



RAO PAHLAD SINGH DEGREE COLLEGE

(Approved by DGHE / Govt. of Haryana & Affiliated to Indira Gandhi University, Meerpur)

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DEPARTMENT OF BOTANY

Programme Outcomes, Programme Specific Outcomes and Course Outcomes

Programme : M.Sc. - Botany

Programme outcome (POs) : As per Syllabus (IGU, Haryana):-

Syllabus of the programme has been designed by the IG University. The programme adds for the students with subject knowledge and technical skills specifically for plants and their uses in this modern era. The aim of the Programme is to make the students expert in all the fields of plant sciences with the combination of core and elective paper as per CBCS. Students learn modern technologies that are used in the subject and make them expert. The program also makes the students aware to the social and environmental issues with respect to the knowledge of plants and their uses in different areas of plant sciences.

Programme Specific Outcomes (PSOs): As per Syllabus (IGU, Haryana):-

PSO1. After completing the programme the student will be able to understand different branches of Botany such as systematics, evolution, ecology, developmental biology, physiology, biochemistry, morphology, anatomy, reproduction, genetics and molecular biology, diversity of plants, microbiology and recombinant technology.

PSO2.

The course enables the students to design and execute experiments related to modern research tools and techniques on different fields of life sciences.

PSO3.

Students will be technically sound for various analytical and biological skills competent to biological fields.

PSO4.

After completion of the programme the students will be able to design short research projects that develop the research attitude and scientific temperament among students.

Programme : B.Sc. Botany

Programme Outcomes (PO's)

The programme enables the students to understand about Plant Diversity and its importance in the maintenance of ecological balance. Students will learn to carry out practical work, in the field and in the laboratory, interpreting plant morphology and anatomy, Plant identification, Vegetation analysis techniques. They will be able to apply the knowledge of basic science, life sciences and fundamental process of plants, modern techniques and instruments for

Biochemical estimation, Molecular Biology, Biotechnology, Plant Tissue culture experiments, cellular and physiological studies of plants and their applications to the society for its growth and development.

Programme Specific Outcomes (PSO's)

PSO1.

Students will be able to study the interaction of different groups of plants such as algae, fungi, bryophytes, pteridophytes, gymnosperms and angiosperms.

PSO2.

Students will also be able to use the comparative biology to learn about evolution of plants and diversity of life on earth.

PSO3.

After completing the programme the students will be able to evaluation of ideas and arguments by collecting relevant information about the plants and put critical value. to recognize their position in the classification systems.

PSO4.

The programme enables students to explain that how Plants function at gene, genome, cellular and tissue level and at phylogenetic level.

DEPARTMENT OF BOTANY

Course Objective & Outcomes

Subject: DIVERSITY OF MICROBES

Class: B.Sc. (Botany) 1st Sem.

Course objectives

The specific objectives of this course are to expose students to the following topics:

1. Origin, evolution, and genetic diversity of microbial life
2. Physiological diversity of metabolic and bioenergetics pathways
3. Microbial species and speciation;
4. Phylogenetic and functional analysis of (meta) genomic data
5. Characterization of uncultivated microbial lineages; and
6. Linkage between microbial diversity, function, and ecology

Course outcomes

Students who successfully complete this course will be able to:

1. Describe cellular, biochemical, and physiological aspects of microorganisms and recognize the similarities and differences between microbial groups (bacteria, algae, fungi, protozoa, viruses, viroids, and prions).
2. Explain cellular and biochemical processes involved in pathogenesis (human-pathogen interactions).
3. Identify microorganisms and their role in various environments.
4. Describe the cultural use of microorganisms in food production, medicine, fuel production, and waste treatment.
5. Apply microbiology techniques (cell culture, chemical and molecular based methods) to solve scientific problems.

DEPARTMENT OF BOTANY

Course Objective & Outcomes

Subject: CELL BIOLOGY

Class: B.Sc. (Botany) 1st Sem.

Course objectives

The specific objectives of this course are to expose students to the following topics:

1. To understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles
2. Students will understand how these cellular components are used to generate and utilize energy in cells
3. Students will understand the cellular components underlying mitotic cell division.
4. Students will apply their knowledge of cell biology to selected examples of changes or losses in cell function. These can include responses to environmental or physiological changes, or alterations of cell function brought about by mutation.

