



ESTD. IN 1965

## St. Mary's College

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## Learning Outcomes 2018-19



*S. M. George*  
PRINCIPAL  
ST. MARY'S COLLEGE  
SULTHAN BATHERY  
WAYANAD-673 592

# BSc.Botany

## Course outcomes

### **Critical thinking**

Take informed actions after identifying the assumptions that frame students thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at their ideas and decisions.

### **Problem solving**

Understand and solve problems of relevance to society to meet the specified needs using the knowledge, skills and attitudes acquired.

### **Effective communication**

Speak, read write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology

### **Effective Citizenship**

Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

### **Environment and sustainability**

Understand the issues of environmental contexts and sustainable development

### **Self - directed and and Life-long learning**

Acquire the ability to engage in independent and life-long learning in the broadest context of socio-technological changes.

### **Knowledge and understanding of:**

1. The range of plant diversity in terms of structure, function and environmental relationships.
2. The evaluation of plant diversity.
3. Plant classification and the flora of Maharashtra.
4. The role of plants in the functioning of the global ecosystem.
5. A selection of more specialized, optional topics.
6. Statistics as applied to biological data.

### **Intellectual skills – able to:**

1. Think logically and organize tasks into a structured form. 2. Assimilate knowledge and ideas based on wide reading and through the internet. 3. Transfer of appropriate knowledge and methods from one topic to another within the subject. 4. Understand the evolving state of knowledge in a rapidly developing field. 5. Construct and test hypothesis. 6. Plan, conduct and write a report on an independent term project.

### **Practical skills:**

Students learn to carry out practical work, in the field and in the laboratory, with minimal risk. They gain introductory experience in applying each of the following skills and gain greater proficiency in a selection of them depending on their choice of optional modules. 1. Interpreting plant morphology and anatomy. 2. Plant identification. 3. Vegetation analysis techniques. 4. A range of physiochemical analyses of plant materials in the context of plant physiology and biochemistry. 5. Analyze data using appropriate statistical methods and computer packages. 6. Plant pathology to be added for sharing of field and lab data obtained.

### **Transferable skills:**

1. Use of IT (word-processing, use of internet, statistical packages and databases). 2. Communication of scientific ideas in writing and orally. 3. Ability to work as part of a team. 4. Ability to use library resources. 5. Time management. 6. Career planning.

### **Scientific Knowledge:**

Apply the knowledge of basic science, life sciences and fundamental process of plants to study and analyze any plant form.

### **Problem analysis:**

Identify the taxonomic position of plants, formulate the research literature, and analyze non reported plants with substantiated conclusions using first principles and methods of nomenclature and classification in Botany

### **Design/development of solutions:**

Design solutions from medicinal plants for health problems, disorders and disease of human beings and estimate the phytochemical

content of plants which meet the specified needs to appropriate consideration for the public health

 **Conduct investigations of complex problems:**

Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and development of the information to provide valid conclusions.

 **Modern tool usage:**

Create, select, and apply appropriate techniques, resources, and modern instruments and equipments for Biochemical estimation, Molecular Biology, Biotechnology, Plant Tissue culture experiments, cellular and physiological activities of plants with an understanding of the application and limitations.

 **The Botanist and society:**

Apply reasoning informed by the contextual knowledge to assess plant diversity, its importance for society, health, safety, legal and environmental issues and the consequent responsibilities relevant to the biodiversity conservation practice.

 **Environment and sustainability:**

Understand the impact of the plant diversity in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

 **Ethics:**

Apply ethical principles and commit to environmental ethics and responsibilities and norms of the biodiversity conservation.

 **Individual and team work:**

Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

 **Communication:**

Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

 **Project management and finance:**

Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

 **Life-long learning:**

Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

## **Course specific outcomes**

### **Scope and importance of Botany**

Understand scope and importance of Botany in every field especially in dealing with societal and environmental issues, agriculture, ethics and healthcare

### **Environmental concern**

Understand the role of plants in sustaining life on earth and the interrelationship between human beings and nature, create awareness on natural resources and their importance in sustainable development, analyze the importance of biodiversity conservation, estimate biodiversity loss and develop conservation strategies.

### **Scientific temper**

Develop scientific temper and undertake scientific projects

### **Practical applications**

Identify and classify plants according to the principles of plant systematics, apply techniques like plant propagation methods, organic farming, mushroom cultivation, preparation of biofertilizers, biopesticides etc. in daily life.

### **Awareness on life processes**

Understand plant life processes, biomolecules, basic hereditary and evolutionary principles. Critically evaluation of ideas and arguments by collection relevant information about the plants, so as recognize the position of plant in the broad classification and phylogenetic level.

