SEMESTER-IV

Core Course: Zoology: DSC-04
BZO-C 401: GENETICS AND EVOLUTIONARY BIOLOGY
(Credits: Theory-4, Practicals-4)
THEORY

Lectures: 60 **M.M.: 70**

UNIT-I

Introduction to Genetics: Mendel's work on transmission of traits, Genetic Variation, Molecular basis of Genetic Information; **Mendelian Genetics and its Extension:** Principles of Inheritance, Chromosome theory of inheritance, Pedigree analysis, Incomplete dominance and codominance, Multiple alleles, Lethal alleles, Epistasis, Pleiotropy, Environmental effects on phenotypic expression, sex linked inheritance, extrachromosomal inheritance involving mitochondria and chloroplast. (12 Lectures)

UNIT-II

Linkage, Crossing Over and Chromosomal Mapping: Linkage and crossing over, Cytological basis of crossing over, Molecular mechanism of crossing over, Recombination frequency as a measure of linkage intensity, two factor and three factor crosses, Interference and coincidence, Somatic cell genetics – an alternative approach to gene mapping. (12 Lectures)

UNIT-III

Mutations: Chromosomal Mutations: Deletion, Duplication, Inversion, Translocation, Aneuploidy and Polyploidy; Gene mutations: Induced versus Spontaneous mutations, Back versus Suppressor mutations, Molecular basis of Mutations; **Sex determination;** Chromosomal mechanisms, dosage compensation; **Quantitative Genetics:** Quantitative and multifactor inheritance, Transgressive variations, Heterosis. (12 Lectures)

UNIT-IV

History of Life: Major Events in History of Life; **Introduction to Evolutionary Theories:** Lamarckism, Darwinism, Neo-Darwinism; **Direct Evidences of Evolution:** Types of fossils, Incompleteness of fossil record, Dating of fossils, Phylogeny of horse: **Processes of Evolutionary Change:** Organic variations; Isolating Mechanisms; Natural selection (Example: Industrial melanism); Types of natural selection (Directional, Stabilizing, Disruptive), Artificial selection. (12 Lectures)

UNIT-V

Species Concept: Biological species concept (Advantages and Limitations); Modes of speciation (Allopatric, Sympatric); **Evolution above species level:** Macro-evolutionary Principles (example: Darwin's Finches); **Extinction:** Mass extinction (Causes, Names of five major extinctions, K-T extinction in detail), Role of extinction in evolution. (12 Lectures)

Note: The question paper shall consist of two sections (A & B). Section A shall contain ten short answer type questions of six marks each and student has to attempt any five questions in about 150 words each. Section B shall consist eight long answer type questions of ten marks each and student shall be required to attempt any four questions in detail. Questions shall be uniformly distributed from the entire syllabus. The previous year paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

SUGGESTED READINGS: GENETICS

1. Gardner, E.J., Simmons, M.J., Snustad, D.P. (2008). *Principles of Genetics*. VIII Edition. Wiley India.

2. Snustad, D.P., Simmons, M.J. (2009). *Principles of Genetics*. V Edition. John Wiley and Sons Inc.

3. Klug, W.S., Cummings, M.R., Spencer, C.A. (2012). *Concepts of Genetics*. X Edition. Benjamin Cummings.

4. Russell, P. J. (2009). *Genetics- A Molecular Approach.* III Edition. Benjamin Cummings.

5. Griffiths, A.J.F., Wessler, S.R., Lewontin, R.C. and Carroll, S.B. *Introduction to Genetic Analysis*. IX Edition. W. H. Freeman and Co.

SUGGESTED READINGS: EVOLUTIONARY BIOLOGY

1. Ridley, M. (2004). *Evolution*. III Edition. Blackwell Publishing

2. Barton, N. H., Briggs, D. E. G., Eisen, J. A., Goldstein, D. B. and Patel, N. H. (2007). E*volution*. Cold Spring, Harbour Laboratory Press.

3. Hall, B. K. and Hallgrimsson, B. (2008). *Evolution*. IV Edition. Jones and Bartlett Publishers