BTPE3005 PLANT BIOTECHNOLOGY (3-0-0)

Module - I: (08 Hours)
Plant genome organization, Organization and expression of chloroplast genome and mitochondrial genome, Cytoplasmic male sterility.

Module - II: (08 Hours)
Intergenomic interaction, Agrobacterium and crown gall tumors: - Ti plasmid & Ri Plasmid vectors. Mechanism of T-DNA transfer to plants, Agro infection. Plant viral vectors. Direct transformation of plants by physical methods.

Module - III: (08 Hours)
Genetic engineering in plants: -Selectable markers, Reporter genes and Promoters used in plant vectors. Genetic engineering of plants for bacteria, fungi, virus, pest and herbicide resistance.

Module - IV: (08 Hours)
Conventional plant breeding, Introduction to cell and tissue culture, tissue as technique to produce novel plants and hybrid. Tissue culture media (composition and media), Initiation and maintenance of callus and suspension culture; single cell clones.

Module - V: (08 Hours)
Applications of secondary metabolites: Isolation and characterization drug development, Biopesticides, growth regulators, Biofertilizers. Value addition via bio transformation. Biocatalyst, Bio remediation, Bio fuels, Feed stock Chemicals, Designer Chemicals.

Course outcomes (Cos)
1. Students will be able to describe the organization and key features of plant nuclear, chloroplast, and mitochondrial genomes
2. Students will be able to explain the principles of intergenomic interactions and their impact on plant development and function.
3. Students will be able to identify and explain the function of selectable markers, reporter genes, and promoters commonly used in plant genetic engineering.
4. Students will be able to differentiate between conventional plant breeding approaches and various plant tissue culture techniques.
5. Students will be able to identify and categorize various plant secondary metabolites and their diverse applications in drug development, agriculture (biopesticides, growth regulators, biofertilizers)..

Program outcomes (Pos)-
1) Knowledge Application: Apply fundamental knowledge of biological sciences, particularly in plant biology and molecular genetics, to solve complex problems in biotechnology.
2) Problem Analysis: Identify, formulate, and analyze complex plant biotechnology problems, reaching substantiated conclusions using principles of plant sciences, engineering, and mathematics.
3) : Design/Development of Solutions: Design solutions for complex plant biotechnology problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
4) Modern Tool Usage: Select and apply appropriate techniques, resources, and modern biotechnology tools, including prediction and modeling, to complex plant biotechnology activities with an understanding of the limitations.
5) Ethics and Professionalism: Understand and commit to professional ethics and responsibilities, and adhere to norms of plant biotechnology practice, recognizing the societal and environmental impact of their work.

Program Specific Outcomes (PSOS)-

1. Plant Genetic Manipulation: Utilize advanced techniques in plant genetic engineering for crop improvement, developing plants with enhanced traits such as disease resistance, abiotic stress tolerance, and improved nutritional value
2. Plant Tissue Culture Expertise: Master various plant tissue culture techniques for micropropagation, germplasm conservation, and the production of disease-free plants and secondary metabolites
3. Bioproduct Development: Apply biotechnological principles for the isolation, characterization, and production of valuable plant-derived compounds, including biopharmaceuticals, biopesticides, and industrial chemicals
4. Sustainable Agriculture Practices: Contribute to sustainable agricultural practices through the application of plant biotechnology for biofertilizer development, bioremediation, and the production of biofuels from plant biomass
5. Research and Innovation: Engage in research and development activities in plant biotechnology, demonstrating critical thinking, experimental design, and data analysis skills to address current challenges in agriculture, medicine, and environment.

Books:

1. Plant Biotechnology by J. Hammod, P. McGarvey, V. Yusibov.
2. Plant cell and Tissue Culture for the production of Food Ingradients by Fu, Singh and Curtis.
3. Biotechnology in crop improvement. H.S.Chawla..