



JAI HIND COLLEGE

Basantsing Institute of Science & J. T. Lalvani College of Commerce.

And Sheila Gopal Raheja College of Management

Affiliated to University of Mumbai

Autonomous

Bachelor of Science (B.Sc in Botany)

Semester I

Course Code: SBOT101	Course Title: Algae, Fungi and Lichens
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Learning Objectives:

- 1. To make them Learn the morphology, structure and importance of the organisms and differentiate between various groups of Algae, Fungi and Lichens.
- To train them about the life cycles of individuals belonging to Chlorophyta, Cyanophyta and Phycomycetes.
- To make them understand Learn the economic importance of each group.

Learning Outcomes:

1. Differentiate morphology, structure and importance of the organisms and differentiate between various groups of Algae, Fungi and Lichens.
- 2. Implement the knowledge of the life cycles of individuals belonging to Chlorophyta, Cyanophyta and Phycomycetes.
- 3. Summerize the economic importance of each group.

Semester I

Course Code: SBOT102	Course Title: Mendelian Genetics, Ecology and Industrial Botany
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Learning objectives:

- 1. To make them Learn the basic principles of Mendelian Genetics.
- 2. To make them Understand the interactions taking place in the Ecosystems and the flow of energy.
- 3.To make them Learn the ecological adaptations of various plants.

· **Learning Outcomes:**

- 1. Elaborate basics of Mendelian Genetics and apply them to day to day life.
- 2. Use knowledge the basics of ecology and adaptations of different groups of plants
- 3. Develop commercial products and their origin from different plants.

Semester I

Course Code: SBOT1PR	Course Title: Practical Paper I
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Learning Objectives:

- To train them use bright field microscopy for observing Algae, Fungi and Lichens
- To make them study variation in members of Chlorophyta and Cyanophyta
- To make them study the morphology and anatomy of primitive fungi Phycomycetes

· **Learning Outcomes:**

- identify the different specimens
- differentiate between different algae
- differentiate between alleles and correlate their interrelationships

Semester II

Course Code: SBOT201	Course Title: Bryophyta, Pteridophyta, Gymnosperms and Angiosperms
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Learning Objectives:

- To make them Learn the classification, life-cycles and economic importance of individuals belonging to Bryophyta, Pteridophyta and Gymnosperms.
- To familiarize them with concept on the morphology, structure and functions of various parts of a flower in detail and explain the use of taxonomical terminology and understand the meaning of the same.
- To make them Understand detailed study of the classification of a few families.

Learning Outcomes:

- 1. Differentiate the morphological, anatomical and reproductional peculiarities and differences between all three groups of plants belonging to Bryophytes, Pteridophytes and Gymnosperm. Economic importance of each group will be understood to realize the potential use of each group.
- 2. Use knowledge on basic study of parts of the flower and types variations in floral morphology along with study of few families as classified as per Bentham and Hooker's system will help to introduce students to the branch of taxonomy.
- 3. Describe the classification of a few families of plants

Semester II

Course Code: SBOT202	Course Title: Anatomy, Physiology and Ethnobotany
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Learning Objectives:

- 1. To make them study Carbohydrate structure, classification and its importance as a primary metabolite in plants.
- 2. To make them learn the basic physiological process of light harvesting mechanisms for the synthesis of carbohydrates in various groups of higher plants. Study the role of photorespiration in plants.
- 3. To help them Study the use of plants for food, medicine, etc from past data in literature. Relate the same to present experimental evidence and future advances in the same.

Learning Outcomes:

- 1. Define anatomical structure and functions of various types of basic tissue systems present in plants.
- use the basic concept of light harvest mechanism, pigments involved, photosynthesis as a process as well as variations seen in carbohydrate accumulation in higher plant species.

Resolve problems on the negative role played by photorespiration in reducing the crop yield.

