GOVERNMENT WOMEN'S COLLEGE, BALANGIR

DEPARTMENT OF BOTANY

Programme Outcomes

•To prepare the students for a career in Botany. • To prepare the students for Higher Education and Research in Botany. • To develop a conceptual understanding of the subject and to develop an inquisitiveness in the subject. • To enable the student to acquire basic skills necessary to understand the subject and to master the skills to handle equipment's utilized to learn the subject. • To generally promote wider reading on the subject and allied inter disciplinary subject.

Semester-I

Course Objectives: • To introduce the diverse group of microorganisms and their habitat relationship. • To learn the discovery, nature and multiplication of virus particles. • To know the characteristics, growth and physiology of bacteria and their role in agriculture, health and industry. • To learn the general characteristics and ecological distribution of bacteria, algae and cyanobacteria and their immense importance to the mankind. • To have knowledge about the habitats, distribution and diversity of algae in the soil, freshwater and marine environments.

Course Objective • To learn the principles and operations of microscopes of various complexity and their application in biological studies. • To learn the techniques of centrifugation for separation of biological samples. • To learn the methods of radioisotopes measurement in and their importance in study of biological materials and processes. • To understand and the principles and applications of spectrophotometry and to understand the basic structural design of a standard instrument. • To learn about various chromatographic techniques in separation of plant extracts. • To acquaint the students with the advanced methods for characterization of biomolecules

Course Outcomes • The students learn about the diverse nature of microbes and their interaction with other organisms. • The students certainly get the opportunities to learn the basics of the nature and impact of viruses. • The students shall be able to understand the potential of various microbes and the approaches to use them for human welfare. • The students would be able to identify the important microbes including bacteria, cyanobacteria,

and algae available in local environments and understand their beneficial roles. • The students shall learn about the immense potential the algal resources and understand the methods of cultivation and use of algae.

Course Outcomes: • Proper understanding of the microscopy and knowledge to analyze plant samples using electron microscopy and flow Cytometer. • Separation of biomolecules and cell organelle and appropriate application of the knowledge of centrifugation for the same. • Basic knowledge on the use of radioisotopes for analysis of biological samples. • Extraction and qualitative and quantitative analysis of extracts as well as the assay mixtures using spectrophotometer. • Skilful application of chromatographic techniques for separation of amino acids, pigments and biomolecules. • Proper method for characterizing protein and nucleic acids and skill on handling electrophoresis equipment for preparation of gels.

Second semester

Course Objectives: • To understand the basic components of prokaryotic and eukaryotic cells and the role of various macromolecules in the cells. • Understand how the formation of cytoskeleton • To have an understanding on nucleic acids as the genetic material; • To learn the basic mechanism of replication of nucleic acids • Understand how cells undergo mitosis & meiosis

Course Outcomes • Students will understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles. • Students will understand the components of cell wall & cytoskeleton • Students will understand how these cellular components are used to generate and utilize energy in cells. • 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. • Students will understand the cellular components underlying mitotic and meiotic cell division.

Second semester Core IV Mycology and Phytopathology

Course Objectives • To learn classification and diversity of fungi and their nutritional requirements. • To learn the life cycle and ecology of some important genera of fungi and their pathogenicity. • To understand the beneficial fungal interactions. • To learn about edible fungi and their role in human nutrition. • To learn the beneficial application of fungi in agriculture and medicine. • To know the phyto-pathological processes and the method of their prevention and control.

Course Outcomes • Have an idea on the vast fungal diversity in nature and method of their identification and culture. • Know the life cycle of commonly occurring fungal genera and the disease caused by them. • Have knowledge on the types of fungal associations and their importance. • Have knowledge and skill on the application of fungi and fungal biomolecules in human welfare. • Have skill to understand the host - parasite relationship and its role in establishment of viral, fungal and bacterial diseases in plants. • Understand the causes and conditions for commonly occurring plant diseases and the methods of their control.

3rd semester

Course Objectives • To know the principles, hypotheses and process of adaptation of plants to land habitat. • To learn about the origin classification, and characteristics of bryophytes through some representative genera. • To learn about the origin and distribution of vascular plants and stages of evolution of conducting tissues. • To study the morphology, and characteristics of pteridophytes through some representative genera. • To learn the characteristics, classification and importance of the gymnosperms. • To have a general knowledge on the fossils and fossilization processes.

