

# **Syllabus: 2020-21 onwards**

## **M.Phil. and Pre-Ph.D. Zoology Courses**



**Department of Zoology, Berhampur University  
Bhanja Bihar, Berhampur, Ganjam, Odisha-  
760007**

### 1. Department Profile

The Department of Zoology offers two years P.G. Course in Zoology with major focus on Modern Biology. The M.Phil. and Ph.D. Program of the Department has been designed to facilitate the students with both theoretical and practical knowledge in different cutting edge area of biological sciences. The major thrust area of department includes Biochemistry, Physiology, Applied Entomology, Nano-technology, Biodiversity, Conservation Biology, Molecular Systematics, Evolutionary Biology, Molecular Parasitism, Molecular Diagnosis and Biosensor.

### 2. Student Strength

- a. P.G. Part-I: 50
- b. P.G. Part-II: 50
- c. M.Phil.: 08
- d. Ph.D.: As per the availability of the slots

### 3. Faculty Strength

Sl. No	Name and Designation	Qualification	Contact No.	E-Mail	Area of Research interest
1	Dr. G. Mishra, Professor	Ph.D.	9437592010/ 9337633384	gmishra.bu@gmail.com	Biochemistry
2	Dr. P.K. Dixit, Reader and Head	Ph.D.	9437090190/ 9090790807	drdixit2001@gmail.com	Physiology, Biochemistry
3	Dr. T.K. Barik, Asst. Professor	Ph.D.	9583500088/ 8917289089	tkbarik@rediffmail.com	Applied Entomology, Nanotechnology
4	Dr. J.K. Seth, Asst. Professor	Ph.D.	9658887688	jkseth52@gmail.com	Biodiversity, Conservation Biology, Molecular Systematic, Evolutionary Biology
5	Mr. L.K. Murmu, Asst. Professor	M.Phil.	9090457648	murmu.laxmankumar36@gmail.com	Molecular Parasitism
6	Dr. S.K. Dash, Asst. Professor	Ph.D.	9438764504	dashsandipkumar@gmail.com	Molecular Diagnosis, Biosensor.

#### 4. Supporting Staff:

Sl. No.	Name of the Employee	Contact	E-Mail
1	Mr. K.C. Panda	9861280550	
2	Dr. D. Sahu	9437030878	deben_sahu@yahoo.co.in
3	Mr. Abhiram Palai	9861346150	
4	Mr. Y. Rajeswar Rao	8596045003	

#### 5. Courses offered

**P.G.: Semester-I:** Biology of Non-Chordate, Cytology, Inheritance Biology, Biosystematics, Conservation Biology, Evolution and Ecology, Biochemistry, Laboratory Course Work-I; **Semester-II:** Biology of Chordates, Molecular Biology, Physiology, Endocrinology and Histology, Ethology, Applied Ecology, Microbiology, Laboratory Course Work-II; **Semester-III:** Instrumentation and methods in Biology, Immunology, Developmental Biology and Biostatistics, Elective 1: Academic Writing/ Entomology, Laboratory Course Work-III; **Semester-IV:** Cytogenetic, Cancer Biology, Applied Entomology, Epigenetic, Stress Physiology, Molecular Parasitism, Elective 2: Applied Biology/Animal Biotechnology, Project, Dissertation and Viva

**M. Phil. Level:** Basic Research Methodology, Advanced tools and Techniques in Biology and electives like advances in Environmental Sciences and Economic Zoology, Seminar Presentation, Dissertation and Viva.

**Research (Ph.D.)** in the specialized areas of Biochemistry, Physiology, Applied Entomology, Nano-technology, Biodiversity, Conservation Biology, Molecular Systematics, Evolutionary Biology, Molecular Parasitism, Molecular Diagnosis and Biosensor.

Besides this, P.G. Department of Biotechnology (SFC) with capacity of 40 students is attached to our Department. The Department started during 2005 to offer two years P.G. course of Biotechnology with emphasis on Advanced Techniques and Modern Biology.

