Post Graduate Department of Zoology

Berhampur University

Bhanja Bihar, Berhampur, Ganjam, Odisha
Berhampur-760007

Pre-Ph.D. Syllabus

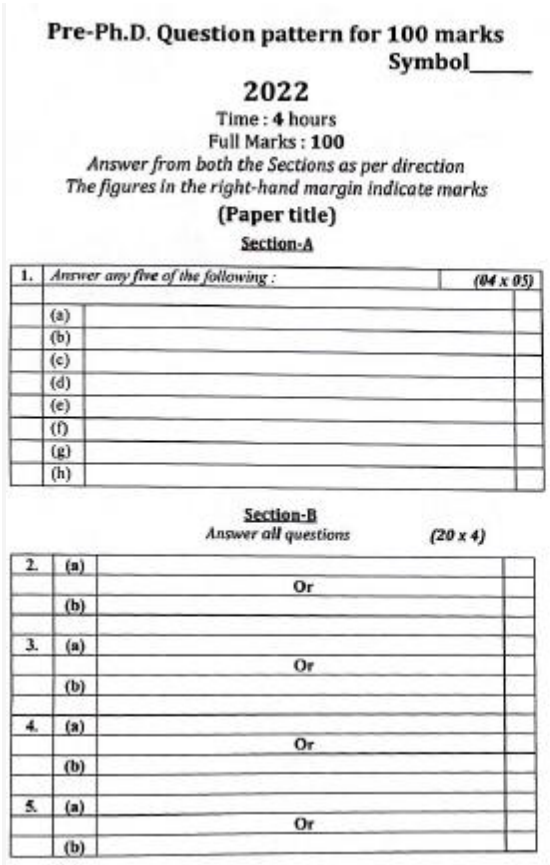
Curriculum Overview (Pre-Ph.D.)

Distribution of Course

- Semester I: Three (03) Core Courses, one (01) Elective and Seminars

Scheme of Evaluation:

1. Each theory papers having 100 Marks is divided into 20 Marks of Internal Valuation and 80 Marks of final examination in each semester.
2. The question pattern is mentioned below



Pre-Ph.D. Question pattern for 100 marks
Symbol_____

2022

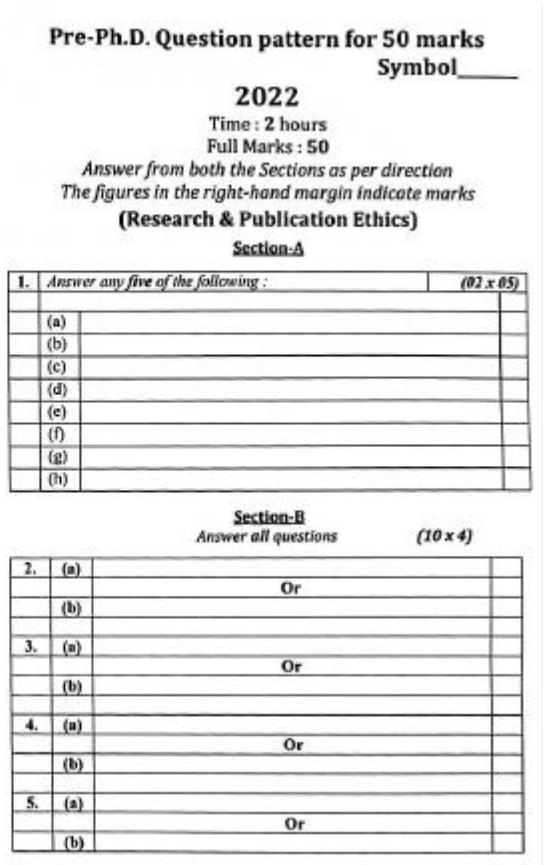
Time : **4** hours
Full Marks : **100**
Answer from both the Sections as per direction
The figures in the right-hand margin indicate marks
(Paper title)

Section-A

1.	*Answer any five of the following :*	*(04 x 05)*	
	(a)		
	(b)		
	(c)		
	(d)		
	(e)		
	(f)		
	(g)		
	(h)		

Section-B
Answer all questions *(20 x 4)*

2.	(a)		
		Or	
	(b)		
3.	(a)		
		Or	
	(b)		
4.	(a)		
		Or	
	(b)		
5.	(a)		
		Or	
	(b)		



Pre-Ph.D. Question pattern for 50 marks
Symbol_____

2022

Time : **2** hours
Full Marks : **50**
Answer from both the Sections as per direction
The figures in the right-hand margin indicate marks
(Research & Publication Ethics)

Section-A

1.	*Answer any five of the following :*	*(02 x 05)*	
	(a)		
	(b)		
	(c)		
	(d)		
	(e)		
	(f)		
	(g)		
	(h)		

