

**KAKATIYA UNIVERSITY**  
Under Graduate Courses (Under CBCS 2020 – 2021 onwards)  
**B.SC. BIOTECHNOLOGY III YEAR**  
**SEMESTER – V**

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**Elective Course DSE-5**  
**PLANT BIOTECHNOLOGY**  
**(ELECTIVE - a)**

**UNIT-I**

- 1.1. Historical perspectives of plant tissue culture, and basic requirement for tissue culture laboratory.
- 1.2. Culture mediums for plant tissue culture – MS medium and B5 medium.
- 1.3. Sterilization of media – steam, dry and filter sterilization - Explant sterilization.
- 1.4. Plant growth regulators and differentiation.
- 1.5. Method of tissue culture – formulation of medium explants collection, surface sterilization, inoculation, callus induction, subculture and regeneration of plants.
- 1.6. Organ culture – Leaf, Root and Stem culture.

**UNIT-II**

- 2.1. Suspension cultures – growth and subculture, types and synchronization of suspension Cultures.
- 2.2. Immobilization of cells and the effect of elicitors on the production of secondary Metabolites of commercial value.
- 2.3. Meristem culture and its uses in production of virus free plants.
- 2.4. Clonal propagation, Micropropagation of plants – medicinal plants and endangered Plants – methods and advantages.
- 2.5. Production of secondary metabolites – culture techniques.
- 2.6. Large scale production of commercially important compounds.

**UNIT-III**

- 3.1. Somatic embryogenesis – Principle, protocol and importance.
- 3.2. Artificial seed production, applications and limitations.
- 3.3. Embryo rescue and its importance.
- 3.4. Anther culture and production of androgenic haploids.
- 3.5. Somaclonal Variations - applications of somaclonal variations in crop improvement.
- 3.6. Cryopreservation of plant tissues and its application in plant tissue culture.

**UNIT-IV**

- 4.1. Protoplast – Properties of protoplast, Protoplast – Isolation (mechanical and enzymatic Methods).
- 4.2. Culturing and regeneration of protoplasts.
- 4.3. Somatic hybridization through protoplast fusion (Mechanical fusion, Chemo Fusion, Electro fusion.)
- 4.4. Selection of Somatic hybrids and Cybrids.
- 4.5. Introduction to *Agrobacterium tumefaciens*, features of Ti- Plasmid, molecular Mechanism of T-DNA transfer.
- 4.6. Physical gene transfer methods – Particle Bombardment, Electroporation and Microinjection.

## **PRACTICAL PAPER –V**

1. Preparation of medium for tissue culture (MS or B5)
2. Sterilization methods of explants (seed leaf, inter node and root), medium
3. Establishment of callus cultures from carrot
4. Cell suspension culture
5. Protoplast isolation and culture
6. Synthetic seed production

## **SPOTTERS**

1. Callus
2. Somatic embryos
3. Rhizogenesis
4. Multiple shoots
5. Somatic hybrids
6. Synthetic seeds
7. Green house
8. Gene gun
9. GUS gene
10. Ti –Plasmid

## **REFERENCE BOOKS**

1. Plant tissue culture and its biotechnological application by W. Aarz, Reinhard, M.H Zenk
2. Plant tissue culture by Akio Fujiwara
3. Frontiers of plant tissue culture by Trevor, Thorpe
4. In vitro Haploids production in Higher plants S. Mohan Jain, SK Sopory, R.E Veilleux
5. Plant tissue by culture : Theory and practice by S.S Bhojwani and A. Razdan
6. Plant cell, tissue and organ culture applied and fundamental aspects by YPS Bajaj and A. Reinhard

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**Elective Course DSE-5**

**MEDICAL BIOTECHNOLOGY**  
**(ELECTIVE-b)**

**UNIT-I**

- 1.1. Scope and importance of Medical Biotechnology.
- 1.2. Karyotyping of human chromosomes.
- 1.3. Chromosome banding – G banding and R- banding technique.
- 1.4. Inheritance patterns in Man – Pedigree analysis.
- 1.5. Diagnosis using monoclonal antibodies – ELISA.
- 1.6. Genetic counselling – Calculating risk and discussing the options.

**UNIT-II**

- 2.1. Chromosomal disorders caused due to structural chromosomal abnormalities (Deletion, Duplication, Translocations).
- 2.2. Chromosomal disorders caused due to numerical chromosomal abnormalities (autosomal and allosomal).
- 2.3. Monogenic disorders ( autosomal and X-linked diseases).
- 2.4. Mitochondrial diseases – LHON, MERRF
- 2.5. Types and causes of male and female infertility.
- 2.6. IVF – methodology.

**UNIT-III**

- 3.1. Gene therapy – *ex vivo* and *in vivo* gene therapy: somatic and germline gene therapy.
- 3.2. Strategies of gene therapy : gene augmentation – ADA deficiency; Prodrug therapy/ Suicide gene – glioma.
- 3.3. Stem cells – potency definitions; embryonic and adult stem cells.
- 3.4. Applications of stem cells - cell based therapies and regenerative medicine.
- 3.5. Encapsulation technology and therapeutics – Diabetes.
- 3.6. Human genome sequences – mapping and cloning of human disease genes.

**UNIT-IV**

- 4.1. Cancer - Types.
- 4.2. Oncogenes, Tumor suppressor genes, Stability of genome, control of cell cycle.
- 4.3. Molecular basis of colon cancer and breast cancer.
- 4.4. DNA/RNA based diagnosis – HBV, HIV.
- 4.5. Applications of PCR in disease diagnosis.
- 4.6. Haemoglobinopathies.

## **PRACTICAL PAPER –V**

1. Karyotyping of normal and abnormal human chromosome sets
2. Human pedigree analysis
3. Estimation of C-reactive protein
4. Dot ELISA
5. Genotyping of candidate genes for diseases by RFLP
6. Encapsulation of mammalian cells

## **SPOTTERS**

1. Pedigree
2. Monoclonal antibodies
3. ELISA
4. Oncogenes
5. Cri du Chat syndrome
6. Trisomy
7. Diabets Mellitus
8. SCID
9. Stem cells
10. HBV

## **REFERENCE BOOKS**

1. Medical biotechnology-Pratibha Nallari, V. Venugopal Rao- Oxford Press
2. Introduction to Human Molecular Genetics- J.J Pasternak, John Wiley Pubishers
3. Human Molecular genetics Tom strache and AP read , Bios Scxientific publishers
4. Recombinant DNA technology AEH Emery
5. Principles and Practice of Medical genetics, I, II, III volumes by AEH Edts, Emery
6. Molecular biotechnology, Glick and Pasternak