Course outcomes

Students who successfully complete this course will be able to:

1. Outline the structure of the biomolecules found in all living organisms.
2. Describe the function and structure of cells including the metabolic reactions that occur in cells.
3. Explain the process of inheritance.
4. Describe how RNA, DNA and proteins are synthesized.
5. Explain the process of cell division in both somatic and germ cells.
6. Describe cytological, biochemical, physiological and genetic aspects of the cell, including cellular processes common to all cells, to all eukaryotic cells as well as processes in certain specialized cells.
7. Relate normal cellular structures to their functions.
8. Explain cellular processes and mechanisms that lead to physiological functions as well as examples of pathological state.
9. Apply modern cellular techniques to solve aspects of scientific problems.
10. Describe the intricate relationship between various cellular structures and their corresponding functions.

DEPARTMENT OF BOTANY

Course Objective & Outcomes

Subject: DIVERSITY OF ARCHEGONIATES

Class: B.Sc. (Botany) 2nd Sem.

Course objectives

The specific objectives of this course are to expose students to the following topics:

1. To study general characteristics of bryophytes.
2. To classify and evaluate sporophytes and economic importance of bryophytes.
3. To study alternation of generations in bryophytes.
4. To study heterospory, apospory, apogamy and economic importance of pteridophytes.
5. To give General account of stellar evolution.

Course outcomes

Students who successfully complete this course will be able to:

1. Describe general account of bryophytes
2. Identify given specimen.
3. Evaluate importance of archegoniates.

DEPARTMENT OF BOTANY

Course Objective & Outcomes

Subject: GENETICS

Class: B.Sc. (Botany) 2nd Sem.

Course objectives

The specific objectives of this course are to expose students to the following topics:

1. The basic principles of inheritance at the molecular, cellular and organism levels.
2. Causal relationships between molecule/cell level phenomena and organism-level patterns of heredity.
3. To test and deepen their mastery of genetics by applying this knowledge in a variety of problem-solving situations.
4. Describe the mechanisms governing Mendelian inheritance, gene interactions, and gene expression.
5. Describe mechanisms that generate variation in traits.
6. Apply principles of genetics to real-world problems in biology.

Course outcomes

Students who successfully complete this course will be able to:

1. Apply quantitative problem-solving skills to genetics problems and issues.
2. Demonstrate their ability to reason both inductively and deductively with experimental information and data.
3. Describe the chromosome theory, molecular genetics and quantitative and evolutionary genetics.
4. Select and apply experimental procedures to solve genetic problems.

DEPARTMENT OF BOTANY

Course Objective & Outcomes

Subject: BIOLOGY AND DIVERSITY OF SEED PLANTS –I

Class: B.Sc. (Botany) 3rd Sem.

Course objectives

The specific objectives of this course are to expose students to the following topics:

1. General characters, origin and evolution of Gymnosperms
2. Geological Time Table; Evolution of Seed Habit.
3. Fossils and Fossilization
4. Economic importance of Gymnosperms
5. General characters, origin and evolution of Angiosperms

Course outcomes

Students who successfully complete this course will be able to:

1. Draw life-cycle and economic importance of : Cycas and Pinus
2. Describe Process involved in fossilization, types of fossils and importance of fossils
3. Evaluate Economic importance of Gymnosperms
4. Give general characters, origin and evolution of Angiosperms

DEPARTMENT OF BOTANY

Course Objective & Outcomes

Subject: PLANT ANATOMY

Class: B.Sc. (Botany) 3rd Sem.

Course objectives

The specific objectives of this course are to expose students to the following topics:

1. Summarize the role of each cell structure in plant development
2. Evaluate the importance of various plant tissues in plant development
3. Summarize the contribution of each organ within the plant body
4. Evaluate the stages of plant growth and development
5. Structural and functional organization
6. To understand the conduction path of water and mineral nutrients
7. Translocation of assimilates into different plant parts
8. Plant metabolic activity
9. Plant development and storage of food

Course outcomes

Students who successfully complete this course will be able to draw Diagram and explain the major structures within the root, shoot, leaves, Flowers, seeds, and seedlings of representative monocot and dicot angiosperm plants.

DEPARTMENT OF BOTANY

Course Objective & Outcomes

Subject: BIOLOGY AND DIVERSITY OF SEED PLANTS-II

Class: B.Sc. (Botany) 4th Sem.

Course objectives

The specific objectives of this course are to expose students to the following topics:

1. To classify the plant Kingdom
2. To diverse taxonomic resources for plant identification, including electronic and print media, reference materials, and herbarium collections
3. To identify and name a plant and fix its rank in a recognized system of classification.
4. Describe the biological basis of plant classification.

