GENERIC ELECTIVE (GE-03)

Credit distribution, Eligibility and Pre-requisites of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course
		Lecture	Tutorial	Practical/ Practice		
Plant Cell and Tissue Culture Techniques **ALS BOT GE 03**	**4**	**2**	**0**	**2**	NIL	**NIL**

Objectives:

To give students knowledge of techniques used in plant tissue culture and its applications.

Learning Outcomes:

The students will:

- learn the basic concepts, principles and processes in plant cell and tissue culture.
- gain the ability to apply concepts and principles of plant cell and tissue culture in biotechnological and agricultural fields.
- understand the role of cell and tissue culture in plant improvement.
- gain knowledge and expertise to become an entrepreneur by establishing their own plant tissue culture lab.

Theory:

Unit 1.Historical perspective and terminology used in tissue culture: Hours: 03

Introduction to Plant Tissue Culture Technique, Contributions of Haberlandt, Reinert and Steward, Murashige and Skoog, Cocking, Guha and Maheshwari, Morel and Martin.Terminology: Cell

culture, tissue culture, organ culture, explant, callus, totipotency, plasticity, dedifferentiation and re-differentiation, regeneration, subculture, somaclonal variants.

Unit 2.Media Preparation and Sterilization: Hours: 05

Media composition - role of organic and inorganic nutrients, vitamins, hormones and supplements. Preparation of nutrient medium. Sterilization of medium, containers and small equipment (steam, dry, filter, UV light, alcohol and flame). Collection and sterilization of plant material, maintenance of aseptic conditions by use of autoclave and laminar flow chamber.

Unit 3. Micropropagation: Hours: 05

Selection of plant material, methodology, plant regeneration pathways-somatic embryogenesis, organogenesis. Advantages.

Unit 4. Protoplast culture: Hours: 05

Protoplast isolation (mechanical and enzymatic), role of osmoticum, culture, purification, viability test and protoplast fusion (spontaneous, induced), selection of fused protoplasts, applications. Somatic hybrids and Cybrids.

Unit 5. *In vitro* Haploid and Triploid Production: Hours: 04

Haploids - Anther culture and microspore culture, Applications. Triploids - Endosperm culture and Applications.

Unit 6.Applications ofTissue culture: Hours: 08

Embryo rescue, Artificial seeds, virus elimination, secondary metabolite production, Cryopreservation, Germplasm conservation.

Practical:

l. (a) Equipment used in tissue culture: autoclave and laminar air flow chamber.
   (b) Preparation of Murashige& Skoog's (MS) medium.
   (c) Demonstration of *in-vitro* sterilization and inoculation methods using leaf and nodal explants.
2. Study of anther, embryo and endosperm culture.
3. Study of micropropagation, somatic embryogenesis & artificial seeds.
4. Isolation of protoplasts.
5. Visit to a plant tissue culture laboratory and submission of field report.

Essential/recommended readings

1. Bhojwani, S. S. (1990). *Plant Tissue Culture: Applications and Limitations, Developments in Crop Science* (1st ed., Volume 19). Elsevier Science.
2. Bhojwani, S.S, & Bhatnagar, S.P. (2011). The Embryology of Angiosperms (5 ed.). Vikas Publication House Pvt. Ltd.
3. Bhojwani, S. S., &Dantu, P. K. (2013). *Plant Tissue Culture: An Introductory Text.* Springer.

Suggestive readings

1. Bhojwani, S. S., &Razdan, M. K. (1996). *Plant Tissue Culture: Theory and Practice* (Revised Ed.). Elsevier.
2. Newmann, K.-H., Kumar, A., & Imani, J. (2020). *Plant Cell and Tissue Culture: A*