

SYLLABUS FOR DOCTOR OF PHILOSOPHY IN MICROBIOLOGY

PAPER I: MBPHD. C01. RESEARCH METHODOLOGY

1. Fundamentals of Scientific Inquiry: Exploration of science's core characteristics: testability, repeatability, and falsifiability. Differentiating hypotheses, theories, and laws in the scientific context. The roles of ad hoc and auxiliary hypotheses, Methods of observation and establishing evidence, including the concept of proof.
2. Experimental Design and Implementation: Foundations of experiment planning: selection of sample, sampling procedures, and determining sample size, Execution of experiments: from observation to data collection, Interpretation and deduction methodologies, Detailed focus on Experiment Design: choosing controls, observational and instrumental requirements, and thorough documentation.
3. Data Handling and Statistical Analysis: Categorization and characteristics of various data types, Acquisition and treatment of data, Emphasis on the importance of statistical tools in interpreting data, Presentation techniques: effective use of graphs, tables, histograms, and pi diagrams, Addressing errors, inaccuracies, and biased observations, Incorporation of computer software for data management and analysis.
4. Scientific Reporting and Research Project Preparation: Essentials of writing a research report and scientific documentation, Standard formats for scientific reports: from tables and texts to footnotes and illustrations, Utilization of computer applications for bibliographic management, Guidelines for formulating research ideas, problem definition, literature search, and report outlining.
5. Advanced Microbiology Techniques and Instrumentation: Overview of colorimetry and spectrometry, including Visible – UV spectrometry, Various separation techniques: Chromatography (TLC, Paper, Gas, Column, Ion exchange, HPLC, GC-MS), Affinity chromatography, Electrophoresis (PAGE, Agarose gel), Centrifugation principles, types, and applications, including Ultracentrifugation, Exploration of Restriction and Modification enzymes, Cloning vectors, DNA primers, Linkers, Adaptors, and their synthesis, Amplification methods such as PCR, Nested PCR, Real-time PCR, and techniques like RFLP, RAPD, AFLP, Focused study on Protein and Nucleic acid sequencing and Nucleic acid microarrays.

Dr. Denoj Sebastian, Ph.D,
Professor of Microbiology,
Department of Life Sciences,
University of Calicut - 673 635.



References

1. Essentials of research design and methodology, Geoffrey Marczyk, David Dematteo, David Festinger, 2005.
2. Research methodology in the medical and biological sciences, Petter Laake, Haakon Breien Benestav and Bjorn Reino Olsen, 2007.
3. Research methodology, Dipak Kumar Bhattacharyya, second edition, 2006.
4. Researching information system and computing, Briony J Oates, 2006.
5. Research methodology-methods and techniques, C.R.Kothari, second edition, 2004.



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UNIVERSITY OF CALICUT
Ph.D. DEGREE COURSE WORK EXAMINATION, JUNE 2024
MICROBIOLOGY
MBPHD. C01. RESEARCH METHODOLOGY

Time: Three hours

Maximum: 70 Marks

I. Answer any one of the following (1x20=20 Marks)

1. Describe science's core characteristics: testability, repeatability, and falsifiability. Clarify how hypotheses, theories, and laws differ.
2. Outline the techniques of RFLP, RAPD, and AFLP, and discuss their applications in microbial genetics.

II. Write on any two of the following (2x10=20 Marks)

3. Detail experiment planning basics: sample selection, sampling methods, and sample size. Review the experiment execution process.
4. Discuss interpretation and deduction in research. Focus on experiment design, controls, and requirements.
5. Provide an overview of protein and nucleic acid sequencing techniques. How do these methods contribute to our understanding of microbial genomes?

III. Write notes on any five of the following (5x6=30 Marks)

6. Describe different data types in research.
7. Discuss data acquisition and treatment. Highlight statistical tools' role in interpretation.
8. Discuss centrifugation techniques
9. Identify issues with errors and biases in research.
10. Discuss the use of software in data management and analysis.
11. Describe essentials of research report writing and documentation.

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