Semester II

Course Code: SBOT2PR	Course Title: Paper I &II
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Learning Objectives:

- to train them perform sectioning of fresh and preserved specimens of Bryophytes, Pteridophytes and Gymnosperms and observe microscopic details to understand their structural variations.
- To help them to observe specimens to study floral morphology.
- to make them understand the section specimens to study and compare anatomical differences in dicotyledonous and monocotyledonous plants.

- **Learning Outcomes:**

- define morphological characters will help them to easily identify the field plants.
 - use the anatomical variations to classify plants.
1. Summarize the importance of Ethno-medicinal plants for various ailments.

Semester III

Course Code: SBOT301	Course Title: Thallophyta, Angiosperms & Modern techniques to study plant diversity
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Learning Objectives:

- To help them to Learn the morphology, structure and importance of the organisms and

differentiate between various groups of Algae, Bryophyta.

- To make them Learn the life cycles of individuals belonging to Algae, and

Bryophytes

- To make them Learn the economic importance of each group

- **Learning Outcomes:**

- identify the different lower groups of plants.
- differentiate the families based on their characters and distinguishing features.

perform modern techniques in plant analysis

Semester III

Course Code: SBOT302	Course Title: Cell biology, Cytology & Molecular biology
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Learning Objectives

1. To Make them understand concept of nucleic acid
2. To Make them learn about ultrastructure of cells

3. To Train them different cell division.

Learning Outcomes

1. understand and use concept of nucleic acid
2. Implement knowledge about ultrastructure of cells
3. Summerize different cell division.

Semester III

Course Code: SBOT303	Course Title: Pharmacognosy and Phytochemistry, Forestry and economic Botany, Industries based onplant products
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Learning Objectives:

- To Make them Learn the function of a pharmacopeia and significance of monographs
- To train them to Learn types of forestry in India and sources of fibres and spices
- TO make them understand the industries based on plant products.

Learning Outcomes:

- 1. read a pharmacopeia and a monograph.
- 2. Describe how forestry grows and the way it can be used for manufacture of spices and fibres.
- 3. identify products of aromatherapy, botanicals and nutraceuticals.

Semester III

Course Code: SBOT3PR	Course Title: Practicals I,II & III
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Objective :

1. To make them aware about wet preservative techniques.
2. To familiarize them with concept of herbarium
3. To train with skills of chromatography.

Outcome :

1. describeabout wet preservative techniques.
2. Practice of making of herbarium
- 3.use skills of chromatography

Semester IV

Course Code: SBOT401	Course Title: Fungi: Lichens, Pteridophyta and Gymnosperms
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Learning Objectives:

- · 1. To familiarize them with concepts of association between fungi and algae while studying lichens.
- 2. To make them understand about different orders of ferns and the classes Psilophyta and Lepidophyta.
- 3 To help them understand about the example of *Selaginella* – structure and life cycle.
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Learning outcomes:

- 1. Summarize detailed account and overall view of an important class of fungi (Ascomycetes) with respect to life cycle, disease cycle as well as control me·
- 2. use knowledge and appreciate the general characters of Psilophytes, Lepidophytes and coniferophytes.
- 3. Define structures of the different groups will benefit in making the students understand the classes they are studying.

Semester IV

Course Code: SBOT402	Course Title: Anatomy, Plant Physiology and Environmental Botany
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Learning objectives:

- 1. To make them aware and introduced to different tissue systems present in plants.
- 2.To make them learn the concept of normal and secondary growth in dicot plants.
- 3.To clear the doubts on the topic on the structures of carbohydrates deals with understanding the structures of molecules or products finally formed after photosynthesis.

