



## **ANDHRA PRADESH STATE COUNCIL OF HIGHER EDUCATION**

**(A Statutory body of the Government of Andhra Pradesh)**

3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> floors, Neeladri Towers, Sri Ram Nagar, 6<sup>th</sup> Battalion Road,  
Atmakur(V), Mangalagiri(M), Guntur-522 503, Andhra Pradesh  
**Web:** [www.apsche.org](http://www.apsche.org) **Email:** [acapsche@gmail.com](mailto:acapsche@gmail.com)

### **REVISED SYLLABUS OF B.Sc. (ZOOLOGY) UNDER CBCS FRAMEWORK WITH EFFECT FROM 2020-21**

#### **PROGRAMME: THREE-YEAR B.Sc.**

**(Zoology)**

***(With Learning Outcomes, Unit-wise Syllabus, References, Co-curricular Activities &  
Model Q.P.)***

***For Fifteen Courses of 1, 2, 3 & 4 Semesters)***

**(To be Implemented from 2020-21 Academic Year)**

### Structure of ZOOLOGY Syllabus

(Under CBCS for 3-year B.Sc. Programme)

(With domain subject covered during the first 4 Semesters with 5 Courses)

YEAR	SEM	PAPER	TITLE	MARKS (100)		CREDITS
				MID SEMESTER	END SEMESTER	
I	I	I	Animal Diversity – I Biology of Non-Chordates	25	75	04
			Practical - I	25	75	01
	II	II	Animal Diversity – II Biology of Chordates	25	75	04
			Practical - II	25	75	01
II	III	III	Cell biology, Genetics, Molecular Biology & Evolution	25	75	04
			Practical - III	25	75	01
	IV	IV	Physiology, Cellular Metabolism & Embryology	25	75	04
			Practical - IV	25	75	01
		V	Immunology & Animal Biotechnology	25	75	04
			Practical - V	25	75	01

**AP STATE COUNCIL OF HIGHER EDUCATION**

w.e.f. 2020-21 (Revised in April, 2020)

**ZOOLOGY – SEMESTER IV**

**COURSE – 5: IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY**

**HOURS : 60 (5X12)**

**Max. Marks: 100**

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**Course Outcomes:**

This course will provide students with a deep knowledge in immunology, genetics, embryology and ecology and by the completion of the course the graduate shall be able to –

- CO1** To get knowledge of the organs of Immune system, types of immunity, cells and organs of immunity.
- CO2** To describe 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.

**Learning Objectives**

- To trace the history and development of immunology
- To provide students with a foundation in immunological processes
- To 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 Histocompatibility Complex in terms of immune response and transplantation
- 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 of recombinant DNA technology in agriculture, production of therapeutic proteins.

- To understand principles of animal culture, media preparation.

**ZOOLOGY SYLLABUS FOR SEMESTER - IV**  
**COURSE – 5: IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY**

**HOURS : 60 (5X12)**

**Max. Marks: 100**

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**Unit – I      Immunology – I (Overview of Immune system)**

- 1.1 Introduction to basic concepts in Immunology
- 1.2 Innate and adaptive immunity, Vaccines and Immunization programme
- 1.3 Cells of immune system
- 1.4 Organs of immune system

**Unit – II      Immunology – II (Antigens, Antibodies, MHC and Hypersensitivity)**

- 2.1 Antigens: Basic properties of antigens, B and T cell epitopes, haptens and adjuvants; Factors influencing immunogenicity
- 2.2 Antibodies: Structure of antibody, Classes and functions of antibodies
- 2.3 Structure and functions of major histocompatibility complexes
- 2.4 Exogenous and Endogenous pathways of antigen presentation and processing
- 2.5 Hypersensitivity – Classification and Types

**Unit – III      Techniques**

- 2.1 Animal Cell, Tissue and Organ culture media: Natural and Synthetic media,
- 2.2 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 of cultures
- 2.3 Stem cells: Types of stem cells and applications
- 2.4 Hybridoma Technology: Production & applications of Monoclonal antibodies (mAb)

**Unit – IV      Applications of Animal Biotechnology**

- 3.1 Genetic Engineering: Basic concept, Vectors, Restriction Endonucleases and Recombinant DNA technology
- 3.2 Gene delivery: Microinjection, electroporation, biolistic method (gene gun), liposome and viral-mediated gene delivery
- 3.3 Transgenic Animals: Strategies of Gene transfer; Transgenic - sheep, - fish; applications
- 3.4 Manipulation of reproduction in animals: Artificial Insemination, *In vitro* fertilization, super ovulation, Embryo transfer, Embryo cloning

#### **Unit - V**

- 4.1. PCR: Basics of PCR.
- 4.2 DNA Sequencing: Sanger's method of DNA sequencing- traditional and automated sequencing (2 hrs)
- 4.3 Hybridization techniques: Southern, Northern and Western blotting
- 4.4 DNA fingerprinting: Procedure and applications
- 4.5 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. Sreekrishna V. 2005. *Biotechnology –I, Cell Biology and Genetics*. New Age International Publ. New Delhi, India.

**ZOOLOGY MODEL PAPER FOR V SEMESTER**

**COURSE – 5: IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY**

**Time: 3 hrs**

**Max. Marks: 75**

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**I. Answer any FIVE of the following:**

**5x5=25**

**Draw labeled diagrams wherever necessary**

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.

**II. Answer any FIVE of the following:**

**5x10=50**

**Draw labeled diagrams wherever necessary**

- 9.

OR

- 10.

OR

- 11.

OR

- 12.

OR

- 13.

OR



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**ZOOLOGY PRACTICAL SYLLABUS FOR V SEMESTER**  
**COURSE – 5: IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY**

**Periods: 24**

**Max. Marks: 50**

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**Learning Objectives:**

- Acquainting student 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 healthier life.
- Demonstrate basic laboratory skills necessary for Biotechnology research
- Promoting application of the lab techniques for taking up research in higher studies

**I. IMMUNOLOGY**

1. Demonstration of lymphoid organs (as per UGC guidelines)
2. Histological study of spleen, thymus and lymph nodes (through prepared slides)
3. Blood group determination
4. Demonstration of
  - a. ELISA
  - b. Immunoelectrophoresis

**II. Animal biotechnology**

1. DNA quantification using DPA Method.
2. Techniques: Western Blot, Southern Hybridization, DNA Fingerprinting
3. Separation, Purification of biological compounds by paper, Thin-layer and Column chromatography
4. Cleaning and sterilization of glass and plastic wares for cell culture.
5. Preparation of culture media.

**REFERENCE BOOKS**

1. Immunology Lab Biology 477 Lab Manual; Spring 2016 Dr. Julie Jameson

2. Practical Immunology A Laboratory Manual; **LAP LAMBERT Academic Publishing**

3. Manual of laboratory experiments in cell biology by Edward, G

4. Laboratory Techniques by Plummer

**SUBJECT EXPERTS**

Dr. K.Veeraiah  
Dept of Zoology  
Acharya Nagarjuna University  
Nagarjuna Nagar

Dr.G.Srinivas  
Lecturer in Zoology  
& Co ordinator JKC,  
O/o CCE, Vijayawada

**SYLLABUS VETTED BY**

Dr.P.Padmavathi,  
Dept of Zoology  
Acharya Nagarjuna University  
Nagarjuna Nagar