DISCIPLINE SPECIFIC ELECTIVE COURSE (DSE 01)

Credit distribution, Eligibility and Pre-requisites of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course
		Lecture	Tutorial	Practical/ Practice		
Biostatistics and Bioinformatics ALS ZOO DSE 01	**4**	**2**	**0**	**2**	**XII pass with Science with Biology/ Biotechnology**	**NIL**

Learning Objectives:

The learning objectives of this course are as follows:

- To acquaint the students of the application of statistical methods for analysing the biological data.
- To impart the theoretical and practical knowledge of biological databases and use of various software for their analysis.

Learning Outcomes:

By studying this course, students will be able to:

- use statistical formulae for analyzing data.
- apply statistical tests like Chi-square tests, Z-test and t- test etc. for testing hypothesis.
- Use different biological databases and bioinformatic tools.

Unit 1: Introduction to Biostatistics **(2 Hours)**

Definition, Aim and Scope, Applications and limitations of biostatistics.

Unit 2: Measures of Central Tendency and Dispersion **(6 Hours)**

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

Unit 3: Testing of Hypothesis and Statistical Tests **(7 Hours)**

Type-I and Type-II errors; Confidence Intervals and Confidence Levels, Chi-square test, Z-test and t-test.

Bioinformatics

Unit 4: Introduction to Bioinformatics (3 Hours)

Historical background, Aims and scope, Bioinformatics in Genomics, Transcriptomics, Proteomics, Metabolomics, Systems biology, Applications and Limitations in bioinformatics.

Unit 5: Biological Databases (5 Hours)

Introduction to biological databases; Primary, secondary and composite databases; Nucleic acid databases (GenBank, DDBJ, EMBL and NDB); Protein databases (PIR, SWISS-PROT, TrEMBL, PDB).

Unit 6: Basic Concepts of Sequence Alignment (7 Hours)

Scoring Matrices (PAM, BLOSUM), Methods of Alignment (Dot matrix, Dynamic Programming, BLAST and FASTA); Local and global alignment, pair wise and multiple sequence alignments; Similarity, identity and homology of sequences.

PRACTICAL (Credit: 02)

(Laboratory practical- 15 classes of 4 hours each)

Part - A 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).

Part - B 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 perform multiple sequence alignment (Clustal X)

Essential/Recommended readings

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

Suggestive readings

1. Zvelebil, Marketa and Baum O. Jeremy (2008. *Understanding Bioinformatics*, Garland Science, Taylor and Francis Group, USA.

2. Antonisamy, B., Christopher S. and Samuel, P. P. (2010). *Biostatistics: Principles and Practice*. Tata McGraw Hill Education Private Limited, India.

3. Pagana, M. and Gavreau, K. (2000). *Principles of Biostatistics,* Duxberry Press, USA

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.