Subject Code: 02MB0403

Subject Name: Biostatistics and Bioinformatics

M. Sc. Semester - I

Objective: Students are expected to have the advanced learning of Biostatistics and Bioinformatics which will enable them to apply these concepts in day to day life. As the name suggests, 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). The course also discusses application of several web servers that can be routinely used for various microbiological applications.

Credits Earned: 5 Credits

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

➢ Recognize importance of Biostatistics in interpreting the biological data and design suitable experiments.

➢ Understand the ways to report the results in a scientific way.

➢ Understand the errors obtained between different sets of experiments and calculate it precisely.

➢ Comprehend the ways to utilize informatics system to derive useful biological information.

➢ Use Bioinformatic tools to analyze different protein or nucleotide sequences to reach meaningful conclusions.

➢ To suitably use the structural information available in order to design ways to manipulate molecular systems.

Pre-requisite of course: NA.

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	Mid Sem (M)	Internal(I)/ (CSE)	Viva (V)	Termwork (TW) /Practicals (P)	
4	0	2	5	50	30	20	25	25	150

Contents:

Unit	Topics	Contact Hours
1	**Fundamental of biostatistics:** Measures of central tendency and dispersal; probability distributions (Binomial and normal); Sampling distribution. Difference between parametric and non-parametric statistics; Confidence Interval; Errors; Levels of significance.	15
2	**Statistical tests:** Hypothesis, Types of Hypothesis, Regression and Correlation; t-test; Analysis of variance; Chi square test.	15
3	**Bioinformatics of Nucleic Acids:** Nucleic acid databases, Sequence alignment, database search for homologous sequences, BLAST and FASTA versions, Smith-Waterman algorithm, Multiple sequence alignment. Primer designing, Restriction digestion analysis & vector designing tools.	15
4	**Bioinformatics of Proteins:** Protein databases, Protein Structure visualization tools, protein motif and domain prediction, comparison and classification. **Phylogenetic analysis:** Basic concepts of phylogenetic analysis, rooted/uprooted trees, approaches for phylogenetic tree construction (UPGMA, Neighbour joining, Maximum parsimony, Maximum likelihood).	15
	Total Hours	**60**

References:
1. *Statistical Methods*, Gupta SP. Sultanchand & Sons.
2. *Fundamentals of Statistics,* Goon, Gupta and Dasgupta –World Press, Kolkata.
3. *Bioinformatics: A practical guide to the analysis of genes and proteins.* (2001) 2nd Edition, Baxevanis AD and Ouellette BFF. John Wiley & Sons, New York.
4. *Bioinformatics*: *Sequence and Genome Analysis,* 2nd Edition (2001), David W. Mount, Cold Spring Harbor Laboratory Press..

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
10%	20%	20%	20%	25%	5%

Instructional 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.