

# **INSTITUTE OF EDUCATION AND RESEARCH**

**University of the Punjab, Lahore**

**Zoology I: Principles in Animal Life**

**Course Code: SE02**

**First Semester**

**(Credit Hours 3)**

## **Pre-requisites course requirement/ Skills**

Nil

## **Learning Outcomes**

This course will be based on following outcomes:

1. Explain the structure and function of biomolecules (carbohydrates, lipids, proteins, nucleic acids) and enzymes.
2. Identify the main biochemical pathways and cycles (e.g., glycolysis, Krebs cycle)
3. Explain the stages of the cell cycle (interphase, mitosis, cytokinesis) and meiosis
4. Define key ecological concepts (population, community, ecosystem, biodiversity) and interactions between organisms and their environment (predation, competition, symbiosis etc)
5. Explain the energy flow and nutrient cycling in ecosystems
6. Explain the mechanisms of evolution (natural selection, genetic drift, gene flow)
7. Identify the key factors influencing evolutionary change (mutation, genetic variation, selection pressure)
8. Explain the different types of animal behaviour (innate, learned, social) and key factors influencing animal behaviour (environment, genetics, evolution)
9. Explain the structure and function of DNA and RNA
10. Describe the processes of DNA replication, transcription, and translation
11. Analyze the applications and implications of molecular genetics in medicine, agriculture, and biotechnology

## **Unit-1. Place of Zoology in Science:**

A One-World View: Genetic Unity.

The Fundamental Unit of Life, Evolutionary Oneness and the Diversity of Life, Environment and World Resources  
What is Zoology?  
The classification of Animals  
The Scientific Method.

**Unit-2: The Chemical Basis of Animal Life**

Atoms and elements  
Building blocks of all matter  
Compounds and molecules  
Aggregates of atoms; acids, bases, and buffers; the molecules of animals  
Fractional account of carbohydrates, lipids, proteins, nucleotides and nucleic acids based on their structural aspects.

**Unit-3. Cells, Tissues, Organs, and Organ System of Animals:**

Structure and Functions of Cell Membranes  
Various Movements across Membranes  
Cytoplasm, Organelles, and Cellular Components  
Functional account of Ribosome's, Endoplasmic Reticulum, Golgi Apparatus, Lysosomes, Mitochondria, Cytoskeleton, Cilia and Flagella, Centrioles and Microtubules, and Vacuoles based on their structural aspects.  
The Nucleus: Nuclear Envelope, Chromosomes and Nucleolus.  
Tissues; Diversity in Epithelial Tissue, Connective Tissue, A Muscle Tissue and Nervous Tissue to perform various functions.  
Structural integrations for functions in Organs and Organ Systems.

**Unit-4: Energy and Enzymes: Life's Driving and Controlling Forces**

Energy and the laws of energy transformation  
Activation energy; enzymes: structure, function and factors affecting their activity  
Cofactors and coenzymes  
ATP: how cells convert energy? An overview.

**Unit-5: How Animals Harvest Energy Stored in Nutrients:**

Glycolysis: The First Phase of Nutrient Metabolism, Fermentation: "Life without Oxygen

Aerobic Respiration: The Major Source of ATP  
Metabolism of Fats and Proteins  
Control of Metabolism  
The Metabolic Pool.

**Unit-6 Cell Division**

- 6.1 Mitosis,
- 6.2 cytokinesis, and the cell cycle: an overview; control of the cell cycle
- 6.3 Meiosis: the basis of sexual reproduction; gamete formation

**Unit-7 Inheritance Patterns**

- 7.1 The birth of modern genetics; Mendelian inheritance patterns; other inheritance patterns
- 7.2 Environmental effects and gene expression

**Unit-8 Chromosomes and Gene Linkage**

- 8.1 Eukaryotic chromosomes; linkage relationships; changes in chromosome number and structure

**Unit-9 Molecular Genetics**

- 9.1 Ultimate Cellular Control, DNA: the genetic material; DNA replication in eukaryotes; genes in action
- 9.2 Control of gene expression in eukaryotes
- 9.3 Mutations
- 9.4 Applications of genetic technologies; recombinant DNA

