

Name of the Programme: M. Sc. Zoology

Course Code: ZOO-503

Title of the Course: Molecular Biology

Number of Credits: 03

Effective from AY: 2023-24

Pre-requisites for the Course:	Basic knowledge of nuclear and cellular components and the functioning of the cell.	
Course Objectives:	1. To summarize the experiments that led to the discovery of DNA. 2. To explain and analyze the molecular structure and function of Nucleic acids. 3. To categorize the types of DNA damage and repair systems. 4. To explain the molecular techniques associated with Nucleic acids.	
Content:	Module 1 Journey to the discovery of DNA structure (Review of research work of Rosalind Franklin, Maurice Wilkins, Linus Pauling, Erwin Chargaff, Watson, and Crick to derive a double helix DNA model). Different types of bonds found in DNA double helix and their associated applications, different types of DNA (B-DNA, A-DNA & Z-DNA). DNA packaging in bacteria (Looped and supercoiled structures, enzymes, and protein involved in DNA compactization), Eukaryotic DNA Packaging (Polynucleotides-DNA Helix-Nucleosome-Chromatosomes-solenoid-Chromatin-Chromosome, Cohesins, and condensins), histone structure, Types of DNA sequences, the structure of Telomere, Centromere, Types of DNA damages (Single base alterations, Double base alterations, Chain Breaks, and Cross linking), Types of Mutagens, DNA repair mechanisms (Direct reversal, MMR, BER, NER, HR, MMEJ, NHEJ, SOS) Module 2	2 hours 2 hours 2 hours 3 hours 2 hours 4 hours

	<p>Understanding central dogma and flow of information. Replication: Prokaryotic (also rolling circle model and Theta model) and eukaryotic DNA replication in Prokaryotes and Eukaryotes,</p> <p>Transcription in prokaryotes (also emphasize Promoter clearance and Promoter escape), Types of RNA Pol Proofreading (Pyro-phosphorolytic editing and Hydrolytic editing), RNA Pol inhibitors/Blockers examples.</p> <p>Transcription in Eukaryotes, Eukaryotic promoter sequence, domains of Transcription factors (Trans-activating domain and DNA binding domains various types)</p> <p>RNA structures (Primary, Secondary, and Tertiary), RNA types (Coding and non-coding), Splicing (Types and classes), Trans splicing, and alternate splicing.</p> <p>Module 3</p> <p>Translation in Prokaryotes and Eukaryotes, Codon and associated concepts, Protein structure and Post-translational modifications (folding, Protein splicing, Phosphorylation-dephosphorylation, N-glycosylation, Methylation, etc.).</p> <p>Inhibitors of protein synthesis, Ramachandran plot for protein structure, The triple helical structure of the collagen protein.</p> <p>Prokaryotic Gene regulation (Lac Trp operons.), Sum-up of various levels of gene regulation in Eukaryotes.</p> <p>PCR techniques, CRISPR/Cas 9 techniques, and their applications.</p>	<p>4 hours</p> <p>3 hours</p> <p>3 hours</p> <p>5 hours</p> <p>5 hours</p> <p>3 hours</p> <p>5 hours</p> <p>2 hours</p>
Pedagogy:	Lectures/Tutorials /Presentations/ Group discussion/Self-study.	
References/ Readings:	<p>1. D. Clark, N. Pazdernik and M. McGehee, Molecular Biology. Academic Cell. 2018</p> <p>2. L. G. Davis, M. D. Dabner and J. F. Battey, Basic Methods in Molecular</p>	

	<p>Biology. Elsevier, 1986.</p> <p>3. E. J. Gardner, M. J. Simmons and D. P. Snustad, (1991), Principles of Genetics. John Wiley & Sons, 1991</p> <p>4. G. Karp, J. Iwasa and W. Marshall W, Karp's Cell and Molecular Biology. 9th Edition, John Wiley, 2019.</p> <p>5. J. E. Krebs, E. S. Goldstein, S. T. Kilpatrick, Lewin's GENES XII. Jones and Bartlett Learning, 2018.</p> <p>6. G.M. Malacinski, Freifelder's Essentials of Molecular Biology, Narosa Book Distributors Private Limited, 2015.</p>
Course Outcomes:	<p>The learner will</p> <ol style="list-style-type: none"> 1. Distinguish between DNA, RNA, and Protein and the various processes involved in the flow of information through these molecules. 2. Relate DNA structure and manipulation to the function and control of genes. 3. Critically evaluate the literature related to molecular biology and modify them. 4. Formulate techniques associated with molecular biology.

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