

**Syllabus for Ph.D. Course Work in Zoology
(For Session 2020-2022 Onwards)**



**Department of Zoology
The University of Burdwan
Burdwan 713104
West Bengal**

Course Structure

Semester	Course Code	Courses	Marks	Credits
I	PHSZO-101	Research Methodology	50	4
	PHSZO-102	Research & Publication Ethics	25	2
	PHSZO-103	Applications of Techniques in Zoology	50	4
	PHSZO-104	Term paper(s) & Seminar presentation (s)	50 (25 + 25)	4
		Total		175

SEM- I

COURSE: MPSZO- 101

(Research Methodology)

Time: 2 hrs.

Full marks: 50 (Credit: 4)

Lectures: 35

Five questions (out of eight) of 1 marks each, two questions (out of four) of 5 marks each and one question (out of two) of 10 marks each are to be answered

1. Sampling and data collection: Sampling methods, experimental data, field data, survey data, estimation of sample size 3L
2. Statistical Methods: Parametric and non-parametric test, Laws of probability, Multivariate analysis, Area under curve, Principal component analysis, Survival analysis, Vital statistics in relation to disease epidemiology 8L
3. Model organisms: Introduction to model organism, Definition, Types, Characteristics. Model organism in biological research: *Dictyostelium discoideum*, Yeast, Hydra, *Caenorhabditis elegans*, *Drosophila*, *Zebrafish*, Mouse. 6L
4. Field biology methods: Characterization of habitat and population study, Scaling laws 4L
5. Bioinformatics: Database searching, Sequence alignment, Structure prediction, Molecular phylogeny 5L
6. Concept of IPR, Brief outline of Indian Patent rule, patent procedure, International patent system – PCT, Patent database and searching – in PASS, EPO, USPTO 4L
7. Computer applications: Network concept, Computer cluster, Super computer, Remote computation platform – Biogrid India, Search engines, Online resources, BioGRID 5L

Suggested readings:

- Kothari, C. R. (2004). *Research Methodology. Methods and Techniques*. New Age International (P) Limited.
- Ronald, N. F., Eun, S. E. & Michael, H. (2007). *Biostatistics. A guide to Design, Analysis, and Discovery*. Academic Press.
- Rastogi, V. B. (2015). *Biostatistics*. Scientific International Pvt. Ltd.
- WHO (2003). *Laboratory Biosafety Manual*
- DBT (1990). *Recombinant DNA safety guidelines and regulation*
- DBT (2011). *Guidelines and Handbook for Institutional Biosafety Committee (IBSC)*
- Manual of Patent office practice and Procedure (2011). THE OFFICE OF CONTROLLER GENERAL OF PATENTS, DESIGNS & TRADEMARKS.
- Tenenbaum, A. S & Wetherhall, D. J. (2013). *Computer Networks*. Pearson
- Zar, J. H. (1999). *Biostatistical analysis*. Pearson Education Inc., New Delhi, India

COURSE: MPSZO- 102

Time: 1 hr.

Full marks: 25 (Credit: 2)

Lectures: 18

(Research and publication Ethics)

Five questions (out of eight) of 1 marks each, two questions (out of two) of 5 marks each and one question (out of two) of 10 marks each are to be answered

THEORY

1. Philosophy and Ethics: Introduction to Philosophy: definition, nature and scope, concept, branches; Ethics: Definition, moral philosophy, nature of moral judgments and reactions
2L
2. Scientific Conduct: Ethics with respect to science and research, Intellectual honesty and research integrity, Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP); Redundant publications: duplicate and overlapping publications, salami slicing; Selective reporting and misrepresentation of data
4L
3. Publication Ethics: Definition, introduction and importance; Best practices/standards setting initiatives and guidelines: COPE, WAME etc.; Conflicts of interest; Publication misconduct: Definition, concept, problems that lead to unethical behavior and vice versa, types; Violation of publication ethics, authorship and contributorship; Identification of publication misconduct, complaints and appeals; Predatory publishers and journals
6L

PRACTICE

4. Open Access Publishing: Open access publications and initiatives; SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies; Software tool to identify predatory publications developed by SPPU: UGC-CARE list of journals; Journal finder/journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggester, etc.
2L
5. Publication Misconduct: *A. Group discussions*–Subject specific ethical issues, FFP, authorship; Conflicts of interest; Complaints and appeals: examples and fraud from India and abroad; *B. Software tools* – Use of plagiarism software like Turnitin, Urkund and other open source software tools
2L
6. Databases and research metrics: *A. Databases*– Indexing databases; Citation databases: Web of Science, Scopus etc.; *B. Research Metrics*–Impact factor of journal as per Journal Citation Report, SNIP, SJR, IPP, CiteScore; Metrics: h-index, g-index, i-10 index, altmetrics
2L

COURSE: MPSZO- 103

(Applications of Techniques in Zoology)

Time: 2 hrs.