Section-B
Answer all questions *(10 x 4)*

2.	(a)		
		Or	
	(b)		
3.	(a)		
		Or	
	(b)		
4.	(a)		
		Or	
	(b)		
5.	(a)		
		Or	
	(b)		

Pre-Ph.D. Zoology

S. No	Paper No	Title	Credits	Proposed Marks
		SEMESTER ONE		
1	ZOOL MPC 101	Research Methodology in Zoology	04	100
2	ZOOL MPC 102	Research Tools and Techniques	04	100
3	ZOOL MPE 103	Elective I*	04	100
4	ZOOL MPC 104	Research and Publication Ethics	02	50
5	ZOOL MPS 105	Seminar Presentation on Review of Literature and research proposal	02	50
		Total	16	400

Recommended Electives

ZOOL MPE 103*Elective I: MPE 103) Advances in Environmental Sciences/ MPE103) Economic Zoology

SEMESTER-I

Semester-One

ZOOL MPC 101

Research Methodology in Zoology

Credits

4

Course Objectives: Objective of the course is to develop technical skill of students in research. The students shall be exposed to various practical problems in research like concept, planning, ethical issues, data analysis and use of ICT in research problem solving and analysis.

Student Learning Outcomes: The students after completion of this course are expected to have a comprehensive idea and hands on experience regarding research methodologies, writing research problems/papers, data analysis using modern statistical software, and use of internet for searching the databases useful in research.

Course Coordinator: Dr. T.K. Barik

Unit I **Scientific Research, its communication** **Lectures:16**	1. Concept of Scientific Research: Nature, Type of research, Methodology, Experimental design, data collection and analysis 2. Literature Survey and problem definition: Need of literature review, Search engines, note taking, library and documentation and management of bibliography software like Endnote and Mendeley 3. Planning of Research: Selection of problem, hypothesis formation, research design/plan 4. Research Communication: Writing review article, research problem, paper, projects and thesis
Unit II **Ethics in Zoological Research** **Lectures:16**	1. Originality, Integrity, Intellectual Property Rights, Patents and Plagiarism in research 2. Ethical issues and bio-safety regulation: DBT Guidelines for Bio-safety, Institutional Bio-safety committee and its functioning 3. Ethics in use of Experimental animals: IAEC, CPCSEA, ICMR Guidelines 4. Ethics in data collection: informed consent, privacy, anonymity, data quality and equity
Unit III **Biostatistics in Research** **Lectures:16**	1. Processing of Data: Classification and tabulation 2. Data analysis: Central tendency, ANOVA, ANCOVA, Variation Correlation and regression 3. Inferential: Hypothesis testing, T- tests, Chi-square test, post- doc tests. Concept of probability 4. Introduction of Computer Program: SPSS/MS-Excel
Unit IV **Informatics in Zoological Research** **Lectures:16**	1. Introduction to internet, Use of internet in Research activities 2. Cyber law, working knowledge of e-resources for research SciNet, JSTOR, Shodhganga, EBSCO host and other online journals. 2. Introduction to Biological databases: FASTA format, Accession, and GI-Number, BIN. 4. Concept of Geographic Information System and application of Global Positioning System in Biodiversity study
	Recommended Textbooks and References: 1. Kothari. C. R. 2004. Research Methodology: Methods and Techniques, New Age International (P) Limited, Publishers, New Delhi – 110002. 2. Jennifer Peat. 2002. Scientific Writing Easy when you know how. BMJ Books 3. Sharma, 2008, Text Book of Biostatistics-I&II, Discovery Publishing 4. Snedecor & Cochran,1968, Statistical Methods, Oxford & IBH 5. Barnes & Gray, 2003, Bioinformatics for Geneticists. Wiley 6. Campbel, 2006, Discovering Genomics, Proteomics and Bioinformatics. LPE 7. Lesk, 2006, Bioinformatics 2/e. Oxford 8. Mount, 2006, Bioinformatics 2/e. CBS 9. Westhead et al, 2003, Bioinformatics Instant Notes. Viva Books (Indian ed.)10.

Semester-One

ZOOL MPC 102

Research Tools and Techniques

Credits

4

Course Objectives: Objective of the course is to provide a descriptive knowledge to the aspirant of Pre-Ph.D. Degree in various basic and advanced laboratory based tools and techniques for application in their research area.

Student Learning Outcomes: The students after completion of this course are expected to have a comprehensive idea and hands on experience regarding handling different routinely used instruments and techniques for their future research endeavor including bio-safety measures required for handling animals.

