



**NSCB Memorial Govt. Degree College
Hamirpur
District Hamirpur (H.P.)**

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**Department of Botany
Programme Specific Outcomes (PSO's)
Programme: M.Sc. Botany**

S.No.	On completing M.Sc. Botany, the student will be able to
PSO1	Acquire comprehensive knowledge regarding biology and diversity of algae, fungi, microbes, bryophytes, pteridophytes, gymnosperms and angiosperms.
PSO2	Develop advanced proficiency in laboratory techniques, including plant identification, microbial and molecular techniques, and handling of scientific instruments.
PSO3	Unravel the genetic basis of life, understanding the mechanisms of evolution, and elucidating the intricate processes underlying cellular function, providing insights into the complexity and diversity of life forms. Gain expertise in Biostatistics and bioinformatics a tools for analyzing and interpreting biological data, facilitating evidence-based decision-making, understanding of complex biological systems, contributing to advancements in healthcare and life sciences.
PSO4	Apply acquired knowledge to offer solutions that positively impact human well-being and the environment. Utilize the understanding of botany to address various aspects related to human health, agriculture, conservation, and sustainable practices.
PSO5	Delve deeper into specific areas of botany (choice based) thereby fostering expertise and specialization enhancing job prospects and research opportunities in the field. Moreover, they promote interdisciplinary learning, allowing students to integrate knowledge from different domains and tackle complex botanical challenges.
PSO6	Employ critical thinking skills to conceive and undertake independent projects. Demonstrate the ability to design and execute experiments both in the field and laboratory, utilizing a wide range of required skills. Apply scientific methodologies to address research questions and generate meaningful outcomes

COURSE OUTCOMES (CO's)

The course outcomes (CO) are mapped to the revised Bloom's Taxonomy using the following abbreviations:

R- Remembering, U – Understanding , Ap- Applying, An- Analyzing , E- Evaluating, C- Creating

SEMESTER-1

COURSE NAME: BIOLOGY AND DIVERSITY OF ALGAE AND FUNGI

COURSE CODE:MBOT-101

CREDITS:4

Sr. No.	On completing the course, the student will be able to	PSO's addressed	Cognitive levels
1	Gain a comprehensive understanding of algae, including their habitats, thallus organization, cell ultra-structure, and diverse modes of reproduction.	1,4	R,U
2	Explore the criteria for classifying algae based on pigments, reserved food, and flagella, while also studying the fine structure of algal plastids.	1,4	R,U
3	Learn about the ecological implications of algal blooms, the potential applications of algal biofertilizers, detailed account of lichens and the economic importance of algae and lichens.	4	U,Ap
4	Develop a comprehensive understanding of mycology, including the general characteristics, cell organization, reproduction, and classification trends of fungi. Explore the significance of fungi in various fields such as microbiology, biotechnology, food production, agriculture, and human health.	4	U,Ap
5	Gain knowledge of the structural diversity and reproductive modes of different fungal groups. Learn about sex hormones, heterothallism, and the parasexual cycle in fungi. Understand the importance of fungi in microbiological processes, biodegradation, biosorption, and their role as pathogens in human mycosis.	1,4	R,U,Ap

COURSE NAME: BIOLOGY AND DIVERSITY OF ALGAE AND FUNGI (PRACTICAL)

COURSE CODE:MBOT-101(P)

CREDITS:2

Sr. No.	On completing the course, the student will be able to	PSO's addressed
1	Gain practical skills in collecting algae from different habitats and identifying them, enhancing their understanding of algal taxonomy.	1,4,6
2	Explore the morphological and reproductive stages of selected genera from various algal groups, including Cyanophyta, Chlorophyta, Xanthophyta, Pheophyta, and Rhodophyta,	1,4,6
3	Acquire essential skills for various laboratory techniques, such as sterilization and media preparation, test tube slant preparation, inoculation, and dilution plate method for fungal culture preparation. These skills will enable them to conduct experiments and handle microorganisms effectively	1,3,6