Course outcomes

Students who successfully complete this course will be able to:

1. Recognize ecologically and economically important plant species by sight.
2. Identify unknown plant species using dichotomous keys.
3. Employ diverse taxonomic resources for plant identification, including electronic and print media, reference materials, and herbarium collections.
4. Discuss current questions in plant evolution and classification.

DEPARTMENT OF BOTANY

Course Objective & Outcomes

Subject: PLANT EMBRYOLOGY

Class: B.Sc. (Botany) 4th Sem.

Course objectives

The specific objectives of this course are to expose students to the following topics:

1. Students should understand complete details about the structures, development of embryo at different stages including gametogenesis, fertilization, and implantation.
2. Ability to correlate between the embryological structure and its significance.
3. Demonstrate activities on the gametogenesis, fertilization.

Course outcomes

Students who successfully complete this course will be able to:

1. complete details about the structures, development of embryo at different stages including gametogenesis, fertilization, and implantation.
2. correlate between the embryological structure and its significance.
3. Demonstrate activities on the gametogenesis, fertilization.

DEPARTMENT OF BOTANY

Course Objective & Outcomes

Subject: PLANT PHYSIOLOGY

Class: B.Sc. (Botany 5th Sem.

Course objectives

The specific objectives of this course are to expose students to the following topics:

1. Identify location and function of apical meristems, and describe their general structure
2. Identify the essential elements, rank their relative abundance in plant tissues, and describe their general roles in plant function.
3. Identify the ionic forms in which essential macro-elements are typically available in the soil.
4. Explain the mechanisms by which inorganic ions are absorbed by the root and transported throughout the plant.
5. Describe the two major symbioses occurring between plant roots and other organisms, and the benefit of each for plant nutrition.
6. Define hormone and explain its general role as a signal transducer. • List the well-documented roles of each of the major hormone groups in plant development and responses to environment.

Course outcomes

Students who successfully complete this course will be able to:

1. Demonstrate an understanding of how water moves in plants at both molecular and organismal levels.
2. Demonstrate an understanding of the biochemical processes of photosynthesis, glycolysis, citric acid cycle, and electron transport.
3. Use simple laboratory skills in scientific measurements.
4. Write a scientific research paper.

DEPARTMENT OF BOTANY

Course Objective & Outcomes

Subject: ECOLOGY

Class: B.Sc. (Botany) 5th Sem.

Course objectives

The specific objectives of this course are to expose students to the following topics:

1. Describe the structure and function of ecological systems and explain how ecological systems work at different spatial and temporal scales
2. List abiotic and biotic factors that affect, the distribution, dispersal, and behavior of organisms
3. Identify factors that affect biological diversity and the functioning of ecological systems
4. Use an ecological vocabulary in arguments and explanations of ecological phenomena
5. Apply concepts and theories from biology to ecological examples
6. Analyze and interpret ecological information, research and data

Course outcomes

Students who successfully complete this course will be able to:

1. Identify and describe the structural features of plants.
2. Discuss the basic processes of plant metabolism, transport, nutrition, growth, and reproduction.
3. Describe major evolutionary lineages of plants and their defining characteristics.
4. Identify plant species important in local ecosystems.
5. Describe the cultural uses of plants for food, fiber, medicine, biotechnology, etc.
6. Discuss plants in the context of broader environmental concerns, such as climate change, habitat destruction, pollution, invasive species, and agriculture.
7. Describe plant and animal distribution patterns in relation to abiotic and biotic factors.
8. Define the essential characteristics underlying natural ecosystems.
9. Explain model population and community-level dynamics.
10. Interpret and present ecological results.
11. Identify global environmental problems.

DEPARTMENT OF BOTANY

Course Objective & Outcomes

Subject: BIOCHEMISTRY AND PLANT BIOTECHNOLOGY

Class: B.Sc. Botany 6th Sem.

Course objectives

The specific objectives of this course are to expose students to the following topics:

1. To study basics of enzymology
2. Discovery, nomenclature and characteristics of enzymes.
3. To study concept of holoenzyme, apoenzyme, coenzyme and co-factors.
4. Regulation of enzyme activity and mechanism of action.
5. To study tools and techniques of recombinant DNA technology.
6. Evaluate biology of nitrogen fixation.

