ESSENTIAL READINGS

1. Lehninger: Principles of Biochemistry (7th ed.) (2017) Nelson, D.L. and Cox, M.M W.H.Freeman & Company (New York), ISBN:13: 9781464126116 / ISBN:10-1464126119.
2. Molecular biology of the gene: (7th ed), (2014) Watson, J. D., Baker, T. A., Bell, S. P.,Gann, A., Levine, M., & Losick, R. International). Pearson.

SUGGESTED READINGS

1. Genetics - A Conceptual Approach,) (6th ed). (2012), Pierce, B.A. W.H. Freeman & Co.(New York), ISBN:13:978-1-4292-7606-1 / ISBN:10:1-4292-7606-
2. Lewin's Gene X (10th edition) (2018). Lewin, B., Krebs, J.E., Kilpatrick, S.T., Goldstein,E.S., Bartlett Learning publishers, LLC, ISBN: 978-0-7637-6632-0.
3. The Cell: A Molecular Approach (7th ed.) (2009). Cooper, G.M. and Hausman, R.E. ASMPress & Sunderland (Washington DC), Sinauer Associates, MA. ISBN:978-0- 87893-3030.
4. *Biochemistry* (6th ed.) (2016). Garrett, R. H., & Grisham, C. M. Brooks Cole. ISBN:9781305882409

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, Universityof Delhi, from time to time.

DISCIPLINE SPECIFIC CORE COURSE – 14

Credit distribution, Eligibility and Pre-requisites of the Course

Course title& Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Transmission and Molecular Genetics (BS-DSC-502)	**4**	**2**		**2**	Class XII pass with Biology and chemistry.	

Learning Objectives

The Learning Objectives of this course are as follows:

- To provide the students with an understanding of both classical and modern

concepts in genetics.

- To familiarize them with the principles and mechanisms of the inheritance of traits and genes, various modes of inheritanceof traits/ phenotypes and Phenotype-genotype correlation.
- To understand the areas of transmission genetics, different mapping techniques, chromosomal aberrations andmolecular and developmental genetics.
- To corelate practical exercises with the theory and facilitate skill-oriented learning outcomes

Learning outcomes

Upon completion of the course, the students will be able to:

- Understand the concept of genotype and phenotype, describe the basic principles of Mendelian genetics and appreciate the various factors that confer genotypic and phenotypicvariability.
- Understand the inter relationship between environment (Nurture) versus inheritance(Nature) in determining the conversion of genotype to phenotype.
- Be able to use the concepts of bacterial and viral genetics to understand resistance patternsand to create linkage and genetic maps
- Be able to apply the principles of transmission and inheritance in real life situations.

SYLLABUS OF DSC- 14

Theory

TOTAL HOURS: 30 **CREDITS: 2**

Unit 1: Transmission Genetics **No. of hours: 8**

Introduction to the basic principles of heredity. Mendelian Genetics and Extensions: Mendel'swork on transmission of traits, genetic variation, molecular basis of Genetic Information.

Principles of Inheritance, Chromosome theory of inheritance, Laws of probability, Incompletedominance and codominance, Multiple alleles, Lethal alleles, Epistasis, Pleiotropy Penetranceand expressivity, norm of reaction and phenocopy. Polygenic inheritance; continuous and discontinuous variation.

Unit 2: Organelle heredity and Chromosomal variations **No. of hours: 6**

Chloroplast mutation/variegation in four'o'clock plant, mitochondrial mutations in Neurospora, maternal effects, infective heredity- Kappa particles in Paramecium. Chromosomal aberrations: Variations in chromosome number and structure.

Unit 3: Linkage, crossing over and mapping techniques **No. of hours: 4**

Linkage and Crossing over, cytological basis of crossing over, Molecular mechanism of crossingover. Recombination frequency as a measure of linkage intensity, two factor and three factor crosses, Interference and Coincidence

Unit 4: Molecular genetics **No. of hours: 6**

Sex determination: Genetic basis of sex determination in Humans, *Drosophila melanogaster,* sexlinked, sex influenced and sex limited traits. Mechanism of dosage compensation- X chromosome inactivation.Epigenetic mechanisms of transcriptional regulation, Genomic imprinting. Eukaryotictransposable elements- Ac-Ds system in maize and P-elements in drosophila.

Unit 5: Genetics of bacteria and virus **No. of hours: 6**

Complementation test, limitations of cis-trans test, intragenic complementation, rII locus of phage T4 and concept of cistron. Mechanism of genetic exchange - conjugation, transformation and transduction. Prokaryotic transposable elements- IS elements, Composite transposons, Tn-3 elements.

Practical

Credits: 2 **Total Hours: 60**

1. To understand the genetic interaction involved using the seed mixture given (all six ratios)
2. Study of Linkage, recombination, gene mapping using marker-based data from Drosophila.
3. Preparation of karyotype and idiogram from the metaphasic plate of *Phlox/Allium sp*
4. Effect of colchicine and demonstration of polyploidy in *Allium sp.*
5. PTC testing in a population and calculation of allele and genotype frequencies.
6. Study of abnormal human karyotype.
7. Study of pedigree conventions and pedigree analysis
8. Squash preparation of salivary glands of Dipteran larva to observe polytene chromosomes.
9. Smear technique to demonstrate sex chromatin in buccal epithelial cells.

Essential readings:

1. Griffiths, A. J. F., Wessler, S. R, Carroll, S. B., Doebley, J. (2010). An Introduction to Genetic Analysis (10thed.). W.H. Freeman & Company (New York). ISBN:10: 1- 4292-2943-8
2. Pierce, B.A. (2012). Genetics - A Conceptual Approach (4thed.). W.H. Freeman & Co. (New York). ISBN:13: 978-1-4292-7606-1 / ISBN: 10:1-4292-7606-1
3. Snustad, D. P., Simmons, M. J. (2015). Principles of Genetics (7th ed.). ISBN: 978-1-119-14228-7.
4. Gardner, E.J., Simmons, M.J., Snustad, D.P. (1991). Principles of Genetics, 8th edition. New Delhi, Delhi: John Wiley & sons.
5. Klug, W.S., Cummings, M.R., Spencer, C.A. (2012). Concepts of Genetics, 10th edition. San Francisco, California: Benjamin Cummings.

Additional Readings:

a. Raven, F.H., Evert, R. F., Eichhorn, S.E. (1992). Biology of Plants. New York, NY: W.H. Freeman and Co. Additional Resources
b. Hartl, D.L., Ruvolo, M. (2012). Genetics: Analysis of Genes and Genomes, 8th edition.New Delhi, Delhi: Jones and Bartlett Learning.

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