COURSE NAME: CELL AND MOLECULAR BIOLOGY

COURSE CODE:MBOT-102

CREDITS:4

Sr. No.	On completing the course, the student will be able to	PSO's addressed	Cognitive levels
1	Learn about the structural organization of plant and animal cells, including the cell wall, plasma membrane, plasmodesmata, vacuole, microbodies, and organelle transport	1.4	R,U
2	Delve into gene expression mechanisms, such as DNA structure, replication, transcription, RNA splicing, translation, and regulation of gene expression in prokaryotes and eukaryotes.	1,3,5	U,Ap
3	Gain an understanding of cellular dynamics through the study of the cytoskeleton, including microtubules and microfilaments. They will also explore detailed mechanisms of various cell signaling pathways	1,3,4	U, Ap
4	Study in detail apoptosis, cell cycle control, and the molecular basis of cancer and its therapeutic interventions.	3,5	U,Ap

COURSE NAME: CELL AND MOLECULAR BIOLOGY-PRACTICAL
COURSE CODE:MBOT-102(P) **CREDITS:2**

Sr. No.	On completing the course, the student will be able to	PSO's addressed
1	Learn various microscopy techniques including bright field, phase contrast, and fluorescence microscopy, and utilize them for cell imaging and micrometry	1,3,6
2	Use different tools and assays such as radioisotopes, fluorescent probes/dyes, hemocytometer, Trypan blue staining, cytotoxicity assays, transfection of mammalian cells, flow cytometry, chromosome analysis, blood smear preparation, cell staining for apoptosis and necrosis, RNA isolation, and DNA extraction from plants.	1,3,6
3	Gain proficiency in staining methods like simple, negative, acid-fast, Gram staining, spore staining, capsule staining, and lactophenol cotton blue staining for differentiating and studying various cell types and components	1,3,6

COURSE NAME: BIOCHEMISTRY AND METABOLISM
COURSE CODE: MBOT-103 **CREDITS:4**

Sr. No.	On completing the course, the student will be able to	PSO's addressed	Cognitive levels
1	Study the classification, structure, and functions of carbohydrates, proteins, lipids, and nucleic acids, along with the biosynthesis and degradation of purines and pyrimidines.	1,3,5	R,U,Ap
2	Understand enzyme nomenclature, classification, kinetics, inhibition, mechanism of enzyme action, and the role of vitamins as co-enzymes.	1,3,5	U,Ap
3	Learn about thermodynamics, redox potential, electron transport, ATP production, and the metabolism of carbohydrates, proteins, and lipids.	1,3,5	R,U
4	Explore key pathways like glycolysis, Krebs cycle, and fatty acid oxidation, as well as metabolic defects and the biosynthesis and functions of secondary metabolites.	1,3,5	R,U

COURSE NAME: BIOCHEMISTRY AND METABOLISM**COURSE CODE: MBOT-103(P)****CREDITS:2**

Sr. No.	On completing the course, the student will be able to	PSO's addressed
1	learn qualitative and quantitative methods to analyze carbohydrates, including performing tests for identification and determining the content of reducing sugars and glucose in solutions	1,3,5,6
2	gain skills in analyzing fats and oils by determining their saponification value and acid number, providing insights into their composition and quality.	1,3,5,6
3	techniques to analyze proteins, including the determination of protein content using Lowry's method. They will also gain the ability to quantify phenol in solutions, expanding their understanding of different chemical components.	1,3,5,6

COURSE NAME: TOOLS AND TECHNIQUES IN BIOLOGICAL SCIENCES**COURSE CODE: MBOT-104****CREDITS:4**

Sr. No.	On completing the course, the student will be able to	PSO's addressed	Cognitive levels
1	Learn about the principles and applications of centrifugation, electrophoresis, chromatography, and spectrophotometry thus equipping them with the skills to separate and analyze biological components.	1,3,5	U,R,Ap
2	gain proficiency in various microscopy techniques and histological methods for studying biological samples at a cellular and subcellular level, preparing and staining tissues for	1,3,5	U,R,Ap
3	Understand the principles and protocols of cell culture, including media preparation, raising cell lines and harvesting in a controlled laboratory setting.	1,3,5	U,R,Ap
4	Learn about radioisotopes, their detection, and molecular imaging and also explore sampling methods for studying behavior, habitat characterization, and population density estimation in the field.	1,3,5	U,R,Ap

