

### **Course 3: Genetics, Taxonomy and Evolution (BSCZO103)**

#### **Course Objectives:**

1. To develop understanding on Systematic and the evolutionary understanding of biological phenomena.
2. To understand the International Code of Zoological Nomenclature, Its operative principals, Zoological nomenclature and formation of scientific names of various taxa.
3. To understand the molecular basis of cell structure DNA structure and functions and types of genetic molecules and their functions in different cells.
4. Chemical structure and functioning of different biological molecules: carbohydrates, lipids, proteins, and nucleic acids in physiological property of animals.
5. Explain the basic pathways and mechanisms in biological energy transduction from oxidation of metabolites to synthesis of ATP.
6. Understand the Causes, Processes, and Consequences of Evolution.
7. Understand the Principal Mechanisms of Evolution through the process of macro, micro and mega evolutionary process.

#### **Syllabus**

Elements of heredity and variation, Mendel's principles of heredity, linkage (Coupling and repulsion), crossing-over (mechanism, theories and importance). Chromosomal mapping (Three point cross). Chromosomal Mutation: Classification, Translocation, Inversion, Deletion, Duplication, Euploidy, Aneuploidy and Polysomy. Genetic interaction: Gene structure and function Methods to study the human inheritance. Recessive inherited disorder, dominant inherited disorder, inborn errors of metabolism, sickle cell anaemia and syndromes. Taxonomy and Systematics: Historical resume of systematic. Introduction to taxonomy and its relationship with systematics. Importance and applications of biosystematics. International Code of Zoological Nomenclature, Binomial, Trinomial components of classification and formation of scientific names of various taxa. Taxonomic characters: Morphological, Embryological, Cytogenetical, Biochemical and Numerical. Components of classification and Linnaean hierarchy. Concept of species: Species category, different species concept, Sub species and other infra species. Nature, types and potential modes of speciation. Special creation theory, theories of spontaneous generation, cosmozoic theory, theory of chemical evolution and spontaneous origin of life at molecular level. Concept of organic evolution: evidences from paleontology (types of fossils and determination of age of rocks and fossils), taxonomy, comparative anatomy, comparative embryology, physiology and biochemistry and cytology. Theories of organic evolution: Lamarckism, Darwinism, Mutation theory and modern synthetic theory. Modern evolutionary Concept and details of micro, macro and mega evolution. Major Zoo-geographical realms and distribution patterns of animals in different zoogeographical realms. Biogeographical regions in India.

## **UNIT SCHEDULE**

### **Block I: Genetics**

**Unit 1:** Mendalism and Elements of heredity

**Unit 2:** Chromosomal Mutation

**Unit 3:** Genetic interaction

**Unit 4:** Human genetics

### **Block II: Taxonomic concept**

**Unit 5:** Taxonomy and Systematics

**Unit 6:** Zoological Nomenclature

**Unit 7:** Kinds of taxonomic characters and classification

**Unit 8:** Concepts of Species

### **Block III. Evolution**

**Unit 9:** Origin of life

**Unit 10:** Concept of organic evolution

**Unit 11:** Theory of organic evolution

**Unit 12:** Evolutionary concept

**Unit 13:** Zoogeographical relams

## **Genetics, Taxonomy and Evolution (BSCZO103)**

### **UNIT WISE CONTENTS**

#### **Block I: Genetics**

##### **Unit 1:** Mendalism and Elements of heredity

Elements of heredity and variation, Mendel's principles of heredity, linkage (Coupling and repulsion), crossing-over (mechanism, theories and importance). Chromosomal mapping (Three point cross).

##### **Unit 2:** Chromosomal Mutation

Classification, Translocation, Inversion, Deletion, Duplication, Euploidy, Aneuploidy and Polysomy

##### **Unit 3:** Genetic interaction

Gene structure and function

##### **Unit 4:** Human genetics

Recessive inherited disorder, dominant inherited disorder, inborn errors

#### **Block II: Taxonomic concept**

##### **Unit 5:** Taxonomy and Systematic

Introduction to taxonomy and its relationship with systematic. Importance and applications of biosystematics.

##### **Unit 6:** Zoological Nomenclature

International Code of Zoological Nomenclature, Binominal and Trinomial components of classification.

##### **Unit 7:** Kinds of taxonomic characters and classification

Taxonomic characters: Morphological, Embryological, Cytogenetically, Biochemical and Numerical. Components of classification and Linnaean hierarchy.

##### **Unit 8:** Concepts of Species

Concept of species and speciation and potential modes of speciation.

### **Block III. Evolution**

#### **Unit 9: Origin of life**

Special creation theory, theories of spontaneous generation, cosmozoic theory, theory of chemical evolution and spontaneous origin of life at molecular level

#### **Unit 10: Concept of organic evolution**

Concept of organic evolution: evidences from paleontology (types of fossils and determination of age of rocks and fossils), taxonomy, comparative anatomy, comparative embryology, physiology and biochemistry and cytology.

#### **Unit 11: Theory of organic evolution**

Theories of organic evolution: Lamarckism, Darwinism, Mutation theory and modern synthetic theory

#### **Unit 12: Evolutionary concept**

Modern evolutionary Concept and details of micro, macro and mega evolution

#### **Unit 13: Zoogeographical realms**

Major Zoo-geographical realms and distribution patterns of animals in different zoogeographical realms. Biogeographically regions in India.

### **Suggested Readings:**

1. Alberts, Bray, Lewis, Raff, Roberts & Watson: Molecular Biology of the Cell (Garland).
2. Alberts: Molecular Biology of the Cell (Garland).
3. De Robertis & De Robertis: Cell and Molecular Biology.
4. Gupta, P.K. : Cycology, Genetics & Evolution Rastogi Publications.
5. Brooker: Genetics : Analysis and Principles (1999, Addison-Wesley.)
6. Gardner *et al*: Principles of Genetics (1991, John Wiley)
7. Snustad & Simmons: Principles of Genetics (2006, John Wiley).
8. Moody: Introduction to Evolution (1978, Kalyani).
9. Savage: Evolution (1963, Holt, Reinhart and Winston)
- 10 Rastogi: Organic Evolution (1988, Kedarnath & Ramnath)
11. Strickberger: Evolution (2004, Jones & Bartlett)