(Elective course)

Course Title: Biostatistics and Bioinformatics

Course code:

Credit: 4 (L-4, T-0, P-0)

Contact Hrs/Week: 4 Hrs

Course Outcomes

Understanding the principles and applications of biostatistics and bioinformatics tools in biology.

Course Learning Outcomes (CLO): The students will be able to:

1. Understand how bioinformatics is related to biology and medicine

2. Gain knowledge about DNA, RNA and protein sequences and structures & to use the information UCSC and ENSEMBL genome browser.

3. Perform pairwise and multiple sequence alignments & phylogenetic analysis.

4. Differentiate between the occurrence of an event and deviation from the mean

5. Use specific statistical test to validate their hypothesis

Unit I

Concept of genomics, functional genomics and comparative genomics and proteomics? Describe homologs, orthologs and paralogs. Definition, significance and limitations of bioinformatics. Implementation of bioinformatics in drug discovery.

Unit II

Database and their types, Sequence databases, Different types of sequence formats; FASTA, GENBANK, EMBL etc. How to retrieve sequences from different databases, Sequence matrices BLAST.

Unit III

Sequence Alignment Global alignment and local alignment, Methods of pair wise sequence alignment, Scoring matrices and gap penalties in sequence alignment, Pair wise alignment with Blast, Multiple Sequence alignment with ClustalW, Methods of multiple sequence alignment, Molecular phylogenetics and its significance.

Unit IV

Mean, median, mode, quartiles and percentiles. Measures of dispersion: range, variance, standard deviation, standard error, coefficient of variation. Hypothesis testing: Null and Alternate hypothesis.

Unit V

Chi square test and Student's t- test, ANOVA, Correlation and regression analysis.

Suggested Readings:

1. Bailey, N.T.J. (1997) Statistical Methods in Biology, III Ed., Cambridge, University Press, New York.

2. Sokal, R., James, F. (1973) Introduction of Bio-Statistics, W.H. Freeman & co., Top Company Ltd., Tokyo, Japan.

3. Introduction to Bioinformatics (1st Edition) by Arthur M. Lesk, Oxford University Press, 2002

4. Bioinformatics: Sequence and Genome Analysis by Mount D., Cold Spring Harbor Laboratory Press, New York. 2004

5. Bioinformatics- a Practical Guide to the Analysis of Genes and Proteins by Baxevanis, A.D. and Francis Ouellellette, B.F., Wiley India Pvt Ltd. 2009.

6. Orengo (2003) Bioinformatics, Genes, Proteins and Computers Garland Book Publishers.

7. Westhead et.al (2003) Bioinformatics Instant Notes, Viva Books (Indian edition).

8. Baxevanis A.D. and Francis Ouelletele B.F. (2001) Bioinformatics: A practical guide to the analysis of genes & proteins John Wiley & Sons publication, New York.

9. Bioinformatics in the Post-Genomic Era by Jeffrey Augen, Addison-Wesley Publisher, 2004.

Course Title: Animal Taxonomy

Course code:

Credit: 4 (L-4, T-0, P-0)

Contact Hrs/Week: 4 Hrs

Course Outcomes

This course develops concepts in animal taxonomy and systematic, modern methods of taxonomy and systematics and their application. The student will get familiarized with different animal taxonomy techniques and their significance.

Course Learning Outcomes (CLO): The students will be able to:

1. Understand historical and modern methods of animal classification and systematics

2. Get acquainted with concepts and techniques including of basic and advance type used in studying animal taxonomy and systematics.

3. Apply the principles of taxonomy and its practical approach in biology

4. Communicate effectively the learnings of the subject and understand the significance and techniques of Animal systematics and taxonomy.

5. Will understand role of animal taxonomy in present scenario with the future dimensions

Unit I

Animal Taxonomy: Basic concepts, principles and methods. Animal systematics, historical resume of systematic, domain concept in systematics. Classification system types: two, three, four, five, and six kingdom classification. Concept of species-taxonomic diversity within species.

Unit II

Species concepts and Theories of biological classification. Evolutionarily significant units.