

Subject Code: 1SC2060202	Subject Title: MOLECULAR BIOLOGY & CYTOGENETIC
COURSE TYPE: CORE COURSE	

Course Objective: Molecular biology has been a subject that gives a lot of emphasis on the core and fundamental processes that are operated at the level of gene in cellular systems. Structures of DNA & RNA, Genetic Material, DNA Replication, Transcription and Translation are the processes that one needs to understand before going for advanced molecular biology techniques. Cytogenetics is a part of cell biology that is concerned with how the chromosomes relate to cell behaviour, particularly to their behaviour during mitosis and meiosis.

Teaching scheme (hours) per week		Credit			Theory Marks		Practical Marks		Total
Theory	Practical	Theory	Practical	Total	Uni. Assessment	Cont. Assessment	Uni. Assessment	Cont. Assessment	
4	--	4	--	4	60	40	--	--	100

Unit	Content	Lectures	Weightage
1	Molecular Biology: - Introduction, molecular composition and structure, chromosome structure, DNA replication, protein synthesis, Transcription of DNA to RNA, Translation, regulation of gene expression, operon concept. - Mechanism of DNA repair, DNA mutation.	15	25%
2	Molecular Biology related Laboratory techniques: - Nucleic acid analysis, Hybridization assays, Diagnostic application of DNA probes, Gene cloning, - Polymerase chain reaction (PCR), Nested PCR, RT-PCR, Multiplex PCR, - Transcription mediated amplification (TMA), Nucleic acid sequence based amplification (NASBA), Strand-displacement amplification (SDA), cleavage/invaser technology, signal amplification methods, biochip technology.	15	25%
3	Cytogenetics I: Introduction, chromosome structure, important aspects and use of cell culture for Cytogenetics studies, method of preparation of cell culture, constitutional chromosome and inheritance patterns, FISH techniques, genetic disorders and inborn errors of metabolism, Autosomal disorders.	15	25%
4	Cytogenetics II: - Clinical cytogenetic testing (CCT), Prenatal and Postnatal Cytogenetics, chromosomal aneuploidy syndrome. - Diagnosis of inborn errors of metabolism, hematopoietic neoplasms and lymphomas. - Molecular diagnosis of genetic disease, Familial cancers, Forensic identity testing, Parentage testing.	15	25%

Learning Outcome: Students will learn the fundamental aspects of genetics at molecular level and cytogenetics. Understanding Replication of DNA, synthesis of RNA, Proteins and genetics disease will be a cakewalk by going through this course.

Reference Books:

1. Text book of Medical Laboratory Technology, P.B. Godkar 2nd Edⁿ. 2003 Bhalani Publication.
2. Watson JD, Baker TA, Bell SP, Gann A, Levine M and Losick R (2008) Molecular Biology of the Gene, 6th edition, Cold Spring Harbour Lab. Press, Pearson Publication
3. Becker WM, Kleinsmith LJ, Hardin J and Bertoni GP (2009) The World of the Cell, 7th edition, Pearson Benjamin Cummings Publishing, San Francisco
4. De Robertis EDP and De Robertis EMF (2006) Cell and Molecular Biology, 8th edition. Lippincott Williams and Wilkins, Philadelphia
5. Karp G (2010) Cell and Molecular Biology: Concepts and Experiments, 6th edition, John Wiley & Sons. Inc.
6. Sambrook J and Russell DW. (2001). Molecular Cloning: A Laboratory Manual. 4th Edition, Cold Spring Harbour Laboratory press.
7. Krebs J, Goldstein E, Kilpatrick S (2013). Lewin's Essential Genes, 3rd Ed., Jones and Bartlett Learning
8. Gardner EJ, Simmons MJ, Snustad DP (2008). Principles of Genetics. 8th Ed. Wiley-India