

SEMESTER-V

Category I

(BSc Honors in Biological Science in three years)

DISCIPLINE SPECIFIC CORE COURSE – 13:

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		
Molecular Biology I(BS-501)	4	2		2	Class-XII pass with Biology & Chemistry	Should have a background in chemistry of biomolecules and enzymes

Learning Objectives

The Learning Objectives of this course are as follows:

- To introduce to the students, the basic concepts of genome, DNA structure, genes, chromatin and chromosomes.
- Provide an understanding of mechanism of DNA replication, recombination, mutations and repair.
- To enable students to apply this knowledge in understanding the life processes and develop an interest to pursue high quality research.

Learning outcomes

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

- Explain the basic information about the structure of DNA and various forms of DNA, about organization of genome in various life forms, supercoiling of DNA and its significance
- Outline and elaborate the molecular basis of processes like DNA replication, recombination and transposition and explain the significance of these processes
- Discuss about the various ways in which the DNA can be damaged leading to mutations and lesions and the different ways that DNA damage can be repaired.

SYLLABUS FOR DSC-13

Credits: 2
30

Total hours:

UNIT 1: Structure of DNA and genomic organization

No. of hours: 8

Watson and Crick model of DNA, various forms of DNA, Supercoiling of DNA, linking number, Topoisomerases, Topoisomerase inhibitors and their clinical

importance, Definition of a gene, organization of genes in viruses, bacteria and eukaryotes, concept of split genes, introns, exons, satellite DNA, highly repetitive DNA.

UNIT 2: Replication of DNA

No. of hours: 10

The chemistry of DNA synthesis, DNA polymerase, the replication fork, enzymes and proteins in DNA replication, *E coli* DNA polymerases, stages of replication: initiation, elongation, origin of replication, relationship between replication and cell division, replication in eukaryotes, end replication problem, telomerases. Comparison of replication in prokaryotes and eukaryotes. Inhibitors of DNA replication and applications in medicine.

UNIT 3: Recombination and transposition of DNA

No.

of hours: 6

Homologous recombination, enzymes in homologous recombination, site-specific recombination, recombinases. Transposition, DNA transposition by cut and paste and replicative mechanism.

UNIT 4: Mutations and DNA Repair

No. of hours: 6

Types of mutations, DNA damage by hydrolysis, alkylation, oxidation and radiation. Mutations caused by base analogs and intercalating agents. Ames test. Replication errors and their repair, mismatch repair system, repair of DNA damage- direct reversal of DNA damage, base excision repair, nucleotide excision repair, translesion DNA synthesis. DNA repair diseases.

PRACTICALS

CREDITS: 2

TOTAL HOURS : 60

1. DNA estimation by DPA
2. Separation of nitrogenous bases by paper chromatography
3. To plot the ultraviolet absorption spectrum of DNA
4. Isolation of chromosomal DNA from *E coli* cells
5. Determination of DNA concentration and purity by UV absorption.
6. Determination of the melting temperature of DNA
7. Demonstration of the mechanism of Transposition and Recombination (Dry Lab)

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. ASM Press & 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, University of 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