

| Course Code | Course Name          | Credits |
|-------------|----------------------|---------|
| 26ZY507     | ANIMAL BIOTECHNOLOGY | 04      |

### Course Objectives

- To understand the principles and scope of Animal Biotechnology and its applications.
- To acquire knowledge on transgenic animals and modern gene transfer techniques.
- To study animal cell culture, hybridoma technology and monoclonal antibody production.
- To understand reproductive biotechnology techniques including IVF, cloning and ICST.
- To develop awareness of biopharmaceutical applications, bioethics and biosafety in Animal Biotechnology.

### Learning Outcomes

- Explain the basic concepts and applications of Animal Biotechnology.
- Describe the production and uses of transgenic animals in medicine and agriculture.
- Apply knowledge of animal cell culture and hybridoma technology in research and diagnostics.
- Discuss reproductive biotechnology methods such as IVF, cloning and embryo transfer.
- Evaluate the ethical, biosafety and industrial aspects of Animal Biotechnology.

### Unit 1 – Culture Techniques (12 Hrs.)

sterilization methods; principles of animal cell culture; culture media and their composition including natural and synthetic media; serum and serum-free media; types of cell cultures such as primary culture, secondary culture and established cell lines; adherent and suspension cultures; organ culture; maintenance and subculturing of cell lines; cell viability; cryopreservation and cell banking; applications of animal cell culture.

### Unit 2 – Transgenic Technology (12 Hrs.)

Cloning - Dolly; methods of gene transfer including microinjection, electroporation, lipofection, gene gun and viral-mediated transfer; production of transgenic animals; selection and screening of transgenic organisms; expression and regulation of foreign genes; knockout and knock-in technology; CRISPR-Cas gene editing system; significance of transgenic animals;

### Unit 3 - Hybridoma technology and monoclonal antibodies (12 Hrs.)

Production of monoclonal antibodies by hybridoma technology; fusion of spleen cells with myeloma cells using polyethylene glycol (PEG); selection of hybrid cells using HAT medium; cloning and screening of hybridoma cells; large-scale production and purification of monoclonal antibodies; characterization and applications of monoclonal antibodies; applications of hybridoma technology in disease diagnosis, advantages and limitations of hybridoma technology; recent advances in monoclonal antibody production and therapeutic applications.

### Unit 4 – Reproductive Biotechnology (12 Hrs.)

Artificial insemination (AI) and semen evaluation; semen collection, dilution, preservation and cryopreservation; superovulation and estrus synchronization; embryo transfer technology (ETT); multiple ovulation embryo transfer (MOET); in vitro fertilization (IVF) and embryo culture techniques; intracytoplasmic sperm injection (ICSI); cloning and somatic cell nuclear transfer (SCNT); cryopreservation of gametes, embryos and ovarian tissues; assisted reproductive technologies (ART).

### Unit 5 - Transgenic Animals (12 Hrs.)

Characteristics and applications of transgenic animals; transgenic mice used for studying cancer, diabetes, Alzheimer's disease and gene function; transgenic rats in neurological and medical research; transgenic rabbits for production of therapeutic proteins; transgenic sheep and goats for improved milk production and pharmaceutical proteins; transgenic pigs in organ transplantation research and meat quality improvement; transgenic cattle for enhanced milk production and disease resistance; transgenic fish for faster growth, disease resistance and aquaculture applications; zebrafish as model organisms in developmental and genetic studies.

### Reference Books:

1. Dubey, RC., (2014). Advanced Biotechnology. S. Chand Publication.
2. Kumaresan, V (2014). Animal Biotechnology. Saras Publications.
3. BD Singh, (2014) Biotechnology: Expanding Horizons, Kalyani Publishers
4. U.Satyanarayan and U Chakrapani, (2014) Biotechnology, Books & Allied Ltd.
5. P.K. Gupta: Biotechnology and Genomics, Rastogi publishers (2017).

### Websites and eLearning Sources:

<https://www.easybiologyclass.com/category/biotechnology/>  
<https://www.biologydiscussion.com/biotechnology>  
<https://nptel.ac.in/courses/102105058>