Course Outcomes: • Able to understand the mechanism of the evolution of the higher plants and their adaptation to land habit. • Knowledge on the diversity of archegoniates and their and their pattern of habitat specific distribution. • Knowledge on the characteristics of bryophytes and skill to differentiate the genera on the basis of their morphology and anatomy. • Ability to identify the members of pteridophytes and knowledge on their characteristic features. • Understand the unique features and distribution of gymnosperms. • Capacity to analyze various types of fossils on the basis of their characters.

Course Objectives • To explain the tissues and tissue systems in plants. • To explain the organization of shoot and root apices. • To educate the students on the activity of meristems for primary and secondary growth of plants • To explain about various types of woods in plants and their developmental pattern. • To give a comprehensive idea about economic botany and its importance in human welfare. • To provide knowledge on general account, cultivation, propagation and uses of common crops.

Course Outcomes: • The ability to examine the internal anatomy of plant systems and organs. • Develop a critical understanding of the evolution of the concept of organization of shoot and root apex. • Evaluate the adaptive and protective morphological systems of plants. • Be able to know the origin and evolution of crops and the importance of wild relatives in crop

improvement. • Develop a basic knowledge on germplasm and the basics for their conservation. • Have an understanding of plants as a source of food, beverages, spices, and materials and its application in human welfare.

Course Objective • To know general organization, possible function, and frequency of genes and non gene DNA sequences in a typical eukaryotic genome. • Practical methodology for applying Mendelian laws (heavily reliant on problem solving). • Extensions of Mendelian genetics, including different forms of allelic relationships. • To know different types of mutations, affect genes and the corresponding mRNAs and proteins. • Inheritance of linked genes, including recombination mapping, and the physical basis of these rules (chromosomal behaviour during meiosis)

Course Outcomes: • Learn the basic principles of inheritance at the molecular, cellular and organismal levels. • Understand the mechanism of inheritance and its relationship with the expression of morphological traits. • Understand the relationships between molecule/cell level phenomena (“modern” genetics) and organism-level patterns of heredity (“classical” genetics) • Know about the variations by polyploidy, chromosomal aberration and gene mutations. • Test and deepen their mastery of genetics by applying this knowledge in a variety of problem-solving situations

4th Semester

Course Objectives • To understand the Historical perspective of DNA and DNA as the carrier of genetic information. • To learn the Organization and structure of DNA and RNA in pro-and eukaryotes. • To understand the structure and function organellar and nuclear genomes. • To understand the General principles of replication and the relationship with genetic code. • To study about Processing and modification of RNA in prokaryotes and eukaryotes for translation.

Course Outcomes: On completion of the course the students shall • Be able to describe

Organization and structure and replication of DNA and RNA. • Have theoretical and practical knowledge the prokaryotic and eukaryotic nucleic acids. • Have a clear understanding on the structure and function of organellar genome. • Understand the processes of bidirectional, semi-conservative and semi discontinuous mode of replication and the importance of the genetic code. • Have ability to understand the mechanism of translation in prokaryotes and eukaryotes.

Course objectives Plant Ecology & Phytogeography • To learn the interaction of biotic components with non-living components of an ecosystem. • To introduce to various natural ecosystems and how the interaction among different biotic and abiotic factors influencing the stability and diversity of an ecosystem. • To study the physical, biological and chemical characteristics of factors influencing population. • To know the experimental approach to determine the physical, chemical and organic matters of soil. • To introduce the students to the characteristics and dynamism of population ecology.

Course Outcomes: • Have ability to understand the ecological functioning of ecosystems and would certainly help students to maintain the local ecosystems. • Have information on species' geographical range and how the size and life history influenced by the various components of ecosystems. • An understanding of the factors that influence patterns of abundance and distribution in populations. • Have knowledge on the process of soil formation and approaches to study the nature of soils. • Have skill to evaluate the dynamics of change of population characteristics.

Course Objectives Plant Systematics Publication, • A comprehensive presentation of the rules, regulations and codes of governing principles of the International Code of Nomenclature of Algae, Fungi and Plants (ICN) • To provide knowledge on basic concepts of plant nomenclature and the tools used for naming the taxa. • To impart knowledge on the traditional and advanced systems of classification of lower and higher plants. • To acquaint the students with the modern approaches for developing systematic relationships in the plant kingdom. • To enlighten the students about the phylogeny and the methods for building phylogeny among taxa of various angiosperms. • To educate the students on the specific taxonomic characteristics of some angiosperm families and the method to make morphological studies of plant materials.

