

**Pre Ph.D. Course Zoology**

**Department of Zoology**

*Pre Ph.D. Course Zoology*

# Pre Ph.D. Course Zoology



**HNB Garhwal University  
(A Central University)  
Srinagar - Garhwal  
Uttarakhand**

**Pre Ph.D. Course (Zoology)- 2020**

<b>Code</b>	<b>Course / Paper</b>	<b>Credits</b>	<b>MM</b>
Core I	Research Methodology	04	100
Core II	A. Research and Publication Ethics (RPE)	02	100
	B. Project Report	01	
Elective I	A. Tools & Techniques	04	100
	B. Environmental Biology	04	100
Elective II	A. Freshwater Biology, Aquaculture, Fish Biology & Fisheries Science	04	100
	B. Animal Behaviour & Conservation	04	100
	Total	15	400

**Core Course**            **4 + 3 = 7 Credits**

**Elective Course**       **4 + 4 = 8 Credits**

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**Total 15 Credits**

**Max. Marks for each course/paper: 100 (Two sessional tests of 20 Marks each + one End Semester Examination [2 hours duration] of 60 marks)**

**Sessional Tests (01 hr duration) may include objective tests, assignments, paper presentation, laboratory work etc.**

## **Core Paper**

### **Paper I: Research Methodology**

#### **Unit – I**

Research: Need and purpose, problem identification, objectives and significance, scope and limitation.

Synopsis: Preparation, introduction of the problem, importance of literature survey. Importance and designing of the problem to be undertaken. Use of books, journals and internet for literature survey. Referencing technique etc.

Scientific writing: History and basic concepts (validity, reliability, objectivity and subjectivity) characteristics and format.

Steps to better writing, flow method, organization of material and style.

#### **Unit – II**

Methods: Data collection, types of data: Primary and secondary, Techniques of sampling, sample size, frequency, bias, error, Data summarization and interpretation.

Field survey, Site selection, Source selection for data acquisition. Qualitative and quantitative data.

#### **Unit – III**

Preparation and presentation of data: Tabulation of data, summarization of monthly and seasonal data, drawing figures, graphs etc. Formatting of a Research paper, citing of references, foot notes etc. Abstracting, methodology expression of results, interpretation and discussion.

Presentation, oral, poster, use of audio-visual aids, skill of presentation. Response to audience.

#### **Unit – IV**

**Biostatistics:** Sampling techniques: Simple and random sampling, systematic sampling, stratified sampling, multistage sampling, cluster sampling, multiphase sampling, sample size.

**Data representation:** Tabular and diagrammatic representation of data.

**Measures of central tendency:** Use of mean, mode, median.

**Measures of dispersion:** Use of range, variance, standard deviation, standard error.

Correlation, multiple correlations, regression, multiple regressions, standard error of estimate.

**Test of significance:** t-test, 95% confidence limit, chi square test, F-test, multivariate test.

## Paper II: Research and Publication Ethics

### ANNEXURE

**Course Title:**

- **Research and Publication Ethics (RPE)**-Course for awareness about the publication ethics and publication misconducts.

**Course Level:**

- 2 Credit course (30 hrs.)

**Eligibility:**

- M.Phil., Ph.D. students and interested faculty members (It will be made available to post graduate students at later date)

**Fees:**

- As per University Rules

**Faculty:**

- Interdisciplinary Studies

**Qualifications of faculty members of the course:**

- Ph.D. in relevant subject areas having more than 10 years' of teaching experience

**About the course**

**Course Code: CPE- RPE**

**Overview**

- 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 (citations, h-index, Impact Factor, etc.) and plagiarism tools will be introduced in this course.

**Pedagogy:**

- Class room teaching, guest lectures, group discussions, and practical sessions.

**Evaluation**

- Continuous assessment will be done through tutorials, assignments, quizzes, and group discussions. Weightage will be given for active participation. Final written examination will be conducted at the end of the course.

