

ZO (N)-220 & ZO (N)-220L Syllabus

B.Sc. III Semester Minor/VOC Syllabus (Zoology)

Bioinformatics, Biostatistics and Instrumentation techniques

Course Code: ZO (N)-220

Credit =3

UNIT WISE CONTENT

Block I: Bioinformatics

Unit 1: Biological Databases

Objective, Introduction, Scope and applications of bioinformatics, primary, secondary and composite databases Nucleotide sequence databases, Protein sequence databases, Gene Expression Database and Structural databases.

Unit 2: Database and search tool

Objectives ,Introduction ,Computational tools and biological databases , National Centre for Biotechnology Information (NCBI) European Bioinformatics Institute (EBI),EMBL Nucleotide Sequence Database , DNA Data Bank of Japan (DDBJ) Swiss-Prot.

Unit 3: Sequence alignment and database searching

Objectives, Introduction, The evolutionary basis of sequence alignment, Database similarity searching Sequence Similarity search tools: BLAST and FAST, Concept of Alignment, Multiple Sequence Alignment (MSA) Percent Accepted Mutation (PAM) Blocks of Amino Acid and Substitution Matrix (BLOSUM)

Unit 4: Computational Tools for DNA Sequence Analysis

Objectives, Introduction, Database submission, Data retrieval Relationship between sequence and biological functions, Molecular Phylogeny, Consistency of Molecular Phylogenetic Prediction Application of bioinformatics

Block II Biostatistics'

Unit 5: Data collection and presentation

Definitions of biostatistics, Statistical symbol, Scope & Applications of biostatistics, Collection (Random and non random sampling or stratified sampling), Organization and representation of data (Graph, Histogram, Scatter diagram).

Unit 6: Measures of central tendency

Mean (Arithmetic), Mode and Median. Major Characteristics of each measures of central tendency. Advantage and disadvantage of mean, mode and median.

Unit 7: Measures of Variability/ Dispersion

Range, Interquartile Range, Mean deviation, Standard deviation, Variance and coefficient of variation.

Block III: Instrumentation and techniques

Unit 8: Principles and uses of analytical instruments

pH meter, UV-visible spectrophotometer, Centrifuges (clinical, high-speed and ultra-centrifuge), Geiger Muller and scintillation counters

Unit 9: Microtomy and Microscopy

Tissue preparation, Fixation, Block preparation, Microtomy (paraffin and frozen tissue sectioning).Types of Microscopes: Bright field, Dark-field, Phase contrast, Fluorescence, Confocal and Scanning and transmission electron microscopes.

Unit 10: Separation techniques and cryopreservation

Chromatography, Electrophoresis and cryopreservation

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Unit 11. Biotechniques (exercise based on chart / picture or sample instrument)

Determination of pH using pH meter, Demonstration of functioning of spectrophotometer

Demonstration of use of bright field, phase contrast, dark field, fluorescence, confocal and electron microscopes (on photograph basis)

Unit 12: Biotechnology/ Biotechnique Exercise (I)

Study of the principles and applications of the following equipment with the help of photographs/Diagram: Laminar flow, Autoclave, Elisa reader, PCR machine, Refrigerated centrifuge, Transilluminator, Double helical DNA Model, Chromatography or Thin Layer Chromatography (TLC), Recombinant DNA techniques

Unit 13 Biotechnology/Biotechnique Exercise (II)

Study of prepared slides, models or specimen. Escherichia coli, Bacteriophages, Plasmid Southern blot DNA Isolation, DNA Replication

Unit 14 Biostatistics Exercise

Calculation of mean, median, mode, standard deviation, standard error from the data provided (Simple non scientific calculator may be used for calculation of data).