Course Coordinator: Dr. L.K. Murmu

Unit I **Cell Culture** **Lectures:16**	1. Aseptic technique and preparation of media 2. Types of cell culture 3. Applications of cell culture 4. Microscopy
Unit II **Instrumentation** **Lectures:16**	1. Colorimetry; Spectrophotometry 2. Preparative Centrifugation 3. Immunological techniques 4. Electrophoretic techniques
Unit III **Laboratory Practices** **Lectures:16**	1. Good laboratory practice; Safety and bio- and radio- hazards, safety and precautions 2. Disposal of biological and chemical wastes 3. Accuracy of liquid transfer 4. Preparation of Reagents, chemicals, buffers
Unit IV **Animal Ethics** **Lectures:16**	1. Animal handling and ethics 2. Maintenance of animals 3. Various routes of injections and sample collection 4. Patent, Indian patent Act, filing of patent application
	Recommended Textbooks and References: 1. Introduction to Spectroscopy, Pavia, Lampman, Kriz, Vivyan, Cengage Learning 2. Modern Spectroscopy, J.M. Hollas, Willey Publication 3. Molecular Structure and Spectroscopy, G. Aruldash 4. Experimental Biochemistry, Wilson and Walker 5. Experimental Biochemistry, Rodney Boyer 6. CPCSEA Manuals for Animal Handling and experimentation 7. Ganguli, P. (2001). Intellectual Property Rights: Unleashing the Knowledge Economy. New Delhi: Tata McGraw-Hill Pub.

Semester-One

ZOOL MPE 103

Advances in Environmental Sciences

Credits

4

Course Objectives: Objective of the course is to provide comprehensive and in depth knowledge of ecosystem, population, environmental impact assessment and biodiversity conservation and associated laws.

Students Learning Outcomes: The students after completion of this course are expected to be aware of the adverse effects of environmental deterioration, social issues, laws, and ethics associated with environment. This will enable them adopt precautionary steps for conservation of nature and wild lives.

Course Coordinator: Dr. J. K. Seth

Unit I **Ecosystem and population ecology** **Lectures:16**	1. Ecological tool and techniques for measurement of Abiotic and Biotic Components 2. Laws of thermodynamics, energy flow, mineral cycling, food chain and food web 3. Population dynamics 4. Community Ecology and Ecological succession
Unit II **Applied Ecology** **Lectures:16**	1. Environment and human health: Hazardous chemicals, Pesticides and impact, oil spill and its consequence, Nuclear waste and its biological impact 2. Social issues and the environment: Sustainable development, Indian environmental laws and regulations, ethics 3. Environmental Impact assessment 4. Social waste management
Unit III **Biodiversity** **Lectures:16**	1. Biodiversity: International and National efforts for its conservation 2. Climate change and associated laws 3. Ex-situ and In-situ conservation of wild life 4. Genetically Modified food and associated hazards
Unit IV **Ecotechnology** **Lectures:16**	1. Bioremediation 2. Vermi-composting 3. Biofuel 4. Bio-fertilizer
	Recommended Textbooks and References: 1. Fundamental of Ecology : O.P. Odum 2. Campbell Biology: Reece, Urry,Cain *et al*. 3. Evolutionary analysis: Herron and freeman 4. Convention of Biological diversity- https://www.cbd.int/ 5. Aichi Biodiversity Targets- https://www.cbd.int/sp/targets/ 6. IUCN-https://www.iucn.org/ 7. CITES-https://cites.org/eng 8. https://sustainabledevelopment.un.org/topics/biodiversityandecosystems 9. https://bch.cbd.int/protocol/ 10. https://www.cbd.int/abs/ 11. https://wwf.panda.org/ 12. http://moef.gov.in/ 13. http://nbaindia.org/

Semester-One

ZOOL MPE 103

Economic Zoology

Credits

4

Course Objectives: Objective of the course is to provide a descriptive knowledge to the Pre-Ph.D. scholars regarding economical aspects and application perspectives of Zoology including advanced genetic engineering.

Student Learning Outcomes: The students after completion of this course are expected to have better understanding and hands on experience for aquaculture, pisciculture and animal farming. This will prompt them towards entrepreneurship development and job creation.

Course Coordinator: Dr. S. K. Dash

Unit I **Aquaculture** **Lectures:16**	1. Fish culture techniques and management 2. Techniques and management of prawn culture 3. Pearl culture 4. Aquaponics
Unit II **Economic Entomology** **Lectures:16**	1. Sericulture 2. Apiculture 3. Lac culture 4. Predator, parasites and pathogens of economic insects
Unit III **Diary and poultry** **Lectures:16**	1. Dairy farming 2. Poultry 3. Piggery 4. Integrated farming
Unit IV **Applicative Genetic Engeenering** **Lectures:16**	1. Genetic Engineering 2. GMO 3. Recombinant Vaccines 4. Gene Therapy
	Recommended Textbooks and References: 1. Venkitaraman: Economic Zoology (Sudarsana Publishers, 1983) 2. Srivastava : A Text Book of Applied Entomology, Vol. II & III (Kalyani Publishers,1988 & 1991) 3. Shukla & Upadhyaya : Economic Zoology (Rastogi Publishers, 1999-2000) 4. Molecular Cell Biology, Lodish, Berk, Kaiser, Krieger, Bretscher, Ploegh, Amon, Martin 5. Cell Biology, G. Karp 6. Cell and Molecular Biology, De Robertis 7. Molecular Biology of the Cell, Alberts *et al*., Garland Science, New York, USA

