Master of Science (Biochemistry)
M. Sc Biochemistry Semester I

Course Code	PS01CBIC51	Title of the Course	Molecular Biology
Total Credits of the Course	04	Hours per Week	04

Course Objectives:	1. To gain deeper understanding about DNA structure and function. 2. To learn about organization of chromosomal DNA in both prokaryotes and Eukaryotes as well as its replication. 3. To gain insights into gene expression processes in both prokaryotes and eukaryotes including its regulation. 4. To inculcate research insights and inquisitiveness amongst students in the field of molecular biology.

Course Content		
Unit	Description	Weightage* (%)
1.	**DNA structure** DNA structure: Chemistry of DNA, DNA structure, Different conformations of DNA (B, A and Z), Denaturation and Renaturation (Cot curves) of DNA. DNA topology: Supercoiling, Biology of Supercoiled DNA, DNA topoisomerases and their mechanism of action. DNA- protein interactions: General features, Sequence specific DNA binding protein motifs, ss DNA binding proteins.	25
2.	**Organization of genome and its replication** Organization of DNA into chromosomes: Packaging of DNA and organization of chromosome in bacterial cells; Packaging of DNA in eukaryotic nucleosome and chromatin condensation, assembly of nucleosomes upon replication, chromatin modification. DNA replication: Mechanism of DNA polymerase catalyzed synthesis of DNA, Types of DNA polymerases in bacteria, Initiation of DNA replication and its regulation in prokaryotes, assembly of replisome and progress of replication fork, termination of replication. DNA replication in eukaryotes and archaea. Inhibitors of DNA replication.	25
3.	**Gene expression in prokaryotes and eukaryotes** Transcription: RNA polymerases, features of prokaryotic and eukaryotic promoters, assembly of transcription initiation complex in prokaryotes and eukaryotes, and its regulation; synthesis and processing of prokaryotic and eukaryotic transcripts. Translation: structure and role of t-RNA in protein synthesis, ribosome structure, basic features of genetic code and its deciphering, translation	25

	(initiation, elongation and termination in detail in prokaryotes as well as eukaryotes).	
4.	**Regulation of gene expression** Regulation of gene expression in prokaryotes: Operon concept, positive and negative regulation. Examples of lac (including mutational analysis), ara, and trp operon regulation; global regulatory responses. Regulation of gene expression in eukaryotes: Transcriptional, translational and processing level control mechanisms.	25
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Teaching-Learning Methodology	Topics will be taught and discussed in interactive sessions using conventional black board and chalk as well as ICT tools such as power point presentations and videos. Practical sessions will be conducted in a suitably equipped laboratory either individually or in groups depending on the nature of exercise as well as availability of infrastructure. Course materials will be provided from primary and secondary sources of information.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	correlate the structural features of DNA with its function
2	explain DNA-protein interactions in detail
3.	describe how genome is organized in prokaryotes and eukaryotes and how
4.	explain the molecular details of DNA replication in both prokaryotes and eukaryotes as well as the molecular basis of its fidelity.

5.	discuss the molecular mechanism of gene expression and its regulation at transcriptional as well as translational levels in all three domains of life.
6	explain experimental insights for gaining molecular level details of gene structure and function

1	Watson, J. D., Tania, A. B., Stephen, P., B., Alexander, G., Michael, L., Richard, L., (2017). Molecular Biology of the Gene. 7th Edn. Pearson Education, United Kingdom
2	Henkin, T. M., Peters, J., E., (2020). Snyder and Champness Molecular Genetics of Bacteria. 5th Edn. ASM Press, Washington, DC.
3	Tropp, B. E., (2012). Molecular Biology: Genes to Proteins. 4th Edn. Laxmi Publications, New Delhi
4	Snustad, P. D., Simmons, M., J., (2011). Principles of Genetics. 6th Edn. Wiley Publications, New Jersey
5	Sinden, R. R. (1994). DNA structure and function. Gulf Professional Publishing.
6	Krebs, J. E., Goldstein, E. S., & Kilpatrick, S. T. (2017). *Lewin's genes XII*. Jones & Bartlett Learning.

On-line resources to be used if available as reference material
On-line Resources

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