**6. Academic Dimension:** In addition to above, the department is conducting weekly seminar for both P.G. Part I and II students, also annual intra and inter class quizzes, essay writing in current event in the field of Science and Technology. The students are also participating in the study tour/field trip each year.

**Alumni Meet:** Alumni, Department of Zoology, were established in 1994 to include more than 1500 members by now with a record of reunion every year along with the Annual Day celebration of the Zoology Seminar. Executive body meeting is carried out 2-3 times a year. The basic objectives being reunion, financial and professional cooperation, felicitation of meritorious students, superannuated alumni. To motivate the department students in national competitive examinations like NET and GATE, a prize has been established by the union

which is being conferred to the students qualified in such examinations. Besides, a bulletin citing activities achievements around the year is published.

## **7. Student Facilities**

- a. **Seminar Library:** About 1403 books of national and International repute and more than previous volumes of Research Journals are available.
- b. **Audio-Visual aids:** LCD Projector, Audio system, and the Department is planning to run dust-free smart classes near future.
- c. **Proctorial classes** for the students are held on regular basis
- d. **Museum:** One of the best Zoology museums of the state with thousands of well-preserved specimens.

# M.Phil. and Pre-Ph.D.Zoology

S.No	Paper No	Title	Credits	Proposed Marks
<b>SEMESTER ONE</b>				
1	ZOOLMPC1	Basic Research Methodology	04	100
2	ZOOLMPC2	Research Tools and Techniques	04	100
3		Elective I*	04	100
4	ZOOLMPS3	Presentation on Review of Literature and research proposal writing	04	100
		<b>Total</b>	16	400
<b>SEMESTER TWO</b>				
5	ZOOLMPS4	Seminar and Pre-Submission Presentations	04	100
6	ZOOLMPD1	Dissertation and Viva	12	300
		<b>Total</b>	16	300
<b>TOTAL</b>			<b>32</b>	<b>800</b>

Recommended Electives

ZOOL-ME-103\*Elective I: A) Advances in Environmental Sciences B) Economic Zoology

## Semester-One

ZOOL MPC1

### Basic Research Methodology

Credits:




**Course Objectives:** This course focuses on the basics of science and ethics, research integrity and 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 introduced in this course.

**Student Learning Outcomes:** This course makes aware the students about the publication ethics and publication misconduct.

Course Coordinator: Dr. P.K. Dixit/Dr. J. K. Seth

<b>Unit I</b> Scientific Ethics <b>Lectures:16</b>	<ol style="list-style-type: none"> <li>1. Philosophy and ethics in research</li> <li>2. Scientific conduct</li> <li>3. Publication ethics</li> </ol>
<b>Unit II</b> Research Publication <b>Lectures:16</b>	<ol style="list-style-type: none"> <li>1. Open Access Publishing</li> <li>2. Publication Misconduct</li> <li>3. Database and Research Metrics</li> </ol>

<b>Unit III</b> <b>Research Writing</b> <b>Lectures:16</b>	<ol style="list-style-type: none"> <li>1. Reading and critical analysis of scientific literature</li> <li>2. Communicating research results in peer-reviewed journals</li> <li>3. Acknowledgement of contributions, authorship issues and Plagiarism</li> </ol>
<b>Unit IV</b> <b>Dissertation</b> <b>Lectures:16</b>	<ol style="list-style-type: none"> <li>1. Dissertation/Thesis writing-I (Synopsis writing, presentation, review of literature)</li> <li>2. Dissertation/Thesis writing-II (Introduction, Material and Methods, and Results writing)</li> <li>3. Dissertation/Thesis writing-III (Discussion, Summary and Referencing patterns)</li> </ol>
	<p><b>Recommended Textbooks and References:</b></p> <ol style="list-style-type: none"> <li>1. Philosophy of Science, A. Bird, Routledge</li> <li>2. A short history of Ethics, A. MacIntyre, London</li> <li>3. Ethics in competitive Research: Do not get scooped, do not get plagiarized, P. Chaddah</li> <li>4. On being a Scientist: a guide to responsible conduct in Research, National Academy of Sciences, 3<sup>rd</sup> Edition</li> <li>5. What is ethics in research and why it is important? D.B. Resnik, National Institute of Environmental Health Sciences</li> <li>6. Predatory publishers are corrupting open access, J. Beall, Nature, 489, 179-179.</li> <li>7. Research and Governance, INSA, Ethics in Science Education</li> </ol>

## Semester-One

ZOOL MPC2

### Research Tools and Techniques

Credits




**Course Objectives:** Objective of the course is to Provide a descriptive knowledge to the aspirant of M.Phil. 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 endeavour including biosafety measures required for handling animals.