Learning Outcomes:

- 1. Implement knowledge to understand the anatomical aspects of higher plants and will grasp the differences between the different tissue systems and anatomical structures.
- 2. To define and understand all basic interconnecting links between photosynthesis, respiration and photorespiration.
- 3. Summerize concepts in ecology of soil formation and its related factors and they will understand the concept of community ecology

Semester IV

Course Code: SBOT403	Course Title: Horticulture, Molecular Biology and Research Methodology
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Learning objectives:

- 1. Make them learning various branches of horticulture and its overall scope of gardening in present times.
- 2.To impart knowledge on Study the basic aspects and strategies involved in gene cloning.
- 3.To make them understand the concept of research, its types and a detail account of the research design.

Learning outcomes:

- 1. . elaborate the strategies involved in gene cloning using different types of vectors as well as role played by some important enzymes involved in recombinant DNA technology.
- 2. Use recombinant DNA technology on applied sciences.
- 3. use knowledge for the basics studied about research in their academics for conducting projects and present them.

Semester IV

Course Code: SBOT4PR	Course Title: Practical Paper I, II & III
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Learning Objectives:

- 1. To train them with technique of sectioning, staining and mounting of preserved and fresh plant materials to observe
- 2.To make them study anatomical structures including mechanical tissue systems, conducting tissues and types of vascular bundles.
- 3. TO impart knowledge to use Technique of respiration will be actually demonstrated in germinating seeds to understand the process.

Learning Outcomes:

- 1. identify lichens and fungal diseases.
- 2. Find solutions to problems encountered in cultivation of plants in different edaphic and climatic zones.
- 3. use their skill to construct gardens with necessary features and plants.

Semester V

Course Code: SBOT501	Course Title: Microbiology, Algae, Fungi and Plant Pathology
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Learning Objectives:

- 1. To make them study types of micro-organisms, culturing techniques and their applications
- 2.To impart knowledge on comparative account of different classes of marine and fresh water algae.
- 3. To make them learn about life cycles of fungi, plant pathogenic fungi and different control measures.

Learning Outcomes:

- 1. Implement culturing techniques of microbes and their role in fermentation
- 2.differentiate marine and fresh water alga better
- 3.summerizelifecycles of plant pathogenic fungi and their control measures

Semester V

Course Code: SBOT502	Course Title: Palaeobotany, Angiosperms, Anatomy, Palynology
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Learning Objectives:

- To train them about the process of fossilization and different fossils.
- To make them aware about Morphology of flower and fruits will help the students understand the classification in an effective manner.
- To train them learn about abnormal secondary growth and importance of the same in identification of plants

Learning Outcomes:

- 1. Define evolution of ancient fossilised plants and their importance
- 2. identify and learn some advanced families of angiosperms.
- 3. identify pollen grains based on morphology.

Semester V

Course Code: SBOT503	Course Title: Cytology and Molecular Biology, Physiology, Environmental Botany, Plant Tissue Culture
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Learning Objectives:

· 1. Make them understand and learn about different cell organelles and important processes within the cell.

· 2. To sensitize them about importance of solute potential and translocation of solutes in plants.

· 3. To impart knowledge to understand the concept of bioremediation and importance of the same.

· **Learning Outcomes:**

· 1. Identify cell organelles and giant chromosomes

· 2. Summarize the physiology of plant growth better.

· 3. Implement practical aspects of bioremediation

Semester V

Course Code: SBOT504	Course Title: Ethnobotany& Mushroom Industry, Biotechnology I, Instrumentation, Pharmacognosy& Medicinal Botany
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Learning Objectives:

· To make them learn about ancient knowledge of plants and importance of the same.

· to train them with the concept of Mushroom cultivation and entrepreneurship

· To make them study the construction and analysis of genomic, chromosomal and c-DNA libraries and analysis of genes and genes transcripts.

· **Learning Outcomes:**

· use knowledge and appreciate importance of ancient medicines

· define and take of cultivation of mushrooms

- use knowledge about importance of libraries.

Semester V

Course Code: SBOT5PR1	Course Title: Practicals I & II
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Learning objectives :

- To make them learn the techniques of isolation and culturing of microorganisms like bacteria, fungi, etc.

