

# Government Degree College (Autonomous), Baramulla

SEMESTER 4<sup>th</sup>

MAJOR / MINOR COURSE

## Subject: Zoology

Course Title: **Physiology and Enzymology**

Credits: Theory: 04; Practical: 02

Course Code: BZO22C401

Contact Hours: Th 64; Pr 64

### Course Objective:

*The course aims to provide students with a comprehensive understanding of physiology, enzymology principles, and laboratory techniques. Students will gain theoretical knowledge and practical skills to analyze physiological processes and enzymatic reactions effectively.*

### Course Outcome:

*Upon successful completion of the "physiology and enzymology" course, students will be able to: Understand the physiological processes involved in digestion, respiration, excretion, and cardiac impulse, and their importance in maintaining homeostasis in the human body.*

*Demonstrate knowledge of neurophysiology and sensory physiology, including the generation and propagation of action potentials, muscle contraction, and the sensory mechanisms of vision and hearing.*

*Apply enzyme kinetics principles, including the Michaelis-Menten equation and Lineweaver-Burk plot, to quantitatively analyze enzymatic reactions.*

### Unit 1 Physiological Integration I

- 1.1 Physiology of digestion; Absorption of carbohydrates, proteins and lipids
- 1.2 Pulmonary respiration, Respiratory volumes and capacities, Transport of Oxygen and carbon dioxide in blood, types of respiratory pigments, oxygen dissociation curves
- 1.3 Formation and excretion of nitrogenous wastes
- 1.4 Origin and conduction of cardiac impulse

### Unit 2 Physiological Integration II

- 2.1 Different types of potentials, action potential and its propagation in different nerve fibres
- 2.2 Molecular and chemical basis of muscle contraction
- 2.3 Physiology of vision
- 2.4 Physiology of hearing

### Unit 3 Introduction to Enzymology

- 3.1 Definition of enzymes and their characteristics
- 3.2 Enzyme nomenclature and classification
- 3.3 Factors affecting enzyme activity: temperature, pH, substrate concentration, enzyme concentration, etc.
- 3.4 Cofactors and their importance in enzyme function

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## **Unit 4 Enzyme Assays and Kinetics**

- 4.1 Enzyme kinetics and the Michaelis-Menten equation
- 4.2 Enzyme inhibition: competitive, non-competitive, and uncompetitive inhibition
- 4.3 Lineweaver-Burk plot
- 4.4 Cytochrome P450 enzymes and their role in drug metabolism

## **Practicals (Credits 02)**

1. Preparation of hemin and hemochromogen crystals
2. Study of permanent histological sections of mammalian pituitary, thyroid, adrenal gland
3. Prepare permanent slides of mammalian, duodenum, liver, lung, kidney, pancreas, bone, cartilage
4. Study of activity of salivary amylase under optimum conditions
5. RBC & WBC counting and Estimation of haemoglobin
6. Measure and calculate different lung volumes and capacities using spirometry.
7. Study the effects of competitive and non-competitive inhibitors on enzyme activity.
8. Express the isozymes of Lactate dehydrogenase (LDH)/Superoxide dismutase (SOD)/expression of Catalase on Native gel Electrophoresis

## **Recommended books**

1. "Principles of Anatomy and Physiology" by Gerard J. Tortora and Bryan Derrickson
2. Guyton and Hall Textbook of Medical Physiology" by John E. Hall
3. Principles of Neural Science" by Eric R. Kandel, James H. Schwartz, Thomas M. Jessell, et al.
4. "Enzyme Kinetics: Behavior and Analysis of Rapid Equilibrium and Steady-State Enzyme Systems" by Irwin H. Segel
5. Enzyme Kinetics and Mechanism, Part E: Energetics of Enzyme Catalysis" by Daniel L. Purich
6. Histology: A Text and Atlas" by Michael H. Ross and Wojciech Pawlina

**Subject: Zoology**

Course Title: **Comparative Anatomy of Vertebrates**  
Credits: Theory: 04; Practical: 02

Course Code: **BZO22C402**  
Contact Hours: Th 64; Pr 32

**COURSE OBJECTIVE**

*The paper intends to introduce the similarities and differences amongst the vertebrate systems such as integument, heart, skeleton, brain, digestive, respiratory and urinogenital system*

**COURSE OUTCOME**

*The course outcome is to provide students with a detailed understanding of comparative vertebrate anatomy, allowing them to appreciate the diversity of anatomical structures across different species. Students will gain valuable insights into the evolutionary history and adaptations of vertebrates, enhancing their knowledge of the animal kingdom's incredible complexity and unity.*

**Unit-I: Integument & its Derivatives**

- 1.1 Comparative anatomy of integument from fishes to mammals
- 1.2 Derivatives of integument: scales, beaks, horns, digital tips- claws, hoofs & nails
- 1.3 Feathers- structure & types; hair- structure & development
- 1.4 Epidermal & Dermal glands and comparative anatomy of tail in fishes