Identify problems and independently propose solutions using creative approaches, acquired through interdisciplinary experiences, and a depth and breadth of knowledge/expertise in the field of Plant Identification

Accurately interpretation of collected information and use taxonomical information to evaluate and formulate a position of plant in taxonomy.

Students will be able to apply the scientific method to questions in botany by formulating testable hypotheses, collecting data that address these hypotheses, and analyzing those data to assess the degree to which their scientific work supports their hypotheses.

Students will be able to present scientific hypotheses and data both orally and in writing in the formats that are used by practicing scientists.

Students will be able to access the primary literature, identify relevant works for a particular topic, and evaluate the scientific content of these works.

Students will be able to apply fundamental mathematical tools (statistics, calculus) and physical principles (physics, chemistry) to the analysis of relevant biological situations.

Students will be able to identify the major groups of organisms with an emphasis on plants and be able to classify them within a phylogenetic framework. Students will be able to compare and contrast the characteristics of plants, algae, and fungi that differentiate them from each other and from other forms of life.

Students will be able to use the evidence of comparative biology to explain how the theory of evolution offers the only scientific explanation for the unity and diversity of life on earth. They will be able to use specific examples to explicate how descent with modification has shaped plant morphology, physiology, and life history

Students will be able to explain how Plants function at the level of the gene, genome, cell, tissue, Flower development. Drawing upon this knowledge, they will be able to give specific examples of the physiological adaptations, development, reproduction and mode of life cycle followed by different forms of plants.

Students will be able to explain the ecological interconnectedness of life on earth by tracing energy and nutrient flow through the environment. They will be able to relate the physical features of the environment to the structure of populations, communities, and ecosystems

Students will be able to demonstrate proficiency in the experimental techniques and methods of analysis appropriate for their area of specialization within biology

**Programme Specific Outcomes: B.Sc. Botany:**

**CORE COURSE: I     BOT1B01T**

**SEMESTER 1**

**Paper-I: ANGIOSPERM ANATOMY**

**COURSE OUTCOMES**

On completion of the course, students are able to

- ✚ Demonstrate the ability to differentiate the plant organs by observing anatomical features
- ✚ Understand the plant cell structure in a detailed manner
- ✚ Understand the tissue level organization in plant system
- ✚ Understand the morphological features of angiosperms
- ✚ Know and carry out the plant anatomical specimen preparations
- ✚ Understand the details of wood anatomy
- ✚ Understand different inflorescence and fruit types in plant kingdom
- ✚ Understand the non-living inclusions of plant and their significance
- ✚ Differentiate tissues and their functions
- ✚ Illustrate primary and secondary structures of plant organs
- ✚ Explain various developmental details of angiosperms

**SEMESTER 2**

**CORE COURSE: 2     BOT2B02T**

**PAPER-2: RESEARCH METHODOLOGY AND MICROTECHNIQUE**

On completion of the course, students are able to

- ✚ Develop scientific temper and problem solving skills
- ✚ Familiarize preparation and use of stains, fixatives and mounting media.
- ✚ Undertake scientific projects and prepare project reports

- # Summarize, organize and display quantitative data and derive conclusions
- # Prepare permanent slides, applying the histochemical techniques
- # Introduce the perspective of science
- # Understands the steps in scientific methods
- # Understand the steps in research methodology in plant science
- # Understand the uses and applications of general informatics
- # Understand the basis of computer in education
- # Understand and perform chromatography and other techniques in botany
- # Understand the statistical terms and its relevance in plant science

### **SEMESTER 3**

**CORE COURSE: 3      BOT3B03T**

**PAPER-3: MICROBIOLOGY, MYCOLOGY, LICHENOLOGY  
AND PLANT PATHOLOGY**

On completion of the course, students are able to

- # Understand basics of microbial life and their economic importance
- # Understand the Biodiversity of Fungi and lichen
- # Understand the reproductive behaviour in fungi and lichen
- # Understand the biotechnological application of fungi
- # Understand ecological significance of fungi and lichens
- # Know the economic significance of the fungal world
- # Carry out the mushroom cultivation in at a small scale industry level
- # Identify the plant diseases and it's control measures
- # Become aware of applications of different plants in various industries
- # Understand the Biodiversity of Fungi
- # Know the Economic Importance of Fungi
- # Know the terminologies in plant pathology.
- # Understand the scope and importance of Plant Pathology.
- # Realize the significance of plant diseases as far as crop production is concerned
- # Know the prevention and control measures of plant diseases and its effect on economy of crops

