# 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 immuneresponses.
    - Understand the significance of the Major Histo compatibility Complex in terms of immune response andtransplantation.
    - 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 livingorganisms.
      * Gain insight on in- vitro fertilization, embryo transfer technology and other reproduction manipulationmethodologies.

**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 ofimmunity.

**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 geneticengineering.

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

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

**UNIT–I IMMUNOLOGY – I (OVERVIEW OF IMMUNESYSTEM)**

* 1. 1.1 Introduction to basic concepts inImmunology
  2. 1.2 Innate and adaptive immunity, Vaccines and Immunizationprogramme
  3. 1.3 Cells of immunesystem
  4. 1.4 Organs of immunesystem

# 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 ofantibodies
  3. 2.3 Structure and functions of major histo compatibilitycomplexes
  4. 2.4Exogenous and Endogenous pathways of antigen presentation andprocessing
  5. 2.5 Hypersensitivity – Classification andTypes

# 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 Endonucleases andRecombinant DNAtechnology
  2. 4.2 Gene delivery: Microinjection, electroporation, biolistic method (gene gun),liposome and viral-mediated genedelivery
  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 ofPCR and types of PCR.

5.2DNASequencing:Sanger’smethodofDNAsequencing-traditionaland automated sequencing (2hrs)

5.3 Hybridization techniques: Southern, Northern and Westernblotting

5.4 DNA fingerprinting: Procedure andapplications

5.5 Applications in Industry and Agriculture: Fermentation:Differenttypes 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 NSSteams
* Charts on types of cells and organs of immunesystem
* 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 andstudents
* Visit to research laboratory in any University as part of Zoological tour and exposure and/ or hands-on training on animal cellculture.
* 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 fishesetc.

# REFERENCE BOOKS

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

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

IV SEMESTER  **ZOOLOGY**  TIME:2HRS/WEEK

Z4554 (2) **IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY** MAX.MARKS:50

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

**LEARNING OBJECTIVES: To enable the students to**

* + Acquaint them with immunological techniques vis-à-vis theory taught in the class room
  + Interconnect the theoretical and practical knowledge of immunity with the outer world for the development of a healthierlife.
  + Demonstrate basic laboratory skills necessary for Biotechnologyresearch
  + Promoting application of the lab techniques for taking up research in higherstudies

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

**CO1:**Identify and demonstrate the understanding different lymphoid organs.

**CO2:**Acquire skills in determination of different immunological test like blood group, Rh typing.

**CO3:** Acquire skills in careful handling of glass ware and maintaining laboratory equipments.

**CO4:** Explain the function of autoclave and importance of sterilization.

**CO5:**Able to summarize the separation of compounds using paper chromatography

**CO6:** Apply standardized procedures using safety measures in the laboratory.

# IMMUNOLOGY

* 1. Demonstration of lymphoid organs (as per UGCguidelines)
  2. Histological study of spleen, thymus and lymph nodes (through preparedslides)
  3. Blood groupdetermination
  4. Demonstrationof
     1. ELISA
     2. Immunoelectrophoresis

# ANIMALBIOTECHNOLOGY

* 1. DNA isolation ,quantification using DPAMethod
  2. Techniques: Western Blot, Southern Hybridization, DNAFingerprinting
  3. Separation, Purification of biological compounds by paper, Thin-layer and Column chromatography
  4. Cleaning and sterilization of glass and plastic wares for cellculture.
  5. Preparation of culturemedia.

# REFERENCE BOOKS

1. Immunology Lab Biology 477 Lab Manual; Spring 2016 Dr. JulieJameson
2. Practical Immunology A Laboratory Manual; **LAP LAMBERT Academic Publishing**
3. Manual of laboratory experiments in cell biology by Edward,G
4. Laboratory Techniques byPlummer.

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