

**MOTHER TERESA WOMEN'S UNIVERSITY  
KODAIKANAL**

**COURSE WORK EXAMINATION: RESEARCH METHODOLOGY**

**BIOTECHNOLOGY**

**UNIT I**

Basic and applied research, Essential steps in research, Defining the research problem, Research / Experimental design, Literature collection, Literature citation, Research report, components, Format of thesis and dissertation, Manuscript / research article, Review monographs, Bibliography and Reference, Significance of research, Plagiarism, Research Ethics

**UNIT II**

Visualization cells and sub cellular components by light microscopy, resolving powers of different microscopes, microscopy of living cells, scanning and transmission microscopes, different fixation and staining techniques for EM, freeze-etch and freeze-fracture methods for EM, image processing methods in microscopy Histochemical and Immunitechniques: Antibody generation, detection of molecules using ELISA, RIA, western blot, immunoprecipitation, flowcytometry and immunofluorescence microscopy, detection of molecules in living cells, in situ localization such as FISH and GISH.

**UNIT III**

pH and buffers, Centrifugation: Basic principle and application: Differential, density and Ultracentrifugation, Principle methodology and applications of gel – filtration, ion-exchange and affinity chromatography; High performance liquid chromatography, FPLC, Principle of biophysical method and used for analysis of biopolymer structure; X ray diffraction, fluorescence, UV, visible, IR, NMR and ESR spectroscopy, Atomic absorption and plasma emission spectroscopy; MS and MALDI – TOE, Electrophoresis; Principle and applications of Native, SDS, garose and 2D gel electrophoresis

**UNIT IV**

Database similarity searching – BLAST – BLASTN and BLASTP, Gene sequence submission format – FASTA, multiple sequence alignment (CLUSTAL W), Phylogenetic analysis (PILE UP), phylogenetic softwares and internet resources. Visualisation of protein structure – (Ras Mol, Cn3d, SWISS – PDB viewer) modeling packages – Mol Mol, VMD.

## UNIT V

Measures of central tendency and dispersal; probability distributions (Binomial, Poisson and normal); sampling distribution; difference between parametric and non-parametric statistics; confidence interval; errors; levels of significance; regression and correlation; t-test ;analysis of variance; X<sup>2</sup> test; basic introduction to Multivariate statistics etc.

## REFERENCE BOOKS

1. Biostatistics: A foundation for Analysis in the Health Sciences 7/E Wayne W. Daniel, Wiley Series in Probability and Statistics
2. Prem S. Mann, 2004. Introductory Statistics. Fifth Edition. John Wiley and Sons (ASIA) Pvt.Ltd.
3. S.C. Rastogi, N. Mendiratta and P.Rastogi, Bioinformatics Methods and Applications Genomics, Proteomics and Drug Discovery
4. Introduction to Bioinformatics, (Atwood, T.K. and Parry – Smith D.J)
5. Protein Purification by Robert Scopes, Springer Verlag Publications, 1982
6. Tools in Biochemistry David Cooper
7. Methods of Protein and Nucleic acid Research, Osterman Vol, I -III
8. Joseph Sambrook & David W.Russell, Molecular cloning – A laboratory Manual (Third Edition) – Cold Spring Harbor laboratory Press, Cold Spring Harbor, New York
9. M.Prakash, C.K.Arora, Laboratory Instrumentation – Anmol Publications Pvt.Ltd
10. Charles N. Rely, Donald T.Saweyer, Robert E.Krieger Huntington Experiments of Instrumental methods, A Laboratory Manual, New York
11. Hobart, H.Willard, Lynne L.Meritt J.R. John Dean, Instrumental Methods of Analysis, East West Press Pvt.Ltd.,
12. Gelvin, Plant Molecular Biology, A Laboratory Manual, Kluwer Academic Press
13. P.N.Arora and P.K. Malhotra, Biostatistics
14. Norman T.S. Bailey, Statistical Methods in Biology. Cambridge University Press, UK
15. Sharma BK, Instrumental method of chemical analysis
16. DA Skoog, Instrumental methods of analysis
17. Plummer, An introduction to practical Biochemistry
18. Chatwal and Anand, Instrumentation
19. Boyer, Modern experimental Biology
20. John G Webster (2004). Bioinstrumentation. Student edition, John Wiley & Sons, Ltd
21. C.R.Kothari, 2nd edition (2004) Research Methodology, Methods and techniques, New Age International(P) Ltd., Publishers, New Delhi