### **SEMESTER 4**

**CORE COURSE: 4      BOT4B04T**



## **PAPER-4: PHYCOLOGY, BRYOLOGY, PTERIDOLOGY**

On completion of the course, students are able to

- ✚ Appreciate the diversity and evolutionary significance of lower plant groups
- ✚ Classify algae, bryophytes and pteridophytes.
- ✚ Understand the diversity among Algae
- ✚ Know the systematic, morphology and structure, of Algae. Understand the life cycle pattern of Algae.
- ✚ Understand the useful and harmful activities of Algae
- ✚ Understand the diversity among Algae.
- ✚ Know the systematic, morphology and structure, of Algae.
- ✚ Understand the life cycle pattern of Algae.
- ✚ Understand the useful and harmful activities of Algae.
- ✚ Understand the morphological diversity of Bryophytes.
- ✚ Understand the economic importance of the Bryophytes.
- ✚ Understand the morphological diversity of Bryophytes
- ✚ Understand the economic and ecological importance of lower plant groups
- ✚ Know the taxonomic position, occurrence, thallus structure, reproduction of Bryophytes.

## **SEMESTER 5**

**CORE COURSE: 5      BOT5B05T**

## **PAPER:5GYMNOSPERMS,PALAEOBOTANY,PHYTOGEOGRAPHY AND EVOLUTION**

On completion of the course, students are able to

- ✚ Understand the role of gymnosperms as a connecting link between pteridophyte and angiosperm
- ✚ Appreciate the process of organic evolution
- ✚ Realize the importance of fossil study
- ✚ Understand the climatic conditions of the past and realize the changes happened
- ✚ Know the evolutionary trends in gymnosperms
- ✚ Know the scope of Paleobotany, types of fossils, its role in global economy and geological time scale.

- ✚ Understand the various fossil genera representing different fossil groups.

### **CORE COURSE: 6 BOT5B06T**

#### **PAPER:6 ANGIOSPERM MORPHOLOGY AND PLANT SYSTEMATICS**

On completion of the course, students are able to

- ✚ Appreciate the diverse morphology of angiosperms
- ✚ Identify and classify plants based on taxonomic principles
- ✚ Make scientific illustrations of vegetative and reproductive structures of plants
- ✚ Develop the skill of scientific imaging of plants
- ✚ Realize the importance of field study
- ✚ Know about the natural order in plant kingdom
- ✚ Understand the various classification systems and its scope in plant systematic
- ✚ Understand the morphological and molecular features of angiosperms in a systematic way
- ✚ Know about field exploration and plant specimen handling in botanical studies
- ✚ Understand the morphological features of angiosperms
- ✚ Understand different inflorescence and fruit types in plant kingdom
- ✚ Change their attitude towards over exploitation of rare/endemic plants

### **CORE COURSE: 7 BOT5B07T**

#### **PAPER: 7 EMBRYOLOGY, PALYNOLOGY, ECONOMIC BOTANY, ETHANOBOTANY AND HORTICULTURE**

On completion of the course, students are able to

- ✚ Understand the role plants in human welfare.
- ✚ Gain knowledge about various plants of economic use.
- ✚ Know importance of plants & plant products.
- ✚ Understand the chemical contents of the plant products
- ✚ Know about the utility of plant resources

- ✚ Apply various horticultural practices in the field
- ✚ Identify the economically important plants
- ✚ Gain knowledge about various plants and plant products
- ✚ Understand the role of plants in human welfare
- ✚ Know about field exploration and plant specimen handling in botanical studies
- ✚ Know about the plants used in daily life by ethnic people and village folks for food, shelter and medicine.

**CORE COURSE: 8 BOT5B08T**

**PAPER: 8 GENERAL AND BIOINFORMATICS, INTRODUCTORY BIOTECHNOLOGY, MOLECULAR BIOLOGY**

On completion of the course, students are able to

- ✚ Analyze the role of biotechnology in daily life
- ✚ Understand the basic aspects of bioinformatics
- ✚ Explain the concept in molecular biology
- ✚ Understand the molecular biology of a cell and its implications
- ✚ Differentiate the ultrastructure of prokaryotic and a eukaryotic cell
- ✚ Understand the chromosomes and the aberrations in its number and structure
- ✚ Understand the stages of cell cycle and carry out mitosis and meiosis
- ✚ Understand the uses and applications of general informatics
- ✚ Understand the basis of computer in education
- ✚ Understand the principle and basic protocols for Plant Tissue Culture

## **SIXTH SEMESTER**

**CORE COURSE: 9 BOT6B09T**

**PAPER: 9 GENETICS AND PLANT BREEDING**

On completion of the course, students are able to

- ✚ Appreciate the facts behind heredity and variations
- ✚ Understand the basic principles of inheritance
- ✚ Solve problem related to classical genetics.
- ✚ Predict the pattern of inheritance

