

**M.Phil/Ph.D Syllabus 2020**  
**School of Life Sciences, AUS**  
**University Level Paper – 501 (Common for Biotechnology, Microbiology, Life Sc**  
**& Bioinformatics)**  
**Total Marks: 100; Credits: 02**

**Paper title: RESEARCH AND PUBLICATION ETHICS (RPE)**

**THEORY**

**Unit 1: PHILOSOPHY AND ETHICS (3 HRS)**

1. Introduction to philosophy: definition, nature and scope, concept, branches
2. Ethics: definition, moral philosophy, nature of moral judgements and reactions.

**Unit2: SCIENTIFIC CONDUCT (5 HRS)**

1. Ethics with respect to science and research
2. Intellectual honest and research integrity
3. Scientific misconducts: falsification, fabrication, and plagiarism.
4. Redundant publications: duplicate and overlapping publications, salami slicing
5. Selective reporting and misrepresentation of data.

**Unit3: PUBLICATION ETHICS (7 HRS)**

1. Publication ethics: definition, introduction and importance
2. Best practices/standards setting initiatives and guidelines: COPE, WAME, etc.
3. Conflicts of interest
4. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types
5. Violation of publication ethics, authorship and contributor ship
6. Identification of publication misconduct, complaints and appeals
7. Predatory publishers and journals

**PRACTICE**

**Unit4: OPEN ACCESS PUBLISHING (4 HRS)**

1. Open access publications and initiatives
2. SHERPA/RoMEO online resource to check publisher copyright and self-archiving policies.
3. Software tool to identify predatory publications developed by SPPU
4. Journal finder/ journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggested, etc.

**Unit5: PUBLICATION MISCONDUCT (4 HRS)**

**A. Group Discussions (2 hrs)**

1. Subject specific ethical issues, FFP, authorship
2. Conflicts of interest
3. Complaints and appeals: examples and fraud from India and abroad

**B. Software tools (2 hrs):** Use of plagiarism software like Turnitin, Urkund and other open source software tools.

**Unit6: DATABASES AND RESEARCH METRICS (7 HRS)**

**A Databases (4 hrs)**

1. Indexing databases
2. Citation databases: Web of Science, Scopus, etc.

**B. Research Metrics (3 hrs)**

Impact Factor of journal as per journal citation report, SNIP, SJR, IPP, Cite Score.  
Metrics: h-index, g index, i10 index, altmetrics

**M.Phil/Ph.D Syllabus 2020**  
**School of Life Sciences, AUS**  
**Course Title: Research methodology**  
**Paper – 502 (School Level)**  
**(Common paper for Biotechnology, Microbiology & Life Sc Departments)**  
**Total Marks: 100**  
**Credits: 04**

**Unit – 1**

1. Statement of research problem, formation of objectives, types of research-basic and applied.
2. Formulation of hypothesis and design of experiments.
3. Review of literature, basic concepts.
4. Laws and theories related to research problem.

**Unit – 2**

1. Intellectual Property Rights (IPR) issues and Biosafety.
2. Ethics in Science and Technology, Plagiarism.
3. Impact of research on environment; Benefits of research to human community.
4. Preparation of research proposal, report and scientific paper.

**Unit – 3**

1. Introduction to databases (Pubmed) for literature.
2. Application of MS-office in research, Data analysis using MS-Excel.
3. Softwares: Mendeley, End note for references, Plagiarism detection tools.
4. Power Point presentations and Software for Graphics.

**Unit – 4**

1. Applications of statistics in research, measures of central tendency (mean, mode, median), measures of dispersion (standard deviation, variance, coefficient of variation).
2. Levels of significance in biological data analysis and their interpretations.
3. Formulation of hypothesis, type I and type II errors, parametric and nonparametric tests, simple correlation and regression analysis.
4. Tests of significance, chi-square test, t-tests and their applications, using software for statistical analysis.

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**Department of Microbiology**

**PAPER 503: BIOINSTRUMENTATION AND BIO-TECHNIQUES**

**Maximum marks: 100**

**(credits 04)**

**Unit I (Research Techniques):**

Centrifugation: Basic principle and application, differential, density and ultracentrifugation.