COURSE NAME: TOOLS AND TECHNIQUES IN BIOLOGICAL SCIENCES (PRACTICAL)

COURSE CODE: MBOT-104

CREDITS:2

Sr. No.	On completing the course, the student will be able to	PSO's addressed
1	Understand and apply techniques in cell biology and biochemistry: Students will gain a solid understanding of the principles and techniques used in cell biology and biochemistry, enabling them to apply these techniques effectively in laboratory settings.	1,5,6
2	Develop practical laboratory skills for separation and analysis: Through hands-on experience, students will acquire the necessary skills to perform various separation techniques, such as centrifugation, electrophoresis, and chromatography. They will also learn to analyze and interpret experimental data obtained from these techniques.	1,5,6
3	Analyze and interpret experimental data, and communicate scientific findings effectively: Students will develop the ability to analyze and interpret experimental data, draw meaningful conclusions, and effectively communicate their findings. They will enhance their scientific communication skills through written reports, presentations, and discussions.	1,5,6

SEMESTER-II

COURSE NAME: BIOLOGY AND DIVERSITY OF MICROBES AND PLANT PATHOGENS

COURSE CODE: MBOT-201

CREDITS:4

Sr. No.	On completing the course, the student will be able to	PSO's addressed	Cognitive levels
1	Understand the history, classification, and identification of plant pathogens: Students will gain knowledge of the historical context, classification, and identification techniques for plant pathogens. They will learn to recognize and diagnose plant diseases, understand symptomology, and appreciate the importance of disease identification.	1,3,4	R,U,Ap
2	Explore host-pathogen interactions at different levels: Students will study the mechanisms of pathogen attack and defense at both the plant and cellular levels. They will learn about the physical, physiological, biochemical, and molecular aspects of host-pathogen interactions, developing an understanding of the complex dynamics involved.	1,3,4	R,U,Ap
3	Learn strategies for plant disease management: Students will be introduced to various management approaches for plant diseases, including chemical, biological, and integrated pest management (IPM) systems. They will also explore the development of transgenics, biopesticides, and quarantine measures. The course will emphasize the importance of effective disease management to minimize crop losses.	1,3,5	R,U,Ap

COURSE NAME: BIOLOGY AND DIVERSITY OF MICROBES AND PLANT PATHOGENS (PRACTICAL)

COURSE CODE: MBOT-201(P)

CREDITS:2

Sr. No	On completing the course, the student will be able to	PSO's addressed
1	Master the Gram's staining technique for bacterial classification and identification.	1,3,4,5
2	Understand nitrogen fixation and isolate Rhizobium sp. from legume root nodules	1,4,5
3	Develop skills in sterilization, media preparation, and inoculation techniques for microbiological studies.	1,3,5,6

COURSE NAME: ECOLOGY AND ENVIRONMENT

COURSE CODE: MBOT-202

CREDITS:4

Sr. No.	On completing the course, the student will be able to	PSO's addressed	Cognitive levels
1	Understand the organization and dynamics of ecosystems: Students will gain knowledge about life zones, biomes, community concepts, ecological succession, and ecosystem structure and function. They will learn about primary production, energy dynamics, decomposition, and biogeochemical cycles in terrestrial and aquatic ecosystems.	1,4	R,U
2	Explore population growth and interactions: Students will study models of population growth, reproduction strategies, mating preferences, and spacing systems. They will gain an understanding of population dynamics and the roles of predation, competition, and mutualism in shaping populations.	1,4	U
3	Analyze biodiversity and its importance: Students will learn about the concepts and levels of biological diversity. They will understand the role of biodiversity in ecosystem function and stability. The course will cover topics such as speciation, extinction, terrestrial biodiversity hotspots, and the impact of environmental pollution on ecosystems.	1,4	U

