Maratha Vidya Prasarak Samaj Nashik
G.M.D Arts, B.W. Commerce & Science College, Sinnar

DEPARTMENT OF BOTANY

B. Sc. Botany

Programme Outcomes:

Knowledge outcomes:

After completing B.Sc. Botany Programme students will be able to:

PO1: demonstrate and apply the fundamental knowledge of the basic principles of major fields of biology;

PO2: Apply knowledge to solve the issues related to plant sciences with the help of computer technology

PO3: Apply knowledge for conservation of endemic and endangered plant species

Skill outcomes:

After completing B.Sc. Botany Programme students will be able to:

PO4: collaborate effectively on team-oriented projects in the field of life sciences.

PO5: communicate scientific information in a clear and concise manner both orally and in writing

PO6: explain Biodiversity, climate change and plant pathology.

PO7: apply Biotechnology, Ecology, Genetics and Plant breeding techniques in plant sciences

PO8: apply knowledge of Medicinal and Economic botany in day to day life.

PO9: apply the knowledge to develop the sustainable and eco-friendly technology in Industrial Botany

Generic outcomes:

After completing B.Sc. Botany Programme students will be able to:

PO10: Have developed their critical reasoning, judgment and communication skills.

PO11: Augment the recent developments in the field of Molecular and cell Biology, Biotechnology, Computational Botany and relevant fields of research and development.

PO12: Enhance the scientific temper among the students so that to develop a research culture and Implementation the policies to tackle the burning issues at global and local level.

Programme Specific Outcomes

PSO1: Students get acquainted with techniques which are used in industrially important plant products.

PSO2: Students get conceptual knowledge of entrepreneurships in mushroom cultivation, Bio fertilizers and Bio pesticides production, plant tissue culture laboratories, Enzyme production, Fermentation, Single cell proteins etc.

PSO3: Understand the diversity of the plants and structural organization of plants like monocots and Dicot.

PSO4: Understand plant structures in the context of physiological and biochemical functions of plants.

PSO5: Students will be well versed with various mechanisms of GMOs and molecular

techniques.

Course Outcomes

F. Y. B.Sc. Botany

Course 111: Plant life and utilization I

After successfully completing this course, students will be able to:

CO1: outline cryptogams and phanerogams.
CO2: Define general characters of cryptogams.
CO3: Classify the members of plants groups in to cryptogams.
CO4: Describe the Life cycle of plant forms of cryptogams.
CO5: Identify lichens and their economic value.

Course 112: Plant morphology and Anatomy

After successfully completing this course, students will be able to:

CO1: Discuss morphology of vegetative and reproductive parts of plants.
CO2: Describe anatomy of Monocot and dicot plants.
CO3: Explain types of plant tissues.

Course 113 Practical Botany -I

After successfully completing this course, students will be able to: CO1: Define industrial botany.

CO1: Recognize the live forms of Cryptogamic plants.
CO2: Illustrate the floral parts, fruits, leaves and their types.
CO3: Categorize the plants into Monocot and Dicot on the basis of anatomical characters.

Course 121: Plant life and utilization II

After successfully completing this course, students will be able to:

CO1: outline cryptogams and phanerogams.
CO2: Define general characters of Phanerogams.
CO3: Classify the members of plants groups in to Phanerogams.
CO4: Describe the Life cycle of plant forms of Phanerogams.

Course 122: Principles of plant science

After successfully completing this course, students will be able to:

CO1: Define the terminologies: Plant water relations, Growth, Transpiration, Ascent of Sap, Plant growth regulators and Nitrogen metabolism.
CO2: Explain processes of mineral nutrition, absorption of water, ascent of sap, mechanisms of water loss from plants.
CO3: Demonstrate processes imbibition, Osmosis, Diffusion and Plasmolysis, measure growth by arc auxanometer.
CO4: Describe Plant growth regulators and their types.

Course 123: Practical Botany -II

After successfully completing this course, students will be able to:
CO1: Analyse and describe botanical concepts, including plant anatomy.

CO2: Recognize the live forms of Phanerogamic plants.
CO3: Explain conservation and sustainable use of plants;
CO4: Explain and demonstrate the impact that plants have on human society.
CO: Recognize the prokaryotic and eukaryotic plant cell.

