

GPB203:PRINCIPLES OF GENETICS

L:2 T:0 P:2 Credits:3

Course Outcomes: Through this course students should be able to

CO1 :: memorize pre- and post-mendelian concepts of heredity and the fundamental principles of inheritance

CO2 :: understand chromosome structure and the chromosomal basis of inheritance, including mitosis and meiosis

CO3 :: demonstrate genetic variations including mutations, cytoplasmic inheritance, and applications of haploids in genetics

CO4 :: demonstrate understanding of molecular genetics including DNA/RNA structure, replication, transcription, and translation

CO5 :: analyze gene interactions, linkage, crossing over, and chromosome mapping techniques

Unit I

Mendelian inheritance : pre and post mendelian concepts of heredity, mendelian principles of heredity, qualitative and quantitative traits, polygenes and continuous variations, multiple factor hypothesis, study of model organisms (drosophila, arabidopsis, garden pea, e. coli, and mice)

Unit II

Chromosomal architecture, cell division and genetic principles : architecture of chromosomes, chromonemata, chromosome matrix, chromomeres, centromere, secondary constriction and telomere, special types of chromosomes, chromosomal theory of inheritance, cell cycle and cell division - mitosis and meiosis

Unit III

Gene interaction and cytogenetics : dominance relationships, epistatic interactions with example, cytoplasmic inheritance, introduction and definition of cytology, genetics and cytogenetics and their interrelation

Unit IV

Patterns of inheritance, sex-linked genetics and genetic mutations : multiple alleles, pleiotropism and pseudoalleles, blood group genetics, sex determination and sex linkage, sex limited and sex influenced traits, probability and chi-square, mutation, classification, methods of inducing mutations, mutagenic agents and induction of mutation

Unit V

Linkage, chromosome mapping and chromosomal variations in genetics : linkage and its estimation, crossing over mechanism, chromosome mapping, structural and numerical variations in chromosomes and their implications, use of haploids, dihaploids and double haploids in genetics

Unit VI

Genetic material and molecular mechanisms of gene expression : types of DNA and RNA, nature, structure and replication of genetic material, protein synthesis, transcription and translational mechanism of genetic material, gene concept: gene structure, function and regulation

List of Practicals / Experiments:

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- To study parts of a compound microscope
- To study plant cell structure
- To perform experiment for studying mitotic cell division
- To perform experiment for studying meiotic cell division
- To study monohybrid, dihybrid, and trihybrid cross using Mendel's Law
- To study test cross and back cross
- To study different types of gene interactions including test cross and back cross
- To analyze the given data using Chi-square test
- To determine linkage and cross-over using two and three point test cross

- To study sex linked inheritance in Drosophila
- To study models of DNA structures
- To study models of RNA structures

Text Books:

1. FUNDAMENTALS OF GENETICS by BD SINGH, KALYANI PUBLISHERS
2. GENETICS by PK GUPTA, RASTOGI PUBLICATIONS

References:

1. GENETICS by STRICKBERGER, Pearson Education India
2. PRINCIPLES OF GENETICS by GARDNER, SIMMONS, SNUSTAD, WILEY