**Course structure**

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

Modules	Unit title	Teaching hours
<b>Theory</b>		
RPE 01	Philosophy and Ethics	4
RPE 02	Scientific Conduct	4
RPE 03	Publication Ethics	7
<b>Practice</b>		
RPE 04	Open Access Publishing	4
RPE 05	Publication Misconduct	4
RPE 06	Databases and Research Metrics	7
	<b>Total</b>	<b>30</b>

**Syllabus in detail****THEORY**

- RPE 01: 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
- RPE 02: SCIENTIFIC CONDUCT (5hrs.)**
  1. Ethics with respect to science and research
  2. Intellectual honesty and research integrity
  3. Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP)
  4. Redundant publications: duplicate and overlapping publications, salami slicing
  5. Selective reporting and misrepresentation of data
- RPE 03: 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 contributorship
  6. Identification of publication misconduct, complaints and appeals
  7. Predatory publishers and journals

**PRACTICE**

- RPE 04: OPEN ACCESS PUBLISHING(4 hrs.)**

1. Open access publications and initiatives
2. SHERPA/RoMEO online resource to check publisher copyright & 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 Suggester, etc.

• **RPE 05: PUBLICATION MISCONDUCT (4hrs.)**

**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

• **RPE 06: DATABASES AND RESEARCH METRICS (7hrs.)**

**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

**References**

- 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](http://www.insaindia.res.in/pdf/Ethics_Book.pdf)

## **Elective I**

### **Paper IA: Tools & Techniques**

#### **Unit - I**

General principle, instrumentation and application of chromatography.

2D gel electrophoresis.

Centrifugation – Types of centrifugation, laboratory operation and application. Digital probes and meters.

Spectroscopic methods: principle and applications of UV-visible, IR, NMR.

#### **Unit- II**

Principle and applications of X ray crystallography. Application of ELISA, RIA and blotting techniques. Types of microscopes and application in biology.

Techniques of Microtomy, radiotracer techniques.

#### **Unit – III**

Fundamentals of Computer, Concepts of Hardware and Software, Operating System.

Working with Microsoft office (MS-WORD, EXCEL, POWER POINT, etc).

Basic idea of Internet, search through internet and Database search.

Use of internet networks in research activities.

#### **Unit – IV**

#### **Biochemical calculation & Lab management.**

General idea of buffer system. Preparation of buffers such as (phosphate buffer, Tris-cl etc.)

General idea of concentration measurement of solution viz. molarity normality, molality etc.)

Management of laboratories chemicals, glassware's and working with equipments, Laboratory setting.

Preparation of specimen, Reagents in aquatic ecology, fish biology.

**Elective I-B**

**Paper IB: Environmental Biology**

Elective I B: Environmental Biology

**Unit - I**

Introduction to Environmental Biology, its multidisciplinary nature and scope

Components of Environment: Atmosphere, lithosphere, hydrosphere, sociosphere, technosphere and noosphere

Climate (micro, regional and global)

Natural Resources: Human impact on natural resources and their management, Renewable and non-renewable resources.

**Unit - II**

Biodiversity and its conservation, Genetic, Species and ecosystem diversity,

IUCN Red list categories, Biodiversity hotspots, Conservation of biodiversity

National and international efforts in biodiversity conservation (UNEP, IUCN, WWF); UNESCO,

CITES, Convention on Biological Diversity (CBD), World heritage mission, Earth Summit,

Rio+20, Environmental Protection laws and Acts.

**Unit - III**

Global Environmental Problems: Climate change, Green house effect, Ozone layer depletion, Acid Rain, Deforestation, Desertification, Marine Pollution

Environmental Pollution: Pollutants and their control with respect to air, water and noise.

Air Quality Standards, Water Quality Standards.

Waste water treatment, Ganga Action Plan, Namami Gange Project Integrated solid waste management

**Unit - IV**

Environmental Hazards: Earthquake, Landslides, Sedimentation, Cloud burst, Flash floods, Glacial retreat,

Radioactive: Radioactive fallouts from nuclear explosion; UV Radiations, nuclear accidents, soil erosion and conservation,

Biological Indicators: Biological monitoring indicator organisms, invasive species and its impact.

Biological control: Biomagnification, Bioassimilation and Bioaccumulation, Bioassays, Plants and animals as indicators.

Xenobiotics: Carcinogenic (heavy metals, pesticides)



**Elective II-A**

**Paper II-A: Freshwater Biology, Aquaculture, Fish biology & Fishery Science**

**Unit – I**

Ecological Principles, Essentials of Freshwater Ecology.