- To make them study the morphological differences and structures of different classes of marine and fresh water algae

To familiarize with morphological and features of different classes of pathogenic fungi

- **Learning Outcome:**

- use technique of isolation, identification and culturing of microbes and will be able to design the various experimental models to study effect of metabolites on the growth of microbes.

- differentiate and classify the various forms of algae and understand their importance to the environment

- classify the various forms of fungal species, understand life cycles of pathogenic fungi and will also be able to suggest measures to protect the plants from pathogenic fungi.

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Semester V

Course Code: SBOT5PRII	Course Title: Practicals III & IV
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Learning objectives:

- to train them to perform staining techniques to observe nuclear chromosomes and various stages of cell division in somatic as well as gametic cells of plants.
- to help them to enhance the skill of the technique of analysing the sequence of codons to correctly determine the sequence of amino acids in any given prokaryotic or eukaryotic mRNA strand.
- to train them with biochemical assays and quantitatively estimate various plant constituents like phosphorus and iron. They will understand the concept and importance of running a standard graph with known quantities of element under analysis while simultaneously extracting, quantitatively estimating and comparing the same element actually present in plant samples.
- **learning outcome**
- use staining techniques for staining of nuclear matter as well as dividing cells.
 - evaluate data involving reading of mRNA transcript to form translation products.
 - carry out accurate biochemical assays and relate their skill and knowledge to carry out plant analysis.
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Semester V

Course Code: SBOT5AC	Course Title: Horticulture and Gardening - I
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Learning Objectives:

- To make them aware about the various branches of horticulture as well as regional centers and research institutes promoting horticulture.

- To make them learn basic gardening skills and operations including propagation of plants by artificial and natural methods
- To make them Learn use of various gardening implements
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Learning Outcomes:

1. manage and operate nurseries as well as fruit and vegetable gardens in a profitable way.
2. solve the common problems encountered with soil pollution and erosion.
3. guide farmers to control pests and diseases in an eco-friendly way .

Semester V

Course Code: SBOT5ACPR	Course Title: Horticulture and Gardening - I Practical
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Learning Objectives:

- To make them perform basic gardening operations including propagation of plants by artificial and natural methods
- To make them experience use of various gardening implements
- To help them in observing common pests as well as samples of diseased specimens of plants and they will learn to prepare eco-friendly insecticides.

Learning Outcomes:

- manage and operate nurseries as well as fruit and vegetable gardens in a profitable way.
- perform indoor gardening techniques and use them as a tool to generate income source.
- guide farmers to control pests and diseases in an eco-friendly way .

Semester VI

Course Code: SBOT601	Course Title: Bryophyta, Pteridophyta & Gymnosperms
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Learning Objectives:

- To make them learn in depth different classes of bryophytes and Pteridophytes. It covers origin and evolution, economic and ecological importance of bryophytes.
- To familiarize them with lifecycles of three genera belonging to an important class coniferophyta of Gymnosperms along with the economic importance of Gymnosperms.

To train them with ecological importance of pteridophytes

Learning Outcomes:

1. differentiate between different classes of bryophytes and Pteridophytes and also
2. Use knowledge to understand their evolutionary aspect as well as ecological significance.
3. differentiate between different genera belonging to class coniferophyta and also learn their economic significance.

Semester VI

Course Code: SBOT602	Course Title: Angiosperms, Anatomy, Embryology & Economics Botany
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Learning Objectives:

- To make them study different systems of classification and will be made aware of recent development in the field of taxonomy and systematics. They will also study of morphological characters in detail.
- To impart knowledge on the relation of anatomy with ecology.
- To make them learn the process of gametogenesis as well as different types of embryos and its development in plants.

