

BTY551:GENETICS

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

Course Outcomes: Through this course students should be able to

CO1 :: remember the principles of inheritance, allelic and gene interactions

CO2 :: understand the concept of chromosomal basis of inheritance and learn about cytoplasmic inheritance

CO3 :: apply knowledge of chromosomal structural variations and mutation to analyze genetic abnormalities

CO4 :: analyze gene transfer and mapping techniques in bacterial populations

CO5 :: evaluate the mechanisms of sex determination in different species, including sex differentiation, and dosage compensation

CO6 :: summarize the genetic knowledge derived from different types of model organisms

Unit I

INTRODUCTION TO GENETICS : Definition of dominance and recessiveness

MENDELIAN GENETICS : The Principles of Dominance and Segregation, The Principle of Independent Assortment

CHROMOSOMAL BASIS OF INHERITANCE : Morgan's Drosophila experiment, Chromosomal theory of Inheritance, Autosomal inheritance, Sex linked inheritance

Unit II

ALLELES : Multiple alleles, Incomplete Dominance and Codominance, Allelic series

GENE INTERACTIONS : Epistasis and types, Pleiotropy, Genomic imprinting, Penetrance, Expressivity

CYTOPLASMIC INHERITANCE : Definition, Inheritance of Mitochondrial DNA, Inheritance of Chloroplast DNA, Examples- Drug resistance in Chloroplast, Four O'clock plant, Kappa particles in Paramecium, Snail shell coiling

Unit III

VARIATION IN CHROMOSOME STRUCTURE : Deletion, Duplication, Inversion, Translocation

VARIATION IN CHROMOSOME NUMBER : Non- disjunction and Aneuploidy, Trisomies - chromosome 13, 18, 21, Sex linked aneuploidies, Turner , Klinefelter, superfemales, Polyploidy in plants, Polyploidy in animals

MUTATIONS : Definition, Types of mutation, Phenotypic effects, Molecular basis of mutation, radiation and chemically induced mutation

Unit IV

LINKAGE AND CROSSING OVER : Definition, Complete and Incomplete Linkage, molecular mechanism of crossing over

CHROMOSOME MAPPING : Two and three factor crosses, tetrad analysis

BACTERIAL GENETICS : Transformation and mapping, Transduction and mapping, Conjugation and mapping

Unit V

SEX DETERMINATION : Mechanism of sex determination in birds, fishes, Mechanism of sex determination in mammals and Drosophila, Sex differentiation, Chromatin bodies, Dosage compensation

POPULATION GENETICS : Hardy-Weinberg Law, Genotypic and allelic frequencies, Changes in allelic frequencies- Mutation, Migration,, Selection, Genetic drift

Unit VI

MODEL SYSTEMS IN GENETIC ANALYSIS : E. coli, Bacteriophage, Neurospora, Yeast, Arabidopsis, Drosophila, C. elegans, Zebra fish

GENETIC ANALYSIS OF DEVELOPMENT IN DROSOPHILA : Drosophila developmental stages, Embryonic development

Text Books:

1. IGENETICS: A MOLECULAR APPROACH by PETER J RUSSEL, PEARSON

References:

1. GENETICS by ELDON JOHN GARDNER, WILEY
2. CONCEPTS OF GENETICS by WILLIAM S. KLUG, MICHAEL R. CUMMINGS, CHARLOTTE A. SPENCER AND MICHAEL A. PALLADINO, PEARSON