MASTERS OF PHILOSOPHY (M. PHIL.)

BIOINFORMATICS

DETAILED SYLLABUS

SESSION 2013-14

PAPER I

RESEARCH METHODOLOGY THEORY AND TECHNIQUES

UNIT - I

Research: Definition, Importance and Meaning of research, Characteristics of research, Types of Research, Steps in research, Identification, Selection and formulation of research problem, Research questions – Research design – Formulation of Hypo Dissertation, Review of Literature.

UNIT – II

Sampling techniques: Sampling theory, types of sampling – Steps in sampling – Sampling and Non-sampling error – Sample size – Advantages and limitations of sampling.

Collection of Data: Primary Data – Meaning – Data Collection methods – Secondary data – Meaning – Relevances, limitations and cautions.

UNIT – III

Statistics in Research – Measure of Central tendency, Dispersion, Skewness and Kurtosis in research, Hypo Dissertation, Fundamentals of Hypo Dissertation testing, Standard Error, Point and Interval estimates, Important Non-Parametric tests: Sign, Run, Kruskal, Wallis tests and Mann, Whitney test.

UNIT – IV

Para metric tests: Testing of significance, mean, Proportion, Variance and Correlation, testing for Significance of difference between means, proportions, variances and correlation co-efficient. Chi-square tests, ANOVA, One-way and Two-way.

UNIT– V

Research Report: Types of reports, contents, styles of reporting, Steps in drafting reports, editing the final draft, evaluating the final draft.

Reference Books:

1. Statistical Methods - S.P. Gupta

2. Research Methodology Methods and Techniques - C.R. Kothari

3. Statistics (Theory and Practice) - B.N. Gupta

4. Research Methodology Methods and Statistical Techniques - Santosh Gupta

PAPER-II

BIOLOGICAL DATABASES, DATA MINING AND MICRO ARRAYS

UNIT-I

Biological database - Sequence databases - Other specialized databases – Microarray databases - Database browsers and search engines.

UNIT-II

Data mining definition – Classification and clustering of data – Association rules – Data visualization.

UNIT-III

Introduction to Micoarrys - Oligonucleotide and Spotted cDNA arrays – Design considerations for microarray experiments – Goals of a microarray experiment.

UNIT-IV

Basic research with DNA microarrays – Micorarrays and Cancer - Myeloid leukemia (AML) vs. acute lymphoblastic leukemia (ALL) data analysis.

UNIT-V

Use of array analysis programs – SAM - TIGR programs – MEV.

References:

1. Analysis of DNA Microarray Data by Steen Knudsen.

2. Discovering Genomics, Proteomics, and Bioinformatics by A.M. Campbell and L.J. Heyer.

PAPER-III

STRUCTURAL BIOINFORMATICS

UNIT I:

Structural features of biomolecules – techniques used to determine the structure of biomolecules - geometrical parameters – potential energy surfaces – molecular graphics – hardware and software requirements – Internet – mathematical concepts,molecular file formats

UNIT II:

Structure prediction – secondary structure – homology modeling, fold recognition and ab initio 3D structure prediction – structure comparison and alignment – prediction of function from structure.

UNIT III:

Molecular dynamic using simple models – simulations with continuous potentials – advantage of constant temperature and pressure simulation – solvent effects – analysis of conformational changes during molecular dynamic simulation.

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UNIT IV:

Molecular docking – structure based drug design – de novo approach – molecular similarity – quantitative structure-activity relationship – 3D pharmacophore derivation and matching – importance of molecular modeling in drug discovery, Cheminformatics and its applications, Combinatorial libraries and Chemical diversity

UNIT V:

Protein stability and folding-SCOP-DALI-assignment of protein structures to genomes-determining gene function through conserved protein structure-prediction of protein function-approaches to protein structural genomics

References:

1. Mount, D.W. (2001**)." Bioinformatics – Sequence and Genome Analysis**", 1st Edition, Cold Spring Harbor Laboratory Press, New York, USA.

2. Westhead, D.R., Parish, J.H. and Twyman, R.M. (2003). **Instant Notes Series Bioinformatics,** 1st Edition, Viva Books Private Limited, New Delhi, India.

3. Ignacimuthu (s.j.), S. (2005). **Basic Bioinformatics**, 1st Edition, Narosa Publishing House, New Delhi, India.

PAPER-IV
DISSERTATION