

DEPARTMENT OF MICROBIOLOGY AND BIOINFORMATICS

UTD, Atal Bihari Vajapayee Vishwavidyalaya, Bilaspur

Scheme and Syllabus of Pre-PhD Course work in Microbiology

Scheme

Paper Code	Title of Paper	Nature of Paper	Max. Marks
CW01	Research Methodology and Computing	Inter Departmental level	100
CW02	Tools and Techniques	Subject Level	100
CW03	Review of Literature and Presentation	Research Level (Based on supervisor concerned)	100

Pattern of question paper for CW 01 and CW 02 and CW 03

1. One question of 20 marks will be compulsory constituting ten short answer types of questions collectively from all the parts of syllabus.
2. Five questions of 16 marks each from all five units (Sections) with internal choice (50%) separately will be in question paper.

PAPER – I (COMPULSORY)

CW 01: RESEARCH METHODOLOGY AND COMPUTING

UNIT – I

Research concept: Introduction of Research methodology, nature, concept, objective and scope of research; Research motivation; Types and method of research; Concepts of abstract, review of literature. Quantitative and qualitative research.

UNIT – II

Research problem and design: Research problem – Identification, selection and its formulation; Research design – Components, materials, hypothesis and its importance; Research journals and research articles, Research project. Criteria of good research. Script Writing, Challenges and opportunities for good research in India.

UNIT – III

Research ethics: Basic concepts and issues, Institutional ethics, Intellectual property rights (IPR), Patents, copy right, Plagiarism, cyber laws, Impact factor, Citation, i10-index, h-index, Reference style, Journal Citation report (JCR), peer review process, referred journal, journal index database, preparation of manuscript.

UNIT – IV

Quantitative data analysis: Types and classification of data, Data collection and representation, tabulation, Sampling methods and size of samples, Central tendency, Standard deviation and error, Probability, Normal and Binomial distribution, Test of significance (t-test, F-test and Chi-square test), basic ANOVA, Correlation and regression.

UNIT – V

Computer fundamentals: Introduction, Software and Hardware; MS-Word, MS-Excel and MS-Power point. Document preparation system: La-Tex, PDF, Basics of computer Network and Internet, Data analysis and graph/ chart designing and preparing using specific software, Search engines. Google scholar, online paper submission system like Easy chair. Basic introduction of SPSS and MATLAB.

Books suggested –

1. Research methodology- Methods and Techniques (3/e): C. K. Kothari (2008), New Age International, New Delhi
2. Research Methodology: R. Panneerselvam (2nd Edition), PHI learning publication, India.
3. Research methodology in Behavioral Sciences (English and Hindi), S. K. Mangal, S. Mangal, PHR Learning publication, India.
4. Computer Fundamentals Architecture and organization by B.Ram and Sanjay Kumar, New Age International Publisher.
5. 2007 Microsoft Office System Step by step by Cox, Joyce etc. All, PHI Learning India.
6. Bio-statistical Analysis (5th /6th Edit.): Jerrold H. Zar, Pearson Education.
7. Experimental design: W. G. Cochran and M. G. Cox, John Wiley & Sons Publication, New Delhi.
8. Plagiarism: Why it happens, How to prevent it? – B. Gilmore.
9. Microsoft Office 2010: Introductory concepts and Techniques: G.B. Shelly & T.J. Cashman.
10. Design and analysis of experiments (5/e): Montgomery and Douglas (2007), Wiley Publication.

➤ *Any other books suggested by Course coordinator/ Course Teacher/ Supervisor concerned may be applied.*

PAPER – III (COMPULSORY)
CW 03: REVIEW OF LITERATURE AND PRESENTATION

Part – A (50 Marks)

Review of Literature:

Writing of literature in the area of the proposed research work under Ph. D. program.

- It should be standard review comprises minimum fifty research articles belonging to peer reviewed journals (National and International).
- Candidate has to submit a report of reviewed literature in printed form to the department concerned at the time of presentation.

Part – B (50 marks)

Presentation:

- Seminar based on the review of literature with the help of PPT.

