



जम्मू केन्द्रीय विश्वविद्यालय  
Central University of Jammu  
राया-सुचानी (बगला), जिला: सांबा-181143, जम्मू (जम्मू और कश्मीर), भारत  
Rahya-Suchani (Bagla), District- Samba, 181143, Jammu (Jammu and Kashmir), India

### Comprehensive syllabus of Major Courses

Course Title : Genetics

Credit: 4 (L-3, T-0, P-1)

Course Code:

Contact Hrs/Week: (L-3, T-0, P-2)

#### Course Outcome (CO)

This course explores genetics fundamentals, including inheritance, mutations, chromosomal organization, microbial genetics, molecular inheritance and evolution.

**Course Learning Outcomes (CLO):** The students will be able to understand:

1. Fundamentals of Genetics, including Mendelian and non-Mendelian patterns, and their application in understanding genetic traits and disorders.
2. The concept of gene and their expression pattern.
3. Mutation, mutagens, chromosome structure, karyotyping, and structural and numerical chromosomal changes.
4. Nuclear genome organization, chromatin structure, euchromatin, heterochromatin, and repetitive DNA types.
5. Viral and bacterial genetics, genetic exchange mechanisms, drug resistance, and gene regulation processes.

#### Unit I

Mendel's Laws, concept of dominance, segregation, independent assortment, Application of Mendelian principles, Mendelian principles in Human genetics.

#### Unit II

Concept of genes, gene loci, allele, pseudoallele, multiple alleles, lethal alleles, allelic variations: Incomplete dominance, Co-dominance multiple alleles, gene inheritance, Sex-linked inheritance and sex influenced traits, epistasis and pleiotropic.

#### Unit III

Mutation- classification, Methods of inducing mutation, mutagenic agents and induction of mutation, Study of chromosome structure, Structural and numerical changes in chromosome, Karyotyping.

#### Unit IV

Organization of nuclear genomes. Nucleosome, Chromatins and their organization, Euchromatin and Heterochromatin Repetitive DNA-satellite DNA and interspersed repeated DNAs.

Department of Zoology



### Unit V

The Genetics of Viruses: T4 bacteriophage and Lambda Bacteriophage, The Genetics of Bacteria: Mechanisms of genetic exchange in bacteria; Transformation, Conjugation and Transduction. Multiple drug-resistant bacteria. Gene regulation- Lac and Trp operons.

#### Lab component:

1. Extraction of DNA
2. PCR reaction
3. Gel electrophoresis
4. RFLP based genotyping
5. Chromosomal preparation and Karyotyping
6. G-banding of chromosomes

#### Suggested readings:

1. Concepts of Genetics by Klug and Cummings (latest edition).
2. Genes by Benjamin Lewis (latest edition)
3. Introduction to Genetics by T.A. Brown (latest edition)
4. iGenetics by Peter J Russell (latest edition)
5. Genetics: A conceptual approach. Pierce, B. A. (2005). New York: W.H. Freeman.
6. Genetics: Principles and analysis. Hartl, D. L., & Jones, E. W. (1998). Sudbury, MA: Jones and Bartlett.
7. Principles of genetics. Tamarin, R. H., & Leavitt, R. W. (1991). Dubuque, IA: Wm. C. Brown.