Institute of Zoology,
Faculty of Life Sciences
University of the Punjab, Lahore
Course Outline

Programme	BS Zoology	**Course Code**	**ZOOL-408**	**Credit Hours**	2
Course Title	**Molecular Biology**				

Course Introduction

1. To impart knowledge about chemical, physical and biological properties of nucleic acids.
2. To understand different molecular mechanisms and their regulation in prokaryotes and eukaryotes.

Learning Outcomes

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

1. EXPLAIN how the structure and chemistry of nucleic acids relate to their functions, relative stability and interactions with proteins.
2. UNDERSTAND the regulation of proteins and nucleic acids interaction
3. COMPARE & CONTRAST mechanisms of DNA Replication, Transcription, Translation, Repair, recombination, Gene regulation, RNA processing in Prokaryotes and Eukaryotes.
4. APPLY molecular knowledge to identify human genetic disorders and to understand underlying molecular mechanism

	Course Content	**Assignments/Readings**
Week 1	**Unit 1: Introduction** • Introduction to nucleic acids • Chromosome structure, Chromatin	
Week 2	**Unit 2:** • DNA forms, structures and packaging • RNA types and structures	
Week 3	**Unit 3:** • DNA Replication • Supercoiling • DNA Replication in Prokaryotes	
Week 4	**Unit 4:** • DNA Replication in Eukaryotes, • Enzymology of replication • Replication of Telomeres, • Role of Telomeres in Aging, and Cancer	
Week 5	**Unit 5:** • DNA damage • Repair Mechanisms to fix the damage	THE HUMAN PERSPECTIVE Page 152: Diseases That Result from Expansion of Trinucleotide Repeats
Week 6	**Unit 6:** • Transcription of RNA • Types of RNA polymerases in prokaryotes and eukaryotes • Structure of Promoter • Transcription of mRNA in Prokaryotes	

Week 7	**Unit 7:**
	• Structure of Promoter,
	• Transcription Factors
	• Transcription of mRNA in Eukaryotes
	• Post Transcriptional Modifications
	  • Addition of Cap
	  • Addition of Tail
	  • Splicing
		Assignment on different topics of relevance.

Week 8	**Unit 8:** • Transcription of rRNA • Structure of Nucleolus • NOR • Post Transcriptional Modifications	
Week 9	**Unit 9:** • Transcription of 5S RNA • tRNA with special reference to enzymes involved • Post Transcriptional Modifications	
Week 10	**Unit 10:** • Genetic Code • Translation of Proteins • Role of Ribosomes • Charging of tRNA	EXPERIMENTAL PATHWAYS Page 212: The Role of RNA as a Catalyst
Week 11	**Unit 11:** • Factors involved in Initiation, Elongation and termination • Mechanism of Translation in prokaryotes and eukaryotes	
Week 12	**Unit 12:** • Mutation • Types of Mutations • Base-Analogue Mutagens • Chemical Mutagens	THE HUMAN PERSPECTIVE Page 306: Consequences of DNA Repair Deficiencies
Week 13	**Unit 13:** • Gene expression and control • Control of gene expression in Prokaryotes. • Example of Inducible operon (Lac Operon).	
Week 14	**Unit 14:** • Regulation of expression of repressible operons (Trp Operon)	
Week 15	**Unit 15:** • Regulation of Gene Expression • Levels of Regulation • Transcription level control	
Week 16	**Unit 16:** • Processing Level Control of gene expression • Translational level Control of gene expression	THE HUMAN PERSPECTIVE page 275: Chromosomal Aberrations and Human Disorders
Textbooks and Reading Material		
Textbooks. 1. Karp G, Iwasa J, Marshall W. Karp's Cell Biology, Global Edition. John Wiley & Sons; 2018.		

Suggested Readings

2. Alberts, B., Bray, D., Lewis, J., Raff, M., Roberts, K., Watson, J. D. 2017. Molecular Biology of the Cell. 6th Edition. Garland Publishing Inc., New York.
3. Lodish H., Berk A., Kaiser C., Krieger M., Bretscher A., Ploegh H., Martin K., Yaffe M., Amon A. 2021. Molecular Cell Biology. W. H. Freeman; 9th ed. edition (Jan. 27, 2021) 978-1319208523
4. Articles in different research Journals.

Teaching Learning Strategies

1. Use of Technology resources.
2. Use of Google Classroom management and Tools Resources
3. Provision of Handouts
4. Demonstration of the concepts using animations of cellular processes
5. Group activity of the students for problem solving skills

Assignments: Types and Number with Calendar

Assignment 1: Due by Midterm Examination
Lab Manual/Notebook: Due before the week of Final Term Examination

Assessment

Sr. No.	Elements	Weightage	Details
1.	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.
2.	Formative Assessment	25%	Continuous assessment includes, Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc.
3.	Final Assessment	40%	Written Examination at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.