COURSE NAME: ECOLOGY AND ENVIRONMENT(PRACTICAL)

COURSE CODE: MBOT-202(P)

CREDITS:2

Sr. No.	On completing the course, the student will be able to	PSO's addressed
1	Develop practical skills in ecological fieldwork: Students will gain hands-on experience in various ecological field techniques such as determining quadrat size, collecting and identifying plant and animal species, measuring soil temperature, and studying biotic components of ecosystems.	1,4,6
2	Understand soil properties and their implications: Students will learn about the physio-chemical properties of soil, including moisture content, bulk density, soil porosity, water holding capacity, and humus content. They will gain knowledge on how these properties affect soil fertility, water retention, and nutrient availability.	1,4,6

3	Gain insights into community ecology and ecosystem dynamics: Students will study community structures using the quadrat method and learn to calculate relative frequency, density, dominance, abundance, and importance value index (IVI) of species. They will also explore biomass determination and analyze CO ₂ levels in water samples, developing an understanding of ecosystem functioning and environmental indicators	1,4,6
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COURSE NAME: CYTOGENETICS AND EVOLUTION

COURSE CODE: MBOT-203

CREDITS:4

Sr. No.	On completing the course, the student will be able to	PSO's addressed	Cognitive levels
1	Understand the structure of chromosomes, DNA packaging, and replication, and explore sex chromosomes, sex determination, and dosage compensation in different organisms. They will also learn about Mendelian and non-Mendelian inheritance patterns, including epigenetic and extra-nuclear inheritance.	1,3	R,U
2	Analyze gene expression and mutation by studying the genetic code, transcription, and translation. They will explore the regulation of gene expression and the consequences of gene mutations, as well as gain an understanding of DNA repair mechanisms.	1,3,	U
3	Explore population genetics and evolution by learning about allele frequencies, the Hardy-Weinberg Equilibrium, and factors that contribute to genetic change in populations. They will study the origin and evolution of species, speciation processes, and theories of gradualism and punctuated equilibrium.	1,3,4	R,U
4	Additionally, students will gain knowledge of molecular evolution, including experimental approaches, phylogenetic trees, and the neutral theory	1,3,4,5	U,Ap

COURSE NAME: CYTOGENETICS AND EVOLUTION

COURSE CODE: MBOT-203(P)

CREDITS:2

Sr. No.	On completing the course, the student will be able to	PSO's addressed
1	Understand cell division and genetic inheritance: Study mitosis and meiosis, explore multiple alleles and blood group inheritance, and investigate nuclear and cytoplasmic inheritance.	1,,5,6

2	Investigate genetic phenomena and probability: Prepare slides of <i>Drosophila</i> larvae chromosomes, study multiple alleles in <i>Trifolium</i> spp., and apply probability principles to genetic traits.	1,5,6
3	Study genetic phenomena in plants: Examine xenia and metaxenia in maize cobs, investigate human traits, and determine frequencies of hereditary characters	1,5,6

COURSE NAME: BIOSTATISTICS AND BIO-INFORMATICS

COURSE CODE: MBOT-204

CREDITS:4

Sr. No.	On completing the course, the student will be able to	PSO's addressed	Cognitive levels
1	Understand the definition and scope of biostatistics, probability theory, and the analysis of discrete and continuous variables. Learn how to effectively present data and calculate measures of central tendency (mean, median, mode) and standard deviation	1,3,5,6	U, Ap,E
2	Develop proficiency in using biostatistics software for data analysis. Explore analysis of variance, correlation, and regression to examine relationships between variables. Gain knowledge of sampling techniques, framing hypotheses, determining significance levels, and conducting hypothesis tests such as Student's t-test and Chi-square test.	1,3,5,6	U,Ap,E
3	Gain a basic understanding of bioinformatics, genomics, and proteomics databases. Utilize nucleic acid sequence databases (GenBank, UCSC, ENSEMBL, EMBL) and protein sequence databases (Swiss-PROT, PDB). Apply tools like BLAST and FASTA for sequence analysis. Learn about the role of bioinformatics in drug discovery and its applications in computational genomics and proteomics	1,3,5,6	U,Ap,E