Learning Outcomes:

- use recent trends in systematics
- differentiate morphological characters will help them to easily identify the field plants.
- resolve problems on anatomical adaptations for different environments

Semester VI

Course Code: SBOT603	Course Title: Physiology, Genetics & Biostatistics
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Learning Objectives:

- To make them learn the structures, classification and nomenclature of important primary metabolites. Students will learn the basics of enzymology and its practical applications in the field of research.
- To provide in depth knowledge on Nitrogen metabolism within the plant as well as in the surrounding atmosphere.

· To make them learn the important topics of linkage and crossing over and mutations its causes and types and some diseases caused due to mutations

· **Learning Outcomes:**

· use knowledge for structures of primary biomolecules will help students understand and relate to other chemical molecules present in plants.

· Define chemical aspect of reactions taking place in plants and teach them to think to provide solutions to agricultural problems.

· solve problems and relate the earlier studied processes of photosynthesis with Nitrogen metabolism and its effects on overall growth of plants.. The measures to increase availability of nitrogen will also be understood

Semester VI

Course Code: SBOT604	Course Title: Biotechnology, Bioinformatics, Biodiversity & Research Methodology
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Learning Objectives:

· To make them learn the applied aspects of biotechnology which includes gene sequencing techniques, PCR, DNA fingerprinting and DNA barcoding which are taught in detail.

· To introduce them with the field of bioinformatics.

To make them learn about the various data bases which store biological data and also about the softwares which retrieve data.

Learning Outcomes:

- use their knowledge of biotechnology and bioinformatics to understand current research articles on most recent developments in recombinant DNA technology.

Resolve problems on applications in the field of evolutionary studies, medicine and forensic science.

use the basics studied about research in their academics for conducting projects and present them

Semester VI

Course Code: SBOT6PRI	Course Title: Practicals Paper I & Paper II
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Learning Objectives:

- To make them observe microscopical details of genera belonging to different classes of bryophytes and Pteridophytes.

To make them understand about specific types of soral arrangements as seen in Pteridophytes. Along with this they will observe microscopic details of three genera belonging to an important class Coniferophyta of Gymnosperms and visually compare the differences.

- To train them to observe anatomical adaptation in plants growing in different ecological habitats.

- **Learning Outcomes:**

- identify and differentiate between different genera belonging to classes of Bryophytes, Pteridophytes and Gymnosperms on field.
- differentiate between different stages of megaspore, microspore and embryo development.
- use the principle behind the use of different extraction procedures for oils and uses of essential oils, fixed oils and vegetable fats.

Semester VI

Course Code: SBOT6PRII	Course Title: Practicals Paper III & Paper IV
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Learning Objectives:

- To make them perform enzymatic assays and biochemical analysis to detect plant metabolites.
- To train them to learn to determine the sequence of genes on chromosomes by using given biological data.
- To train them to learn to detect mutations occurring in given sequence of messenger RNA strands.

· **Learning Outcomes:**

- perform the technique of biochemical analysis to analyze large number of samples.
- use the softwares and computers for analysis of biological data.

use the basics studied about research in their academics for conducting projects and present them

Semester VI

Course Code: SBOT6AC	Course Title: Horticulture and Gardening - II
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Objectives:

- To make them learn the basic principles of landscape gardening, different types of gardens and important garden features.
- To make them learn the commercial production and harvesting of flowers, fruits and vegetables. They will also learn various techniques of preservation of fruits and vegetables.
- To make them understand the topic on principles of landscape gardening is added to understand the basic concepts involved in construction of various types of garden.

Outcomes:

- acquire entrepreneurial skills.
- use in-depth knowledge about crop cultivation & food preservation technology.
- perform landscape gardening and the importance of the need of space gardening and basic techniques involved in construction of different types of gardens.

Semester VI

Course Code: SBOT6ACPR	Course Title: Practicals in Horticulture and Gardening - II
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objective:

1. To make them aware about terrace gardening.
2. To make them learn about instruments
3. To train them to make terrarium

Outcomes

1. Use knowledge for making terrarium
2. Implement techniques of instruments for gardening
3. Design terrace gardens.