Course Outcomes

S. Y. B.Sc. Botany

BO 231: **Taxonomy of Angiosperms and plant Ecology**

After successfully completing this course, students will be able to:

CO1: Define plant taxonomy and taxonomic related terminologies.
CO2: Explain classification systems of angiosperms.
CO3: Use required data sources for classification of angiosperms.
CO4: Determine Botanical Nomenclature of angiosperm plants.
CO5: Recognize ecological plant groups with examples.
CO6: Explain plant families with examples.
CO7: Apply proper herbarium methods - collecting, mounting, and keeping records.
CO8: Execute computer knowledge in plant taxonomy and digital herbarium.

BO 232: **Plant Physiology**

After successfully completing this course, students will be able to:

CO1: Define the terminologies: Plant water relations, Growth, Transpiration, Ascent of Sap, Plant growth regulators and Nitrogen metabolism.
CO2: Explain processes of mineral nutrition, absorption of water, ascent of sap, mechanisms of water loss from plants.
CO3: Demonstrate processes imbibition, Osmosis, Diffusion and Plasmolysis, measure growth by arc auxanometer, Bose Cresco graph.
CO4: Describe Plant growth regulators and their types.
CO5: Discuss nitrogen metabolism in plants
CO6: Explain mechanisms and application of photoperiodism
CO7: Explain Mechanism of vernalisation.
CO8: Classify the plants based on Photoperiodism.

BO 233: Practical Paper III

After successfully completing this course, students will be able to:

CO1: Define the botanical terms to identify the plant families.
CO2: Identify the plant families.
CO3: Draw the floral diagram of plants belonging to specific families.
CO4: Demonstrate physiological experiments, fermentation and fermentation products.
CO5: Calculate water holding capacity, pH, plasmolysis, DPD.

BO 241: Plant Anatomy, Embryology

After successfully completing this course, students will be able to:

CO1: Define terms related to plant Anatomy, Embryology.
CO2: Describe various tissue systems in plants like epidermal, mechanical and vascular.
CO3: Interpret the Principles involved in distribution of mechanical tissues.
CO4: Explain the process of normal and abnormal secondary growth in plants.
CO5: Differentiate between normal and abnormal secondary growth.
CO6: Identify the process of pollination and fertilization.
CO7: Discuss the Structure and development process of male and female gametophyte

CO8: Illustrate the types of microspore, ovules, embryo, seed and endosperm.

BO 242: **Plant Biotechnology**

After successfully completing this course, students will be able to:

CO1: Define the terminologies related to plant biotechnology.
CO2: Describe the fermentation process.
CO3: Explain enzyme technology and their industrial scale production.
CO4: Interpret the production of Single cell proteins.
CO5: Illustrate the concept of phytoremediation.
CO6: Describe General method of gene isolation from the plants and their application.
CO7: Explain Methods of gene, transfer in plants.
CO8: Illustrate Application of plant genetic engineering and Nano-biotechnology in crop improvement.

BO 243: Practical Paper III

After successfully completing this course, students will be able to:

CO1: Describe internal morphology of plant organs.
CO2: Describe the Transpiration process.
CO3: Demonstrate the Electrophoresis and its use.

Course Outcomes

T. Y. B. Sc. Botany

BO 351: **Algae and Fungi**

After successfully completing this course, students will be able to:

CO1: Define Higher and Lower cryptogams.
CO2: Identify the vegetative and reproductive structures in algae and fungi.
CO3: Describe thallus organization of cryptogams.
CO4: Describe the Internal structure of the thallus of the cryptogams.
CO5: Diagram life cycle of various fungal and algal forms.
CO6: Classify the lower cryptogams algae and fungi, upto their class level.
CO7: Describe uses and economic importance and role of Cryptogams for human welfare.

BO 352: A**rchegonate**

After successfully completing this course, students will be able to:

CO1: Define bryophytes and pteridophytes.
CO2: Identify the vegetative and reproductive structures in bryophytes and pteridophytes.
.CO3: Describe range of thallus organization of bryophytes and pteridophytes.
CO4: Describe the Internal structure of the thallus of the bryophytes and pteridophytes.
CO5: Diagram life cycle of various fungal and algal forms.

BO 353: Spermatophyta and Palaeobotany

After successfully completing this course, students will be able to:

CO1: Memorize general characters of gymnosperms and origin of angiosperms
CO2: Define fossil and fossil groups.
CO3: Discuss gymnosperms with example of plants *Pinus* and *Gnetum*,
CO4: Describe morphology and anatomy of gymnosperms
CO4: Classify different theories of angiospermic origin.
CO5: Summarize types and forms of fossils.
CO6: Classify Artificial, natural and phylogenetic systems.
CO7: Demonstrate families according Bentham and Hooker's system
CO8: Illustrate floral formula, floral diagram and identification key.

