DEPARTMENT OF BIOTECHNOLGY
GOVT. DEGREE COLLEGE BARAMULLA

SEMESTER 6th (NEP) **MAJOR COURSE**

SUBJECT: BIOTECHNOLOGY

TITLE: ANIMAL BIOTECHNOLGY

- CREDIT: (4+2) THEORY: 04; PRACTICAL: 02 CONTACT HOURS: 64 (T) + 64 (L)

- **Course Learning Objective:** *This course aims to acquaint students with animal cell culture techniques, maintenance and their applications*.
- **Course outcome:** A student will be able to:
  - *Learn about the requirement of cell culture lab.*
  - *perform different assays.*
  - *use cell culture technology for different applications.*
  - *employ modern techniques in animal biotechnology.*

UNIT – 1 (16 HOURS)

Introduction to animal cell culture. Requirements for animal cell culture, Sterilization techniques and maintenance of aseptic conditions. Overview of culture media: composition, criteria for selecting media, physico-chemical properties of media (pH, CO_2, Oxygen, temperature, osmolarity). Different types of media: natural and synthetic media, complete and serum free media. Commonly used media formulations (DMEM, RPMI). Cell culture contaminants and their control.

UNIT – 2 (16 HOURS)

Basic Techniques of mammalian cell culture: Tissue disaggregation (mechanical and enzymatic method), Primary culture, Secondary culture, Cell Line - finite and continuous cell lines, adherent and suspension cell lines. Commonly used cell lines (HeLa, MCF7, MDAMB231, HEK293, HL60). Cell transformation - methods and properties. Cell viability and cytotoxicity assay (MTT and TUNNEL). Cryopreservation of cultured cells.

UNIT – 3 (16 HOURS)

Stem cell technologies: Generation of chimeric animals and animal cloning; Pro-nuclear injection of blastocysts, transplantation of blastocysts into pseudo-pregnant mice and generation of chimeric and knockout animals. Manipulation of reproduction in animals (artificial insemination, multiple ovulations, invitro fertilization, embryo transfer technology). Xenotransplantation.

UNIT – 4 (16 HOURS)

Potential application of transgenic animals: models for various diseases/ disorders like cancer, diabetes and drug development and testing; Production of Monoclonal antibodies (Hybridoma technology), Production of Vaccines (live, attenuated, subunit and DNA), Production of Peptides and proteins of biopharmaceutical interest (molecular farming). Ethical consideration of transgenic animals.

PRACTICALS (2 CREDITS: 64 hours) Maximum Marks: 50, Minimum Marks: 20

1. Demonstration of organization of animal cell culture laboratory
2. Sterilization techniques.
3. Preparation of animal cell culture media.
4. Isolation of lymphocytes from whole blood
5. Isolation of cells from Chick liver/ disaggregation of tissues (trypsinization).
6. Demonstration of cell viability assays.
7. Subject Tour.

BOOKS RECOMMENDED

1. R. Ian Freshney and Amanda Capes-Davis Freshney's Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications, Wiley-Blackwell
2. Butler, M., Animal cell culture and technology: The basics. II Edition. Bios scientific Publishers.
3. Glick, B.R. and Pasternak, J.J. Molecular biotechnology- Principles and applications, Taylor & Francis.
4. (https://vlab.amrita.edu/?sub=3&brch=69&sim=1422&cnt=1)

DEPARTMENT OF BIOTECHNOLGY

GOVT. DEGREE COLLEGE BARAMULLA

SEMESTER 6th (NEP) **MAJOR/MINOR COURSE**

SUBJECT: BIOTECHNOLOGY

TITLE: ENVIRONMENTAL BIOTECHNOLGY

- CREDIT: (4+2) THEORY: 04; PRACTICAL: 02 CONTACT HOURS: 64 (T) + 64 (L)
- **Course Learning Objective:** *To apprise the students about the global environmental issues and role of Biotechnology in management of environment and for sustainable development.*

- **Expected Learning Outcomes:** At the end of the course students should be able to;
  - *differentiate between different types of pollutions and their respective causes.*
  - *to treat waste water and solid waste and turn it into eco- friendly end products.*
  - *employ biotechnological approaches for neutralizing the toxic effects of different substances.*

Unit - 1 (16HOURS)

Introduction to Environmental Biotechnology: Concept and Scope. Global environmental issues: Global warming, Acid rain, Ozone depletion, Desertification, Bioaccumulation and Biomagnification, Global Biodiversity Loss. Biotechnological Approaches for the management of Environmental Problems: An Overview.

Unit - 2 (16 HOURS)

Waste water treatment: preliminary, primary, secondary and disinfection. Activated sludge process, oxidation ponds, anaerobic digestion, anaerobic filters. Solid waste management: collection, segregation, disposal of solid waste, composting and vermicomposting, management of hazardous and biomedical waste.

Unit - 3 (16 HOURS)

Bioremediation: principle and types (ex-situ and in-situ bioremediation). Phytoremediation. Persistent organic pollutants. Biodegradation of pesticides, hydrocarbons, synthetic detergents and xenobiotics. Idea of bioplastics. Concept of biomining, bioaugmentation and biofiltration.

Unit - 4 (16 HOURS)

Renewable and Non-Renewable Resources of Energy. Energy from Solid Waste. Conventional Fuels and their Impact on Environment - Firewood, Plant, Animal, Water, Coal and Gas. Conversion of Sugar to Alcohol and Gasohol, Green fuels: Bioethanol, Biodiesel. Environmental significance of genetically modified microbes, plants and animal.

PRACTICALS (2 CREDITS: 64 hours) Maximum Marks: 50, Minimum Marks: 20

1. Process of collection, segregation and storage of effluent samples.
2. Determination of chemical oxygen demand in waste water samples.
3. Determination of dissolved oxygen/ total dissolved solids in waste water samples.
4. Analysis of total hardness/temporary hardness of waste water sample.
5. Visit to solid/waste-water treatment plant.

BOOKS RECOMMENDED

1. Kumar, A., Environmental Biotechnology. Daya publishing house.
2. Bruce E. Rittmann, Perry L. McCarty, Environmental Biotechnology Principles and Applications, McGraw Hill.
3. Tchobanoglous, G., Franklin, B. and Stensel, H. D., Wastewater Engineering – Treatment, Disposal and Reuse, Tata McGraw Hill, New Delhi
4. De, A. K., Environmental Chemistry Wiley Eastern Ltd., New Delhi
5. Cutter, S. L., Environmental risks and Hazards. Prentice Hall..
6. Pathade, G. R. and Goel, P.K. (2003) Biotechnology in Environmental Management. ABD Publications.