

Subject Code: 2SC2020304	Subject Title: Biostatistics and Bioinformatics
COURSE TYPE: CORE COURSE	

Course Objective:

The fundamentals of Bioinformatics and Biostatistics have their roots as deeper as the science of living systems. The Advancement in the fields of biology majorly depend on using predictable models utilizing the science of information, bioinformatics as well as the tools and techniques employing biostatistics.

Teaching scheme (hours) per week		Credit			Theory Marks		Practical Marks		Total
Theory	Practical	Theory	Practical	Total	Uni. Assessment	Cont. Assessment	Uni. Assessment	Cont. Assessment	
4	2	4	2	6	60	40	30	20	150

Unit	Content	Lectures	Weightage
1	Unit:1 : Introduction to Biostatistics ✓ Introduction to Biostatistics: Definition of statistics and biostatistics, Development of biostatistics, Applications and role of biostatistics ✓ Sources and Presentation of Data: Types of data and Collection of data, Classification and tabulation, Diagram and Graph, Frequency distributions of data. ✓ Sampling: Introduction and Definition, Types of population, Sample, sampling variation and Bias, Listing of population and sample size	15	25%
2	Unit:2: Tools and Techniques for data-analysis ✓ Measures of central Tendency: Mean, Median and Mode, Position of averages, Selection of the appropriate measure of central Tendency, Geometric mean and Harmonic mean ✓ Chi-Square Test: The formula for Chi-Square Test, Distribution of Chi-Square Test and degree of freedom, Application of Chi-Square Test ✓ Student t-test: Introduction, Student's t-Distribution, Application of tDistribution ✓ Analysis of Variance (ANOVA): Principle of ANOVA, Partitioning of ANOVA, Comparison of pairs of Means, Assumption Underlying ANOVA, Application of ANOVA	15	25%
3	Unit:3: Databases: In Silico Resources for the Information: ✓ Central Dogma of Molecular biology ✓ Introduction to Bioinformatics ✓ Objective of Bioinformatics ✓ Applications of Bioinformatics ✓ Major bioinformatics database: Protein database, Nucleotide and Genome sequence database, DNA microarray database Sequence Analysis: ✓ Local alignment, Global alignment, Dot plots, Multiple sequence	15	25%

	alignments (MSA) ✓ Tools for Similarity search and sequence alignment: BLAST & FASTA		
4	Unit:4: Applied Bioinformatics: ✓ Phylogeny: Statistical methods to obtain phylogenetic tree ✓ Protein Modelling: Homology modelling; fold recognition and threading approaches, and Ab-initio structure prediction methods. ✓ Drug discovery: Introduction, Computer Aided Drug Design, Software for Structure based drug design ✓ Bioinformatics software and its applications: CLUSTALW, RASMOL, Tree view, BioEdit	15	25%

Learning Outcome:

Students will learn the fundamentals of bioinformatics as well as biostatistics that will help them to achieve their goals of learning the advancements in the fields of biological sciences.

Reference Books:

1. Bioinformatics: Sequence and Genome Analysis, 2nd Edition, by David W. Mount
2. Bioinformatics: Principles and Applications, Oxford University Press, by Zhumur Ghosh and Bibekanand Mallick
3. Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins By Andreas D. Baxevanis (Ed), B. F. Francis Ouellette (Ed) Edition: 3rd edition, October 2004 Format: Hardcover textbook, 540pp Publisher: Wiley, John & Sons, Inc. ISBN: 0471478784
4. Bioinformatics Basics: Applications in Biological Science & Medicine By Hooman Rashidi, Lukas K. Buehler, 2nd Edition, May 2005, 335 pgs, CRC Press, Taylor & Francis ZGroup, ISBN: 0849312833
5. Bioinformatics: Genes, Proteins & Computers by C.A. Orengo, D.T. Jones, J.M. Thornton, 1st Edition, May 2003, 320 pgs, Routledge Publishers, ISBN: 1859960545
6. Introduction to Bioinformatics by Teresa K. Attwood, David Parry-Smith, Pearson Publications, 1st Edition, May-2001, ISBN: 0582327881
7. Bioinformatics: Sequence, Structure and Databanks: A Practical Approach, by Des Higgins and Willie Taylor, Oxford University Press, 272 pgs, 1st Edition, October-2000, ISBN: 0199637903
8. Arora, P. N. (2007). Biostatistics. Himalaya Publishing House.
9. Sundar Rao, P. S. S. (2006). Introduction to Biostatistics and Research Methods. 4th Edition. Prentice-Hall of India Private Limited, New Delhi.
10. Gurumani, N. (2005). An Introduction to Biostatistics. 2nd Edition. MJP Publishers, Chennai.
11. Singh, B. D. (2011). Biotechnology Expanding Horizons, 2nd revised Edition, Kalyani Publishers.
12. Dubey, R.C. (2012). A text book of Biotechnology, 4th edition, S.Chand & company