Course Title	Molecular Biology				
Course Code	BMS213				
Course Type	Compulsory				
Level	Bachelor (1st Cycle)				
Year / Semester	2nd Year / 5th Semester				
Teacher's Name	TBA				
ECTS	6	Lectures / week	2 Hours	Laboratories / week	3 Hours
Course Purpose and Objectives	The purpose of this course is to familiarize biomedical sciences students with basic molecular biology principles and techniques as well as their applications in basic and applied research in genetics and biotechnology.				
Learning Outcomes	Upon completion of this course students will be able to: • Describe the principles on which basic molecular biology techniques are based • Recall the basic concepts of molecular biology related to the flow of genetic information (central dogma of molecular biology) and the nature and organization of genetic material • Recognize the importance of the using enzymes in Molecular Biology • Describe and apply nucleic acid isolation techniques • Explain and perform polymerase chain reaction (PCR) experiments • Demonstrate proficiency in laboratory molecular techniques				
Prerequisites	BMS111, BMS124	Co-requisites	None		
Course Content	**Theory**: Introduction to Molecular Biology. Historical perspective. • Nuclear architecture and nuclear organelles The Genetic Material. Chromatin organization. • From DNA to protein: the central dogma of molecular biology. DNA replication, transcription, translation, recombination. • Repair mechanisms. • Gene expression regulation mechanisms • Post-translation modifications of proteins. • Isolation and study of nucleic acids -DNA isolation methods (plasmid, viral, genomic). -RNA isolation methods (total and poly A-RNA). -Methods to study DNA and RNA. -The electrophoresis technique (agarose gels and				

	polyacrylamide). -Southern and Northern blotting -Specialized methods for RNA analysis: RNAse protection, primer extension. • Non-coding RNAs (microRNAs, siRNAs, piRNAs, long ncRNAs). • Polymerase Chain Reaction (PCR): The basic principle, primer selection, degenerated primers, cloning of PCR products. Types of PCR: touch-down PCR, hot start PCR, nested PCR, inverse PCR, reverse transcription PCR / RT-PCR), differential Display PCR, SELEX (Systematic Evolution of Ligands by Exponential Enrichment), Real Time PCR, in vivo footprinting and using PCR in genetic polymorphism analysis. • Applications of Molecular Biology in research, genetic engineering and biotechnology • DNA cloning **<u>Laboratory Exercises:</u>** • The main equipment in a molecular biology lab- Basic Techniques - Ensure validity of laboratory results - common problems. • Small scale isolation of plasmid DNA using the boiling method (boiling miniprep) and digestion with restriction enzymes. • Genomic DNA isolation and assessment of its concentration. • Total RNA extraction using a solution of guanidine thiocyanate - phenol – chloroform. • The polymerase chain reaction (PCR) – Preparation, primer design, amplification. Real-Time PCR. Confirmation by agarose gel electrophoresis. • Southern and Northern Blot • Commercial Applications of DNA isolation and PCR i.e. Salmonella detection in food.
Teaching Methodology	Face- to- face
Bibliography	Molecular Biology: Genes to Proteins, by Burton E. Tropp, 4th Edition. Recombinant DNA. Genes and genomes-a short course, by J. D. Watson, A. A. Caudy, R. M. Myers, J. A. Witkowski (2007). Basic Laboratory Methods for Biotechnology, by Lisa A Seidman and Cynthis J. Moore (Academic press, 2011)

Assessment	Mid – Term Examination 30% Final Examination 40% Assignments/Lab 20% Class Participation 10% 100%
Language	English