Basic of chromatography and its application: Thin layer, Gel filtration, Ion exchange, Affinity, HPLC, FPLC,

Principle and application of electrophoresis: Native, SDS, Agarose and 2D gel electrophoresis, DGGE and TGGE- application in metagenomics.

Isolation and purification of nucleic acids, amplification of DNA using PCR, recombinant PCR, Asymmetric PCR, nested PCR, use of restriction and modification in enzymes in cloning, plasmid vectors, DNA sequencing- Sanger sequencing, next generation sequencing.

Principle and applications of Southern, Northern and Western blotting.

**Unit II (Research Area Specific):**

Fundamental knowledge of infectious diseases, Bacterial and viral infectious diseases, Parasitic infectious diseases, Neglected tropical diseases, Emerging infectious diseases

**Food Microbiology and Public Health:** Introduction to Food microbiology and Principles of food microbiological analysis; Techniques for Bacterial Isolation and identification; Microbial Contamination, Preservation and Spoilage of different foods; Microbial Toxins and Food Protection; Food Toxicology and Waste Management; Microbial Food Products for Human Consumption; Standards for Food safety; Food Biotechnology and Food Quality Control act; and Trade Regulation of Food.

**Leishmaniasis:** Life cycle of *Leishmania*, Types of leishmaniasis, Indian scenario of leishmaniasis, Epidemiology and geography of leishmaniasis, Vector and transmission of leishmaniasis, diagnosis and treatment for leishmaniasis- Current Scenario of available treatment, Mechanism of drug resistance and drug susceptibility for promastigotes and amastigotes, Design of new therapeutics and their validation: In-silico approach to develop new therapeutics, Identification of drug targets; Vaccine design and validation

**Mechanism of Bacterial infection:** Molecular basis of bacterial pathogenesis and virulence, bacterial biofilm, bacterial persistence, bacterial secreting systems, cell wall biosynthesis, hospital acquired infections and ESKAPE pathogens, biology and distribution of infection caused by *A. baumannii*, *P. aeruginosa*, *S. aureus*, *K. pneumoniae*, *S. typhi*, *S. typhimurium*, *M. tuberculosis*, *E. coli*, *H. pylori*, *V. cholera* etc, Current therapeutics and their resistance: Antibiotics: classes and mechanism of action, Surveillance model for prediction of antimicrobial susceptibility; Bacterial drug resistance mechanism; Diagnosis of bacterial infection: 16S sequencing, PCR, ELISA, microscopy, antimicrobial susceptibility assay, model systems to understand pathogenic mechanisms.

**Soil and Environmental Microbiology:** Rhizosphere, Plant growth promoting rhizobacteria and Biocontrol agents, Mechanisms of plant growth promotion by bacteria. Biodegradation of pollutants in soil by microorganisms. Techniques used in assessment of soil microbial

diversity. Environmental Genomics. Heavy metal resistance in bacteria. Bacterial endophytes and Plant – microbe cross-talks, Quorum sensing.

## REFERENCES

1. Skoog, A., Holler, F. J., Nieman, T. A. Principles of Instrumental Analysis Douglas. Saunders College Pub.
2. Principles and Techniques of Practical Biochemistry by Wislon and Walker, fifth edition, Cambridge University Press.
3. Principles and Techniques of Practical Biochemistry by Wislon and Walker, fifth edition, Cambridge University Press.
4. Michael J Pelczar, Microbiology, Tata McGraw, India. Prescott's Microbiology 8th Edition by Joanne Willey , Linda Woolverton
5. WHO technical series-949; Control of the leishmaniasis (ISBN 978 92 4 120949).
6. Ian Pepper Charles Gerba Terry Gentry, Environmental Microbiology, ISBN: 9780123946263, eBook ISBN: 9780123948175, Academic Press

### **MPhil/PhD SYLLABUS 2020 Department of Microbiology**

#### **PAPER 504: Term Paper**

**Maximum marks: 100**

**(credits 04)**

Research based paper, be taken up by the scholars under the supervision of faculty member, on specific topic of research.