year / Certificate Course

COURSE TITLE	COURSE LEARNING OUTCOMES
APPLIED BOTANY S1-BOTA-1T <i>Major-I</i>	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Get the knowledge of application of Botany for human welfare2. Know about different types of pollution and its remedy3. Know about organic farming, horticulture and forestry4. Understand plants used by tribals5. Understand about genetic engineering and plant tissue culture
BASIC BOTANY S1-BOTA-2T <i>Major-II / Minor / Open Elective</i>	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Understand the diversity of plants and evolutionary process in Plant Kingdom2. Understand plant adaptations from aquatic condition to colonize terrestrial habit3. Learn about the changes in morphological, anatomical and reproductive structures that propel plant evolution4. Have knowledge of significance of plants in nature5. Acquaint with locally prevalent microbial diseases of plants and humans
APPLIED BOTANY (PRACTICAL) S1-BOTA-1P <i>Major-I (Practical)</i>	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Identify ethnomedicinal plants2. Prepare soil health card of any agricultural field3. Study vermicomposting and composting of kitchen waste4. Prepare list of important air, water, and soil pollutants of local areas5. Understand Plant Tissue Culture Techniques: sterilisation, inoculation, culture media preparation, acclimatisation and hardening6. Prepare list of ethnomedicinal, food, fibre plants, locally available7. Study local plants grown around agricultural field

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BASIC BOTANY (PRACTICAL) S1-BOTA-2P Major-II / Minor / Open Elective (Practical)	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Study various types of leaves, inflorescences, flowers and fruits2. Understand various parts of simple and compound microscope3. Study plant cells; study of permanent slide of mitosis and meiosis4. Identify various algae like <i>Nostoc</i>, <i>Oscillatoria</i>, <i>Volvox</i>, <i>Spirogyra</i>, <i>Oedogonium</i> etc.5. Identify Bryophytes like <i>Riccia</i>, <i>Marchantia</i>, <i>Anthoceros</i>, <i>Funaria</i> etc.6. Study Pteridophytes like <i>Lycopodium</i>, <i>Sellaginella</i>, <i>Equisetum</i>, <i>Marselia</i> etc.7. Cut section of Pteridophytes and Gymnosperms8. Study cones of Pteridophytes and Gymnosperms9. Study fungi like <i>Mucor</i>, <i>Rhizopus</i>, <i>Aspergillus</i>, <i>Yeast</i>, <i>Penicillium</i>, <i>Alternaria</i>, <i>Albugo</i>, <i>Helminthosporium</i>10. Study fungal plant diseases11. Identify bacteria by Gram Staining Technique



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II Year / Diploma Course

COURSE TITLE	COURSE LEARNING OUTCOMES
PLANT ANATOMY AND EMBRYOLOGY S2-BOTA-1T <i>Major-I</i>	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Understand the internal structure of plants; it will enhance the basic understanding of organization of plant body by cells and tissues2. Understand the dynamic mechanism of plant pollination, fertilization and development3. Have hands on training on section cutting, preparation of slides, study of pollen and ovules4. Understand <i>in vitro</i> fertilization methods
INDUSTRIAL BOTANY S2-BOTA-2T <i>Major-II / Minor / Open Elective</i>	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Get knowledge on plants and their parts used in various industries2. Get an idea to establish plant based natural product industry3. Get knowledge about the grants and funding provider organisations of India4. Understand project proposal preparation for establishment of an industry
PLANT ANATOMY AND EMBRYOLOGY (PRACTICAL) S2-BOTA-1P <i>Major-I (Practical)</i>	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Recognize different types of tissue system2. Acquaint with the internal structure of plant- root, stem, leaf3. Learn the techniques of section cutting and slide preparation4. Demonstrate pollen germination5. Understand types of ovules in plants and placentation through temporary slides/photographs/permanent slides
INDUSTRIAL BOTANY (PRACTICAL) S2-BOTA-2P <i>Major-II / Minor / Open Elective (Practical)</i>	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Get knowledge on plants and their parts used in various industries2. Get an idea to establish plant based natural product industry3. Understand project proposal preparation for establishment of an industry4. Know about grants and funding provider organisation of India

