# ST.JOSEPH’S COLLEGE FOR WOMEN (A), VISAKHAPATNAM

# IVSEMESTER ZOOLOGY TIME:4HRS/WEEK

Z 4504 (3) **IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY** MAX. MARKS:100

w.e.f. 2020-2021 (20AH) **SYLLABUS**

# LEARNING OBJECTIVES: To the enable students to

* + - Understand the basics of immunology.
    - Be able to compare and contrast the innate versus adaptive immune systems and humoral versus cell-mediated immune responses.
    - Understand the significance of the Major Histo compatibility Complex in terms of immune response and transplantation.
    - Acquire knowledge about the techniques of recombinant DNA technology, Animal cell culture and applied aspects of biotechnology
    - Empower with the latest biotechnology techniques like stem cell technology, genetic engineering, hyridoma technology, transgenic technology and their application in medicine and industry for the benefit of living organisms.
      * Gain insight on in- vitro fertilization, embryo transfer technology and other reproduction manipulation methodologies.

**COURSE OUTCOMES: By the end of the course, students will be able to**

**CO1** Acquire knowledge of the organs of Immune system, types of immunity, cells and organs of immunity.

**CO2** Describe the immunological response as to how it is triggered (antigens) and regulated (antibodies)

**CO3** Understand the applications of Biotechnology in the fields of industry and agriculture including animal cell/tissue culture, stem cell technology and genetic engineering.

**CO4** Get familiar with the tools and techniques of animal biotechnology and to understand principles of animal culture, media preparation.

**CO5** Realize the importance of complying with ethical issues in biotechnology**.**

**UNIT–I IMMUNOLOGY – I (OVERVIEW OF IMMUNE SYSTEM)**

* 1. 1.1 Introduction to basic concepts in Immunology
  2. 1.2 Innate and adaptive immunity, Vaccines and Immunization programme
  3. 1.3 Cells of immune system
  4. 1.4 Organs of immune system

# UNIT – II IMMUNOLOGY – II (ANTIGENS, ANTIBODIES, MHC AND HYPERSENSITIVITY)

* 1. 2.1 Antigens: Basic properties of antigens, B and T cell epitopes, haptens and adjuvant; Factors influencing immune genicity
  2. 2.2 Antibodies: Structure of antibody, Classes and functions of antibodies
  3. 2.3 Structure and functions of major histo compatibility complexes
  4. 2.4Exogenous and Endogenous pathways of antigen presentation and processing
  5. 2.5 Hypersensitivity – Classification and Types

# UNIT – III TECHNIQUES

3.1 Animal Cell, Tissue and Organ culture media: Natural and Syntheticmedia,

3.2 Cell cultures: Establishment of cell culture (primary culture, secondary culture, types of cell lines; Protocols for Primary Cell Culture); Established Cell lines (common examples such as MRC, HeLa, CHO, BHK, Vero); Organ culture; Cryopreservation ofcultures

3.3 Stem cells: Types of stem cells andapplications

3.4 Hybridoma Technology: Production & applications of Monoclonal antibodies (mAb)

# UNIT – IV APPLICATIONS OF ANIMAL BIOTECHNOLOGY

* 1. 4.1 Genetic Engineering: Basic concept, Vectors, Restriction Endo nucleases and Recombinant DNA technology
  2. 4.2 Gene delivery: Microinjection, electroporation, biolistic method (gene gun),liposome and viral-mediated gene delivery
  3. 4.3 Transgenic Animals: Strategies of Gene transfer; Transgenic -, - fish, sheep; applications
  4. 4.4 Manipulation of reproduction in animals: Artificial Insemination, Invitro

fertilization, super ovulation, Embryo transfer, Embryo cloning

# UNIT - V

5.1.PCR: Basics of PCR and types of PCR.

5.2DNA Sequencing: Sanger’s method of DNA sequencing- traditional and automated sequencing (2hrs)

5.3 Hybridization techniques: Southern, Northern and Western blotting

5.4 DNA fingerprinting: Procedure and applications

5.5 Applications in Industry and Agriculture: Fermentation: Different types of Fermentation and Downstream processing; Agriculture: Monoculture in fishes, polyploidy in fishes

# CO-CURRICULAR ACTIVITIES (SUGGESTED):

* Organizing awareness on immunization importance in local village in association with NCC and NSS teams
* Charts on types of cells and organs of immune system
* Student study projects on aspects such as – identification of allergies among students (hypersensitivity), blood groups in the class (antigens and antibodies duly reported) etc., as per the creativity and vision of the lecturer and students
* Visit to research laboratory in any University as part of Zoological tour and exposure and/ or hands-on training on animal cell culture.
* Visit to biotechnological laboratory in University or any central/state institutes and create awareness on PCR, DNA finger printing and blot techniques or Visit to a fermentation industry or Visit to a local culture pond and submit report on culture of fishes etc.

# REFERENCE BOOKS

1. Immunology by Ivan M.Riott
2. Immunology by Kubey
3. Sree krishna V. 2005. Biotechnology –I, Cell Biology and Genetics. New Age International Publ. New Delhi, India.

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