Essentials of Indian Geography (Plains, plateaus, mountains, major rivers) and Geology (Major soil and rock types), Himalayan Geography (Divisions of Himalaya, Major rivers) and Geology (Greater/Lesser/Himalaya, Siwaliks, Major Rock types). River system in Uttarakhand State.

Geomorphological set up of freshwater bodies of Garhwal Himalaya. Land use and vegetation type in mountains, plains and plateau.

**Unit – II**

Ecological principles: Tolerance, limiting factors, food chains and web, Essentials of freshwater ecology: Properties of water, stream orders stream geomorphology and river classification; Lake types (glacial, tectonic, volcanic), ox-bow stratification.

Freshwater resources of Peninsular India and Himalaya (Rivers, Lakes, Ponds Reservoirs, Canals, Wetlands), their morphometry physical & chemical environment.

Mountain freshwaters: Biodiversity, Freshwater communities, Structure & Function.

Computer Applications (Excel spreadsheets, Power Points, Web) & Statistical Techniques in Freshwater biology(Descriptives, Significance testing, t test, ANOVA, Multivariate analysis).

**Unit – III**

Elements of freshwater aquaculture, fish farms, hatcheries, poly and cage culture. Freshwater ornamental fishes, key features.

Culture techniques for coldwater fish (trout, mahseer), Nutrition.

Essentials of Fish Biology-Respiratory, Reproduction, Digestive systems & Behaviour.

Histological and histochemical techniques in fish biology.

**Unit – IV**

Essentials of Fish Taxonomy, Molecular techniques in taxonomy.

Fish wealth of peninsular India and Himalaya.

Scope and Essentials of Fishery Science, techniques with special reference to morphometry, dietary habits, feeding, intensity spawning season, frequency, size at first maturity fecundity, ageing and growth and population dynamics.

Softwares (FISAT) & Statistical Techniques in fishery Biology.

**Elective II-B**

**Animal Behaviour and Conservation Biology**

**Unit-I**

General principles: Importance of the study in the culture, farming, propagation and management of animal species.

Sense organs and receptor system: Exteroceptors, interoceptors & proprioceptors. Use of sensory information.

Hormone-behaviour interrelationships: Activational effects, organizational effects.

Nervous control of behaviour. Genetic basis of behaviour.

**Unit- II**

Communication system in animal kingdom: Modes of communication. Specific patterns of communication; Bees dance, echolocation in bat and electro-communication in fish. Crypsis & communication. Development of Singing in birds. Role of chemicals in feeding, reproduction and migration.

Social organization: Why animals live in a group? Evolution of colonial behaviour. Cost & benefits. Prey – predator relationships: Antipredator behaviour. Ecology & evolution of antipredator behaviour. Importance of territoriality. Male-female reproductive tactics. Nature's architects: spider-web, bird's nest, mouse holes.

**Unit-III**

Biodiversity Conservation: How does biological diversity matters? Animal biodiversity in India & Garhwal Himalayas.

Endangered / threatened animal species. Scientific research and biodiversity action plans.

Monitoring biological diversity-survey, Surveillance & census.

Wildlife biodiversity of Himalayas Research options and priorities for conservation of biodiversity. Conservation through gene bank. Integration of traditional knowledge skills and modern/recent scientific tools & techniques. Biotechnological applications.

Conservation strategies: Development of National Parks, sanctuaries, culture & farming.

Awareness campaign & training programmes, creation of alternative sources of livelihood.

Strengthening of protected areas/sacred zones networks.

Building database. Game reserve & other protected areas. **Networking programs.**

In-situ conservation and ex-situ conservation of animal species. Monitoring of biodiversity: survey identification of threatened faunal species habitat status.

**Unit- IV**

Rehabilitation of degraded habitats, people's participation.

Socio-economic and cultural factors associated to the biodiversity exploitation & conservation.

Legal & Policy framework. Legislation & laws, wildlife protection acts.

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Role of Govt. and NGO'S in the conservation of biodiversity collaborations to conserve biodiversity and biological diversity management. Indian wildlife protection act 1972, International Red list species, IUCN criteria, concepts & Assessment. Man & Biodiversity: River valley, mines and power projects-impact Assessment. Wildlife of Garhwal Himalayas: Ecology, distribution, conservation and management.