

# BACHELOR OF SCIENCE

## 4<sup>th</sup> SEMESTER

### DISCIPLINE SPECIFIC COURSE - 4 (CORE-4)

#### BT420C: BIO-TECHNOLOGY: PLANT BIOTECHNOLOGY AND ANIMAL CELL SCIENCE

CREDITS: THEORY – 4, PRACTICAL – 2 (4+2)

THEORY (4 CREDITS: 60 HOURS)

MAXIMUM MARKS: 60, MINIMUM MARKS: 24

**Objective:** This course has been aimed to introduce students towards advancement in plant and animal biotechnology that can be used for benefit of mankind.

#### Unit – 1 (15 Hours)

Basic concepts regarding plant cell; Concept of totipotency and plasticity; Plant tissue culture media composition and role of its essential components with specific reference to Murashige and Skoog Medium; Plant hormones and their usefulness in plant tissue culture; Micropropagation and its applications; Brief account of various culture types – callus culture, cell-suspension culture, anther / microspore culture, ovule culture, embryo culture, shoot tip / meristem culture, root culture; Plant regeneration through organogenesis and somatic embryogenesis.

#### Unit – 2 (15 Hours)

Overview of plant transformation techniques; Agrobacterium-mediated transformation – biology of *Agrobacterium tumefaciens*, Ti-plasmid & its features (T-DNA & vir region) and mechanism of gene transfer leading to crown-gall disease; Direct gene transfer methods – biolistics, electroporation, polyethylene glycol (PEG)-mediated transformation, transformation using silicon carbide fibres with advantages and limitations of each method; GM crops with specific reference to Golden Rice & Bt cotton; Concerns about GM crops.

#### Unit – 3 (15 Hours)

Basic facilities and equipment required for setting up a tissue culture facility; Culture media – introduction to balanced salt solutions and complete media along with the role of their essential constituents including serum, advantages of serum-free media, commonly used media formulations with their specific uses; Aseptic technique – objectives & elements, commonly employed techniques in sterile handling; Biology of cultured cells.

#### Unit – 4 (15 Hours)

Types of tissue culture; Primary and secondary cultures; Suspension and adherent monolayer cultures; Subculturing and development of cell lines – criteria for subculturing, phases of

culture, understanding of cell line / cell strain / passage number / generation number / split ratio, properties of finite and continuous cell lines, transformation and immortalization; Transfection of cell lines, commonly used cell lines with their specific applications; Principles of cryopreservation; Applications of animal cell culture technology - monoclonal antibodies, viral vaccines and therapeutic recombinant glycoproteins.

**PRACTICALS (2 CREDITS: 60 HOURS)      MAXIMUM MARKS: 30, MINIMUM MARKS: 12**

1. Preparation of plant tissue culture media.
2. Preparation of different explants for culturing and steps of explant inoculation.
3. Explant culture (embryo/ovary).
4. Establishment and maintenance of cell lines.
5. Subculture of monolayer cells.
6. Determination of cell viability by trypan blue assay.

**BOOKS RECOMMENDED**

1. Plant Biotechnology – The Genetic Manipulation of Plants: Slater, A., Scott, N. W. and Fowler, M. R. – Oxford University Press.
2. Introduction to Plant Biotechnology: Chawla, H. S. – Science Publishers Inc.
3. Culture of Animal Cells – A Manual of Basic Technique and Specialized Applications: Freshney, R. I. - Wiley-Blackwell.
4. Animal Cell Culture and Technology: Butler, M. – BIOS Scientific Publishers.
5. Animal Cell Culture – A Practical Approach: Masters, J. R. W. – Oxford University Press.

**Expected Learning Outcomes:**

1. Understanding of basic concept of plant and animal tissue culture, and their applications.
2. Practical know-how of basic techniques used for initiation and maintenance of cultured tissues/ cells.