COURSE NAME: BIOSTATISTICS AND BIO-INFORMATICS

(PRACTICALS)

COURSE CODE: MBOT-204(P)

CREDITS:4

Sr. No.	On completing the course, the student will be able to	PSO's addressed
1	Learn effective present data and calculate measures of central tendency (mean, median, mode) and standard deviation	1,3,5,6

2	Hands on experience for running ANOVA test, determining significance levels, and conducting hypothesis tests such as Student's t-test and Chi-square test.	1,3,5,6
3	Learn working on bioinformatics tools like BLAST and FASTA for sequence analysis.	3,5,6

SEMESTER-III

COURSE NAME: Biology and Diversity of Bryophytes and Pteridophytes

COURSE CODE: MBOT-301

CREDITS: 4

Sr. No.	On completing the course, the student will be able to	PSO's addressed	Cognitive levels
1	Understand the general introduction, classification, and salient features of Bryophytes and Pteridophytes, comparing them with other plant groups.	1,4	R,U
2	Acquire knowledge about specific taxa within Bryophytes and Pteridophytes, such as Liverworts, Hornworts, Mosses, and various fossil Pteridophyte	1,4	R,U
3	Study the unique characteristics and evolutionary lines within Bryophytes and Pteridophytes, including the morphogenesis, stelar system, sporophyte evolution, heterospory, and seed habit.	1,4	R,U
4	Explore the distribution, ecology, and economic importance of Bryophytes and Pteridophytes, with a particular focus on their presence in India, including the Himalayan region and Himachal Pradesh.	1,3,4	U

COURSE NAME: Biology and Diversity of Bryophytes and Pteridophytes

(PRACTICALS)

COURSE CODE: MBOT-301(P)

CREDITS:2

Sr. No.	On completing the course, the student will be able to	PSO's addressed
1	Gain practical field experience through trips to natural habitats, enabling familiarity with the growth forms, diversity, and natural habitats of Bryophytes and Pteridophytes.	1,4,5

2	Develop a thorough understanding of the morphological and anatomical features of both vegetative and reproductive structures of Bryophytes and Pteridophytes through the examination of specimens, temporary slides, and permanent slides.	1,4,5
3	Acquire practical skills in performing differential staining techniques and preparing permanent slides of Pteridophytes.	1,5,6
4	Expand knowledge about important fossil Pteridophytes through the examination of permanent slides.	1,5

COURSE NAME: Plant Physiology

COURSE CODE: MBOT-302

CREDITS:4

Sr. No.	On completing the course, the student will be able to	PSO's addressed	Cognitive levels
1	Understand the principles of plant-water relations, including water potential, solute transport, and bulk movement of water.	1,4	U
2	Gain knowledge of key physiological processes such as stomatal physiology, photochemistry, and photosynthesis, respiration, and nitrogen and sulphur metabolism.1	1,2,4	R,U
3	Comprehend the role of plant growth regulators and elicitors in regulating plant growth and development	1,4,	U,Ap
4	Acquire an understanding of the flowering process, including photoperiodism, floral induction and development, and the influence of environmental factors	1,4	U,Ap

COURSE NAME: Plant Physiology

COURSE CODE: MBOT-301(P)

CREDITS: 2

Sr. No.	On completing the course, the student will be able to	PSO's addressed
1	Develop practical skills in determining water potential using different methods, including the weighing method, plasmolytic method, and hanging drop method.	1,5,6
2	Acquire proficiency in measuring stomatal index on the adaxial and abaxial surfaces of leaves, providing insights into leaf structure and function.	1,5,6

