

Dr. V. S. KRISHNA GOVERNMENT DEGREE AND PG COLLEGE (A), VSKP
DEPARTMENT OF BIOTECHNOLOGY
B.Sc BIOTECHNOLOGY SYLLABUS
SEMESTER IV

Course V – BASICS IN BIOTECHNOLOGY

(Total Hours of Teaching 60 @ 04 hrs/week)

Credits - 04

Course Outcomes:

On successful completion of this course, the students will have the knowledge and skills to:

- Understand how bacteria and other microbes can be manipulated by rDNA technology or selective isolation for use of industrial processes to generate products of interest.
- Be familiar with fermentation technology and the issues surrounding industrial scale up.
- Know how animal cells can be used as vehicles for the production of products of interest for industry and medicines.
- Understand the key developments in the sphere of Plant biotechnology.
- Illustrate the in vitro propagation of plants and their maintenance.
- Recognize and discuss diverse types of pollutants and their impacts on health and the environment including impact and human activities.
- Describe various energy sources and management of waste water by various methods.
- Understand the principles of intellectual property in the context of industrial biotechnology.
- Understand the ethics concerned with biotechnology.

UNIT I: Microbial and Industrial Biotechnology

12

Hours

- 1.1. Isolation, screening and selection of microorganisms for industrial products; preservation of microorganisms.
- 1.2. Strain development and improvement; Strategies of strain improvement, selection and recombination.
 - 1.3. Production of rDNA insulin, growth hormone and rDNA vaccines, amino acids and vitamins.
 - 1.4. Production of single cell proteins, dairy products, penicillin and streptomycin.

UNIT II: Animal and Medical Biotechnology

12

Hours

- 2.1. Cell culture techniques and applications.
- 2.2. Animal Breeding (selective breeding and cross breeding) and its applications.
- 2.3. *In vitro*-techniques: *In vitro* fertilization (IVF); Genetically modified animals: Transgenic animals and knock-outs; Mouse models in disease study: cancer and diabetics.
- 2.4. Gene therapy: *in vivo* and *ex vivo*; Stem cells and applications (stem cell based therapies and regenerative medicine).

UNIT III: Plant Biotechnology

12

Hours

- 3.1. Plant tissue culture: Media, sterilization and culture types.
- 3.2. Micro-propagation, Synthetic seeds, Somatic hybrids and Haploid plants; protoplast fusion

and culture; Somaclonal variation and applications.

- 3.3. Transgenic plants: Insect resistant (Bt-cotton), Herbicide resistant (Glyphosate tolerant), Abiotic and Biotic stress resistant plants
- 3.4. Applications of transgenic plants (improving crop yield, nutrition quality, stress tolerant plants and molecular farming); Biofertilizers and Biopesticides.

UNIT IV: Environmental Biotechnology

12

Hours

- 4.1. Environmental pollution: Air, water, and soil pollutions; Greenhouse gases, global warming and climate change. Measurement of environmental pollution: BOD & COD.
- 4.2. Biomass and Biofuels: Renewable and Non-renewable resources, Fossil fuels, Types of biomass and production of biofuels (bioethanol and biodiesel).
- 4.3. Waste water management- sewage and industrial effluents (aerobic and anaerobic methods)
- 4.4. Bioremediation and Phytoremediation: Concepts, types and applications.

UNIT V: Biosafety and Bioethics

12

Hours

- 5.1. Intellectual Property Rights (IPR): Types (patents, trademarks, copyrights, design registration, trade secret, geographical indicators) and significance
- 5.2. Copyrights: nature and significance, rights of authors and owners.
- 5.3. Plant variety protection and plant breeding rights.
- 5.4. Management studies: Society and Ethical aspects of Biotechnology.

PRACTICALS
SEMESTER - IV

Course V– BASIC BIOTECHNOLOGY
(Total hours of Laboratory Exercises – 30 hours @ 03 hrs/week)
Credits - 02

Course Objectives

On successful completion of this practical course, the students have the knowledge and skills to:

- To prepare the plant tissue culture media
- To grow callus from the explant
- To prepare synthetic seeds and isolate protoplast and their culture
- To isolate microbes from industrial effluents
- To estimate BOD and COD
- To develop Biofertilizers using microbes

Practical Syllabus

1. Preparation and sterilization of plant tissue culture media.
2. Sterilization methods of explants (seed, leaf, internode and roots).
3. Establishment of callus culture – from carrot/peanuts.
4. Preparation of synthetic seeds.
5. Cell suspension culture.
6. Protoplast isolation, fusion and culture.
7. Isolation of microbes from industry waste.
8. Isolation of microbes from industrial effluents.
9. Estimation of BOD
10. Estimation of COD
11. Production of microbial fertilizers