ST. JOSEPH’S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM

III SEMESTER   **ZOOLOGY** TIME:3HRS/WEEK

Z-Ma3-3501(3) **ANIMAL BIOTECHNOLOGY** MARKS:100

w.e.f 2024-2025 (23AK Batch) **SYLLABUS**

# LEARNING OBJECTIVES:

* To provide knowledge on animal cell and tissue culture and their preservation.
* To empower students with latest biotechnology techniques like stem cell technology, genetic engineering, hybridoma technology, transgenic technology and their application in medicine and industry for the benefit of living organisms
* To explain *in vitro* fertilization, embryo transfer technology and other reproduction manipulation methodologies.
* To get insight in applications or recombinant DNA technology in agriculture, production of therapeutic proteins.
* To understand principles of animal culture, media preparation.

# LEARNING OUTCOMES:

This course will provide students with a deep knowledge in animal biotechnology, by the completion of the course the graduate shall able to –

* CO1: L3- Demonstrate knowledge of the Vectors and Restriction enzymes used in biotechnology
* CO 2: L3-Summarise the gene delivery mechanism, PCR technique, the principles of DNA sequencing and hybridization.
* CO 3: L4-Explain media preparation, cell culture techniques and stem cell technology.
* CO 4: L4-Analyse the genetic engineering principles and their efficacy in creating transgenic animals, showcasing expertise in assisted reproductive technology.
* CO 5: L3-Apply biotechnological advancements like DNA finger printing, gene therapy highlighting the significance of biotechnology in both industry and agriculture.

**UNIT-I:**

* 1. Functions of Enzymes and Definition of a vector and characteristics. Restriction modification systems: Types I, II and III.
  2. Mode of action, nomenclature, applications of Type II restriction enzymes in genetic engineering.
  3. **DNA modifying enzymes and their applications**: DNA polymerases, Knelow fragment, Terminal deoxynucleotidyl transferase, kinases, phosphatases, and DNA ligases
  4. **Cloning Vectors**: Plasmid vectors (pBR and pUC series), Bacteriophage (lambda and M13 based vectors), Cosmids, BACs, YACs, and shuttle vectors.

# UNIT- II:

**2.1 Gene delivery:** **Transfection** (Microinjection, electroporation, biolistic method (gene gun), liposome) and **Transduction (** viral mediated delivery).

* 1. **PCR**: Basics of PCR, types of PCR and their applications.
  2. **DNA Sequencing**: Sanger’s method of DNA sequencing- traditional and automated sequencing.
  3. **Hybridization techniques**: Southern, Northern and Western blotting.

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# UNIT-III:

* 1. Natural and Synthetic Cell cultures: primary culture, secondary culture, continuous cell lines (Hela, CHO, BHK, VERO, MRC)
  2. Organ culture; Cryopreservation of cultures.
  3. Hybridoma Technology: Cell fusion, Production of Monoclonal antibodies (mAb), Applications of mAb.
  4. Stem cells: Types of stem cells, applications

# UNIT-IV:

* 1. **Manipulation of reproduction in animals**: Artificial Insemination, In vitro fertilization
  2. **Manipulation of reproduction in animals**: Super ovulation, Embryo transfer, Embryo cloning
  3. **Transgenic Animals**: Strategies of Gene transfer;
  4. Transgenic - sheep, - fish; applications

# UNIT-V:

* 1. DNA fingerprinting and its applications
  2. **Application of biotechnology in fisheries** – monosex culture in fishes, polyploidy in fishes
  3. **Gene therapy**-application
  4. **Bio informatics**- concept-definition-database types

# REFERENCES BOOKS:

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* Clark DP and Pazdernik NJ. (2009). Biotechnology: Applying the Genetic Revolution. Elsevier Academic Press, USA
* Primrose SB and Twyman RM. (2006). Principles of Gene Manipulation and Genomics, 7th edition. Blackwell Publishing, Oxford, U.K.
* Sambrook J and Russell D. (2001). Molecular Cloning-A Laboratory Manual. 3rd edition. Cold Spring Harbor Laboratory Press
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* Methods in Cell Biology, Volume 57, Jennie P. Mathur and David Barnes, 1998. Animal Cell Culture Methods Academic Press.
* P.K. Gupta: Biotechnology and Genomics, Rastogi publishers (2003).
* B.D. Singh: Biotechnology, Kalyani publishers, 1998 (Reprint 2001)

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