Course Outcomes: • Knowledge on various levels of taxonomic hierarchy and the relationships among various hierarchical levels with respect to their similarities and variations of characters. • The skill to use various taxonomic literature, Flora and herbaria, keys of both physical and digital types for plant identification and floristic studies. • Critical thinking on the ancient, traditional and modern classification systems and evaluation of their applicability in taxonomic placement of taxa. • Knowledge on the evolution of the concepts in classifying plants and weighing the potential of various tools. • Ability to build the phylogeny among various taxa of different levels of hierarchy and identifying the apomorphy and plesiomorphy. • Critical observations of the morphology of plant materials for taxonomic description and identification to the family, genus and species level.

Semester V

Course Objectives • To give a comprehensive idea about economic botany and its importance in human welfare. • To know the origin, introduction, domestication and evolution of new crops / varieties of crop plants. • To create awareness about importance of germplasm diversity. • To provide knowledge on general account, cultivation, propagation and uses of common crops and processing of the materials. • To know the extraction and uses of different oils as well as essential oils.

Course Outcomes: • Have an understanding on the fundamental concepts of Economic Botany. • Develop a basic knowledge on the evolution of crops/varieties. • be aware about the importance of germplasm diversity and learn the methods for their conservation. • Increase appreciation of diversity of plants and plant products used in everyday life of human and the methods for their enhanced production. • Have an understanding of plants as a source of food, beverages, spices, and materials.

Course Objectives Basic Plant Physiology • About the mechanism and physiological activities in plants. • On nutrient uptake and translocation to different plant parts. • On the nature and physiological roles of various plant hormones on plant growth and development. • On the physiological requirements for plant morphogenesis and flowering • On the role of light responsive pigments in plant morphogenesis.

Course Outcomes • The governing principles behind various physiological processes in plants. • About various uptake and transport mechanisms (water and solutes) in plants and the factors governing these processes. • The role of various plant hormones, signaling compounds, and stress responses. • The skills to manipulate the plant hormones in plants for desired morphological and physiological responses. • The climatic and physiological requirements for molecular signaling of plants for growth, differentiation, maturity.

Course Objectives: Basic Plant Biotechnology • To have a basic idea on principles and methods of Plant Tissue culture and in vitro tissue differentiation. • To study about Somatic embryogenesis; Embryo culture and embryo rescue • To have theoretical and practical knowledge on Protoplast isolation, fusion, culture and Selection of hybrid cells for regeneration of hybrid plants. • To study about Recombinant DNA technology and its application. • To study various techniques of gene transfer and its application in plant improvement.

Course Outcomes • Have knowledge the about methods of Plant Tissue culture and its application. • Be able to describe the Somatic embryogenesis; Embryo culture and embryo rescue • Have skill to isolate plant Protoplast and differentiate the normal and hybrid protoplasts • Have knowledge the Gene Construct; construction of genomic and cDNA libraries, screening DNA libraries • Gain knowledge on methods for developing transgenic plants and application of transgenics for human welfare.

Semester VI

Course Objectives: • To learn the anabolic and catabolic cellular processes and their regulations. • To understand the mechanism of signal transduction in plants and the major signaling pathways. • To learn the photochemical and biochemical mechanisms for photosynthetic carbon fixation. • To learn the mechanism of carbon oxidation and ATP synthesis. • To understand the pathways of synthesis and oxidation and of lipids and fatty acids. • To understand the role of enzymes and enzyme action.

Course Outcomes: • The students shall be able to explain the importance of biochemical pathways and regulatory pathways. • The students can explain the role of enzymes in metabolic activities. • The students shall have ability to differentiate various carbon metabolic pathways. • The students shall have proper level of knowledge on carbon oxidation and energysyn thesis. • The students can explain the processes of lipid metabolism and its importance in theg erminating seeds. • The students shall be able to understand and explain the amino acid metabolic pathways.

Course Objectives: Natural Resource Management • To introduce the types of natural resources and the concept of sustainable development. • To understand the status of biological diversity and their management. • To know the contemporary tools such as EIA and GIS for assessment and conservation of natural resources. • To know about the non-conventional energy resources and their application. • To learn the concept of resource accounting for better natural resource management

Course Outcomes: • Be able to understand importance of each component of natural resources and try to use the available resources judiciously. • Know about different biological conventions and treaties emphasizing the conservation of biological diversities. • Clearly understand the importance of sustainable use of natural resources and procedures for their

assessment. • Have skill to use renewable energy sources for the betterment of the human civilization and actively participate in popularization of the methods of energy and resource conservation. • Know the national and international efforts for management and accounting of natural resources.