**CELL AND TISSUE CULTURE CREDIT HOUR 2+1**

**LEARNING OUTCOMES:**

**Students will be able to:**

1. Learn how to develop micro-environment and which factor will affect tissue culture outcomes.
2. Describe/practice sterile methods to avoid microbial contaminations.
3. Gain knowledge of organogenesis and embryogenesis protocols and differences between them.

**COURSE CONTENTS:**

Plant cell and tissue culture: requirements for in vitro cultures; culture facilities; sterile techniques; media preparation and handling; callus cultures; cell suspension cultures; protoplast culture; haploid cultures, organ culture; meristem culture for virus elimination; embryo culture and embryo rescue; regeneration of plants and micropropagation; somaclonal variation; industrial uses of plant cell culture; tissue culture in genetic engineering and biotechnology. Mammalian cell culture; origin and principles of cell culture; qualitative characteristics of cell cultures; cell counting and analysis; cryopreservation; cell banking and subculture (variety of different systems); primary cell culture techniques; development of immortalized cell line; detection of microbial contaminants; animal cells for bioassays and bioproducts; design and operation of animal cell culture bioreactors for therapeutic protein production; growth environment; Stem cell culture.

**PRACTICALS:**

1. Culture media preparation.
2. Starting a primary culture (tissue digestion, cell count and cell culture).
3. Maintenance of a cell line.
4. Cryopreservation of cell line.
5. Plant cell culture (callus induction , suspension culture)
6. Vital staining.
7. Organ culture.

**RECOMMENDED BOOKS:**

1. Al-Rubeai, M. 2014. Animal cell culture. Cham : Springer.
2. Barnum, S. 2004. Biotechnology: An Introduction, Brooks Cole, U.S.A.
3. Christou, P. and Harry, K. H. 2004. Handbook of Plant Biotechnology, John Wiley and Sons, N.Y.
4. Doyle, A. and Griffiths, J. B. 1998. Cells and Tissue Culture: Laboratory Procedures in Biotechnology, John Willey and Sons, N.Y.
5. Freshney, I. I. 2000. Culture of Animal Cells: A Manual of Basic Techniques, John Wiley and Sons, N.Y.
6. Gayatri, M. C., & Kavyashree, R. 2015. Plant tissue culture: Protocols in plant biotechnology. Oxford: Alpha Science Intl.
7. Jennie, P. M. and Penelope, E. R. Introduction to Cell and Tissue Culture; Theory and Technique.1998. Plenum Press, New York.
8. Nelson, C. M. 2015. Tissue morphogenesis: Methods and protocols. Humana Press. NewYork.

Sharma, V., and Alam, A. 2015. Plant tissue culture. I K International Publish. New Delhi .