Course Coordinator: Dr. T.K. Barik/Dr. S. K. Dash

<b>Unit I</b> <b>Cell Culture</b> <b>Lectures:16</b>	<ol style="list-style-type: none"> <li>1. Aseptic technique and preparation of media</li> <li>2. Types of cell culture</li> <li>3. Applications of cell culture</li> <li>4. Microscopy</li> </ol>
<b>Unit II</b> <b>Instrumentation</b> <b>Lectures:16</b>	<ol style="list-style-type: none"> <li>1. Colorimetry; Spectrophotometry</li> <li>2. Preparative Centrifugation</li> <li>3. Immunological techniques</li> <li>4. Electrophoretic techniques</li> </ol>
<b>Unit III</b> <b>Laboratory Practices</b> <b>Lectures:16</b>	<ol style="list-style-type: none"> <li>1. Good laboratory practice; Safety and bio- and radio- hazards, safety and precautions</li> <li>2. Disposal of biological and chemical wastes</li> <li>3. Accuracy of liquid transfer</li> </ol>

	4. Preparation of Reagents, chemicals, buffers
<b>Unit IV</b> Animal Ethics <b>Lectures:16</b>	<ol style="list-style-type: none"> <li>1. Animal handling and ethics</li> <li>2. Maintenance of animals</li> <li>3. Various routes of injections and sample collection</li> <li>4. CPCSEA guidelines; Institutional ethics committees</li> </ol>
	<b>Recommended Textbooks and References:</b> <ol style="list-style-type: none"> <li>1. Introduction to Spectroscopy, Pavia, Lampman, Kriz, Vivyan, Cengage Learning</li> <li>2. Modern Spectroscopy, J.M. Hollas, Willey Publication</li> <li>3. Molecular Structure and Spectroscopy, G. Aruldash</li> <li>4. Experimental Biochemistry, Wilson and Walker</li> <li>5. Experimental Biochemistry, Rodney Boyer</li> <li>6. CPCSEA Manual for Animal Handling and experimentation</li> </ol>

## Semester-One

ZOOL MPE1

### Advances in Environmental Sciences

Credits




**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: Prof. G. Mishra/L. K. Murmu

<b>Unit I</b> Ecosystem and population ecology <b>Lectures:16</b>	<ol style="list-style-type: none"> <li>1. Ecological tool and techniques for measurement of Abiotic and Biotic Components</li> <li>2. Laws of thermodynamics, energy flow, mineral cycling, food chain and food web</li> <li>3. Population dynamics</li> <li>4. Community Ecology and Ecological succession</li> </ol>
<b>Unit II</b> Instrumentation <b>Lectures:16</b>	<ol style="list-style-type: none"> <li>1. Environment and human health: Hazardous chemicals, Pesticides and impact, oil spill and its consequence, Nuclear waste and its biological impact</li> <li>2. Social issues and the environment: Sustainable development, Indian environmental laws and regulations, ethics</li> <li>3. Environmental Impact assessment</li> <li>4. Social waste management</li> </ol>
<b>Unit III</b> Laboratory Practices <b>Lectures:16</b>	<ol style="list-style-type: none"> <li>1. Biodiversity: International and National efforts for its conservation</li> <li>2. Climate change and associated laws</li> <li>3. Ex-situ and In-situ conservation of wild life</li> <li>4. Genetically Modified food and associated hazards</li> </ol>