**Unit-II: Endoskeleton and Coordinating system**

- 2.1 Comparative anatomy of skull in vertebrates
- 2.2 Development and comparative study of brain in various classes of vertebrates.
- 2.3 Outline of axial and appendicular skeleton;
- 2.4 Comparative anatomy of pelvic and pectoral girdles from fishes (bony and cartilaginous fishes) to mammals

**Unit-III: Digestive & Respiratory system**

- 3.1 Comparative anatomy of jaw suspension, oral cavity, teeth (dentition in mammals); oesophagus, stomach and intestine in vertebrates
- 3.2 Comparative account of digestive glands viz., liver, pancreas and gall bladder
- 3.3 Visceral arches in vertebrates
- 3.4 Respiratory system: structure of gills, lungs & air sacs

**Unit-IV: Circulatory & Urogenital System**

- 4.1 Types of kidney, developmental stages and Evolution of kidney and their ducts in vertebrates

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4.2 Comparative account of testes and ovaries from fishes to mammals

4.3 Evolution of heart and evolution of aortic arches and their significance

4.4 Comparative anatomy of heart in vertebrates.

### **Practicals**

**(Credit 02)**

1. Preparation of temporary mounts or slide study of placoid, cycloid and ctenoid scales
2. Identification of integument derivatives in mammals (hooves, horns, antlers) and their functions.
3. Comparative study of skull structures in vertebrates, identifying variations among different classes.
4. Comparative study of pelvic and pectoral girdles in fishes (bony and cartilaginous) to mammals.
6. Dissections: alimentary canal & cranial nerves of scoliodon / fish / fowl, as per availability
7. Study of various organ systems in fish / fowl / rat
8. Dissection of eye and brain of sheep to show their different parts
9. Prepare permanent slides of various organs (Liver, kidney, heart, Lungs and stomach) from different vertebrates
10. Field Trip to Zoo, Wildlife Sanctuary and Biosphere reserves and submission of field report

### **Books Recommended:**

1. Anatomy of Chordates- Charles K. Weichert
2. Modern Text Book of Zoology (Vertebrates)- R. L. Kotpal
3. Chordate Zoology- E. L. Jordan and P. S. Verma
4. Comparative Anatomy of Vertebrates- R. K. Saxena and Sumitra Saxena
5. Chordates by Dhama and Dhama

**Subject: Zoology**

Course Title: *Animal Ecology*

Course Code: BZO22C403

Credits: Theory: 04; Practical: 02

Contact Hours: Th 64; Pr 64

**Course Objective(s)**

This course provides a brief background of the ecology and describes physical factors. It gives insight into the features of population, ecosystem and community; and also explains ethics and conservation of natural resources.

**Course Outcome(s)**

Student will be able to understand:

1. The concept of ecology, role of abiotic factors in distribution and performance of animals and nutrient cycling.
2. The concept of individual and module along with population growth patterns and regulation; and ecological niche.
3. Features of ecosystem, community and energy flow; and ecological succession.
4. Natural resources and their conservation methods.

**Unit-I:**

- 1.1 Introduction, history and scope of Ecology.
- 1.2 Life supporting properties of water. Physical factors: temperature, light, pH and salinity.
- 1.3 Thermal stratification. Concept of limiting factors.
- 1.4 Biogeochemical cycles: C,N, P & S cycles.

**Unit-II:**

- 2.1 Unitary and Modularpopulations. Population characteristics: Distribution, density, natality, mortality, life tables, survivorship curves, age structure, sex ratio.
- 2.2 Exponential and logistic growth, equation and patterns.
- 2.3 Population regulation: density-dependent and independent factors.
- 2.4 Ecological niche.

**Unit-III:**

- 3.1 Ecosystems and types: pond, desert and forest ecosystems
- 3.2 Detritus and grazing food chains, ecological pyramids, food web, energy flow.

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3.3 Community characteristics: Dominance, diversity, species richness, abundance, stratification, ecotone and edge effect.

3.4 Types of interaction: Inter and intra-specific. Ecological succession.

### **Unit-IV:**

4.1 Environmental ethics.

4.2 Causes of environmental degradation.

4.3 Natural resources: Mineral, water and bio resource; their significance and conservation.

4.4 Application of ecology in biodiversity management.

### **Practicals:**

### **02 Credits**

1. Determine the phosphorus and nitrogen content present in a provided soil sample through calculations.
2. Determine the pH, conductivity, and turbidity measurements for a given water sample
3. Determine the levels of dissolved oxygen (DO) and alkalinity in the nearby water source
4. Construct and analyze food webs to understand energy flow in an ecosystem
5. Study interspecific interactions (e.g., competition, predation) using model ecosystems.
6. Visit local pond, desert, and forest ecosystems to observe and document their unique characteristics.
7. Visit local water bodies and water treatment facilities.

### **Books recommended**

1. Odum, E.P. & Barrett, G. W Fundamentals of Ecology
2. Stiling, P. Ecology: Theories and application
3. Singh, H.R. & Kumar, N. Ecology and Environmental Science
4. Subrahmanyam, N.S. & Sambamurty, A.V.S.S. Ecology
5. Dhaliwal, G.S., Sangha, G.S. & Ralhan, P.K. Fundamentals of Environmental Science