Signature (s) -

PAPER - II (MICROBIOLOGY)
CW 02: TOOLS AND TECHNIQUES

UNIT - I

Fundamentals of Microbiology: Basic concept of microbial research. Concepts of microbial diversity and their habitats. Koch's postulates. Identification of microbes (bacteria, fungi and cyanobacteria) - basic and ribosomal gene sequence analysis methods. Assessment of microbial diversity by molecular techniques. Applications of microbiology in agriculture, industry, medical science and environment science.

UNIT - II

Applied Microbiology: Methods of microbiological examination of water and aerobiological research. Biodegradation of recalcitrant compounds (lignin, pesticides); Bio-inoculants - Bio-pesticides, Bio-herbicides and Bio-insecticides. Production of proteins in bacteria; Recombinant and Edible vaccines; Antibiotics - Properties, Production and its applications. Probiotics, Biofuels, Genetically modified microorganisms and their applications. Bio-fermenter, Biosensor.

UNIT - III

Basic Techniques of Microbial research: Condition and maintenance of microbiological laboratory; Culture media for bacteria, fungi and cyanobacteria; Sterilization - methods applied for samples, chemicals, glassware and whole laboratory; Autoclave and Laminar air flow. Isolation and characterization of microbes (bacteria, fungi and cyanobacteria). Techniques to measure growth of microorganisms. Effects of carbon, nitrogen, temperature, osmotic pressure, oxygen and CO₂ on microbial growth. Methods for antimicrobial assay.

UNIT - IV

Instrumentation: Microscopy - Confocal, Phase contrast and Electron microscopy. Chromatography - Principle, Protocol and Applications of TLC, GLC and HPLC. Spectrophotometry - Principle and applications. Centrifugation - Principle, types and applications. Electrophoresis - Principle, protocol and applications. Principle and applications of pH meter, colony counter and flow cytometer.

UNIT - V

Advanced Techniques & Bioinformatics: Principles and applications of PCR and DNA Sequencer. DNA isolations, DNA microarray, DNA sequencing, Protein microarray, Protein sequencing /profiling, X-ray Crystallography and NMR. Introduction and Bioinformatics; Knowledge of various databases and bioinformatics tools available at these resources - Literature databases, Nucleic acid sequence databases: GenBank, EMBL and DDBJ. Protein sequence and structure databases, Genome Databases, Basic online and offline tools for Sequence alignment, Molecular phylogeny, Genomics and Proteomics, and Drug designing.

Books suggested –

1. Dubey, R.C. and Maheshwary, D.K. (1999). Text book of Microbiology. S. Chand and company.
2. Aneja, K.R. Experiments in Microbiology, Plant pathology and Biotechnology, Fourth edition, New Age International publishers.
3. Powar, C.B. and Dagainawal, H.F. General Microbiology. Vol-I and Vol- II, Himalaya Publishing House.
4. Wilson & Walker. (2000). Principles and Techniques in Practical Biochemistry. 5th Edition Cambridge University Press.
5. Reed, G. Prescott and Dunn's (1999). Industrial Microbiology. CBS Publishers.
6. Demain, A. L. (2001). Industrial Microbiology and Biotechnology. 2nd Edition.
7. Waites, M.J., Morgan, N.L., Rockey, J.S. and Higton, G. (2002). Industrial Microbiology: An Introduction. Blackwell Science Publishers.
8. Mount D. (2004). Bioinformatics: Sequence and Genome Analysis. Cold Spring Harbor Laboratory Press, New York.
9. Baxevanis, A.D. and Francis Ouellette, B.F. (2009). Bioinformatics- A Practical Guide to the Analysis of Genes and Proteins. Wiley India Pvt Ltd.
10. Text Book of Spectroscopy. Jyoti Kumar, Sonali Publications, New Delhi. 110002.
11. Chromatography :Kamlesh Bhansal, Campus Books International, Prahlad Street, Ansari Road, Darya ganj New Delhi 110002.
12. Biopesticides and pest management. G.S. Dhaliwal and Opendar Koul, Kalyani Publishers. New Delhi.

➤ *Any other books suggested by Course coordinator/ Course Teacher/ Supervisor concerned may be applied.*

