



M.Sc. – Semester I Microbiology and Biotechnology  
PAPER: (MB/BT) **402: INHERITANCE BIOLOGY (GENETICS)**  
[ CSIR – UGC – NET - TOPIC: 8 ]

**Total Credits – 3**

**Total Hours – 45**

**Objective:**

- To understand the process of transmission of genetic material at molecular as well as cellular levels and to impart the sound knowledge about the techniques which alter the genes and reconstruct the genetically modified organisms by genetic engineering.

**Unit – 1: Mendelian principles and gene mapping**

Mendelian principles: Dominance, segregation, independent assortment. Concept of gene: Allele, multiple alleles, pseudoallele, complementation tests. Extensions of Mendelian principles: Codominance, incomplete dominance, gene interactions, pleiotropy, genomic imprinting, penetrance and expressivity, phenocopy, linkage and crossing over, sex linkage, sex limited and sex influenced characters.

Gene mapping methods: Linkage maps, tetrad analysis, mapping with molecular markers, mapping by using somatic cell hybrids, development of mapping population in plants.

**Unit – 2: Chromosomal inheritance and microbial genetics**

Extra chromosomal inheritance: Inheritance of Mitochondrial and chloroplast genes, maternal inheritance.

Microbial genetics: Methods of genetic transfers – transformation, conjugation, transduction and sex-duction, mapping genes by interrupted mating, fine structure analysis of genes.

**Unit – 3: Human genetics**

Human genetics: Pedigree analysis, lod score for linkage testing, karyotypes, genetic disorders. Quantitative genetics: Polygenic inheritance, heritability and its measurements, QTL mapping. Mutation: Types, causes and detection, mutant types – lethal, conditional, biochemical, loss of function, gain of function, germinal verses somatic mutants, insertional mutagenesis.

Structural and numerical alterations of chromosomes: Deletion, duplication, inversion, translocation, ploidy & their genetic implications.

Recombination: Homologous and non-homologous recombination including transposition.

**References:**

1. Principles of Genetics – D. Peter Snustad, Michael J. Simmons, Publisher: Wiley, 2015, Seventh Edition.
2. Genetics: Principles and Analysis – Daniel L. Hartl and Elizabeth W. Jones, Publisher Jones & Bartlett Learning, 2012, Eighth Edition.
3. Genetics – BD Singh, Kalyani Publishers, 2009.