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III Year

COURSE TITLE	COURSE LEARNING OUTCOMES
PLANT PHYSIOLOGY AND BIOCHEMISTRY BSC1Y310	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Understand about biomolecules and importance of water for living being2. Understand important events for plants and human life like photosynthesis and respiration3. Learn about mechanism of enzymes and also about plant hormones
PLANT ECOLOGY, BIODIVERSITY AND PHYTOGEOGRAPHY BSC1Y311	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Learn cell organelles and Signal Transduction2. Learn the effects of variation in chromosome structure and number3. Learn very important modern era technology that is Genetic Engineering and its application4. Understand plant breeding which is extremely important to agriculture
PLANT PHYSIOLOGY AND BIOCHEMISTRY & PLANT ECOLOGY, BIODIVERSITY AND PHYTOGEOGRAPHY (PRACTICAL) BSC1Y310(P)	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Observe osmotic process by Osmoscope of potato, plasmolysis of plant cells, imbibition process in seeds, endosmosis in raisins exosmosis in grapes, transpiration in plants by Bell Jar Method2. Show the rate of transpiration by Ganong's photometer3. Compare stomatal and cuticular transpiration by four leaf method4. Separate chloroplast pigments by strip Paper Chromatography5. Demonstrate evolution of oxygen gas during photosynthesis6. Show RQ in different respirable materials by Ganong's Respirometer7. Test the presence of monosaccharides in plant tissues, starch test in leaves, presence of lipids in plant tissues, presence of proteins in plant tissues8. Demonstrate the activity of amylase and catalase enzymes in plant tissues9. Prepare stained temporary mount of Onion's epidermal peel and to study the plant cells10. Examine the electron micrograph of an eukaryotic cell, chloroplast, mitochondrion, endoplasmic reticulum, Golgi body, ribosome, nucleus11. Isolate DNA from available plant materials such as spinach leaves12. Understand the phenomenon of segregation by yellow and green coloured pea seeds13. Understand Independent Assortment by various types of pea seeds

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Master of Science in Botany

Program Specific Outcomes

After completion of M.Sc. Botany students will be able to -

1. Know the diversity of flora and understand its relation with other existing life forms of our environment
2. Understand about factors affecting plants community as well as forests
3. Understand ecological and economical aspects of whole vegetation community
4. Learn about sustainable use of natural resources and their conservation
5. Know the threats to vegetation and their impact on other life forms
6. Understand the process of evolution of different type of vegetation community



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I Semester

COURSE TITLE	COURSE LEARNING OUTCOMES
BACTERIOLOGY, VIROLOGY AND GENERAL MICROBIOLOGY MSC001	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Treat and prevent disease which are caused by Viruses, Bacteria, Protozoa and Fungi.2. Know about the discovery and development of antibiotics and vaccines3. Use classical, molecular and genomic methods to identify micro-organism isolated from natural environment4. Use good microbiological practices in laboratory setting5. Evaluate how micro- organism interact with animal, plants, other microbes and the environment in beneficial natural ways
BIOLOGY, DIVERSITY OF FUNGI AND PLANT PATHOLOGY MSC002	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Identify various life forms of plants, design, and execute experiments related to basic studies2. Gain knowledge on general concepts and classification of plant disease3. Know the early development and role of different microorganisms in development of plant diseases
BIOLOGY, DIVERSITY OF ALGAE BRYOPHYTES AND LICHENS MSC003	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Understand the diversity among algae2. Know the systematic morphology and structure of Algae, Bryophyta and Lichens3. Understand the useful and harmful activities of Algae, Bryophytes and Lichens4. Understand the life cycle pattern of Algae, Bryophytes and Lichens
BIOLOGY, DIVERSITY OF PTERIDOPHYTES AND GYMNOSPERM MSC004	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Learn the evolution of Pteridophytes and evolutionary relationships between Pteridophyte and Gymnosperms2. Know the vegetative and reproductive organs and interrelations of important groups of Gymnosperms3. Understand the cytology, speciation and evolutionary trends in Gymnosperms4. Know economic importance of Gymnosperms

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<p>PRACTICAL COURSE BASED ON THEORY COURSE 001 AND 002 (PRACTICAL)</p> <p>MSC006</p>	<p><i>After successful completion of this course, students will be able to-</i></p> <ol style="list-style-type: none">1. Prepare culture media2. Isolate different microorganisms (Bacteria, Virus, Fungi) from air, water and soil3. Maintain asepsis in laboratory4. Learn about various methods of bacterial staining to study cell wall, endospore, capsule and flagella5. Identify important genera by using biochemical tests6. Isolate antibiotic resistant bacteria7. Determine quality of milk and drinking water8. Perform drug sensitivity test of different organisms9. Learn about different pure culture techniques10. Learn about fermentation of alcohols and biogas from waste material11. Study morphological characters and reproductive structure of different genera12. Study diseased specimens of plants with reference to symptomatology13. Isolate, purify Single Spore Culture of pathogens14. Measure activity of enzymes of fungal pathogens like cellulase and pectinase15. Perform test of fungicides (systematic and non-systemic) against pathogenic fungi in laboratory16. Learn different staining techniques17. Learn about carbon and nitrogen utilization by fungi18. Understand Biological Control of pathogenic fungi

