

I Year & I Sem.; M.Tech. Biotechnology & Bioprocess Engg.	L	T	P	TO	C
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(BT541) ADVANCED PLANT AND ANIMAL BIOTECHNOLOGY

Objectives of the Course:

This Course was designed to provide the advanced concepts and industrial applications in the field of agricultural biotechnology. Production of high yielding, disease resistant crop varieties by using plant transformation technology. Introduction and concepts about Structure and organization of animal cell lines and stems cell culture and embryonic development to enhance the live stock production for the future needs. Concepts of Molecular farming and production antibiotics, plantibodies from GM organisms. To provide students opportunities to participate in R&D projects, and develop clinical and laboratory research skills.

UNIT I : Introduction to Tissue Culture & Applications:

An over view and important concepts of tissue culture and tissue engineering technology, its applications in various fields. Embyo culture and embryo rescue. Anther, pollen, ovary, ovule, nucellus culture, Endosperm culture for production of haploid plants and homozygous lines. Germplasm conservation (Cryopreservation); Hardening & Field transformation of cultured Plants;

UNIT II: Plant Genetic Engineering for Productivity and Performance (Biotic & Abiotic Stress):

Gene transformation technology-Agrobacterium mediated gene transfer; Agrobacterium based vectors, viral vectors and their application. Direct gene transfer methods; chemical methods, electroporation, microinjection, particle bombardment Herbicide resistance, Insect resistance, Disease resistance, virus resistance,. Abiotic stress tolerance ;Drought, temperature, salt tolerance.

UNIT III: Animal Biotechnology:

Primary culture – Mechanical and enzymatic mode of desegregation, establishment of primary culture. Subculture - passage number, split ratio, seeding efficiency, criteria for subculture. Cell cycle; primary cell culture; nutritional requirements for animal cell culture; techniques for mass culture of animal cell lines.

UNIT IV: Techniques of Animal Biotechnology:

In vitro fertilization - Concept of superovulation, collection, maintenance, and maturation of oocytes, fertilization of oocytes, Maintenance and assessment of embryos, embryo transfer - Artificial insemination, preparation of foster mother, surgical and non-surgical methods of embryo transfer, donor and recipient aftercare.

UNIT V: Molecular Farming & Industrial Products:

Production of secondary metabolites from plants and animals, principles and mechanisms of Processes for enhancing the production of secondary metabolites. Technology of plant cell culture for production of chemicals; Bioreactors systems and models for mass cultivation of plant and animal cells. Applications of Plant and Animal biotechnology principles for the production of quality oil, Industrial enzymes, Antigens (edible vaccine) and plantibodies. Application of animal cell culture for production of vaccines, growth hormones; interferons, cytokines and therapeutic proteins. Hybridization of cell lines, stem cells and its application in organ synthesis; transgenic animals and molecular farming. {Ref: 3,6,7,8}

Text Books:

1. Bhojwani, S.S. and Rajdan, "Plant Tissue Culture: Theory and Practice", 2004.
2. H.K.Das, "Text Book of Biotechnology ". 5th ed., Wiley India, (P) Ltd. New Delhi, 2007.
3. H.S. Chawla, "A Text Book of Planat Biotechnology", 2nd ed., Oxford & IBH, New Delhi, 2002.

Reference Books:

1. Freifelder D," Molecular Biology", Jones and Bartlett Publishers inc. 1987.
2. Kalyan Kumar De., "Introduction to Plant Tissue Culture", 2nd ed., New Central Book Agency, Kolkata, 1992.
3. Jennie, P.Mather & David Barnes (Ed.) "Animal Cell CultureMethods", Academic Press (An imprint of Elsevier) USA. 1998.