Semester-One

ZOOL MPC 104

Research and Publication Ethics

Credits:

2

Course Objectives: This course has total 6 units focusing on basics of philosophy of science and ethics, research integrity, publication ethics. Hands-on-sessions are designed to identify research misconduct and predatory publications. Indexing and citation databases, open access publications, research metrics (citation, h-index, impact factor, etc.) and plagiarism tools will be covered in the course

Student Learning Outcomes: This course makes aware the students about the publication ethics and publication misconduct that will reframe them to avoid scientific and publication misconduct and improve their ethical research abilities.

Course Coordinator: Dr. P.K. Dixit

The course comprises six modules listed in table below. Each module has 4-5 Units

Modules	**Unit Title**	**Teaching Hours**
Unit-I	Philosophy and Ethics	4
Unit-II	Scientific Conduct	4
Unit-III	Publication Ethics	7
Practice		
Unit-IV	Open Access Publishing	4
Unit-V	Publication Misconduct	4
Unit-VI	Database and Research Metrics	7
	Total	30

Syllabus in detail:

THEORY

- **Unit-I: Philosophy and Ethics (4 Hrs)**
  - Introduction to philosophy: definition, nature and scope, concept, branches
  - Ethics: definition, moral philosophy, nature of moral judgments and reactions

- **Unit-II: Scientific Conduct (4 Hrs)**
  - Ethics with respect to science and research
  - Intellectual honesty and research integrity
  - Scientific misconduct: falsification, fabrication and plagiarism
  - Redundant publications: duplicate and overlapping publications, salami slicing
  - Selective reporting and misrepresentation of data

- **Unit-III: Publication Ethics (7 Hrs)**
  - Publication ethics: definition, introduction and importance
  - Best practices/standard setting initiatives and guidance: COPE, WAMe etc.
  - Conflict of interest

- Publication misconduct: definition, concept, problem 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

PRACTICE

- **Unit-IV: Open Access Publishing (4 Hrs)**
  - Open access publishing and initiatives
  - SHERPA/Romeo online resource to check publisher copyright and self-archiving policies
  - Software to identify predatory publications developed by SPPU
  - Journal finder/journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal suggestions etc.

- **Unit-V: Publication misconduct (4 Hrs)**
  - **A: Group Discussion (2 Hrs)**
    - Subject specific ethical issues, FFP, authorship
    - Conflict of interest
    - Complaints and appeals: examples, fraud from India and abroad
  - **B: Software tools (2 Hrs)**
    - Use of plagiarism software like Turnitin, Urkund and other open source software tools

- **Unit-VI: Database and Research Metrics (7 Hrs)**
  - **A: Databases (4 Hrs)**
    - Indexing databases
    - Citation databases: WoS, Scopus Etc.
  - **B: Research Metrics (3 Hrs)**
    - Impact factor of journal as per citation report, SNIP, SJR, IPP, and Cite score
    - Metrics: h-index, g-index, i10-index and altmetrics

Bird, A. (2006). *Philosophy of Science*. Routledge.
MacIntyre, Alasdair (1967) *A Short History of Ethics*. London.
P. Chaddah, (2018) Ethics in Competitive Research: Do not get scooped; do not get plagiarized, ISBN:978-9387480865
National Academy of Sciences, National Academy of Engineering and Institute of Medicine. (2009). *On Being a Scientist: A Guide to Responsible Conduct in Research: Third Edition*. National Academies Press.
Resnik, D. B. (2011). What is ethics in research & why is it important. *National Institute of Environmental Health Sciences*, 1–10. Retrieved from https://www.niehs.nih.gov/research/resources/bioethics/whatis/index.cfm
Beall, J. (2012). Predatory publishers are corrupting open access. Nature, 489(7415), 179–179. https://doi.org/10.1038/489179a
Indian National Science Academy (INSA), Ethics in Science Education, Research and Governance(2019), ISBN:978-81-939482-1-7. http://www.insaindia.res.in/pdf/Ethics_Book.pdf

Semester- One

ZOOL MPS 105

Seminar Presentation on Review of Literature and research proposal

Course Objectives: This paper is designed to give the student an exposure to the methodology in preparation of his/her dissertation and improve the communication/presentation skills.

Student Learning Outcomes: Students after completion of this course will be acquainted with presentation and discussion of scientific thoughts along with development of understandings and skills.

Credits

2

Course Coordinator: Head, Department of Zoology

	Presentation on review of literature, Research Proposal and plan of research