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COURSE TITLE	COURSE LEARNING OUTCOMES
<p>PRACTICAL COURSE BASED ON THEORY COURSE 003 AND 004 (PRACTICAL)</p> <p>MSC007</p>	<p><i>After successful completion of this course, students will be able to-</i></p> <ol style="list-style-type: none">1. Collect and study different algae and their identification upto generic level2. Prepare synthetic media and cultivation of algae and their maintenance, collection and preservation of algal herbarium; staining techniques of cytological studies3. Learn about Electron Microscopic study of some algae4. Learn morphology and structural study of representative members of the following groups using clear whole mount preparation, dissection and section; Jungermanniales- <i>Pellia</i> and <i>Porella</i>, Marchantiales- <i>Plagiochasma</i>, <i>Dumortiera</i>5. Study morphology and anatomy of vegetative and reproductive tissues and organs using clear whole mounts, dissections, sections, maceration and permanent preparation of living and fossil forms6. Do experiment on spore germination of prothallus, induction of sporophytes7. Prepare models to demonstrate stellar evolution8. Study Pteridophytes in their natural habitats9. Do a comparative study of the anatomy of vegetative and reproductive parts of <i>Gingko</i>, <i>Cedrus</i>, <i>Abies</i>, <i>Picea</i>, <i>Cupressus</i>, <i>Cryptomeria</i> etc.10. Study important reproductive stages through specimens and permanent slides



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II Semester

COURSE TITLE	COURSE LEARNING OUTCOMES
ECOLOGY CLIMATOLOGY SOIL SCIENCE AND AUTECOLOGY MSC2007	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Identify the most important types of soil, distinguish uses and characteristics of different types of soil2. Discover and develop principles of crop and soil science and to apply these principles to the development of new varieties and new crops3. Develop soil science programs, and study sustainability of alternative cropping system such as organic, site specific, biointensive and direct seed system
ANGIOSPERM ANATOMY, EMBRYOLOGY AND PALYNOLOGY MSC2008	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Know about meristems, ontogeny, phylogeny, ultrastructure of primary and secondary xylem and phloem2. Understand contemporary Plant Anatomy and its relation to Taxonomy3. Understand how a plant and plant parts developed from a zygote4. Know about Palynology, which is an important branch of botany
WATER RELATION GROWTH AND DEVELOPMENT MSC2009	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Know basic principles, processes and function of plant growth and reproduction including photosynthesis, respiration etc.2. Understand how plants control the hydration of their cells, including the collection of H₂O from the soil, its transport within the plant and its loss by evaporation from the leaves3. Understand physiological principles and processes involved in plant growth and development
PLANT BIOCHEMISTRY AND METABOLISM MSC2010	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Know about synthesis of proteins, lipids, nucleic acids, carbohydrates and their role in metabolic pathways2. Understand concept of free energy and Gibb's Free Energy Concept3. Understand about nitrogen fixation and interrelation between photosynthesis and nitrogen metabolism

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COURSE TITLE	COURSE LEARNING OUTCOMES
PRACTICAL-I (PRACTICAL) MSC2011	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Study physical and chemical characteristics of soil2. Determine moisture content of soil3. Determine pH of water4. Determine dissolved oxygen in water5. Determine soil profile6. Determine soil texture, colour, consistence7. Determine height of the tree8. Dissect whole mount of endothecium, tapetum, ovule, endosperm and embryo9. Study seed appendages from dissection, structure of seed coat from section and macerations10. Learn techniques of making temporary and permanent microscopic preparation
PRACTICAL -II (PRACTICAL) MSC2012	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Determine water potential in different tissues2. Demonstrate endosmosis by Osmoscope of potato3. Demonstrate plasmolysis and deplasmolysis in plant cell4. Extract and estimate starch5. Measure the rate of transpiration by Ganong's Potometer6. Understand principles of Colorimetry and Spectrophotometry7. Estimate protein by Biuret and Lowry's method8. Demonstrate reducing sugar in fruits9. Separate and identify sugars by Paper Chromatography10. Isolate nitrogen fixing bacteria and estimate the activity of catalase enzyme in plant tissue

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III Semester

COURSE TITLE	COURSE LEARNING OUTCOMES
ANGIOSPERM MORPHOLOGY AND TAXONOMY MSCC043301	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Learn and be trained for usage of floras for identification of species, field trips for preparation of field notes and compilation of plant data2. Understand principles of general Taxonomy and origin and evolution of flower3. Learn about different systems of classification4. Learn about botanical nomenclature and about threatened species, IUCN and Red Data Book
CYTOLOGY AND MOLECULAR BIOLOGY OF PLANTS MSCC043302	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Understand structural organisation of plant cell and cell organelles at molecular level2. Understand genetic composition of plant cell and importance of genetic material like DNA, RNA & Mitosis3. Learn about process of cell division and molecular events during Mitotic and Meiotic cycles4. Understand irregularity in genetic material and its consequences which may result in structural changes in plants
BIOMETRY, BIO- INFORMATICS AND INSTRUMENTATION MSCC043303	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Learn about central tendencies, deviations, Analysis of Variance and Test of Significance2. Understand basic principles and concepts of electrophoresis, chromatography and centrifugation3. Learn about important techniques like microscopy, spectrophotometry and colorimetry4. Know about a very new field: Information Technology and Data types and Database in Molecular Biology

