**Department of Botany**

PROGRAMME OUTCOMES:

On Successfully completion of the programme, Graduates should be able to demonstrate the acquisition of:

**PO-1. Critical Thinking**: Learning of the concepts, principles and processes in basic and applied field plant biology, a graduate develops ability to identify relevant assumptions and formulate coherent arguments, analyse and synthesize data from a variety of sources and draw valid conclusions and support them with evidence and examples.

**PO-2. Problem Solving**: Understand and solve the problems relevance to society to meet the specified needs using the knowledge, skills and attitudes acquired.

**PO-3. Communication skill**: The graduates demonstrate the skills, that enable them to listen carefully, read texts and research papers analytically and present complex information in a clear and concise manner to different groups/audiences confidently. The graduate also, express thoughts and ideas effectively through writing, orally and communicate with others using appropriate media.

**PO-4. Effective Citizenship**: Demonstrate empathetic social concern and equity centred national development and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

**PO-5. Skill enhancement**: Inculcation of theoretical and practical knowledge and its application, build entrepreneurship and employability skill in the graduate to contribute holistic development of the society.

**PO-6. Moral and ethical awareness:** Develops ability to embrace moral/ethical values to formulate an ethical issue from multiple perspectives and use ethical practices in all work adhering to intellectual property rights.

**PO-7. Research-related skills**: The interdisciplinary knowledge acquired by a graduates enable them to design research by putting suitable hypothesis, rationale objectives, research methodology, draw conclusion and future applications related to the various issues of society, including environment.

**PO-8. Leadership readiness/qualities:** The inculcation of vast and deep knowledge of the subject, analytical and scientific reasoning, effective communication, problem-solving skill, decision making ability and basic managerial skills through the programme develops leadership potentiality in a graduate.

**PO-9. Self-directed and Life-long Learning:** Acquire the ability to engage in independent and lifelong learning in the broadest context of socio-technological changes.

**PO-10. Disciplinary Competency:** This programme will produce competent human resource in plant science, who can implement their gained knowledge in basic and applied aspects to profoundly influence the prevailing paradigm of research, agriculture, industry, biotechnology, healthcare, environment etc., for progressive development of nation.

**PROGRAMME SPECIFIC OUTCOMES (PSOs)**

For a graduate student in Botany (Honours) the qualification descriptors may include following:

1.To show a systematic, extensive, coherent knowledge and understanding of academic subjects and their applications, including critical understanding of the established theories, principles and concepts of a number of advanced and emerging issues in the field of Botany;

2. To gain knowledge to produce professionals in the field of plant sciences in research and development, academics (teaching in Schools, Colleges and University), government and public services e.g., conservationist, plant explorer, ecologist, horticulturist, plant biochemist, genetics, nursery manager, molecular biologist, plant pathologist, taxonomist, farming consultant and environmental consultant.

03. Display skills and ability to use knowledge efficiently in areas related to specializations and current updates in the subject.

04. Provide knowledge about plants, current research, scholarly and professional literature of advanced learning areas of plant sciences

05. Use knowledge understanding and skills for critical assessment of wide range of ideas and problems in the field of Botany

06. Communicate the outcomes of studies in the academic field of Botany through publications in print and digital media.

07. Apply one’s knowledge and understanding of Botany to new/unfamiliar contexts and to identify problems and solutions in daily life

08. Design and apply the knowledge of plant sciences in identifying the problems which can be solved through the use of plants

09. To think of adopting expertise in plant structure, functions and solve the problems of environment, ecology, sustainable development and enhancing productivity.

10. Concept and significance of sustainable development and use of the plant resources

**COURSE OUTCOMES:**

**On completion of this course, a student will have developed ability to:**

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|  Course | Course name | Course outcome (CO) |
| Core Paper-I | Microbiology andPhycology | CO1-Learners able to understand detailed about the viruses and and their applications in various field.  |
| CO2-Develops the knowledge of Bacteria and applications in different fields. |
| CO3- Understand about ecology, structure of algae and its application |
| CO4-Interpret the evolution of algae and the life cycle |
| CO-5 Students will learn to create models of virus and develops skill of identification and staining methods of Bacteria |
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|  Course | Course name | Course outcome (CO) |
| Core Paper-II | Biomolecules  and Cell Biology | CO1- Students will understand principles of bioenergetics and mechanism of enzyme action. |
| CO2-Develops fundamental ideas regarding structure and function of various biomolecules. |
| CO3- Provide comprehensive knowledge pertains to origin of cell, Cell membrane, cytoskeleton and membrane transport. |
| CO4-Comprehend the structure of cell organelles and cell cycle |
| CO-5-Build cytological and biochemical analysis skill in learner. |

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|  Course | Course name | Course outcome (CO) |
| Core Paper III | Mycology and Phytopathology | CO1-Provides basic knowledge of the kingdom fungi and about individual members. |
| CO2-Understand about allied fungi, lichen and applicationof Lichen |
| CO3- Explain applied aspects of Fungi and especially in Biotechnology. |
| CO-4 Students will learn etiology and control measure of plantdiseases |
| CO5- Incorporate skill of herbarium preparation of diseased Plant materials. |

