

Subject Code: 2SC2010301	Subject Title: Plant Biotechnology
COURSE TYPE: CORE COURSE	

Course Objective: This course is framed to give knowledge of advanced plant tissue culture techniques and applications, genetic modification techniques of plant, their applications and its ethical issues.

Teaching scheme (hours) per week		Credit			Theory Marks		Practical Marks		Total
Theory	Practical	Theory	Practical	Total	Uni. Assessment	Cont. Assessment	Uni. Assessment	Cont. Assessment	
4	-	4	-	-	60	40	-	-	100

Unit	Content	Lectures	Weightage
1	- Laboratory Organization - Plant Tissue Culture Media composition, Plant growth regulators (auxin, gibberlins, cytokinins, abscisic acid, acetylene etc.) - Sterilization of Explants - Types of Culture - In-vitro somatic embryogenesis, Artificial Seeds - Micro propagation (Rapid Clonal propagation) - Meristem culture - suspension cultures - Embryo culture and embryo rescue,	12	20%
2	- Production of haploid plants: Androgenic methods (anther culture, pollen) and Gynogenic haploids (ovule / ovary culture) - Methods of protoplast isolation, Protoplast development, culture & fusion (Somatic hybridization- cybrids) - Production of secondary metabolites, different bioreactors and their use in secondary metabolite production, biochemical pathways for the production of different secondary metabolites - Somaclonal variation, - Cryopreservation: germplasm collection and conservation	15	25%
3	Methods for genetic transformation: Vector-less or direct DNA transfer (Particle bombardment, Electroporation, Microinjection), Design of expression vectors: Use of 35 S and other promoters; Genetic markers; reporter genes; Methods of nuclear transformation; Viral vectors and their applications Plasmid vectors-p Blue script IIKs, pBin19, p Green vectors Markers: Types, their advantages and disadvantages Molecular markers – RFLP, RAPD, AFLP map based cloning, Molecular Marker Assisted Selection (MAS)	12	20%
4	Application of Plant Biotechnology Crop improvement–Insect resistance (Bt cotton, Bt brinjal), Herbicide resistance, Disease resistance (viral resistance, bacterial resistance, fungal resistance), Golden rice, abiotic stresses resistance. Post-harvest technology: RNAi and antisense RNA technology for extending shelflife of fruits (delay of softening and ripening of fleshy fruits eg. tomato, banana, water melons) and flowers (ACC synthase gene and polygalacturonase);, Post-harvest protection of cereals, millets and pulses. Current status of transgenic plants in India and other countries, Ethical issues associated with GM crops and GM food, Environmental impact of herbicide resistance crops and super weeds; labeling of GM plants and products.	21	35%

Learning Outcome: Students should become aware of advance applications of plant tissue culture, techniques of genetic modifications, different applications of transgenic plants, applications of transgenesis in post harvest technology, current status and issues related to it.

Reference Books:

- Plant biotechnology – J Hammond, et. al., Springer Verlag.
- Biotechnology in crop improvement – H S Chawla.
- Practical application of plant molecular biology – R J Henry, Chapman & Hall.
- Elements of biotechnology – P K Gupta.
- An introduction to plant tissue culture – M K Razdan.
- Plant propagation by tissue culture: The technology (Vols. 1 & 2) – Edwin George.
- Handbook of plant cell culture (Vols. 1 to 4) – Evans et. al., Macmillan.
- Plant tissue and cell culture – H E Street, Blackwell Scientific.
- Cell culture and somatic cell genetics of plants (Vols. 1 to 3) – A K Vasil, A. Press.
- Plant cell culture technology – M M Yeoman.
- Plant tissue culture and its biotechnological applications – W Bary, et. al., Springer Verlag.
- Principles of plant biotechnology: An introduction to genetic engineering in plants – S H Mantel, et. al.
- Advances in biochemical engineering / Biotechnology – Anderson, et. al.
- Applied and fundamental aspects of plant cell tissue and organ culture edited by Reinert & Bajaj Y P S, Springer Verlag.
- Plant cell and tissue culture – S Narayanswamy, Tata Mc Graw Hill Co