3	Gain practical experience in assessing the effects of environmental factors such as darkness, K ⁺ concentration, and ABA on stomatal movement.	1,5,6
4	Learn laboratory techniques for enzyme assays, including α -amylase activity in germinating wheat seeds and dehydrogenase activity in excised embryos from germinating bean seed, surface tension of given liquids, electrical adsorption and chlorophyll content determination.	1,5,6

COURSE NAME: Biology and Diversity of Gymnosperms

COURSE CODE: MBOT-303

CREDITS:4

Sr. No.	On completing the course, the student will be able to	PSO's addressed	Cognitive levels
1	Develop a comprehensive understanding of Gymnosperms, including their general introduction, classification, and salient features. Gain knowledge of their evolutionary history through the study of important fossil species in the Cycadopsida and Coniferopsida groups	1,4	R,U
2	Acquire the ability to compare Gymnosperms with other Tracheophyta (vascular plants), enhancing understanding of their unique characteristics and evolutionary relationships.	1,4	U
3	Explore the diversity and characteristics of living Gymnosperms, including Cycadales, Coniferales (including Taxus), Ginkgoales, Ephedrales, Welwitschiales, and Gnetales. Understand their distribution patterns and economic importance, with a specific focus on the distribution of Conifers in India, particularly in Himachal Pradesh	1,4	U
4	Develop practical skills in studying Gymnosperms, such as analyzing the structure and evolution of archegonia, investigating embryogeny processes, conducting comparative studies of leaf anatomy, male and female cones, male and female gametophytes, and understanding pollination mechanism	4,5,6	U,Ap

COURSE NAME: Biology and Diversity of Gymnosperms (PRACTICALS)

COURSE CODE: MBOT-303(P)

CREDITS: 2

Sr. No.	On completing the course, the student will be able to	PSO's addressed
1	Explore Gymnosperm diversity through field trips.	1,4

2	Study the morphology and anatomy of Gymnosperms.	1,4
3	Analyze the commercial significance of Gymnospermic woods.	1,4
4	Investigate the evolutionary history of Gymnosperms using fossil specimens.	1,4,5

COURSE NAME: Biology and Diversity of Angiosperms

COURSE CODE: MBOT-306

CREDITS: 4

Sr. No	On completing the course, the student will be able to	PSO's addressed	Cognitive levels
1	Study the characteristics and significance of fossilized angiosperms in understanding plant evolution and history.	1,4	R,U
2	Explore different systems of angiosperm classification, including phenetic and phylogenetic approaches, and understand the International Code of Botanical Nomenclature.	1,4	R,U
3	Examine the interrelation of taxonomy with anatomy, embryology, palynology, cytology, and secondary metabolites in plants. Learn about numerical taxonomy and its techniques.	1,3,5	R,U
4	Understand concepts such as endemism, hotspots, and plant exploration. Explore the principles of plant conservation, including in-situ and ex-situ strategies, and the importance of intellectual property rights (IPR) in protecting plant resources.	1,4,5	U

COURSE NAME: Biology and Diversity of Angiosperms-PRACTICALS

COURSE CODE: MBOT-306(P)

CREDITS:

Sr. No.	On completing the course, the student will be able to	PSO's addressed
1	Gain knowledge of fossil angiosperms and their importance in understanding plant evolution.	1,4
2	Understand the systems of angiosperm classification and the principles of botanical nomenclature	1,3
3	Analyze the relationship between modern taxonomy and various disciplines, such as anatomy, embryology, and cytology.	3,5
4	Recognize the concepts of phytogeography and plant resource conservation, including conservation strategies and the significance of intellectual property rights	1,4