BO 354 Plant Ecology

After successfully completing this course, students will be able to:

CO1: Define ecology, remote sensing, In situ conservation and ex situ conservation.
CO2: Summarize the characterization of biodiversity.
CO3: Explain environmental crisis
CO4: Apply Environmental Impact Assessment in ecology.
CO5: Explain data analysis of remote sensing technique.
CO6: Evaluate the EIA and Environmental audit.
CO7: Analyse inventorying and monitoring biodiversity.
CO8: Illustrate social approach to biodiversity conservation

BO 355: Cell and Molecular Biology

After successfully completing this course, students will be able to:

CO1: Define terminologies related to cell and molecular biology.
CO2: Identify localization and describe all cell organelles.
CO3: Discuss the dynamics of plant cell structure and function.
CO4: Describe Nucleus and chromosomes.
CO5: Describe DNA replication, Transcription and Translation.
CO6: Explain the concepts as well as mechanisms of damage and repair.
CO7: Explain gene action and regulation (concept of operon, its structure and regulation).
CO8: Interpret the genomic organization and its role in gene expression

BO 356: Genetics

After successfully completing this course, students will be able to:

CO1: Define the terminologies of Genetics
CO2: Describe the concept of mendelism.
CO3: Discuss the Interactions of genes.
CO4: Explain the Concept, Characters and Examples of multiple alleles.
CO5: Describe the Euploidy, Aneuploidy and chromosomal aberrations.
CO6: Summarize the Population Genetics and Evolution.
CO7: Describe the sex linked inheritance,
CO8: Determine Linkage, Crossing over and quantitative inheritance.

BO 357: Practical Paper I

After successfully completing this course, students will be able to:

CO1: Recognise Algae, fungi, bryophytes and pteridophytes with respect to systematic position thallus structure and reproduction with suitable examples.
CO2: Describe morphology and anatomy of Algae, fungi, bryophytes and pteridophytes .

BO 358: Practical Paper II

After successfully completing this course, students will be able to:

CO1: Describe the flowering plants in botanical terms.
CO2: Identify the plant families.
CO3: Draw the floral diagram of plants belonging to specific families.
CO4:position thallus structure and reproduction with suitable examples.
CO5: Describe morphology and anatomy of gymnosperms.
CO6: Illustrate gymnosperms *Gnetum* and *Pinus*.
CO7:Recognize types and forms of fossils.

BO 359: Practical Paper III

After successfully completing this course, students will be able to:

CO1: Demonstrate cytological techniques like mitosis and meiosis as well as plant physiology practical.

CO2: Illustrate Maceration technique and study of plant tissues.

CO3: Determine DNA, RNA from plant cell.

CO4: Calculate gene mapping by three-point test cross.

BO 3510: Medicinal Botany

After successfully completing this course, students will be able to:

CO1: Define concept and scope of Pharmacognosy and economic botany.

CO2: Explain concept of Ayurvedic Pharmacy.

CO3: Discuss Ayurvedic principles and Ayurvedic formulation.

CO4: Recognize drug adulteration, methods of extraction and evaluation.

CO5: Discuss the process of cultivation, collection and processing of herbal drugs.

CO6: Recognize medicinally important drugs.

CO7: Explain principles and scope of ethnic societies in India.

CO8: Describe the methods in Analytical Medicinal botany.

BO 3511: Plant Diversity and Human Health

After successfully completing this course, students will be able to:

CO1: Evaluate the EIA and Environmental audit.

CO2: Analyse inventorying and monitoring biodiversity.

CO3: Illustrate social approach to biodiversity conservation.

BO 361: Plant Physiology and Metabolism.

After successfully completing this course, students will be able to:

CO1: Define plant physiological concepts and biochemical terms.

CO2: Explanation of the physiological processes like photosynthesis, respiration, translocation and stress physiology.

CO3: Demonstrate various physiological and metabolic pathways in plant**.**

BO 362: Biochemistry

After successfully completing this course, students will be able to:

CO1: Explain Description and classification of biomolecules.

CO2: Illustrate metabolic pool and biosynthesis of secondary metabolite.

CO3: Classify different photosynthetic pathways and their significance.

