MANGALORE UNIVERSITY

DEPARTMENT OF BIOCHEMISTRY

MSc in Biochemistry

SOFT CORE BCS 504: GENETICS

Total number of lecture hours:42 **Total number of credits: 03**

Course objectives

- To study the basic principles of genetics, gene linkage and X-linked inheritance and cytoplasmic inheritance
- To study the organization of chromosomes in prokaryotes and eukaryotes
- Causes of mutation and repair mechanism
- Various diseases associated with anomalies in chromosome number and structure.

Course outcome

- The student understands the basic principles of genetics, gene linkage and X-linked inheritance and cytoplasmic inheritance
- Various causes of mutation and their repair mechanism
- Diseases associated with changes in chromosome number and structure.

Unit I **14hrs.**

Basic Principles of Mendelism- Laws of Inheritance, dominance, codominance, epistasis, (e.g., Comb shape in chicken) Pleiotropism. Cytoplasmic inheritances (e.g., Male sterility in plants, Shell Coiling). **Gene Linkage and Chromosome-** Linkage and recombination of genes in a chromosome. Crossing over gene mapping with three - point test cross, mapping by tetrad analysis. X-linked inheritance. Polygenic inheritance, mitochondrial inheritance, Y-chromosome inheritance.

Unit II **14hrs.**

Organization of Genes in Prokaryotic and Eukaryotic Chromosome-Genome size and evolutionary complexity, C- value paradox, structure of bacterial chromosome, structure of eukaryotic chromosome, nucleosome organization, arrangement of chromatin fibers in a chromosome. Polytene chromosomes, Centromere and telomere structure. **Organization of Genes in Chromosomes-** Single copy gene, gene families, tandemly repeating genes, pseudo genes, **Chromosome Number-**ploidy, Karyotyping, sex chromosome and dosage compensation. Mobile genetic elements, transposons, allocating genes to chromosomes- chromosome walking, RFLP and RAPD.

Unit III **14 hrs.**

Molecular Genetics- Mutations-nature of Mutations, spontaneous and induced mutation, conditional, lethal (eg. Temperature sensitive) mutation. Biochemical basis of mutation. Point mutation, base substitution mutation, missense, nonsense and silent mutation. Mutation rates. Chemical mutagens, radiation induced mutation, reverse mutations and suppressor mutations- intergenic and intragenic suppression, reversion as

a means of detecting mutagens- Ame's test. **Repair Mechanism-** Reciprocal recombination, site specific recombination, E.colirec system. Holliday model of recombination. **Chromosomal Basis ofHuman Diseases-** Extra or missing chromosome, abnormality in chromosome structure – deletion duplication, inversion, translocation

REFERENCES:

1. Genetics, Strick Berger, M.W. (1990) 3rd edn.McMillan.
2. Human Molecular Genetics; Peter Sudbery, (2002) PrinticeHall.
3. Introduction to Genetics: A Molecular Approach; T A Brown, Garland Science(2011).
4. Molecular Biology of the Cell; 7th Edn. Bruce Alberts et al., Garland Publications(2008).
5. Human Genetics; Lewis, 7th Edn. WCB & McGraw Hill (2007).
6. Molecular Cell Biology; Lodish et al., 7th Edn. W.H. Freeman and Co.(2012).
7. Essential Genetics: A Genomics Perspective; Daniel L. Hartl, 6th Edition, Jones and Barlett Learning(2012).