# MANGALORE UNIVERSITY

## DEPARTMENT OF BIOSCIENCES

### IV SEMESTER - HARD CORECOURSES

### BSH 551 BIOTECHNOLOGY

**52hrs**

**Course Outcomes:**

*After successful completion of the course, students will be able to:*

- Understand how to make use of the knowledge in basic science to develop technologies.
- Know the recent advancements in the field biotechnology.
- Gain the knowledge about different types of bioreactor and fermentation technologies.
- Know how to produce bioplastics as an eco-friendly strategy.
- Get a good awareness about production and utility of biofertilizers and biopesticides.
- Know how to apply the techniques of aseptic plant tissue culture.
- Comprehend how to produce various hybrid plants.
- Know the significance of microorganisms in pharmaceutical industries.
- Become familiar with animal cell line culture and production of transgenic animals.
- Enhance the knowledge about rDNA technology with recent developments.
- Get an idea how to run the PCR, RT-PCR and DNA fingerprinting.

**UNIT I (13 hrs)**

Aims and scope of biotechnology, basic concepts of biotechnology, traditional and modern biotechnology. Microbial Biotechnology: Fermentation techniques: Fermenters and bioreactors. Batch, submerged (SmF), solid substrate (SSF) and continuous fermentation. Fermented foods, oriental foods, silage, probiotics, single cell proteins, production of hormones and growth factors. Microbial polysaccharides, bioplastics, cell immobilization and its applications. Biopesticides (fungi, bacteria and viruses). Biofertilizers, plant-growth promoting microorganisms, biocontrol agents and bioprotestants. Transgenic microbes and their applications.

**UNIT II (13hrs)**

Plant Biotechnology: Plant tissue culture laboratory and aseptic techniques, culture media, callus induction, organogenesis, somatic embryogenesis, micropropagation, production of secondary metabolites, selective markers, somaclonal variation, synthetic seeds and cryopreservation. Haploid production: pollen, anther and ovule cultures. Cell suspension cultures, protoplast culture, protoplast fusion and hybridoma technology. Transgenic plants, production of disease-, salinity-, pest-, herbicide-, drought-resistant and high yielding varieties of plants. Production of improved varieties using Ti plasmids. Application of rhizobia and mycorrhizas in plant tissue culture. Plant-derived vaccines and antibodies.

**UNIT III (13 hrs)**

Animal Biotechnology: Animal cell culture techniques, culture media, primary and secondary cell cultures, cell lines and cell strains and growth factors. Stem cells, gene expression in cell culture, organ culture, histotypic culture; Natural and synthetic cell culture media composition; cytotoxicity and cell viability assays; Transgenic animals and their uses. Animals as biorareactors.

**UNIT IV (13 hrs)**

Molecular Biotechnology: Gene manipulation, restriction enzymes, DNA insertion through vectors, clone selection and expression of cloned genes. Expression systems and their applications: *Escherichia coli*, Streptomyces, yeast, baculovirus and animal cells as cloning hosts. Analysis of DNA-DNA sequences, mutagenesis and gene expression, DNA amplification, PCR and RtPCR techniques and DNA fingerprinting.

**References:**


1. Comprehensive Biotechnology, Vol. 1, 2, 3 & 4 Murray Moo Young, Pergamon Press
2. Industrial Biotechnology, Cruger & Cruge
3. Microbial Biotechnology, Alexander, G, WH Freeman and Company
4. Microbial Technology. Peppler, Vol. 1 &2
5. Biotechnology in Agriculture and Forestry. Bajaj YPS series. Springer VerlagPub.
6. Biotechnology of Higher Plants -Russell.
7. Plant Cell and Tissue Culture. A Lab manual. Reinert J. NarosaPub.
8. Plant Biotechnology. Mantell and Smith. Cambridge Univ. Press.
9. Animal Transgenesis and Cloning by Louis-Marie Houdebine John Wiley &Sons.
10. Animal Cell Culture and Technology by Michael Butler BIOS Scientific Publishers.
11. Basic Cell Culture: A Practical Approach (Practical Approach Series) by J. M. Davis, Oxford university press, Oxford