	6. Murray, R.K. et al (1990). *Harper's Biochemistry* 7. Elliott, W.H. & Elliott, D.C. (2005). *Biochemistry and Molecular Biology* 8. Branden C. & Tooze J. (1999). *Introduction to Protein Structure*	
Learning Outcomes	Gain fundamental knowledge in biochemistry and understand the role of enzymes in the regulation of metabolic pathways.	

Programme: M. Sc. Biotechnology

Course Code: GBC-183 **Title of the Course:** Molecular biology

Number of Credits: 3

Effective from AY: 2019-2020

Prerequisites for the course:	No prerequisites required.	
Objective:	The aim of this course is to obtain and understand fundamental knowledge of molecular and cellular processes such asRNA transcription, protein synthesis, mutation, epigenetic modificastion and gene regulation.	
Content:	**MODULE I** • Structure of DNA - A,B, Z and triplex DNA; • Organization of bacterial genome and eukaryotic chromosomes Heterochromatin and Euchromatin • DNA melting and buoyant density; Tm; DNA reassociation kinetics (Cot curve analysis) Repetitive and unique sequences; Satellite DNA; DNase I hypersensitive regions; DNA methylation & epigenetic effects. • Structure and function of prokaryotic and eukaryotic mRNA, tRNA (including initiatortRNA), rRNA and ribosomes. Processing of eukaryotic hnRNA: 5'-Cap formation; 3'-end processing of RNAs and polyadenylation; loop model of translation; Splicing of mRNA. • Gene transfer in bacteria-Conjugation, transformation and transduction. • DNA mutation and repair, Transposons	12 hours

	MODULE II • Prokaryotic and eukaryotic transcription -RNA polymerase/s and sigma factors, • Transcription unit, Prokaryotic and eukaryotic promoters, Promoter recognition, Initiation, Elongation and Termination (intrinsic, Rho and Mfd dependent) • Gene regulation: Repressors, activators, positive and negative regulation, Constitutive and Inducible, small molecule regulators, operon concept: *lac*, *trp*operons, attenuation, anti-termination, stringent control, translational control. • Eukaryotic transcription - RNA polymerase I, II and III mediated, General eukaryotic transcription factors; TATA binding proteins (TBP) and TBP associated factors (TAF); assembly of pre-initiation complex for nuclear enzymes, interaction of transcription factors with the basal transcription machinery and with other regulatory proteins, mediator, TAFs. ; Silencers, insulators, enhancers, mechanism of silencing and activation. **MODULE III** • Translation in prokaryotes and eukaryotes, • Regulatory RNA and RNA interference mechanisms, miRNA, non-coding RNA; • Families of DNA binding transcription factors: Helix-turn-helix, helix-loop-helix, homeodomain; 2C 2H zinc finger, multi cysteine zinc finger, basic DNA binding domains (leucine zipper, helix-loop-helix), nuclear receptors. • Interaction of regulatory transcription factors with DNA: properties and mechanism of activation and repression including Ligand-mediated transcription regulation by nuclear receptors. • DNA replication. • DNA recombination.	12 hours 12 hours
Pedagogy:	lectures/ tutorials/assignments/self-study	
References/Reading	1. RF Weaver Molecular Biology 5th edition (2012) McGraw Hill Higher Education 2. Watson JD, Baker TA, Bell SP, Gann A, Levine M &Losick R (2014) Molecular Biology of the Gene, 7th Edition, Cold Spring Harbor Laboratory Press, New York. 3. Principles of Genetics Paperback – Wiley Student Edition, 2006 by Gardner, Simmons, Snustad 4. Concepts of Genetics 10e (2012)	

	Klug/Cummings/Spencer. Pearson 5. Genetics, 3Rd Edn by Strickberger, Pearson India, 2015, 6. iGenetics: A Molecular Approach 2016 by 3Rd Edn Peter J Russell, Pearson Education 7. Lewin's GENES XII 2017 Jocelyn E. Krebs , Elliott S. Goldstein , Stephen T. Kilpatrick Jones and Bartlett Publishers 8. Molecular Cell Biology 2016 Arnold Berk , Chris A. Kaiser , Harvey Lodish , Angelika Amon WH Freeman; 8 edition 9. Molecular Biology of the Gene (2017) by James D. Watson Pearson Publisher	
Learning Outcomes	The students should be able to explain and summarize the scientific principles of the molecular biology of DNA,RNA and understand the role played in overall functioning of the cell.	

Programme: M. Sc. Biotechnology

Course Code: GBC-184 **Title of the Course:** Biophysical Principles & Analytical Techniques

Number of Credits:2

Effective from AY: 2019-2020

Prerequisites for the course:	No prerequisites required.	
Objective:	The course is designed to provide a broad exposure to basic techniques used in Modern Biology research. The goal is to impart basic conceptual understanding of principles of these techniques and emphasize biochemical utility of the same. Student is expected to have a clear understanding of all analytical techniques such that the barrier to implement the same is abated to a great extent.	
Content:	**MODULE I** Nucleic Acid, Protein-Polymer Description of Macromolecular Structure, Intermolecular and Intramolecular forces, Non Covalent Interaction; Hydrodynamic properties: Diffusion and sedimentation, determination of molecular weight from sedimentation	12 hours