M.V.R. DEGREE COLLEGE
(UG And PG Courses)
(Affiliated to Andhra University)
An Institution of Priyadarshini Educational Academy)
NAAC ACCREDITED COLLEGE

Dr.V.Rama Rao, M.A.,Ph.D.,
Secretary & Correspondent

Dr.A.Balakrishna,M.Sc.,Ph.D.,
Principal

Department of Botany
Bachelor of Science (BSc; CBZ)
APSCHE, Revised Syllabus of Botany under CBCS Framework
w.e.f.2020-21 (revised in April 2020)
Course Out Comes (COs) for Botany (CBZ)

Code	Title of the paper	Outcomes
Course1 (TH)	**Fundamentals of Microbes and Non-vascular Plants**	**CO1:** Develop skills and knowledge in microbial diversity and microscopic methods. **CO2:** Be able to understand the microbial world and identify microbial diversity. **CO3:** Gain knowledge about classification of microorganisms and special groups of bacteria. **CO4:** Study, discovery and structure of different viruses and different plant diseases caused by viruses. **CO5:** Learn about the discovery, general characteristics, nutrition and economic importance of bacteria. CO6: Study and import knowledge about the occurrence, distribution, structure and life history of lower plants such as Algae, Fungi and Lichens. **CO7:** Study the structure, reproduction and life history and economic importance of different algae in the local ecosystems. **CO8:** Familiarise with the general characteristics of fungi. Gain knowledge about the structure, reproduction and life history of different types of fungi. **CO9:** Know about lichens-structure, reproduction and ecological & economic importance. CO10: Understanding and comparison of various Bryophytes, Study and importing knowledge about the occurrence, distribution, structure and life history of some bryophytes.
Course 1 (Pr)	**Fundamentals of Microbes and Non-Vascular Plants**	**CO1:** Gain knowledge about equipment used in microbiology and safe laboratory practices like safe chemical handling, hazardous waste management and proper use of lab equipment. **CO2:** Learn about the study of viruses and bacteria using electron photon micrographs.

		CO3: Gain knowledge about the plant disease symptoms caused by bacteria under microscope and hands on experience. **CO4:** Understand the vegetative and reproductive structures of bacteria, algae and fungi and familiarise with microscopic technique and cellular drawing. **CO5:** Advanced study of plant material infected by fungi and learning of morphology and anatomy of different thalli. **CO6:** Field visits to gain more hands-on experience. CO7: Gain knowledge on bacterial identification using gram staining methods of analysis. CO8: Advanced learning of bryophytes and anatomy slides and specimens under microscope and gain hands-on experience. **CO9:** Familiarize with the external and internal structure of Bryophytes.
Course 2 (TH):	**Basics of Vascular plants and Phytogeography**	**CO1:** Understanding and comparison of various Pteridophytes. **CO2:** Study and importing knowledge about the occurrence, distribution, structure and life history of lower plants such as Pteridophytes, Gymnosperms and wood yielding plants. **CO3:** Gaining knowledge about the phylogeny and evolutionary concepts in lower group of vascular plants like Pteridophytes. **CO4:** Understanding the classification, characteristics, ultra-structure of Pteridophytes and Gymnosperms. **CO5:** Know about fossilisation and types of fossils, Bennettitales general account. **CO6:** Gain understanding about evolutionary significance of Pteridophytes. **CO7:** Gain insights on geological time scale process. **CO8:** Understanding of various theories to gain knowledge of shoot and root apex organisation. **CO9:** Acquire knowledge on plant histology, anatomy and anomalous secondary growth. **CO10:** Familiarize with some common wood yielding plants of India. **CO11:** Understanding of principles of taxonomy and the modern trends in plant taxonomy.

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		CO12: Gain knowledge about identification and naming of plants as per ICBN regulations. **CO13:** Acquiring knowledge about the classification of Phanerogams according to the standard system of classification.
Course 2 (Pr):	**Basics of Vascular plants and Phytogeography**	**CO1:** Learn about the principles of basic and advanced microscopy. **CO2:** Advanced learning of Pteridophytes and anatomy slides and specimens under microscope and gain hands-on experience. **CO3:** Familiarize with the external and internal structure of Pteridophytes and Wood yielding plants. **CO4:** Gain knowledge on the double staining technique. **CO5:** Understand how to survey techniques and to identify and evaluate the values of different timbers available locally. **CO6:** Understanding different types of systems of classification based on natural and evolutionary tendencies. **CO7:** Gain knowledge on the diversity of families of angiosperms. **CO8:** Understand the angiospermic plant diversity and identify the members of the representative families through taxonomic observations. **CO9:** Acquiring the skill of Herbarium technique.
Course 3 (TH)	**Anatomy and Embryology of Angiosperms, Plant Ecology and Biodiversity**	**CO1:** Understanding of various theories to gain knowledge of shoot and root apex organisation. **CO2:** Acquire knowledge on plant histology, anatomy and anomalous secondary growth. **CO3:** Familiarize with some common wood yielding plants of India. **CO4:** Understand the various aspects of embryology of plants. **CO5:** Understand and identify the different stages in reproduction leading to seed formation in angiosperms. **CO6:** Enable to understand the process of pollination and fertilisation leading to the formation of fruit, seed and embryo. **CO7:** Gaining knowledge about the diversity in embryogeny of dicots and monocots and also about polyembryony as an abnormal characteristic.

