

MBTCR 9242T/P: Animal Biotechnology

Theory: CIA: 10 Marks; End-Sem: 50 Marks

Practical: 40 Marks

No. of Credits	6
Theory/Composite	Composite
No. of periods assigned	4 Theory + 3 Practical

Course description/objective:

The course is designed to

1. provide a comprehensive overview of animal cell culture to enable students to understand and be familiar with the methods and techniques of the same.
2. provide a comprehensive understanding of cancer biology including the molecules involved in progression and metastasis of cancers and techniques for diagnosis and potential therapies for various cancers.
3. enable students to gain experience in advanced techniques used for study and visualization of chromosomes and biomolecules of importance.
- 4.4. familiarize students with the principles of applied zoology and certain practical techniques associated with the same.
5. provide an overview of applied zoology and related culture methodologies, farming techniques and pest management.
6. impart knowledge of bioethical concerns in cell culture biotechnology, animal handling, animal house management and clinical trials.

Syllabus:

Module A: (25 marks)

(2 classes / week)

UNIT I: Animal Cell and Tissue Culture: Standard techniques and equipment for animal cell and tissue culture, culture media and its components, the role of serum, serum free cultures, primary cultures, cell lines, maintenance of attached and suspended cell types in culture, measurement of cell growth and viability, sub culturing.

UNIT II: Cancer Biology: Cancer and tumour progression: stages of cancer and tumour progression, carcinogens and carcinogenesis, metastasis, role of proteases in cancer with reference to matrix metalloproteinases (MMPs), signal transduction cascades in cancer, models for cancer propagation. Molecular diagnosis of haematological cancers and carcinomas. Cancer therapy: Chemotherapy, radiotherapy, gene therapy strategies, use of signalling pathway inhibitors and natural products in cancer therapy, resistance to cancer therapy.

UNIT III: Cloning in Animals: Strategies and methods for nuclear transfer and animal cloning.

Module B: (25 marks)

(2 classes / week)

UNIT IV: Biotechnology and Applied Zoology: (i) Culture of economically significant insects: Lac culture, Sericulture, Apiculture (Overview of culture methodologies, breed management and improvement), (ii) Poultry and dairy farming (Overview of farming techniques, breed management and improvement), (iii) Fisheries (culture systems, induced breeding in fish, fish hybridization), (iv) Pharmaceuticals from animals

UNIT V: Pest Control and Management: Concept of injury level, Integrated pest management, Genetic manipulation and new generation pesticides in pest management.

UNIT VI: Bioethics and animal biotechnology: Bioethical concerns in cell culture biotechnology, animal handling, maintenance of animal house and care of animals, clinical trials.

Practical (40 Marks)

- 1. Animal Cell and Tissue Culture Techniques:** Maintenance of cell cultures, cell count and determination of viability.
- 2. Analysis of Proteins and Enzymes:** Extraction and visualization of proteins, determination of enzyme activity.
- 3. Analysis of Nucleic acids:** Isolation and visualization of nucleic acids.
- 4. Histochemistry:** Histochemical detection of physiologically important substances.
- 5. Chromosome and Genetic Studies:** Study of meiotic chromosomes, *Drosophila* as model organism for genetics, polytene chromosomes (from photographs).
- 6. Water quality parameters for culture of aquatic organisms.**
- 7. Applied Zoology:** Study of animals of economic and ecological importance.
- 8. Report on educational tours/ laboratory visits for study of topics relevant to animal biotechnology.**

Texts & Reading/Reference Lists:

- 1) R.I. Freshney. Culture of Animal Cells – a Manual of Basic Techniques.
- 2) R.A. Weinberg. The Biology of Cancer.
- 3) G.M. Cooper, R.E. Hausman. The Cell – A Molecular Approach.
- 4) S. Rastogi, N. Pathak. Genetic Engineering.
- 5) S.B. Primrose, R.M. Twyman. Principles of Gene Manipulation & Genomics.
- 6) R.L. Metcalf, W.H. Luckmann. Introduction to Insect Pest Management.
- 7) D. Dent. Insect Pest Management.
- 8) P.V. Jabde. Text Book of Applied Zoology.
- 9) Fish and fisheries of India, V. G. Jingran, Hindustan Pub. Corp. New Delhi.
- 10) Fisheries & Aquaculture Biotechnology. Yawn Mehta, Campus Books International, Prahalad street, Ansari Road, Durga Ganj, New Delhi.
- 11) K. C. Ghose, B. Manna. Practical Zoology.
- 12) T.K. Poddar, S. Mukhopadhyay, S.K. Das. An Advanced Laboratory Manual of Zoology.
- 13) Relevant scientific literature.

Q.Paper Structure for End Sem Theory

Module A (25 marks):

Objective Questions: Answer any 5 out of 6 questions. $1 \times 5 = 5$ marks

Subjective Questions: Answer any 2 out of 3 questions (with subparts). $10 \times 2 = 20$ marks

Module B (25 marks):

Subjective Questions:

Answer any 1 out of 2 questions. $10 \times 1 = 10$ marks

Answer any 3 out of 5 questions. $5 \times 3 = 15$ marks