



Subject code: 02BT0452

Subject name: Biostatistics and Bioinformatics (Core)

M.Sc. Semester- II

Objective: The objective of this course is to make students familiar with the biological data and its various aspects; storage, maintenance, retrieval, and for the better part of course, being able to analyse the data and derive inferences. The course is divided into two parts: Biostatistics (the use of statistics to interpret biological data) and Bioinformatics (the use of informatics system to extract biological information and interpret results).

Credits Earned: 4 Credits

Course Outcomes: After completion of this course, student will be able to

1. Recognize importance of Biostatistics in interpreting the biological data and design suitable experiments.
2. Understand the errors obtained between different sets of experiments and calculate it precisely.
3. Comprehend the ways to utilize informatics system to derive useful biological information.
4. Use Bioinformatic tools to analyse different protein or nucleotide sequences and structures to reach meaningful conclusions as well as to manipulate molecular systems.

Pre-requisite of course: Basic understanding of molecular biology and structural biology.

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	IA (M)	CSE (I)	Viva (V)	Practicals/ TW	
4	0	0	4	50	30	20	0	0	100



Contents:

Unit	Topics	Teaching Hrs
1	Fundamental of Biostatistics The scope of statistics in data analysis; types of data & their representation, samples & population, variables, Measures of central tendency and dispersal; Probability distributions (Binomial and normal); Sampling distribution	10
2	Statistical Tests Statistical design of experiments for clinical and laboratory data, Hypothesis, Types of Hypothesis, Analysis of variance; Types of errors, Parametric and non-parametric statistics, Regression and Correlation	10
3	Computational Approach to Biological Data Introduction & Application of Bioinformatics; current perspective & emergence, commercial use, Biological Databases; Data Management & Retrieval, Sequence Alignment & Analysis; Pair wise alignment, global & local alignment, multiple sequence alignment, scoring matrices, algorithm, Homology modelling, Phylogenetic Analysis & tree construction	20
4	Prediction, Interpretation & Application – Bioinformatics Gene Prediction, ORF Prediction, Visualization of molecular structure, Protein structure prediction; Protein motif and domain prediction, comparison and classification, Structure-function annotation, Next Generation Sequencing, Chemoinformatics, Immunoinformatics,	20
	Total Hours	60



References:

1. Lehninger's Principles of Biochemistry, 6th edition, (2013) by David L. Nelson and Michael M. Cox; W. H. Freeman.
2. Proteins Structure and Molecular properties. T. Creighton, W. H. Freeman, 2nd ed. 1992
3. Fundamentals of Biostatistics, 7th edition by Bernard Rosner
4. Introduction to biostatistics, 2nd edition, Robert R. Sakal and F. James Rohlf
5. Essential Bioinformatic, Jin Xiong, Cambridge University Press. 2006
6. Bioinformatics. Sequence and Genome Analysis, D. W. Mount, Cold Spring Harbour, Lab Press. 2004
7. Bioinformatics and Functional Genomics, J. Pevsner, Wiley-Liss, 2003
8. Bioinformatics: A practical guide to the analysis of genes and proteins. (2001) 2nd Edition, Baxevanis AD and Ouellette BFF. John Wiley & Sons, New York

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
20%	25%	25%	15%	10%	5%

Instruction Method:

- a. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, etc.
- b. The internal evaluation will be done on the basis of continuous evaluation of students in the class-room in the form of attendance, assignments, verbal interactions etc.
- c. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.