Full marks: 50 (Credit: 4)

Lectures: 35

Five questions (out of eight) of 1 marks each, two questions (out of four) of 5 marks each and one question (out of two) of 10 marks each are to be answered

1. Microscopy: Principles of Light Microscope (LM), Fluorescence Microscope, Confocal Microscope, Scanning Electron Microscope (SEM), Transmission Electron Microscope (TEM) 3L
2. Histological and Histochemical methods: Tissue preparation for light microscopy, SEM, TEM, Ultramicrotomy, Staining, Laser Micro Dissection (LMD) 3L
3. Cell culture techniques, Adherence and suspension culture, Cryofreezing, Animal cell for microbial research 4L
4. Techniques in toxicological study 3L
5. Techniques in nutrition studies: Nutrient evaluation, Digestibility determination , Nutrigenomics 3L
6. Biosystematics: Cladistics: Theory, character coding, character polarity, tree building techniques; Parsimony analysis; Parametric phylogenetics; Keys: Types and Methods of construction; Important rules of ICZN 5L
7. Spectroscopy: UV-VIS, IR, Spectrophotometry, Spectrofluometry, Mass spectroscopy, NMR 3L
8. Chromatography: HPLC, FPLC, Gas chromatography 2L
9. Microbial techniques: Sterilization techniques: Physical methods (Dry heat, moist heat, radiation and filtration) and Chemical methods (alcohol, aldehyde and inorganic chemicals); Bacterial culture methods 3L
10. Allergy: Background of allergy, Different types of allergy & symptoms, Mechanism of allergic reactions, Diagnostic methods, Genomic approach of allergy, Therapeutic approach 4L

Suggested readings:

- Bancroft, J. D. & Gamble, M. (2002). *Theory & practice of Histological Technique*. Churchill Livingstone.
- Chen, M-H. , Kuo, L. & Lewis, P.O. (2014). *Bayesian phylogenetics: methods, computational algorithms, and applications*. CRC Press, Taylor & Francis group, A Chapman & Hall book.
- Forey, P. L., Humphries, C. J., Kitching, I.J., Scotland, R. W. & Siebert, D. (1993). *Cladistics – A practical course in systematics*. Oxford University Press.

- Friefelder, D. (1982). *Physical Biochemistry*. W. H. Freeman & Co. (Reprint 1999).
- Hayat, M. A. (ed.) (1970-1978). *Principles and Techniques of Electron Microscopy: Biological Applications*. 2nd edition. vanNostrand Reinhold, New York.
- International Commission on Zoological Nomenclature (1999). *International Code of Zoological Nomenclature*. 4thed. The International Trust for Zoological Nomenclature.
- Kapoor, V. C. & Kapoor, M. (2012). *Theory and Practice of Animal Taxonomy*. Oxford and IBH. 7th ed.
- Kiernan, J. A. (1999). *Histology and Histochemical Methods: Theory & Practice*. 3rd ed, Butterworth Heinemann.
- Kitching, I. J., Forey, P. L., Humphries, C. J. & Williams, D. (1998). *Cladistics: Theory and Practice of Parsimony Analysis (Systematics Association Special Volumes)*. 2nd ed. OUP Oxford.
- Livingstone, C. & Weesner, F. M. (1965). *General Zoological Techniques*. The William & Wilkins Company
- Mayr, E. & Ashlock, P. D. (1991). *Principles of Systematic Zoology*. 2 ed. McGraw-Hill.
- Quicke, D. A. J. (1993). *Principles and Techniques of Contemporary Taxonomy*. Blackie Academic and Professional.
- Scott-Ram, N. R. (1990). *Transformed cladistics, taxonomy and evolution*. Cambridge University Press.
- Sharma, B. K. (1991). *Techniques in Microscopy and Cell Biology*. Tata-McGraw Hill.
- Sharma, V. K. (1991). *Techniques in Microscopy and Cell Biology*. Tata-McGraw Hill.
- Spencer, M. (1982). *Fundamentals of Light Microscopy*. Cambridge University Press, Cambridge.
- Stoward, P. J. & Everson Pearse, A. G. (1991). *Histochemistry: Theory and Practical*. 4th ed.
- Wilson, K., & Walker, J. (eds.) (2001). *Principles & Techniques of Practical Biochemistry*. 5th ed. Cambridge University Press.

COURSE: MPSZO- 104
(Term paper)

Full marks: 50 (Credit: 4)

Term paper submission:	25
Seminar presentation and interaction:	25 (15+10)