

BIOINFORMATICS AND BIOSTATISTICS

Paper 16

THEORY (48 Periods)

Part-A BIOINFORMATICS (24 Periods)

Unit 1: Introduction (2)

Importance, Goal, Scope; Limitations of Bioinformatics

Unit 2: Biological Databases and Data Retrieval (9)

Introduction to biological databases: Primary, secondary and composite databases; Types of biological databases: (Gene Bank, EMBL, DDBJ, NDB); Protein databases (PIR, SWISS-PROT, TrEMBL, PDB); Metabolic pathway database (KEGG, EcoCyc, and MetaCyc); Small molecule databases (PubChem, Drug Bank, ZINC, CSD)

Unit 3: Basic Concepts of Sequence Alignment (8)

Similarity, identity and homology of sequences; Alignment: Local and global alignment, pair wise and multiple sequence alignments, Alignment algorithms (Dynamic and Heuristic, Scoring matrices)

Unit 4: Applications of Bioinformatics (5)

Structural Bioinformatics (3-D protein, PDB), Functional genomics, Drug discovery method (Basic concepts)

Part-B BIOSTATISTICS (24 Periods)

Unit 1: Introduction to Biostatistics: Aim and scope (2)

Unit 2: Measures of Central Tendency and Dispersion (7)

Mean, Median and Mode; Variance, Standard deviation, Standard error, Co-efficient of Variance

Unit 3: Distributions (4)

Normal, Binomial and Poisson; Skewness and Kurtosis

Unit 4: Testing of Hypothesis (3)

Type-I and Type-II errors; Confidence Intervals and Confidence Levels

Unit 5: Statistical Tests (6)

Chi-square tests, Z-test and t-test, F-test (ANOVA)

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PRACTICAL

Part - A Bioinformatics

1. To learn about biological databases and their characteristics.
2. To retrieve nucleotide and protein sequences from the databases.
3. To perform pair-wise alignment of sequences (BLAST).
4. To predict the structure of protein.

Part - B Biostatistics

1. To compute Coefficient of Variance from samples provided.
2. To collect data on different parameters of animal samples and test significant difference between means (Z-test, t-test)
3. To compute 'test of independence' and test for 'goodness of fit' with samples/data provided.
4. To learn graphical representations of statistical data with the help of computers (e.g. MS Excel).

ESSENTIAL READINGS

- Ghosh Z and Mallick B. (2008). *Bioinformatics: Principles and Applications*, Oxford University Press.
- Pevsner J. (2009). *Bioinformatics and Functional Genomics*, II Edition, Wiley Blackwell.
- Zar, Jerrold H. (1999). *Biostatistical Analysis*, IV Edition, Pearson Education Inc and Dorling Kindersley Publishing Inc. USA

SUGGESTED READINGS

- Zvelebil, Marketa and Baum O. Jeremy (2008). *Understanding Bioinformatics*, Garland Science, Taylor and Francis Group, USA.
- Antonisamy, B., Christopher S. and Samuel, P. P. (2010). *Biostatistics: Principles and Practice*. Tata McGraw Hill Education Private Limited, India.
- Pagana, M. and Gavreau, K. (2000). *Principles of Biostatistics*, Duxberry Press, USA