<b>Unit IV</b> <b>Applied Biology</b> <b>Lectures:16</b>	<ol style="list-style-type: none"> <li>1. Bioremediation</li> <li>2. Vermi-composting</li> <li>3. Biofuel</li> <li>4. Bio-fertilizer</li> </ol>
	<b>Recommended Textbooks and References:</b> <ol style="list-style-type: none"> <li>1. Introduction to Spectroscopy, Pavia, Lampman, Kriz, Vivyan, Cengage Learning</li> <li>2. Modern Spectroscopy, J.M. Hollas, Willey Publication</li> <li>3. Molecular Structure and Spectroscopy, G. Aruldash</li> <li>4. Experimental Biochemistry, Wilson and Walker</li> <li>5. Experimental Biochemistry, Rodney Boyer</li> <li>6. CPCSEA Manual for Animal Handling and experimentation</li> </ol>

## Semester-One

ZOOL MPE2

### Economic Zoology


Credits



**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. T. K. Barik/Dr. S.K.Dash

<b>Unit I</b> <b>Aquaculture</b> <b>Lectures:16</b>	<ol style="list-style-type: none"> <li>1. Fish culture techniques and management</li> <li>2. Techniques and management of prawn culture</li> <li>3. Pearl culture</li> <li>4. Aquaponics</li> </ol>
<b>Unit II</b> <b>Economic Entomology</b> <b>Lectures:16</b>	<ol style="list-style-type: none"> <li>1. Sericulture</li> <li>2. Apiculture</li> <li>3. Lac culture</li> <li>4. Predator, parasites and pathogens of economic insects</li> </ol>
<b>Unit III</b> <b>Diary and poultry</b> <b>Lectures:16</b>	<ol style="list-style-type: none"> <li>1. Dairy farming</li> <li>2. Poultry</li> <li>3. Piggery</li> <li>4. Integrated farming</li> </ol>
<b>Unit IV</b> <b>Applicative Genetic Engineering</b> <b>Lectures:16</b>	<ol style="list-style-type: none"> <li>1. Genetic Engineering</li> <li>2. GMO</li> <li>3. Recombinant Vaccines</li> <li>4. Gene Therapy</li> </ol>
	<b>Recommended Textbooks and References:</b> <ol style="list-style-type: none"> <li>1. Venkitaraman: Economic Zoology (Sudarsana Publishers, 1983)</li> <li>2. Srivastava : A Text Book of Applied Entomology, Vol. II &amp; III (Kalyani Publishers, 1988 &amp; 1991)</li> <li>3. Shukla &amp; Upadhyaya : Economic Zoology (Rastogi Publishers,</li> </ol>



	1999-2000) <b>4.</b> Lehinger Principles of Biochemistry, D.L. Nelson, M.M. Cox, 07 <sup>th</sup> Edition <b>5.</b> Biochemistry, J.M. Berg, L. Stryer, J.L. Tymoczko, G.J. Gatto, 08 <sup>th</sup> Edition <b>6.</b> Animal Cell Culture-Practical Approach., R.W. John, Masters, <b>7.</b> Animal Cell Culture Techniques, M. Clynes,
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## Semester- One

ZOOL MPS3

Presentation on  
Review of  
Literature and  
research  
proposal

Credits



Course Coordinator:  
Head, Department of  
Zoology

**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 aquented with presentation and discussion of scientific thoughts along with development of understandings and skills.

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

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

	Presentation on review of literature, Research Proposal and plan of research
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## Semester- Two

ZOOL MPS4

Seminar and  
Pre-Submission  
Presentations

Credits



**Course Objectives:** This presentation is set for rigorous discussion and analysis of their M.Phil. work.  
**Student Learning Outcomes:** Students after completion of this seminar will have a clear idea and positive feed backs for betterment of their project and take home messages for their future career.

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

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

Course Coordinator: Head, Department of Zoology

	Seminar and Pre-Submission Presentations
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## Semester-Two

ZOOL MPD1

### Dissertation

Credits:



Course

Coordinator: Concern  
Supervisor

**Course Objectives:** This will be the final assessment of the M.Phil. project works.

**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.

	Dissertation and Viva-voce
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