**Unit-10 Ecology I: Individuals and Populations**

- 10.1 Animals and their abiotic environment
- 10.2 Populations; interspecific interactions

**Unit-11 Ecology II: Communities and Ecosystems**

- 11.1 Community structure and diversity; ecosystems; ecosystems of the earth
- 11.2 Ecological problems; human population growth, pollution, resource depletion and biodiversity

### **Unit-12: Animal Behavior**

Four approaches to animal behavior

Proximate and ultimate causes

Anthropomorphism

Development of behavior

Learning; control of behavior

Communication

Behavioral ecology

Social behavior

### **Unit-13: Evolution: A Historical Perspective**

Pre-Darwinian theories of change; Lamarck: an early proponent of evolution; early development of Darwin's ideas of evolution and evidences; the theory of evolution by natural selection; evolutionary thought after Darwin; biogeography.

### **Unit-14: Evolution and Gene Frequencies**

The modern synthesis: a closer look; the Hardy-Weinberg theorem; evolutionary mechanisms: population size, genetic drift, natural selection, gene flow, mutation, and balanced polymorphism; species and speciation; rates of evolution; molecular evolution; mosaic evolution.

### **Teaching-Learning Strategies**

*Discussion, Demonstration Method, Lecture Method, Project Method*

### **Assignment-types and number with calendar**

*Class presentation, written assignment, Case study. 01 assignment before mid-term exam and 02 assignment after mid-term exam.*

### **Assessment and Examination**

<b>Sr. No.</b>	<b>Elements</b>	<b>Weightage</b>	<b>Details</b>
1.	Midterm Assessment	35%	It takes place at the mid-point of the semester. 9 <sup>th</sup> Week

2.	Formative Assessment	25%	It is continuous assessment. It includes classroom participation, attendance, assignment and presentations, homework, attitude and behavior, hands-on-activities, short tests, quizzes etc.
3.	Final Assessment	40%	It takes place at the end of the semester. It will be a written test.

### **Suggested Readings**

Campbell, N. A. (2002). *Biology* (6<sup>th</sup> ed). Menlo Park, California: Benjamin/Cummings Publishing Company, Inc.

Hickman, C.P., Roberts, L.S., & Larson, A. (2004). *Integrated principles of zoology* (12<sup>th</sup> ed) (International). Singapore: McGraw Hill.

Kent, G. C. & Miller, S. (2001). *Comparative anatomy of vertebrates*. New York: McGraw Hill.

Miller, S. A., & Harley, J. B. (2000). *Zoology* (4<sup>th</sup>, 5<sup>th</sup>, 6<sup>th</sup>, 10<sup>th</sup> ed) (International). Singapore: McGraw Hill.

Pechenik, J. A. (2000). *Biology of invertebrates*, (5<sup>th</sup> ed) (International). Singapore: Mc

## **Zoology Lab-I: (Principles in Animal Life)**

### **First Semester**

**(1 Credit Hour)**

#### **Pre-requisites course requirement/ Skills Nil**

#### **Paper-C: Practical-I**

1. Tests for different carbohydrates, proteins and lipids. (Emphasis on the concept that tests materials have been ultimately obtained from living organisms and constituted their body.)
2. Study of the prepared slides of squamous, cuboidal, columnar epithelial tissues, adipose, connective, cartilage bone, blood, nervous, skeletal muscle, smooth muscle and cardiac muscle tissues. (Prepared microscopic and or projection slides and or CD ROM computer projections must be used.)
3. Plasmolysis and deplasmolysis in blood
4. Protein digestion by pepsin.
5. Study of mitosis in onion root tip.
6. Study of meiosis in grass hopper testis. (Note for 5-6. Prepared microscopic and or projection slides and or CD ROM computer projections must be used.)
7. Problem based study of Mendelian ratio in animals.
8. Multiple alleles study in blood groups.
9. Survey study of a genetic factor in population and its frequency.
10. Study of chromosomal number and structural change in *Drosophila*.
11. Study of karyotypes of *Drosophila*, Mosquito.
12. Study of cytochemical destruction of DNA in protozoa and avian blood cell.
13. Study of stages in the development of an Echinoderm.
14. Study of early stages in the development of a frog, chick and a mammal. (Note for 10-14. Prepared slides and preserved specimen and or projection slides and or CD ROM computer projections may be used.)