CO4: Determine factors affecting enzyme activity.

CO5: Calculate balance sheet of ATP.

BO 363: Plant Pathology

After successfully completing this course, students will be able to:

CO1: Define terminologies related plant diseases.

CO2: Discuss the plant and pathogen interaction.

CO3: Summarize the economic importance of plant diseases.

CO4: Explain principles and concepts of host-parasite interactions, systemic and acquired resistance and major signalling pathways.

CO5: Categorize the plant diseases on the basis of pathogen.

CO6: Evaluate the disease cycle of diseases caused by fungi, Bacteria, Nematode, viruses.

CO7: Apply wide spectrum control measures for plant diseases.

CO8: Justify molecular techniques to control the plant diseases.

BO 364: Evolution and Population Genetics

After successfully completing this course, students will be able to:

CO1: Define the terminologies of Genetics and evolution
CO2: Describe the concept of mendelism.
CO3: Discuss the Interactions of genes.
CO4: Explain the Concept, Characters and Examples of multiple alleles.
CO5: Describe the Euploidy, Aneuploidy and chromosomal aberrations.
CO6: Summarize the Population Genetics and Evolution.
CO7: Describe the sex linked inheritance,
CO8: Determine Linkage, Crossing over and quantitative inheritance.

BO 365: Advanced Plant Biotechnology

After successfully completing this course, students will be able to:

CO1: Define biotechnology, plant tissue culture, bioinformatics, genomics and proteomics.
CO2: Describe Plant Tissue Culture techniques.
CO3: Explain the concept and technique of Germplasm and Cryopreservation.
CO4: Describe the concept of Transgenic Plants as Bioreactors.
CO5: Explain applications of Genomics, Proteomics, Transgenic plants, Bioinformatics, Germplasm and cryopreservation.
CO6: Evaluate recombinant therapeutic products for human healthcare.
CO7: Describe mechanism of biological nitrogen fixation.
CO8: Recite uses of biotechnology to the society.

BO 366: Plant Breeding and Seed Technology

After successfully completing this course, students will be able to:

CO 1: Define plant breeding, hybridization, Seeds, germination testing.
CO 2: Describe conventional techniques, methods and practices of breeding.
CO 3: Discuss mechanisms and genetic bases of resistance/tolerance to biotic and abiotic stresses in plants.
CO 4: Analyse general procedure of seed certification.
CO 5: Summarize the mechanisms of Seed sampling, storage and packaging.
CO 6: Explain the seed Testing and Seed marketing.
CO 7: Evaluate plant breeding methods for betterment of mankind and crop improvement.
CO 8: Interpret application of conventional and non-conventional methods of plant breeding

BO 367 Practical Paper I

After successfully completing this course, students will be able to:

CO1: Estimation of osmotic potential of plant cell sap.
CO2: Demonstrate Bolting, transpiration, respiration and RQ.
CO3: Estimation of soluble proteins by Lowery et. al. method..
CO4: Demonstration of Enzyme activity: Amylase /invertase.
CO5: Estimation of total free amino acids by spectrophotometry.

BO 368 Practical Paper II

After successfully completing this course, students will be able to:

CO1: Preparation of any one culture media for isolation of plant pathogens.

CO2: Culture technique- Streak plate methods, pour plate methods, Spread plate methods.

CO3: Study of any two of fungal (Downy mildew of Grapes, Head smut of Jowar, Tikka diseases of Groundnut) diseases.

CO4: Demonstration of any three evidences of Organic Evolution.

CO5: Numerical Problems based on Allele frequency and Genotype frequency

CO6: Numerical Problem based on Hardy-Weinberg Equilibrium.

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BO 369 Practical Paper III

After successfully completing this course, students will be able to:

CO1:Preparation and sterilization of MS Medium and Callus Induction using leaf primordia

CO2: Production of secondary metabolites in any suitable plant material

CO3: Artificial seed production by Sodium Alginate method encapsulation (somatic embryogenesis)

CO4: Demonstration to equipments used in genetic engineering like gene gun, PCR, gel doc, microcentrifuge, electrophoresis, micropipettes, incubator, shaker etc.

CO5: Demonstration to Fermentation of fruit juice and wine production from grapes/pomegranate/jamun/ apple/ber CO6: Illustrate line, bar and pie diagram

CO7: Problems on genetic engineering.

Dr. D.M. Jadhav
Head of Department
HEAD
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