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		CO8: Enable to understand concept and components, energy flow, food chain, food web, food ecological pyramids,ecological succession. CO9: Understand population community and production ecology. CO10: Understand biodiversity, value of biodiversity, types and levels of biodiversity, hotspots in India.
Course 3(Pr)	**Anatomy and Embryology of Angiosperms, Plant Ecology and Biodiversity**	**CO1:** Gaining knowledge about identification of different stages in reproduction leading to seed formation in angiosperms. **CO2:** Isolating the embryos and testing the viability of pollen grains **CO3:** Learn handling of instruments used to measure microclimatic variables; soil thermometer, maximum and minimum thermometer, anemometer, psychrometer, rain gauze and lux meter. **CO4:** Learn the quantitative aspects of a plant community by quadrat method. **CO5:** Estimation of primary productivity of an ecosystem. **CO6:** Gain understanding of the phytogeography of India and the world. **CO7:** Locate the hotspots, phyto geographical regions and distribution of endemic plants in the map of India..
Course 4 (TH)	**Plant physiology and metabolism**	**CO1:** Understanding the requirement of mineral nutrition for plant growth. **CO2:** Acquiring knowledge about sensory photobiology. **CO3:** Understanding the process of photosynthesis, respiration and nitrogen metabolism. **CO4:** Knowing about the plant growth nutrients and understanding the biosynthesis of nitrogenous compounds and their role in plants. **CO5:** Understanding physiology of flowering – photoperiodism; role of phytochrome in flowering and vernalization. **CO6:** A pervasive understanding on the kingdoms of bimoleculas, metabolites and pathways that are the prerequisites and consequences of physiological phenomenon for further manipulations. **CO7:** Acquaintance with mechanistic view on the plant

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		environment interactions. **CO8:** Development of an integrative approach for visions in biological problems. **CO9:** Understanding the stress tolerance mechanism adopted by plants. **CO10:** Knowing about the plant growth hormones (Auxins, Gibberellins, Cytokinens, Ethylene, Brassinosteroids) and assessing their role in plants.
Course 4 (Pr)	**Plant physiology and metabolism**	**CO1:** Upon completion of this course, students will be able to understand the major functions and physiological processes occurring in plants. These processes have both theoretical and practical value. **CO2:** Become acquainted with plant metabolism (photosynthesis, respiration and mineral nutrition), water relations, gas exchange and physiology of growth and development and plant responses to environmental stress. Be able to describe and use the basic techniques for studying. CO3: Students will be able to discuss some practical applications of plant physiological research.
Course 5 (TH)	**Cell biology, genetics and plant breeding**	**CO1:** Gain basic knowledge to understand the ultrastructure of envelopes of plant cell, nucleus, chromosomes and cell division. **CO2**: Gain detailed knowledge about genetic material DNA, its structure, replication and types of RNA **CO3:** Gain detailed knowledge about the various stages of cell division and chromosomal analysis or karyotyping. **CO4:** Acquire an insight of molecular biology. **CO5:** Enable the student to understand and comprehend the basic principles of heredity. **CO6:** Gain basic and better knowledge about the mutations and polyploidy. **CO7:** Solve problems in genetics on the basis of Mendel's laws of inheritance. **CO8:** Enable the students to know the different concepts, methods and recent trends of plant breeding. **CO9:** Acquire practical knowledge to understand the principles and techniques of plant breeding. CO10: Learn basic concepts on Molecular breeding – use of DNA markers in plant breeding and crop improvement (RAPD, RFLP).

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Course 5 (Pr)	**Cell Biology, Genetics and Plant Breeding**	**CO1:** Study the structure of plant cell through temporary mounts and cell organelles through microphotographs. **CO2:** Acquire practical knowledge in cytochemical methods of fixation and nuclear staining. **CO3:** Gain good skills for cytological preparation for study of mitosis using onion root tips. **CO4:** Be able to identify different stages of mitosis by squash preparations of onion roots. **CO5:** Able to do calorimetric estimation of DNA by diphenylamine method. **CO6:** Develop analytical skills to solve numerical problems in genetics and field skills to perform emasculation and hybridization methods in plant breeding.
Course 6 & 7 (TH)	Domain related Skill Enhancement Courses (02) - Three (3) pairs of courses (each pair has 2 related courses) will be offered, student has to choose a pair of courses	**Domain Subject(Botany) Objectives :** 1. To impart knowledge on origin, evolution, structure, reproduction and interrelationships of microbes and early plant groups. 2. To provide knowledge on biology and taxonomy of true land plants within a phylogenetic framework. 3. To teach aspects related to anatomy, embryology and ecology of plants, and importance of Biodiversity. 4. To explain the structural and functional aspects of plants with respect to the cell organelles, chromosomes and genes, and methods of plant breeding. 5. To develop a critical understanding on SPAC, metabolism and growth and development in plants. 6. To enable the students proficient in experimental techniques and methods of analysis appropriate for various sub-courses in Botany. **Domain Subject(Botany) Outcomes:** 1. Students will be able to identify, compare and distinguish various groups of microbes and primitive plants based on their characteristics. 2. Students will be able to explain the evolution of trachaeophytes and also distribution of plants on globe. 3. Students will be able to discuss on internal structure, embryology and ecological adaptations of plants, and

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		want of conserving Biodiversity. 4. Students will be able to interpret life processes in plants in relation to physiology and metabolism. 5. Students will be able to describe ultrastructures of plant cells, inheritance and crop improvement methods. 6. Students will independently design and conduct simple experiments based on the knowledge acquired in theory and practicals of the different sub-courses in Botany.

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