- ✚ Understand various plant breeding technique
- ✚ Realize the role of plant breeding in increasing crop productivity
- ✚ Understand the science of plant breeding and genetics
- ✚ Understand the branch of plant breeding for the survival and success of human civilizations
- ✚ Understand the techniques for the production of new superior crop varieties
- ✚ Mendelian and Neo-mendelian genetics
- ✚ To study the phenomenon of dominance, laws of segregation, independent assortment of genes.
- ✚ To understand the different types of genetic interaction, incomplete dominance, codominance, inter allelic genetic interactions, multiple alleles and quantitative inheritance etc
- ✚ Understand the modern strategies applied in genetics and plant breeding for human welfare
- ✚ Understand the inheritance and variation of genetic characters
- ✚ Understand the background of genetic disorders
- ✚ Analyze and predict the occurrence of genetic traits and its impact in human life

## **CORE COURSE: 10    BOT6B10T**

### **PAPER: 10        PLANT PHYSIOLOGY AND METABOLISM**

On completion of the course, students are able to

- ✚ Understand the Biochemical nature of cell
- ✚ Know the chemical nature of biomolecules.
- ✚ Understand the different types of interaction in Biomolecules.
- ✚ Structure and general features of enzymes.
- ✚ Concept of enzyme activity and enzyme inhibition.
- ✚ Learn about the movement of sap and absorption of water in plant body
- ✚ Know importance and scope of plant physiology.
- ✚ Understand the plants and plant cells in relation to water.
- ✚ Understand the process of photosynthesis in higher plants with particular emphasis on light and dark reactions, C<sub>3</sub> and C<sub>4</sub> pathways.
- ✚ Understand the respiration in higher plants with particular emphasis on aerobic and anaerobic respiration

- ✚ Learn about the movement of sap and absorption of water in plant body
- ✚ Understand the plant movements.
- ✚ Understand the plant movements.
- ✚ Identify the osmotic pressure, stomatal index, and pigment variations in plant system

**CORE COURSE: 11    BOT6B11T**

**PAPER: 11 CELL BIOLOGY AND BIOCHEMISTRY**

On completion of the course, students are able to

- ✚ The eukaryotic cell cycle and mitotic and meiotic cell division
- ✚ Structure and organization of cell membrane
- ✚ Understand the properties of Monosaccharides, Oligosaccharides and Polysaccharides.
- ✚ They will learn about the Significance of Carbohydrates.
- ✚ Understand the Properties of saturated fatty acids, and unsaturated fatty acids.
- ✚ Understand lipid metabolism in plants.
- ✚ Understand the Beta Oxidation, Gluconeogenesis and its role in mobilization of fatty acids during germination
- ✚ They will learn about the Significance of lipids.
- ✚ They will be able to understand Brief outline of biosynthesis of amino acid
- ✚ Understand the protein - structure and classification and protein biosynthesis in prokaryotes and eukaryotes.
- ✚ They will learn about the nucleic acid metabolism.

**CORE COURSE: 12    BOT6B12T**

**PAPER: 12 ENVIRONMENTAL SCIENCE**

On completion of the course, students are able to

- ✚ Know about the significance of environmental science
- ✚ Create responsible citizens on conservation of nature and natural resources
- ✚ Understand the ecological interactions in various ecosystems
- ✚ Understand the current environmental issues and its global impacts

- ✚ Analyze various ecosystems for its impact in human life
- ✚ Realize the importance of ecological studies
  
- ✚ Develop environmental concern in all their actions and practice Reduse, Reuse and Recycle
- ✚ Try to reduce pollution and environmental hazards and change their attitude towards throwing away plastic wastes
- ✚ Spread awareness of the need of conservation of biodiversity and natural resources
- ✚ Analyze the reasons for climate change and find out ways to combat it.

### **CORE COURSE (ELECTIVE) BOT6B15E**

### **ADVANCED ANGIOSPERM SYSTEMATICS**

On completion of the course, students are able to

- ✚ Know the conceptual development of „taxonomy“ and „systematics“
- ✚ Understand the Phylogeny of angiosperms -A general account of the origin of Angiosperms
- ✚ Understand the general range of variations in the group of angiosperms
- ✚ Trace the history of development of systems of classification emphasizing angiospermic taxa
- ✚ To learn the wide activities in angiosperm and trends in classification.
- ✚ Learn about the characters of biologically important families of angiosperm
- ✚ Know the floral variations in angiospermic families, their phylogeny and evolution.