COURSE NAME: Anatomy, Palynology and Reproductive Biology of Angiosperms

COURSE CODE: MBOT-401

CREDITS: 4

Sr. No.	On completing the course, the student will be able to	PSO's addressed	Cognitive levels
1	Gain knowledge of plant tissues, including their types and functions in roots, stems, and leaves, and understand the process of organogenesis.	1,4	U
2	Develop an understanding of meristems and their ultrastructure, histochemistry, and their role in plant growth and development.	1,4	U
3	Explore secondary growth in plants, including the concept of anomalous secondary growth in stems, and understand ecological adaptations in plant anatomy	1,4	U
4	Acquire knowledge in reproductive biology, including the study of male and female gametophytes, pollen-pistil interaction, fertilization, seed development, and seed dormancy, along with practical skills in palynology techniques	1,4	U

COURSE NAME: Anatomy, Palynology and Reproductive Biology of Angiosperms (PRACTICALS)

COURSE CODE: MBOT-401(P)

CREDITS : 2

Sr. No.	On completing the course, the student will be able to	PSO's addressed
1	Develop the ability to study the vertical sections (V.S.) of apical meristems and understand their structure and function	1,4,6
2	Acquire the skills to cut and stain transverse sections (T.S.) of different plants to observe and analyze anomalous secondary growth	1,4,6
3	Gain knowledge and understanding of the anatomical features of hydrophytes and xerophytes through the study of permanent slides.	1,4,6
4	Develop proficiency in examining and analyzing permanent slides of ovules, anthers, and embryosacs, enhancing their understanding of reproductive structures in plants	1,4,6

COURSE NAME: Plant Resource Utilization and Breeding

COURSE CODE: MBOT-402**CREDITS : 4**

Sr. No.	On completing the course, the student will be able to	PSO's addressed	Cognitive levels
1	Develop a comprehensive understanding of wood and timber, including their formation, composition, properties, and uses. Gain the ability to identify important timber plants such as <i>Pinus</i> , <i>Cedrus</i> , <i>Tectona</i> , and <i>Populus</i> .	1,4	R,U
2	Acquire in-depth knowledge of bamboo, including its structure, properties, and various uses. Understand the significance of bamboo as a valuable nonwood forest product.	1,4	R,U
3	Gain knowledge about cork, including its structure, properties, and applications. Understand the importance of cork as a nonwood forest product.	1,4	U
4	Develop an understanding of tannins, dyes, gums, and resins as nonwood forest products. Explore their general characteristics and applications	1,4	U
5	Gain knowledge about the diverse world of plant resources, including aromatic plants, psychoactive drugs, fruits, nuts, underutilized plants, medicinal plants, bioenergy sources, and the origin of cultivated plants.	1,4	U
6	Explore various aspects such as essential oils, perfumery, poisons, traditional uses, economic importance, and breeding methods, contributing to a comprehensive understanding of plant resources and their applications.	1,3,4	R,U

COURSE NAME: Plant Resource Utilization and Breeding (PRACTICAL)**COURSE CODE: MBOT-402(P)****CREDITS : 2**

Sr. No	On completing the course, the student will be able to	PSO's addressed
1	Understand the three-dimensional structure of wood and its composition, allowing for accurate identification and differentiation between softwood and hardwood	1,4
2	Develop proficiency in preparing and examining permanent slides of various types of wood, including transverse sections, longitudinal sections, tangential longitudinal sections, and radial longitudinal sections.	1,3,4,5

3	Acquire analytical skills to identify and analyze different constituents present in plant-based products, enabling a deeper understanding of their composition and properties	1,4,5,6
4	Gain knowledge of plant morphology and anatomy, specifically focusing on cereals, pulses, fruits, and vegetables, enhancing the ability to identify and study their structural characteristics	1,4

COURSE NAME: Ethnobotany and Biodiversity

COURSE CODE: MBOT-404(i)

