MB - 202 Research Methodology and Professional Practices

Section - I

Unit -1   Introduction to Scientific Research   15 hours

   1.1. Characteristics and types of scientific research, Basics of research methodology, Research and Experimental design, Method of Data collection
   1.2. Scientific Deliveries and Communications: Writing Research proposal, Paper, Thesis, Report and Citations, Presenting scientific research: Power point presentations, Posters, Flyers, etc.
   1.3. Publication processes, Review Processes and Significance of scientific communications
   1.4. Study of Critical review and scientific Paper in Microbiology

Unit-2   Statistical Methods and Data analysis   15 hours

   2.1. Definition and scope, Organizing a statistical survey and presentation of statistically analyzed information, Basic statistical methods: Measures of central tendency, dispersion and standard error; Probability distributions: binomial, poisson and normal distribution
   2.2. Statistical significance: Hypothesis testing, types of error, level of significance, Student's t test, F test and Chi square goodness of fit
   2.3. Comparing Parametric and Non parametric statistics, Rank test, F-max test, Mann –Whitney (U) test, and Sign test, Applications of non parametric statistics in biological research
   2.4. Simple linear regression and correlation analysis,

Section – II

Unit -3   Computer Science and Bioinformatics   15 hours

   3.1. Basic computing: MS Office ®, Internet, , Use of computers in statistical analysis, Database and Data base management system, Biological database : Sequence, Structure and classification
   3.2. Sequence Analysis : concepts of sequence similarity, identity and homology, Global and Local alignment, Scoring matrices, BLAST, FASTA
   3.3. Multiple Sequence Alignments (MSA): The need for MSA, basic concepts of various approaches for MSA (e.g. progressive, hierarchical etc.); Introduction to CLUSTALW and PileUp ; concept of dendrogram and its interpretation.
   3.4. Application of Bioinformatics: Gene finding, PCR Primer designing, Microbial identification, Comparative genomics, Secondary and tertiary protein structure prediction

Unit - 4   Professional Practices   15 hours
   4.1. Concept of Quality Control and Assurance in life science research and industry, Concept of GMP, GLP, ISO, WHO
   4.2. The Business of biotechnology: Sciences and Business, Biotechnology company fundamentals, funding, research development and marketing
   4.3. Legal and regulatory issues for Biotechnology based business
   4.4. Survey on Microbiology and Biotech Industry in State and Nation

List of Experiments

   1. Standard operation procedure and validation of autoclave, pH meter, UV visible spectrophotometer and laminar air flow
   2. Computation of Mean, Mode and Median
   3. Computation of Standard deviation and Co-efficient of variation.
   4. Calculation of confidence limit for the population mean.
   5. Student's 't' test. (Paired and unpaired)
   6. ANOVA.
   7. regression and correlation analysis
   8. Chi square goodness of fit
   9. perform non parametric tests

10. Application statistical software (SPSS/ minitab/ metlab)
11. Use of Word, Excel, Power Point, Access and internet
12. Submission of scientific Review in relevant topics
13. Internet gene bank search and SRS
14. BLAST and FASTA
15. Local Global and Multiple sequence alignment
16. Protein structure visualization
17. Primer designing

List of Reference Books

1. Yali Friedman, Building Biotechnology
2. David Hoyle, ISO 9000 Quality Systems Handbook
3. Denyer, Handbook of Microbiological Quality Control
4. The North Carolina Association for Biomedical Research, Mapping your future: Exploring Careers In biomanufacturing
5. Chap, Introductory Biostatistics
6. Zar, Biostatistical Analysis.
7. Gibas, Developing Bioinformatics computer skill
8. Ghosh, Bioinformatics Principle and application
9. Selzer, Applied Bioinformatics
10. Baxevanis, Bioinformatics
11. Claverie, Bioinformatics for dummies
12. Mount, Bioinformatics: sequence and genome analysis
13. Oren, Bioinformatics, Gene, Proteins and Computers.
14. Rastogi, Bioinformatics
15. Twyman, Instant notes on Bioinformatics,
16. **Jin,** Essential Bioinformatics