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COURSE TITLE	COURSE LEARNING OUTCOMES
ECOLOGY-II SYNECOLOGY ECOSYSTEMATOLOGY AND PHYTOGEOGRAPHY MSCC043304	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Know about the basic features and different forms of plant community2. Learn about successive stages of development of a plant community and its role in different terrestrial ecosystems as well as other ecosystems3. Understand about the energy transfer in ecosystem at various trophic levels and direction of energy flow and its relative productivity in different types of ecosystem4. Learn about vegetation types and floristic regions of India, Age and Area, Satpura hypothesis
PRACTICAL-I (BASED ON 301 AND 302) (PRACTICAL) MSCC043305	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Prepare typical herbarium, do labelling of herbarium, learn collection procedure of plant sample by using sampling kit2. Survey local flora3. Collect endemic species4. Prepare whole mounts of floral parts of polypetalae, sympetalae and monocots for vasculature5. Prepare model of vascular skeleton of flower and placentation6. Stain and study flagella7. Collect, fix and prepare paraffin blocks of materials8. Learn microtomy and staining of the slides by various methods9. Study size and shape of the cell with help of microscope10. Isolate DNA from plant material
PRACTICAL-II (BASED ON 303 AND 304) (PRACTICAL) MSCC043306	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Perform gel electrophoresis2. Estimate protein by UV-Visible Spectrophotometry3. Study objects under Bright Field Microscope4. Separate biomolecules by Paper and Thin Layer Chromatography5. Separate genetic material by centrifugation6. Determine frequency and abundance of various species by quadrat method7. Determine minimum size of quadrat by Species Area Curve Method

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IV Semester

COURSE TITLE	COURSE LEARNING OUTCOMES
GENETICS PLANT BREEDING AND EVOLUTION MSCC043401	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Know about heredity and details of hereditary unit2. Understand linkage and crossing over and its measurement3. Understand process of genetic recombination and types of mutations4. Know plant breeding and heterosis, both are very important for agriculture
PLANT BIOTECHNOLOGY: INVITROCULTURE GENETIC ENGINEERING AND IPR ISSUES MSCC043402	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Know about plant tissue culture technique and its uses2. Learn about Recombinant DNA Technology and its use in improvement of plants and animals3. Learn about different techniques used in Biotechnology and cloning vehicles
INDUSTRIAL MICROBIOLOGY MSCC043403	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Demonstrate knowledge and understanding of types of antibiotics, its range and production2. Understand immune system and development and production of various kinds of vaccines, vitamins and proteins3. Know about industrial productions of vinegar, citric acid, amino acids etc.4. Learn about biopesticides, biofertilizers and bioremediation
ETHNO-BOTANY AND ISOLATION OF NATURAL PRODUCTS MSCC043404	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Learn about an important branch of Botany - Ethnobotany, in this branch plants used by tribals are studied2. Explain the basic information about the important plants which are used in different system of medicines, such as Ayurveda, Homeopathy, Allopathy, Unani and Siddha3. Gain knowledge of oils used in perfumes, cosmetics and flowering agents

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PRACTICAL-I MSCC043409	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Determine probability of tossing one coin2. Determine probability of throwing the dice3. Determine probability of tossing two coins4. Apply Chi Square Test to the result of above three experiments5. Do emasculation of flower6. Isolate culture of protoplast7. Isolate screening of industrially important microorganism8. Isolate plant DNA9. Prepare culture media
PRACTICAL-II MSCC043410	<i>After successful completion of this course, students will be able to-</i> <ol style="list-style-type: none">1. Isolate and identify bacteria and fungi from bakery products2. Perform fermentation of glucose and sucrose solution by bacteria and fungi3. Isolate and identify different types of fungi and bacteria from curd, rotten fruits and vegetables4. Prepare spawn for cultivation of edible mushrooms5. Observe antagonism among plant pathogens and perform drug sensitivity test on plant pathogens by disc method6. Identify and describe important plants of ethnobotanical importance7. Identify important aromatic plants of the locality8. Extract active ingredients of plant and plant parts9. Extract perfumes of aromatic plants10. Identify diseases of some medicinal plants

(Dr. Niranjana Shrotriya)

CO-ORDINATOR, IQAC

& HOD, Department of Botany

Govt. Postgraduate College, Guna (M.P.)

(Dr. B.K. Tiwari)

PRINCIPAL

Govt. Postgraduate College,

Guna (M.P.)