Course outcomes

Students who successfully complete this course will be able to:

1. Describe biocatalysis, pathway engineering, bioprocess control and downstream processing.
2. Demonstrate their ability to reason both inductively and deductively with experimental information and data.
3. Explain the theory and practice of recombinant DNA technology.
4. Select and apply experimental procedures to the spectrum of fields making use of biotechnology.
5. Grow, maintain, and propagate specific plant and animal cell types in a sterile environment.
6. Handle, store and identify cells in culture.
7. Count, identify and assess viability of cells by microscopic examination.
8. Identify the problems associated with growing, storing and identifying a wide range of different cell types.
9. Describe how cell culture can be used for in vitro studies and commercial applications.
10. Analyze data using appropriate techniques.

DEPARTMENT OF BOTANY

Course Objective & Outcomes

Subject: ECONOMIC BOTANY

Class: B.Sc. (Botany) 6th Sem.

Course objectives

The specific objectives of this course are to expose students to the following topics:

1. Investigate utilization and domestication of crop plant throughout history.
2. Investigate many uses of plants by other culture
3. Study origin, distribution, botanical description, brief idea of cultivation and economic uses of pulses
4. Analyze morphological description, brief idea of cultivation and economic uses of medicinal plants
5. Study botanical description, processing and uses beverages, sugar, tea and coffee.

Course outcomes

Students who successfully complete this course will be able to:

1. Learn the importance of plant identification.
2. Learn the importance of plant identification.
3. Participate in plant identification using observation skills.

DEPARTMENT OF BOTANY

Course Objective & Outcomes

Subject: Cell Biology

Class: M.Sc. Botany 1st Sem.

Course objectives

1. To understand the structures and purposes of basic components cells, especially macromolecules, membranes, and organelles.
2. To understand how these cellular components are used to generate and utilize energy in cells.
3. To understand the cellular components underlying mitotic cell division.
4. To understand responses to environmental or physiological changes, or alterations of cell function brought about by mutation.
5. To understand the process of cell division in both somatic and germ cell.
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Course outcomes

After completion of course, students will be:

1. Able to describe the function and the composition of the plasma membrane.
2. Able to explain the principles of the cell theory.
3. Able to differentiate between prokaryotes and eukaryotes.
4. Able to understand the importance of the nucleus and its components.
5. Able to Understand how the endoplasmic reticulum and Golgi apparatus interact with one another and know with which other organelles they are associated..
6. Able to identify the three primary components of the cell's cytoskeleton and how they affect cell shape, function, and movement.

DEPARTMENT OF BOTANY

Course Objective & Outcomes

Subject: Virology, bacteriology and mycology

Class: M.Sc. Botany 1st Sem.

Course objectives

The specific objectives of this course are to expose students to the following topics:

1. Origin, evolution, and genetic diversity of microbial life.
2. Physiological diversity of metabolic and bioenergetics pathways.
3. Microbial species and speciation; Viral infection and transmission modes.
4. Phylogenetic and functional analysis of (meta) genomic data, archaeobacteria and Eubacteria.
5. Characterization of various fungal divisions and their economic importance.
6. Linkage between microbial diversity, function, and ecology

Course outcomes

After completion of course, students will be:

1. Describe cellular, biochemical, and physiological aspects of microorganisms and recognize the similarities and differences between microbial groups (bacteria, algae, fungi, protozoa, viruses, viroids, and prions).
2. Explain cellular and biochemical processes involved in pathogenesis (human-pathogen interactions).
3. Identify microorganisms, Fungi, Lichens and their role in various environments.
4. Describe the cultural use of fungi in food production, medicine, fuel production, and waste treatment.

DEPARTMENT OF BOTANY

Course Objective & Outcomes

Subject: Cryptogamic Botany

Class: M.Sc. Botany 1st Sem.

Course objectives

The specific objectives of this course are to expose students to the following topics:

1. To learn about the diversity of Cryptogams
2. To understand the life cycle pattern of Algae, Bryophytes and Pteridophyte.
3. To develop and an understanding of the economic and ecological important of cryptogamic plant

Course outcomes

After completion of course, students will be:

1. Differentiate and identify the algal species using algal pigments.
2. Acquire knowledge on diversity among Algae, Bryophytes and Pteridophytes.
3. Understand the life cycle patterns and reproduction of Cryptogams.
4. Apply the medicinal and economic knowledge of Algae, Bryophytes and Pteridophytes for the human welfare.