



Hindi Vidya Prachar Samiti's

Ramniranjan Jhunjhunwala College

of Arts, Science & Commerce

(Empowered Autonomous College)

Affiliated to

UNIVERSITY OF MUMBAI

SYLLABUS FOR M.Sc-I.

SEMESTER : I & II

PROGRAM : M.SC. ZOOLOGY

PROGRAM CODE : RJSPGZOO

NATIONAL EDUCATION POLICY (NEP 2020)

LEVEL 6.0

(CBCS 2023-2024)

SEMESTER- I

OPEN ELECTIVE -I ANIMAL PHYSIOLOGY

M.Sc - I NEP Zoology Open Elective Course Syllabus Semester I & II

SEMESTER-I (THEORY)		L	Cr
RJSPGZOOE101		60 hrs	2
UNIT I		15	
Physiology of Nutrition			
1	1.1 Nature and Acquisition of nutrients-Essential and Non-Essential nutrients, role of symbionts. 1.2 Comparative biochemistry of digestion in vertebrates, Neural and hormonal regulation of secretion of digestive enzymes 1.3. Nutrigenomics: Introduction and application 1.4 Regulation of nutritional intake- Hunger drive, Glucostatic and Hepatostatic theories of hunger drive *Case study Anorexia Nervosa		
UNIT II		15	
Physiology of Circulation			
2	2.1 Overview of Circulation: Types of hearts-arthropods, annelids, molluscs, tunicates and vertebrates. 2.2 Neurohormonal regulation of different types of hearts 2.3* Circulating fluids: cytoplasm, hydrolymph, hemolymph, lymph and blood 2.4 Hemodynamics: Blood pressure, Blood flow- Turbulent and Laminar Blood flow, Microcirculation, peripheral resistance to blood flow, Regulation of blood flow and blood pressure. * Case study :Hypertensive drugs-types and mechanism of action		
UNIT III		15	
Physiology of Motility			
3	3.1 Physiology of non- muscular contractile elements-Contractile proteins, axoplasmic movement, chromosome movement. 3.2 Comparative physiology of invertebrate muscle-Polyneural innervation in arthropod muscle, Insect non-oscillatory postural muscle, Resonant flight and tymbal muscle in insects, Catch muscle and delayed relaxation. 3.3 Physiology of skeletal muscle fibre- Actomyosin complex, source of energy for muscle contraction, excitation of contraction and mechanism of regulation of contraction by calcium, mechanism of relaxation, Sliding filament theory. * Case study: Muscle relaxant (types and mechanism of action)		
UNIT IV		15	
Physiology of Neuronal System			
4	4.1 Integrative Neurophysiology- neurons, interneurons, neural circuits, networks, primitive nervous systems, nerve nets, central pattern generators in invertebrates, chordate nervous system. 4.2. Membranes Potential- action potential, resting membrane potential, ions as current carriers - protons, calcium, potassium, structure of cation-permeable channels and chloride channels. 4.3 Neurotransmitters- types, neurotransmission: synaptic and electrical transmission, * Case Study : Alzheimer w.r.t neuroimmunology & treatment * Case Study : Neurotoxins: Organophosphate pesticides		

SEMESTER I RJSPGZOOE 101	LEARNING OBJECTIVES • To familiarize the learner with nutritional physiology. • To familiarize the learner to circulation of body fluids and types of circulation in various phyla. • To understand the mechanics of blood pressure and drugs used for regulation of blood pressure. • To familiarize the learner to intracellular and extracellular processes involved in movement and locomotion in animals. • To familiarize the learner to structural and functional aspects of neurophysiology. COURSE OUTCOMES • The learner shall comprehend the molecular processes at membrane level and genetic level, their significance in nutrition and digestion. • The learner will understand the comparative mechanics and regulation of circulation • The learner will comprehend the mechanism of action of hypertensive drugs. • The learner shall discern molecular and supra-molecular structures and processes responsible for movement and locomotion in the animals. • The learner shall comprehend molecular, structural and functional dimensions of neurophysiology in the animal kingdom. • The application of therapy used to treat the neurological disorders. • The case studies will help the learner to understand, evaluate and apply the knowledge gained.
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SEMESTER I PRACTICALS
(OPEN ELECTIVE :ANIMAL PHYSIOLOGY)
CODE: RJSPGZOOEP101

1. Study of effect of various factors like pH, temperature, activator, inhibitor on enzyme (amylase/ fungal or salivary) activity.
2. Comparison of K_m of a given enzyme from two different sources. (bacterial enzyme/fungal enzyme/ pancreatic amylase)
3. A comparative study of RBC and WBC of fish/ bird/ goat / human. (any two)
4. Preparation of glycerinated muscle fibre and study of its properties.
5. Effect of different concentrations of sodium chloride on the diameter of RBC.

