COURSE TITLE	**BIOINFORMATICS AND STATISTICS**
COURSE CODE	**02MB0459**
COURSE CREDITS	**4**

Objective:

1 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.

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

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

4 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

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
4	0	0	50	30	20	0	0

Contents : Unit	Topics	Contact Hours
1	**Fundaments of Biostatistics and Statistical Tests** The scope of statistics in data analysis, types of data and their representation, sample and population, , Measures of Central Tendency and Dispersion, Probability distribution (Binomial and Normal), Types of Hypothesis and Hypothesis testing. Statistical Tests: Z-test, T-test, ANOVA, chi squared test.	15
2	**Basics of Bioinformatics and Biological Databases** History of Bioinformatics, Study, scope and applications. Branches emerged from Bioinformatics. Study of Databases of Nucleic Acids and Proteins: primary, secondary and composite. Submission and Retrieval of entry from database	15

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Digitally signed by (Name of Dean/ Principal)

Contents : Unit	Topics	Contact Hours
3	**Sequence Alignment and Phylogenetic Analysis** Brief introduction of local and global Sequence alignment, pairwise and multiple sequence alignment, progressive alignment, scoring an alignment, scoring matrices, PAM & BLOSUM series of matrices, Types of phylogenetic trees, Different approaches of phylogenetic tree construction - UPGMA, Neighbour Joining, Maximum Parsimony, Maximum Likelihood, Tools for sequence alignment: ClustalW, ClustalX, MEGA	20
4	**Genomics and Protein Prediction Methods** Brief introduction of genomics, Next generation genome sequence mechanisms and application of NGS, Gene prediction, Protein structure prediction methods, Protein structure visualization software's: Rasoml, PyMoL, Chimera, Application of protein prediction methods, Ramchandran plots.	10
Total Hours		**60**

Textbook :

1 Bioinformatics: A practical guide tothe analysis of genes and proteins. (2001) 2nd Edition, Baxevanis AD and Ouellette BFF, John Wiley & Sons, New York., 2001

References:

1 Bioinformatics: Sequence and Genome Analysis, 2nd Edition , Bioinformatics: Sequence and Genome Analysis, 2nd Edition , David W. Mount, Cold Spring Harbor Laboratory Press., 2001

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as 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 / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking
10.00	20.00	25.00	25.00	10.00	10.00

Instructional Method:

1 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.

Supplementary Resources:

1 https://open.oregonstate.education/appliedbioinformatics/chapter/chapter-3/

2 https://www.geeksforgeeks.org/phylogenetic-tree/