Programme	BS Biotechnology	Course Code	BCBT. 102	Credit Hours	3
Course Title	**Principles of Genetics**				

Course Introduction

Genetics is the study of heredity and the variation of inherited characteristics. This course provides an introduction to the fundamental concepts of genetics, including the structure and function of genes, the mechanisms of genetic inheritance, gene interactions and the role of genetics in diseases and human health.

Learning Outcomes

On the completion of the course, the students will:

- Explain the principles of classical and modern genetics.
- Analyze genetic data to predict inheritance patterns and gene interactions.

Course Content

Theory Unit

- Introduction, History and significance of genetics,
- Mendelian Genetics, Mendel's laws of Inheritance
- Monohybrid cross, Dihybrid cross
- Punnett squares, chi square and probability
- Extensions of Mendelian genetics (incomplete dominance, codominance, etc.)
- Mosaicism and Chimerism
- Structure of DNA, chromosome and Gene
- Gene Interaction (Epistasis, Pleiotropy)
- Modifier genes
- ABO Blood grouping
- Mode of Inheritance
- Pedigree construction
- Genetic Disorders
- Linkage and crossing over, Linkage mapping, Exclusion mapping
- Monogenic Inheritance, Polygenic Inheritance, Multi-factorial Inheritance
- Genetic Variation and Inheritance
- Sources of Genetic Variation
- Recombination and mutations
- Sex Determination, Sex Chromosomes, Environmental factors and Sex determination
- Chromosomal Aberrations, Down Syndrome and Trisomy, Turner syndrome
- Karyotype, Banding pattern and analysis
- FISH Technique
- Ethical, Legal, and Social Issues in Genetics
- Genetic testing, Genetics Privacy, Population Genetics
- Hardy Weinberg equilibrium, Factors effects on Hardy Weinberg equilibrium

- Forces of evolution (selection, gene flow, genetic drift, mutation)
- Founder and Sporadic effect, Bottle Neck Effect
- Genetic Counselling
- Awareness about inbreeding and its effects
- Ethical considerations in genetic research

Textbooks and Reading Material

Textbooks.

- Hartwell, Goldberg (2018), "*Genetics: From Genes to Genomes"* (8th ed). Fischer.
- Griffiths, Wessler, Lewontin, and Carroll (2019) "Introduction to Genetic Analysis" (9th ed).
- Suggested Readings
- D.Peter Snustad and Michael J. Simons *Principal of Genetics* (7th ed).
- Eldon John Gardner, Michael J. Simons, and D. Peter Snustad (2006). *Principles of Genetics.*

Teaching Learning Strategies

- **Lectures**: Comprehensive presentations on core topics.
- **Numerical /Drawing of crosses, Pedigree**: reinforcement of theoretical concepts.
- **Discussions**: In-class and online discussions on current issues and developments in genetics.
- **Assignments**: Problem sets, research papers, and projects.
- **Exams**: Midterm and final exams to assess understanding and application of course material.

Assignments: Types and Number with Calendar

- Quizzes
- Ascertainment of genetic disease
- Pedigree construction and mapping of any Genetic disorder as assignments
- Presentation

Assessment

Sr. No.	Elements	Weightage	Details
1	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.
2	Formative Assessment	25%	Continuous assessment includes: Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc.

3	Final Assessment	40%	Written Examination at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.