



SEMESTER- V

Branch	Subject Title	Subject Code
B.Sc. (Zoology)	Genetics	ZODSE1 -151

Course Objective :- This is designed to provide students with specific knowledge, skills, and behaviors that are essential competencies in the field of medical genetics. Understanding the principles of human genetics and their applications in medicine is an integral part of the clinical practice of every physician. The course aims at providing students the core knowledge in genetics as well as an understanding of the role of genetic factors in health and disease.

Course Learning Outcomes (CLO) -

On successful completion of this course, the students will be able to

1. Gain knowledge of basic principles of inheritance and variations, DNA, RNA and their function.
2. Deeper understanding of linkage, Sex determination, Chromosomes, Mutations and mutagens.
3. Gain knowledge of human karyotype, Genome project, Inheritance of blood group and genetic diseases in human.
4. Demonstrate gene therapy, PCR, DNA fingerprinting techniques and their application.
5. Find Job Opportunities in Hospitals, Pharmaceutical Companies and other health services, Forensic Science Research Associates, Genetic Counselor, Clinical Research Associate, Animal Breeder, Genetic Laboratory Technician.

Content

Unit – I

Overview of Genetics

1. Introduction and Historical background of genetics
2. Definition, Scope and Importance of Genetics
3. Chromosomes: Transmitters of Heredity
 - 3.1. Structure and Organization of Chromosomes
 - 3.2. Types of Chromosomes
 - 3.3. Chemical composition of chromosomes
4. Nucleocytoplasmic Interaction
5. Mendel's laws of Heredity
6. Variations: Types and genetic basis of Variations

Unit – II

Gene and Genetic Material

1. Chemistry of Gene - Nucleic acids and their structure
2. Concept of DNA replication
3. Nucleosome (Solenoid Model)
4. Types of genes: Split genes, Overlapping genes and Pseudogenes
5. Genetic code



Unit – III

Linkage and Chromosomal Aberrations

1. Gene linkage and recombination
2. Sex-determination
3. Sex-linked Inheritance
4. Structural changes in chromosomes: Deficiency, Duplication, Translocation and Inversion
5. Numerical changes in chromosomes: Aneuploidy, Polyploidy
6. Mutation: Types of mutations and mutagens

Unit – IV

Human Genetics

1. Human chromosomes: Human Karyotype and Human Genome Project
2. Common genetic disorders
3. Multiple factors and blood groups
4. Twins: Fraternal, Maternal and Siamese twins
5. Transgenic and except Genetic Engineering

Unit – V

1. **Gene Therapy:** Germline, and Somatic cell gene therapy.
2. Recombinant DNA technology
3. Gene cloning
4. Gene library
5. PCR and Hybridization techniques
6. DNA finger printing



Practical's

- I.** Study of special types of chromosomes through model, charts and photographs
- II.** Study of DNA and RNA through model, charts and photographs
- III.** Mendelian Experiments:
 - 1. Monohybrid and Dihybrid Cross
 - 2. Verification of Mendelian Ratio
- IV.** Study of genetic disease in humans (through internet and photographs)
 - 1. Gene related disorder (Sickle cell Anemia, Thalassemia, Retinoblastoma, Goitre cretinism, Albinism)
 - 2. Multiple factorial Diseases (Schizophrenia, Diabetes, Asthma, Depression, Heart Diseases, Thyroidism)
 - 3. Chromosomal Disorders (Down syndrome, Edward syndrome, Patau syndrome, Turner syndrome, Klinefelter syndrome)
 - 4. Mitochondrial genetic inheritance disease (Leigh syndrome, MELAS, Neurological disorder, Dementia)
- V.** Problems related to sex-linked inheritance (Colour blindness and Haemophilia)
- VI.** Exercise based on inheritance of Blood groups
- VII.** Study and e-demonstration of PCR and DNA fingerprinting techniques.



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