

Hargobind Khurana School of Life Sciences: Assam University, Silchar
M.Phil/Ph.D. Syllabus - 2020

Common University Level Paper:

IPP – 501: Research and Publication Ethics (RPE)

Total Marks: 100

Credits: 02

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.

Unit 2: 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.

Hargobind Khurana School of Life Sciences: Assam University, Silchar
M.Phil/Ph.D. Syllabus - 2020

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):

1. 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)

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

Hargobind Khurana School of Life Sciences: Assam University, Silchar
M.Phil/Ph.D. Syllabus - 2020

Common School Level Paper:

IPP – 502: School Level

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

Hargobind Khurana School of Life Sciences: Assam University, Silchar
M.Phil/Ph.D. Syllabus - 2020

Department Level Papers:

IPP – 503: Biotechnology

Total Marks: 100

Credits: 04

Unit – 1

1. Principles and applications of spectrophotometry & NMR.
2. Principles and applications of Chromatography, GC-MS.
3. Principles and applications of PCR, DNA sequencing.
4. Principles and applications of flow cytometer.
5. Gene cloning- vectors, restriction endonucleases, Genetically Modified Organisms (GMOs), Genetically Modified Microorganisms (GMMs) and their applications.

Unit – 2

1. DNA markers and their applications. Biotechnological approaches for disease diagnosis.
2. Plant transgenesis and tissue culture, transgenesis in animals
3. Metagenomics, Bioremediation and applications of biotechnology in controlling climate change.
4. Identification of bacteria on the basis of ribosomal gene sequence analysis. Assessment of microbial diversity by molecular techniques.
5. Biodegradation of recalcitrant compounds (lignin- pesticides), bioinoculants-biopesticides and bioinsecticides.

Unit – 3

1. Scientific databases and retrieval of data: Nucleotide databases, protein databases and literature databases.
2. Tools for alignment of nucleotide and protein sequences- local alignment and multiple alignment.
3. Writing of Research Proposal, Report and Research Paper: Meaning and types - Stages in preparation - Characteristics - Structure - Footnotes and Bibliography- use of Endnote. Checklist for a good proposal/report/research paper. Ethical, legal, social and scientific issues in Biological Research. IPR, patents and Biosafety.
4. Principles and applications of Atomic absorption spectrophotometry, Flow cytometry, Western blotting, ELISA, PAGE, SDS-PAGE, Agarose gel electrophoresis, 2D-gel electrophoresis, microarray analysis, mass spectrometry.
5. Isolation and purification of DNA. Commonly used vectors for gene-cloning, DNA manipulating enzymes, construction of genomic and cDNA libraries. Applications of Quantitative Real Time PCR

Unit – 4

1. Introduction to applications of statistics in biology.
2. Measures of dispersion, Simple correlation and Regression analysis.
3. Tests of significance; F-test, paired t-test and unpaired t-test, Chi-square test and its applications.

Hargobind Khurana School of Life Sciences: Assam University, Silchar
M.Phil/Ph.D. Syllabus - 2020

4. Analysis of variance (ANOVA)
5. Design of experiments (CRD and RBD designs) for Biotechnology.

IPP – 503: Life Science and Bioinformatics

Total Marks: 100

Credits: 04

Unit – I: Common methodology of general nature

1. Biosafety regulations and laboratory safety measures in biological research
2. Free radicals and antioxidants in health and disease
3. Isolation and quantification of DNA and RNA from various sources
4. Ecotoxicogenomics: Concepts, principles and applications

Unit – II: Advanced methodology of general nature

1. Functional foods, nutraceuticals and Ayurveda for lifestyle disorders
2. Classical and combined therapies in life style disorders
3. Biogeochemistry of priority trace elements and their quantification techniques
4. Reprogenetics – Concepts, principles and applications

Unit – III: Research area specific methods related to plant sciences

1. Separation and identification of phytochemicals
2. Nucleotide sequence databases and sequence analysis
3. Microbial cell factories for biomolecule production: Methods, tools and techniques
4. Methods of floristic, revisionary & monographic studies; process of describing new species

Unit – IV: Research area specific methods related to animal sciences

1. Neurodegenerative disorders: Implications and therapeutic strategies
2. Stereotactic surgery in neuroscience research
3. Bioremediation: Concepts, principles and applications
4. Assisted reproductive technology: Methods and applications

N.B.- Reading materials and text/reference books will be suggested by the concerned faculty in the class room

Hargobind Khurana School of Life Sciences: Assam University, Silchar
M.Phil/Ph.D. Syllabus - 2020

IPP – 503: Microbiology
(Bioinstrumentation and Bio-Techniques)

Total 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. coil*, *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

Hargobind Khurana School of Life Sciences: Assam University, Silchar
M.Phil/Ph.D. Syllabus - 2020

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

Hargobind Khurana School of Life Sciences: Assam University, Silchar
M.Phil/Ph.D. Syllabus - 2020

IPP – 504: Term paper
(Biotechnology/Life Science / Microbiology)

Total Marks: 100

Credits: 06

Total Marks: 100

Credits: 06

Term paper is to be assigned in the beginning of the semester to each Ph.D/MPhil student for its submission to the Department. The paper may include preparation of Protocol, Review of Literature, Methodology or any relevant topic of Research.
