Next Generation Sequencing

Semester No 7-8	Code BI-4XX	Credit Hours 3-0

Course description:

This course sheds light on the next generation sequencing technologies that have a wide area of applications and analyzes several properties of biological systems. NGS is a revolutionary technology in the biological sciences. With its ultra-high throughput, scalability, and speed, NGS enables researchers to perform a wide variety of applications and study biological systems at a level never before possible. Today's complex genomic research questions demand a depth of information beyond the capacity of traditional DNA sequencing technologies. Next-generation sequencing has filled that gap and become an everyday research tool to address these questions. This course will deal with diverse types of tests, analysis and visualization techniques that may be used in the analysis of diverse types of NGS techniques.

Recommended Books:

1. *Next Generation Sequencing – 2018 Methods and Protocols by Dr. Steven R. Head Dr. Phillip Or- doukhanian Dr. Daniel R. Salomon. Springer*
2. *Next-generation Sequencing: Current Technologies and Applications. Caister Academic Press*
3. *Clinical Applications for Next-Generation Sequencing. Urszula Demkow Rafal Ploski. Elsevier*

Prerequisite:

1. Essential of Genetics
2. Genomics

Course Learning Outcomes:

After the course, the students will apply different concepts of NGS analysis on practical problems. They would be able to grasp the idea of high throughput sequencing and their application in various domains.

Assessment system:

Quizzes	10-15%
Assignments	5-10%
MSE	30-40%
ESE	40-50%

Week wise Lecture Plan:

Week	Lecture Topic	Quizzes	Assign ments
1	Overview of Genetic Testing and Sequencing Technologies		

2	What is Genetic Testing? The Promise of Genetic Testing and Sequencing Technologies		1
3	Clinical Genetic Testing Overview of Genetic Testing Amino Acids and Proteins		
4	Traditional Cytogenetics Microarray Diagnostics	1	
5	Biochemical Genetic Tests Diagnostic Genetic Testing		
6	Reproductive Genetic Testing		2
7	Sequencing Technologies Sequencing Approaches		
8	Polymerase Chain Reaction Sanger Sequencing Sequencing by Synthesis	2	
9	**MIDTERMS**		
10	Raw Data Analysis Variant Identification		
11	Clinical Linkage: Diagnostic Genetic Testing		3
12	Emerging Areas in Genetic Testing and Analysis		
13	Non-coding Variants DNA Methylation Testing	3	
14	Improving Variant Classification Complex Trait Variants		
15	Determining Risk in Complex Traits		4
16	Long Read Sequencing		
17	Single Cell Sequencing	4	
18	**END SEMESTER EXAMINATION**		