15. Study to demonstrate nervous or endocrine basis of behaviour (conditioned reflex or aggression or parental behaviour).
16. Study to demonstrate social behaviour (Honeybees, Monkey group in a zoo).
17. Ecological notes on animals of a few model habitats.
18. Field observation and report writing on animals in their ecosystem (a terrestrial and an aquatic ecosystem study).

### Teaching-learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

### Assignment Types and Number with Calendar

*Class Presentations, Written Assignment, 01 assignment before mid-term exam and 02 assignment after mid-term exams*

### Assessment and Examinations

Sr. No.	Elements	Weightage	Details
1.	Midterm Assessment	35%	It takes place at the mid-point of the semester. 9 <sup>th</sup> Week
2.	Formative Assessment	25%	It is continuous assessment. It includes classroom participation, attendance, assignment and presentations, homework, attitude and behavior, hands-on-activities, short tests, quizzes etc.
3.	Final Assessment	40%	It takes place at the end of the semester. It will be a written test.

### Suggested Readings

- Hickman, C. P. & Kats, H. L. (2000). *Laboratory studies in integrated principles of zoology*. Singapore: McGraw Hill.
- Miller, S. A. (2002). *General zoology laboratory manual* (5<sup>th</sup> ed) (International). Singapore: McGraw Hill.

# **INSTITUTE OF EDUCATION AND RESEARCH**

**University of Punjab, Lahore**

**BSSEd (4 year) Science Education**

**MATHEMATICS A-I [CALCULUS (I)]**

**Course Code: SE02A**

**Semester: 1<sup>st</sup>**

**Credit Hours: 4**

## **Learning Outcomes**

The student will be able to:

1. Recall the set of real numbers as a union of sets of rational and irrational numbers.
2. Depict real numbers on number line.
3. Know the properties of real numbers.
4. Define complex number  $z$  represented by an expression of the form  $z=a+ib$ , where  $a$  and  $b$  are real numbers as imaginary part of  $z=a+ib$ .
5. Define conjugate of a complex number.
6. Explain the properties of inequalities of real numbers.
7. Depict complex numbers system, polar form of complex numbers and De Moivre's theorem.
8. Analyze circular function, hyperbolic functions and logarithmic functions.

## **Preliminaries**

1. Real numbers and the real line
2. Functions and their graphs
3. Shifting and scaling graphs
4. Solution of equations involving absolute values
5. Inequalities
6. Complex numbers system. Polar form of complex numbers, De Moivre's theorem
7. Circular function, hyperbolic functions, logarithmic



## **Limit and Continuity**

- Limit of a function, left hand and right hand limits, Theorems of limits
- Continuity, Continuous functions

## **Derivatives and its Applications**

- Differentiable functions
- Differentiation of polynomial, rational and transcendental functions
- Mean value theorems and applications
- Higher derivatives, Leibniz's theorem
- L'Hospital's Rule
- Intermediate value theorem, Rolle's Theorem
- Taylor's and Maclaurin's theorem with their remainders

## **Integration and Definite Integrals**

- Techniques of evaluating indefinite integrals
- Integration by substitutions, Integration by parts
- Change of variable in indefinite integrals
- Definite integrals, Fundamental theorem of calculus
- Reduction formulas for algebraic and trigonometric integrands
- Improper integrals, Gamma functions

## **Recommended Books**

1. Thomas, Calculus, 11th Edition. Addison Wesley Publishing Company, 2005
2. H. Anton, I. Bevens, S. Davis, Calculus, 8th Edition, John Wiley & Sons, Inc. 2005
3. Hughes-Hallett, Gleason, McCallum, et al, Calculus Single and Multivariable, 3rd Edition. John Wiley & Sons, Inc. 2002.
4. Frank A. Jr, Elliott Mendelson, Calculus, Schaum's outlines series, 4th Edition, 1999
5. C.H. Edward and E.D Penney, Calculus and Analytics Geometry, Prentice Hall, Inc. 1988
6. E. W. Swokowski, Calculus and Analytic Geometry, PWS Publishers, Boston, Massachusetts, 1983.