CREDITS: 4

Sr. No	On completing the course, the student will be able to	PSO's addressed	Cognitive levels
1	Develop an understanding of traditional botanical knowledge and its significance in the context of ethnobotany, including the history, scope, and importance of the field.	1,3,4,	U
2	Recognize the role of ethnobotany in healthcare and the development of cottage industries in India, appreciating the cultural and economic value of traditional plant-based practices.	1,3,4,5	U,Ap
3	Gain insight into the methods of research in ethnobotany, including data collection, analysis, and documentation of indigenous knowledge and practices	1,3,5,6	U,Ap
4	Understand the importance of plant genetic resources conservation and the role of biotechnology in preserving and utilizing plant diversity, contributing to sustainable resource management and biodiversity conservation.	1,3,4,5	U

COURSE NAME: Ethnobotany and Biodiversity (PRACTICAL)

COURSE CODE: MBOT-404 (P)

CREDITS:2

Sr. No	On completing the course, the student will be able to	PSO's addressed
1	Gain practical experience through visits to tribal areas, collecting plant materials used by tribes, and understanding their cultural significance.	1,4
2	Develop the ability to identify and describe at least 10 plants of ethnobotanical value, including their traditional uses and medicinal properties.	4,6
3	Identify and describe 10 plants used by tribals in their household activities, such as food, shelter, and crafts, highlighting their importance in daily life.	4,6

4	Collect and document plants used by tribals in their socio-cultural customs and taboos, recognizing the interplay between plants and traditional beliefs	4,6
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COURSE NAME: Advances in Plant Physiology and Biochemistry

COURSE CODE: MBOT-404 i

CREDITS:4

Sr. No	On completing the course, the student will be able to	PSO's addressed	Cognitive levels
1	Understand the principles and applications of important phytochemical techniques such as chromatography, spectrophotometry, electrophoresis, centrifugation, and tracer techniques, and apply them in plant research and analysis.	1,2,3,5,6	U,Ap
2	Gain knowledge of the physiology and biochemistry of phytohormones, including their structure, biosynthesis, metabolism, transport, function, and mechanism of action, with a focus on auxins, gibberellins, cytokinins, ethylene, abscisic acid, brassinosteroids, polyamines, jasmonic acid, and salicylic acid.	1,2,3,5	U
3	Explore the discovery, chemical nature, effects on growth and development, and mechanism of action of synthetic growth regulators, including growth inhibitors and retardants, and their applications in manipulating plant growth.	1,4,5	U
4	Develop an understanding of signal transduction in plants, including the overview of signaling pathways, receptors and G proteins, phospholipid signaling, cyclic nucleotides, calcium-calmodulin cascade, diversity in protein kinases and phosphatases, and the sucrose-sensing mechanism	1,2,4	U

COURSE NAME: Advances in Plant Physiology and Biochemistry

(PRACTICAL)

COURSE CODE: MBOT-404 (P)

CREDITS:2

Sr. No	On completing the course, the student will be able to	PSO's addressed
1	Understand the effect of auxin on rhizogenesis in <i>Vigna munga</i> , demonstrating knowledge of plant hormone interactions and their role in root development.	1,4
2	Investigate the impact of kinetin and ABA on leaf senescence, demonstrating an understanding of the physiological processes involved in aging and the influence of plant hormones.	1,5,6

3	Apply paper chromatographic technique to separate amino acids, showcasing proficiency in analytical techniques used in plant biochemistry.	1,5,6
4	Determine the Km value for α -amylase from germinating wheat seeds, showcasing skills in enzyme kinetics and quantitative analysis.	1,5,6

COURSE NAME: PROJECT (Assigned in the 3rd Semester and goes until 4th Semester

COURSE CODE: MBOT-407

S.No.	On completing the course, student will be able to	PSO's covered
1	Grow professionally by networking with faculty, peers, and professionals, and developing effective communication and presentation skills	2,5,6
2	Apply their theoretical knowledge and scientific skills to practical situations through project work in MSc Botany.	2,5,6
3	Enhance their problem-solving and critical thinking abilities by identifying research gaps and proposing innovative solutions.	2,5,6
4	Develop essential research skills, including formulating research questions, designing experiments, and analyzing data	2,5,6