SEMESTER I PRACTICALS	LEARNING OBJECTIVE • The learners will acquire the practical skills for enzymology and hematology. • To learn the preparation of invitro model.
RJSPGZOOEP 101	
ANIMAL PHYSIOLOGY	COURSE OUTCOME • Learners will be able to design experiments. • Learner will acquire the practical skills and analytical skill

SEMESTER- II

OPEN ELECTIVE -I ANIMAL PHYSIOLOGY

M.Sc - I NEP Zoology Open Elective Course Syllabus Semester I & II

SEMESTER-II (THEORY)		L	Cr
RJSPGZOOE201		60	2
UNIT I		15	
Stress and Biochemical Adaptation			
1	1.1 Environmental Stress and Stressors. 1.2 Response to Stress- Plasticity: Phenotypic, Developmental and Transgenerational. 1.3 Strategies of Biochemical adaptation to stress 1.4 Osmotic Stress- preservation of solvent capacity, molecular crowding, enzymes, proteins and nucleic acids under osmotic stress. * Case study: Halophiles		
UNIT II		15	
Environmental Factors and Adaptation			
2	2.1 Oxygen: Oxygen debt in vertebrate muscle, Adaptations of vertebrates during prolonged diving, Decompression sickness in humans. 2.2 Temperature: Biochemical adaptations of Ectothermy- antifreeze substances, heat shock proteins, LDH as a model enzyme for temperature adaptation, Endothermy and Homeothermy in Insects *Case Study Hypoxia in Humans, *Adaptation of population in Tibet, Andes and Ecuador.		
UNIT III		15	
Model Systems in Animal Physiology			
3	3.1 Introduction to Animal Models: <i>Drosophila</i> , <i>Caenorhabditis elegans</i> , Zebrafish, Mouse 3.2 Induced and spontaneous, knockout (transgenic) Animal Models 3.3 Alternatives to animal models- <i>in silico</i> systems, <i>in vitro</i> systems 3.4 *Animal Ethics- CPCSEA guidelines for Animal Experiments		
UNIT IV		15	
4	Advanced Tools and Techniques in Diagnostics		
	4.1 PCR based diagnostics for detection of infectious diseases. 4.2 Immunoprecipitation- types and application 4.3 Scanning Techniques- PET Scan, CT, MRI (Introduction and application). 4.4 Application of Proteomics in diagnosis of diseases		

M.Sc - I NEP Zoology Open Elective Course Syllabus Semester I & II

SEMESTER II RJSPGZOOE201	LEARNING OBJECTIVES ● To understand the mechanism of stress induced responses in animals. ● To understand the biochemical adaptation to stress. ● To understand the working and application of techniques used for diagnosis. ● To introduce the learner various animal models. ● To introduce the learner to Animal ethics and governing bodies in animal experimentation. COURSE OUTCOMES ● The learner will understand the effect of environmental factors on gene expression. ● The learner will appreciate different techniques used in diagnostics. ● The learner will understand the use of different animal models, alternatives for animals experimentation and the ethics for animal research.
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SEMESTER II

PRACTICALS (OPEN ELECTIVE: ANIMAL PHYSIOLOGY)

RJSPGZOOEP201

1. Effect of decreasing PO₂ of water on the respiratory rate of a fish and accumulation of lactic acid in muscle.
2. Estimation of salt loss and gain in fish.
3. Performance of Ouchterlony technique to demonstrate immunodiffusion.
4. Demonstration of single radical immunodiffusion of antibody and antigen.
5. ELISA: Demonstration of technique

SEMESTER II PRACTICALS	LEARNING OBJECTIVES ● The learner will acquire the practical skills for maintenance of fish. ● To acquire the skill to perform immunoprecipitation techniques.
RJSPGZOOEP 201	COURSE OUTCOME ● Learner will be able to design experiments involving fish as a model. ● Learner will acquire the practical skills and analytical skill

PRACTICAL PAPER PATTERN

SEMESTER I PRACTICAL EXAMINATION

ELECTIVE ANIMAL PHYSIOLOGY

CODE: RJSPGZOOEP101

Total- 50 marks

Q.1 Compare the Km of given enzymes from two different sources. 25M

OR

Q.1 To study the effect of pH/ temperature/ activator/ inhibitor on the activity of the given enzyme.

Q.2 Make a preparation of glycerinated muscle fibre and study the effect of given salts on its properties. 15M

OR

Q.2 Compare the RBC/WBC of the given blood samples.

OR

Q.2 Determine the effect of different concentrations of NaCl on the diameter of RBCs.

Q.3 Viva 5M

Q.4 Journal 5M

- Candidates are required to present certified journal on the day of practical examination.

SEMESTER II PRACTICAL EXAMINATION

ELECTIVE ANIMAL PHYSIOLOGY

CODE: RJSPGZOOEP201

Total- 50 marks

Q.1 Estimate the salt loss in the given fish.

25M

OR

Q.1 Estimate the salt gain in the given fish.

Q.2 Determine the effect of decreasing PO₂ of water on respiratory rate of the given fish.

15M

OR

Q.2 Determine the concentration of antibody by using immunodiffusion technique (Ouchterlony or Single radial).

OR

Q.2 Identify the antigen using Ouchterlony technique (photograph can be used or graph can be given).

Q.3 Viva

5M

Q.4 Journal

5M

- Candidates are required to present certified journal on the day of practical examination.