

UG SEMESTER 7

Semester: 7	
Course : Minor	
Paper Title: Genomics And Proteomics	
Paper code: B4MB230721T	Credits:4
Hours/week : 4 hours/week	
Category: Core/MDC/SEC/VAC : core	
Theory / Practical / Composite : Theory (Non composite)	
No of Modules : No modules	
Course Overview: This course provides a comprehensive study of the most advanced and state-of-the art field in biology ie, genomics, gene therapy and proteomics which will help get the students acquainted with how different factors can lead to disease and its manifestation in each individual and how therapy can be designed to provide personalized medicare to make human life better. It also helps understand, how different types the genetic mapping techniques are used to understand the family history of a mutant gene, diseased gene and also identify genetic markers of a physiological and pathological condition. Further students are exposed to techniques to study gene expression levels in individuals under different conditions. Students are exposed to basic techniques to study protein expression levels in different conditions, change in interactions of protein partners under certain physiological conditions. Assays to identify new interacting partners, protein based biomarkers to fish out changes in protein interaction, study of their primary structure and post-translational modifications of proteins are also dealt with. Further, students are exposed to different gene therapeutic studies which can provide relief from different diseased condition. the course is designed to provide a holistic overview of -omics in understanding and solving various physiological conditions.	
Course Outcome:	
1. Remember the basic concepts of genomics, gene therapy and proteomics	
2. Understand the techniques of -omics era.	
3. Apply the knowledge of the development of field in understanding the difference in various physiological conditions in different individuals.	
4. Analyze the variations at the genetic and protein level by use of state -of the art techniques.	
5. Evaluate how various biomarkers be used to study the conditions and develop reliable assay systems.	
6. Create better therapeutic assays at the gene and protein level.	
Prerequisites: Basic knowledge about any prior course: 10+2 level of physics, chemistry and biology	
SYLLABUS	

UNIT/Module	CONTENT	HOURS or NUMBER OF CLASSES	CO Mapping	COGNITIVE LEVEL
	Unit 1: Genomics Significance of genome mapping , structural and functional annotation of genome, Different types of genomics (structural, functional and comparative genomics), Different types of genome mapping (linkage mapping and physical mapping) different types of marker (physiological, biochemical and molecular markers), techniques for linkage mapping analysis, numerical analysis of linkage mapping, linkage mapping in bacteria, limitations of linkage map, different types of physical mapping, Radiation hybridization and somatic cell hybridization, FISH techniques, karyotyping, restriction mapping, EST and STS mapping ,DNA fingerprinting techniques Unit 2: Gene therapy Introduction, types of gene therapy; vectors: viral vectors, delivery methods; application inheritable and non-heritable diseases, stem cell therapy. Unit 3: Proteomics Basic overview of proteomics, transition from protein chemistry to proteomics, cellular	1 hour /week (approx 14 per semester) 1 hour/week(approx 14 in semester)	CO1 CO2 CO3 CO4 CO5 CO6	K1,K2,K3, K4, K5 K5,K6 K1, K2,K3,K4, K5

	proteomics. Unit 4: Assays to study protein interactions Immunoprecipitation, pull-downs, Yeast two hybrid system, Fluorescence resonance energy transfer (<i>in vivo</i>) Unit 5: Protein separation and identification 2D gel electrophoresis, brief concept of mass spectrometry for identification. Peptide mass fingerprinting. Use of biomarkers in proteomics and metabolomics.	1 hr/week (approx 14 per semester)		
Text Books				
Genome 2 T.A Brown Gene therapy 2010 by MauroGiacca. Principles of Gene Manipulation and genomics: An Introduction to genetic engineering 2007, by Primrose and Twyman. <i>Introduction to Proteomics: Tools for the New Biology</i> by Daniel C. Liebler				
Suggested readings				
1. Fundamentals of Proteomics by George Wright States Academic Press				
2. Introduction to Genomics by Arthur M. Lesk,				
Web Resources				
1.				
2.				
3.				
4.				
Evaluation Theory				
CIA:30 Semester Exam:70; No Practical component is included in the course				
Full marks 70				
Short questions: 10 (each 2 marks) from 12 (10x2=20)				
Long questions:5 (each 10 marks) from 7 (5x10=50)				

Course outcomes (COs) and Cognitive Level Mapping

COs	CO Description	Cognitive levels
CO1	Remember the basic concepts of genomics, gene therapy and proteomics	K1
CO2	Understand the techniques of -omics era.	K2
CO3	Apply the knowledge of the development of field in understanding the difference in various physiological conditions in different individuals	K3
CO4	Analyze the variations at the genetic and protein level by use of state -of the art techniques.	K4
CO5	Evaluate how various biomarkers be used to study the conditions and develop reliable assay systems	K5
CO6	Create better therapeutic assays at the gene and protein level.	K6