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|  Course | Course name | Course outcome (CO) |
| Core Paper IV | Archegoniate | CO1-Able to explain unifying feature of archegoniate, Furthermore, structure, reproduction, ecological and economic importance of Bryophytes. |
| CO2-Comprehend characteristics, life cycle and economic significance of Pteridophytes. |
| CO3- Understand characteristics, life cycle and economic significance of Pteridophytes. |
| CO-4: Learner grasps the concepts regarding Geological time scale, fossilization Process and fossil pteridophytes |
| CO5-Develops practical skill Microscopic and morphological examination of plant Specimen  |

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|  Course | Course name | Course outcome (CO) |
| Core Paper-V  | Anatomy of angiosperms | CO1- Provides information about Plant anatomy and its application in systematics, forensics and pharmacognosy. |
| CO2-Students learn regarding anatomical features of stem and leaves |
| CO3-Explain organography of root and secondary growth of plant organs. |
| CO4-Leraner grasps knowledge about adaptive and protective system, secretory System, mechanical tissue systemof plants |
|  |  | CO5-Examination of internal structure enhance organographic skill of students  |

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|  Course | Course name | Course outcome (CO) |
| Core Paper VI | Economic Botany | CO1-Studends understand origin of cultivated plants as well as cultivation and economic importance of cereals, legumes and sugar-starch yielding plants |
| CO2-Provides insight into cultivation and economic importance of spices and drug yielding plants. |
| CO3- Facilitate learner regarding cultivation and economic importance of oil yielding plants. |
| CO4-Develops skill of tapping of natural rubber as well as discuss about timber and fibre yielding plants. |
| CO5-Examination of plant samples inculcate knowledge of Socio-economic applications. |

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|  Course | Course name | Course outcome (CO) |
|  Core paper-VII | Genetics | CO1-Understand the concept of Mendelian, Non-Mendelian and Extrachromosomal inheritance. |
| CO2-Develops skill of gene mapping through analysis of linkageand crossing over data. |
| CO3- Comprehend the knowledge of chromosomal mutation, gene mutation and their consequences. |
| CO-4-Understand Population and Evolutionary genetics  |
| CO5-Blood typing and Pedigree analysis provides the learnersemployability skill. |

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|  Course | Course name | Course outcome (CO) |
| Core paper-VIII | Molecular Biology | CO1-Understand structure of Nucleic acid and genome organisation prokaryotes and eukaryotes. |
| CO2-Comprehend chemistry, mechanism of DNA replication and Repair. |
| CO3- Provides knowledge transcription and post transcriptional modifications. |
| CO4-Incorporate mechanism of translation and post-translational Modifications.  |
| CO5-Experiment on Nucleic Acid develops analytical skill of Learners. |

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|  Course | Course name | Course outcome (CO) |
|  C-9 | Plant Ecology &Phytogeography | CO1-Understand the relationship between organism and Environment. |
| CO2-Students learn about Soil and water. |
| CO3-Learner understands biotic interaction, population,Community. |
| CO4-Students learn Ecosystem and phytogeography.  |
| CO5-Analysis of various parameters of soil and waterenables the learner to apply in agriculture. Besides enables student to analyse foral diversity of an area |
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|  Course | Course name | Course outcome (CO) |
|  CC-X | PlantSystematics | CO1-Learner gains knowledge regarding plant identification |
| CO2-Understand how to assign correct name to the plantsaccording to ICN |
| CO3-Comprehend classification of plant. |
| CO4-Provides information regarding phylogeny of Angiospermic Plants and also develops skill of learners about plant families |
| CO5-Filed visit enables students to identify plant and assigned to respective family. |

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|  Course | Course name | Course outcome (CO) |
|  Core Paper XI | Reproductive biology of angiosperms | CO1-Grasps concepts of development of male gametophyte and pollen biology |
| CO2-Understand structure and development female Gametophyte. |
| CO3-Intrpret pollination, fertilization and self-incompatibility |
| CO4-Provides knowledge about Endosperm, Embryo, Seed,Polyembryony and Apomixis.  |
| CO5-Lab work provides Embryological skills to the learner  |

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|  Course | Course name | Course outcome (CO) |
|  Core paper-XII | Plant Physiology | CO1-Understand plant water relationship and phloemTranslocation. |
| CO2-Learner grasps knowledge of mineral nutrition and nutrient Uptake. |
| CO3- Develops skill in learner regarding chemistry and application phytohormones |
| CO-4-Learner understands physiology of flowering |
| CO5-Practical knowledge is help full for field application |

