**Essentials of Genetics 3+1**

### Specific objectives of the course

This course provides the basic principles of inheritance and students will gain experience in variety of techniques used in gene analysis.

### Course Outline

Introduction, heredity and variations, Mendelian and non-Mendelian inheritance, chromosomal structure, chromosomal theory of heredity, multiple allelic, linkage and gene mapping, polygenic inheritance, epitasis, epigenetics, penetrance and expressivity, Sex-linked inheritance, chromosomal aberrations, gene mutation, genetic disorders; DNA polymorphism, cytoplasmic inheritance, population genetics [Hardy- Weinberg equilibrium, selection, inbreeding and heterosis]

**Lab Contents**

Chromosome staining, Problems solving related to topics covered – ABO blood grouping,

### Recommended Books

Latest editions of following books

1. Strickburger, “Genetics”, Mac Millan.
2. Gardner, “Principles of Genetics”, John Wiley and Sons.
3. Griffith et al., “An Introduction to Genetics analysis”, W. H. Freeman.
4. William S. Klug, Michael Cummings, “Essentials of Genetics”, Pearson/Prentice Hall.
5. Ricky Lewis, “Human Genetics”, McGraw Hill.

**GENERAL GENETICS CREDIT HOURS 2+1**

**LEARNING OUTCOMES**:

**Students will be able to:**

1. Learn the classical genetics with emphasis on basic principles of inheritance and Mendelian Genetics.
2. Apply what they learn in genetics by applying this knowledge in a variety of problem-solving situations.

**COURSE CONTENTS:**

Definition and genesis (history) of genetics. Heredity and variation. Chromosomal theory of inheritance. Mendel’s laws of inheritance. Gene interaction; genotypic and phenotypic ratios. Multiple alleles, Multiple factor hypothesis and use of binomial theorem. Linkage and crossing over and their calculations, gene mapping. Sex linkage, sex determination and sex linked inheritance, sex influenced, sex limited and holandric genes. Genetic material. Gene and environment: penetrance, expressivity, pleiotropism and phenocopies. Twin studies, nature and nurture. Mutations. Extra–nuclear inheritance: maternal effects and maternal inheritance. Qualitative and quantitative inheritance.

**PRACTICALS:**

1. Preparation of culture medium and maintenance of Drosophila cultures in lab.

2. Problems related to Mendelian inheritance, gene interaction, gene mapping.

3. Blood groups-ABO blood groups and Rh factors

**RECOMMENDED BOOKS:**

1. Asche, A., 2013. Recent Advances in Cloning Genetics and Stem Cell Technology. RDM.
2. Brown, T.A.,2016. Gene Cloning and DNA Analysis: An Introduction 7th Edition, John and Wiley sons Limited, UK.
3. Costa, L. G. and Eaton, D. L. 2006. Gene-Environment Interactions; Fundamentals of Ecogenetics, John Wiley and Sons, N.Y.
4. Eldon, J. G., Michael, J. S. and Snustad D. P. 6thEdition. Principles of Genetics
5. Griffiths, A.J.F., Wessler,S.R., Carroll, S.B., Doedley,J.,2015.An Introduction to Genetic Analysis 11th Edition W.H. Freeman. 41 Madison Ave, New York, NY 10010, United States.
6. James D. W. 2013. Molecular Biology of Gene. Benjamin Cumming.
7. James D. W. 2013. Molecular Biology of Gene. Benjamin Cumming.
8. Leland, H., Leroy, H.2010. Genetics: From Gene to Genome. McGraw-Hill Sciences.
9. Philip, M.,2009. Advanced Genetic Analysis: Genes, Genomes and Networks in Eucaryotes. Oxford University Press.
10. Primrose, S. B. and Twyman, R. M. 2006. Principles of Gene Manipulation and Genomics, Blackwell Scientific Publications, U.S.A.
11. Robert, B.2014. 5thEdition. Genetics: Analysis and Principles. McGraw-Hill educations.
12. Sirks M. J., 2013; General Genetics. Springer Science & Business Media.