

FACULTY OF SCIENCE

DEPARTMENT OF BIOCHEMISTRY AND BIOTECHNOLOGY

SBIOVAC02 - APPLIED BIOTECHNOLOGY

Learning Objective (LO):

LO To comprehend the industrial, agricultural and environmental applications of biotechnology for human welfare.

Course Outcomes (CO)

At the end of the course, the student will be able to

CO1 Understand the applications of biotechnology in wide areas of life sciences.

CO2 Comprehend the technology for development of biotechnology products

CO3 Appreciate and solve biomedical and biological problems applying biotechnology

CO4 Understand the technology employed in medicine and tissue engineering.

CO5 Understand the ethical issues and patent process in biotechnology

Unit 1 - Industrial Biotechnology

Industrially important microbes, screening and strain improvement. Fermentation – introduction and types. Production of alcohol (wine, beer), vitamins (B2 and B12), organic acid (acetic acid) and antibiotics (tetracycline, streptomycin). Outline of rDNA technology. Production of SCP.

Unit 2 - Agricultural Biotechnology

Biofertilizers and biopesticides. Transgenic plants – Herbicide, virus and pest resistant varieties. Bt cotton and golden rice. Plants as bioreactors – edible vaccines, therapeutic proteins and antibodies. Transgenic animals – qualitative improvement of livestock (Cow, goat, sheep). Artificial insemination, embryo transfer, *in vitro* fertilisation. Genetically modified foods.

Unit 3 - Environmental Biotechnology

Environment pollution – types. Control of pollution through biotechnology. Waste water and effluent treatment. Bioremediation of contaminated soil and waste land, oil spill cleanup. Development of biodegradable (polyhydroxybutyrate) polymers (brief outline only).

Unit 4 -Medical biotechnology

Biopharmaceuticals – insulin, growth hormone and erythropoietin. Recombinant vaccines – subunit, attenuated and vector based vaccines. Monoclonal antibodies, artificial blood. Gene therapy. Tissue engineering – organogenesis. Production of complete organs (brief outline only).

Unit 5 –Ethics and Biotechnology

Ethical, legal and social issues in biotechnology, Intellectual property rights – types - patents, trademarks, copyrights, and trade secrets. TRIPS and its function. Patent process in India.

Current Streams of Thought

The faculty will impart knowledge on the current developments in the subject to the students and this component will not be covered in the examinations.

Text Books

1. U. Satyanarayana. (2017) *Biotechnology*. 12th ed. Books and Allied (P) Ltd., Kolkata.
2. Nag A. (2008) *Text book of Agricultural Biotechnology*. 1st ed. PHI Learning Private Ltd. New Delhi.
3. Gaur VK. (2012) *Agricultural Biotechnology*. Sonali publications, New Delhi.
4. Thakur IS. (2010) *Environmental Biotechnology: Basic Concepts and Applications*. 2nd ed. IK International Publishing house Ltd. New Delhi.
5. Balasubramanian D. (2004) *Concepts in Biotechnology*. Oxford University press, Oxford, UK.

Supplementary Reading

1. Cheremisinoff P (1997). *Biotechnology for Waste Management and Site Restoration*. Springer, Berlin, Germany.
2. Raman K et al. *Advances in Environmental Biotechnology*. Springer. 2017.