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|  Course | Course name | Course outcome (CO) |
| Core paper-XIII | Plant metabolism | CO1-Understand basic concept of plant metabolism and cell signalling. |
| CO2- Learner grasps knowledge of Photosynthesis |
| CO3- Comprehend carbon assimilation and ATP synthesis. |
| CO4- Learner gains knowledge about lipid metabolism and Nitrogen metabolism. |
| CO5-Develops skills to examine physiological process in plants |

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|  Course | Course name | Course outcome (CO) |
| Core Paper-XIV | Plant biotechnology | CO1-Provides different technical skills to learner to culture plant Tissue for various purposes. |
| CO2-Understand basic techniques of Recombinant DNA Technology.  |
| CO3-Acquired knowledge of gene transfer and selection of transformed cells. |
| CO4-Implement concept of biotechnology in agriculture,Environment, industry and medicine.  |
| CO5- Develops practical skills of tissue culture, DNA isolation, Gel Electrophoresis etc. |

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|  Course | Course name | Course outcome (CO) |
| DisciplineSpecificElective-I | Analytical techniques in plant science | CO1-Understand and apply imaging technology; microscopy |
| CO2-learner grasps techniques of cell fraction, spectroscopy, Radio isotope and their applications. |
| CO3-Learn separation and analytical techniques;Chromatography, Mass spectroscopy, X-ray diffraction, Electrophoresis. |
| CO4-Gains knowledge of biostatistics and its application to wide Range of data. |
| CO5- Develops skill in imaging, analytical and Separation Techniques. |

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|  Course | Course name | Course outcome (CO) |
| DisciplineSpecificElective-II | Natural resource management | CO1-Understand natural resource and their sustainableutilization |
| CO2- Learner acquired knowledge of Biodiversity conservation, Forest resource and its management. |
| CO3-Provides knowledge about energy resources and contemporary practices in resource management. |
| CO4-Learner understand National and international effortsin resource management.  |
| CO5- Develops practical skills of solid waste management, Soil analysis and their applications in agriculture. |

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|  Course | Course name | Course outcome (CO) |
| Discipline Specific Elective Paper-III | Horticultural practices and post-harvest technology | CO1-Learner understands scope of Horticulture and importance in rural economy along with food security. |
| CO2--learner grasps management and marketing of vegetableand fruit crops. |
| CO3-Undestand the concepts of landscaping and gardening. |
| CO4-Develops Horticultural technical skills including post harvest technology of Horticultural crops to minimise the lossin the learner. |
| CO5-Understand documentation of germplasm, IPR Issues, national and international society associated with horticulture. |

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|  Course | Course name | Course outcome (CO) |
| Discipline Specific Elective Paper-IV | DSE-4Dissertation/Review | Students undertakes project pertains to local issues. |
| Students conducts dissertation addressing to regional problems. |
| Students carry out projects related to national issues. |
| Students conducts dissertation focusing global topics. |
| Dissertation/projects carried by students develops scientific aptitude to solve the problem. |

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|  Course | Course name | Course outcome (CO) |
|  DSE-3 | Stress Physiology | CO1- Learner understands about various environmental stress. |
| CO2-Understand signalling mediated by NO, Calcium modulation and phospholipid.  |
| CO3-Provides knowledge about developmental and physiological mechanisms that protect plants. |
| CO4- learner grasps the mechanism, how plants manage reactive Oxygen species. |
| CO5-Able to understand acclimation and adaptation mechanismsof plants response to various biotic and abiotic stress. |

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|  Course | Course name | Course outcome (CO) |
| Discipline Specific Elective-II | PlantBreeding | CO1- Develops knowledge of different methods of crop improvements. |
| CO2- learner grasps concepts of quantitative inheritance and its relation to different valuable agricultural characters. |
| CO3- Students understand concepts and significance of inbreeding depression and heterosis. |
| CO-4-Provide knowledge regarding role of mutation, polyploidydistant hybridization and biotechnology in crop improvement. |
| CO5-Inculcates practical skills of plant breeding  |

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|  Course | Course name | Course outcome (CO) |
| Generic Elective Paper IIA | Plant Physiology and metabolism | CO1Provides knowledge on the vital physiological processes of plants and their importance in plant growth and Survival. |
| CO2-Understand the nutrient uptake and translocation in plants. |
| CO3-Learner understands the processes of and Photosynthesis and organic carbon oxidation. |
| CO4-Students comprehends the metabolic pathways of cells and their regulation by enzymes. |
| C05-Lerner grasps the concepts of physiological roles of phytohormones and their applications. |

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|  Course | Course name | Course outcome (CO) |
| Generic ElectivePaper II(B) | Plantanatomy and embryology | CO1-Learner understands different types of tissues and organography of different plant organs. |
| CO2-Provides knowledge regarding secondary growth as well as adaptive and protective systems of plants. |
| CO3-Lerner grasps the concepts pertains to various events related with Sexual reproduction of higher plants |
| CO4-Understand structure and development of endosperm, embryoand seeds. Moreover, mechanism of seed dispersal. |
| CO5-Examination of internal structure enhance organographic skill of students |