

BACHELOR WITH BIOTECHNOLOGY AS MAJOR

7th SEMESTER

BTG 722J1: Molecular Genetics and Epigenetics

CREDITS: THEORY – 3, PRACTICAL – 1

- **Course Learning Objective:** aim of this course is that students will learn basic concepts in genetics and epigenetics.
- **Course outcome:** A student will be able to;
 - differentiate between different inheritance patterns.
 - distinguish between the different genetic diseases.
 - realize the different effects of chromatin modification.

UNIT-1 15 Hours

Mendelian genetics: crosses & laws of inheritance. Test and back crosses, incomplete dominance, co-dominance, pleiotropy, multiple allelism, polygenic inheritance, epistasis, penetrance and expressivity with examples. Essential and lethal alleles. Extra-chromosomal inheritance & importance. Genetic mapping and linkage.

UNIT-2 15 Hours

Genetic diseases and inheritance pattern: autosomal inheritance- dominant (Adult polycystic kidney and neurofibromatosis) and recessive (Albinism, Sickle cell anemia), sex linked-recessive (Duchene muscular dystrophy) and dominant (Hypophosphatemia). Numerical (Klinefelter, Down, Turner, Edward & Patau syndromes), structural chromosomal aberrations (Prader-Willi, Angelman, Williams and Cri-du-chat Syndromes). Translocation- reciprocal and Robertsonian.

UNIT-3 15 Hours

Epigenetics: introduction, modulation of chromosome structure, ATP dependent chromatin modelling, chromatin modification (acetylation, methylation, phosphorylation and ubiquitination). Histone code hypothesis, formation of heterochromatin, dosage compensation, DNA methylation at CpG islands, intergenic regions and repetitive elements.

PRACTICALS (2 CREDITS: 30 hours)

1. Pedigree charts of some common characters like Blood grouping & Color Blindness
2. Design & criteria of unmethylated & methylated primers.
3. Karyotyping.
4. Detection of mutations based on PCR.
5. Lab/institute/university visit.

BOOKS RECOMMENDED:

1. Concepts of Genetics by Klug, W.S., Cummings, M.R., Spencer, et al, Benjamin-Cummings Pub Co.
2. Genetics- A Molecular Approach by Russell, P. J. Benjamin Cummings.
3. Epigenetics by Allis, Jenuwein, and Reinberg. Cold Spring Harbor Press.
4. Snustad, D.P. and Simmons, M.J, Principles of Genetics
5. Harvey Lodish, Arnold Berk, Chris A. Kaiser, Monty Krieger, Anthony Bretscher, Molecular Cell Biology, W H Freeman & Co.