SCHEME OF EXAMINATION

AND

COURSE OF STUDY

IN

Zoology and Environmental Science

Pre-Ph.D. Course Work

(w. e. f. 2021-2022)

DEPARTMENT OF ZOOLOGY & ENVIRONMENTAL SCIENCES
GURUKULA KANGRI (Deemed to be University), HARIDWAR – 249404

10/9/21

Prof. Sunil Trivedi
Department of Zoology

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10/9/21

10/9/21

Syllabus w. e. f. 2021-2022
Department of Zoology and Environmental Science
Gurukula Kangri (Deemed to be University), Haridwar

Pre-Ph.D. Course Work

S. No.	Subject Code	Subject Title	Period/ Week			Evaluation Scheme					Subject Total
						Credit	Sessional			ESE	
			L	T	P		CT	TA	Total		
1.	PZE-101	Research Methodology	4	2	-	6	20	10	30	70	100
2.	PZE-102	Research Publication Ethics	2	-	-	2	20	10	30	70	100
3.	PZE-103	Environmental and Biological Analytical Techniques	4	2	-	6	20	10	30	70	100

L : Lecture T : Tutorial P : Practical
CT : Cumulative Test TA : Teacher Assessment
ESE : End Semester Examination

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10/9/21

PRE- Ph.D. COURSE

ZOOLOGY AND ENVIRONMENTAL SCIENCE

W.E.F. 2021-22

PAPER-I: RESEARCH METHODOLOGY
PAPER CODE : PZE 101

MM : 100
Time: 3 hrs.
L T P Credit
4 2 0 6

Sesssional : 30
ESE: 70
Pass Marks: 55%

NOTE: Question paper is divided into two sections A & B. Section A consists ten short answer type questions and student has to attempt any five questions in about 150 words each. Each question carries six marks. Section B consists eight long answer type questions and answer any four questions in detail. Each question carries ten marks.

UNIT-I

Basic research concept: Research definition, Scientific research; Selection of research problem, designing of research, observational, interventional, descriptive, analytical, qualitative and quantitative research.

UNIT-II

Types of research: Survey for field study, Sources of primary and secondary research data, Laboratory experiments and protocol, Field experiments, sample size & design, selection criteria of sampling sites, Methods of data collection and validation.

UNIT-III

Computer application: Basic of latest computer operating system, system software, application of software, Wide area network (WAN), MS Word, MS Excel, MS PowerPoint Presentation, Use of SPSS and Origin software, Application of computer in biological and environmental research.

UNIT-IV

Statistical analysis: Sources and presentation of data, graphical representation of data, measures of central tendencies, Standard deviation, Correlation and Linear regression. Elementary knowledge of probability, Test of significance- testing hypothesis, t-test (P-value), Distribution-Normal, Binomial and Poisson, Analysis of Variance (ANOVA).

UNIT-V

Ecosystem modeling: Introduction and fundamental of modeling, process of modeling and its advantages and limitations, selective ecological variables for ecosystem modeling, basic models for environmental research (surface, ground water and ecosystem models), Fundamental of GIS/GPS and its applications in environmental research.

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10/9/21

PRE- Ph.D. COURSE

ZOOLOGY AND ENVIRONMENTAL SCIENCE

W.E.F. 2021-22

PAPER-II : RESEARCH PUBLICATION ETHICS
PAPER CODE : PZE 102

MM : 100
Time: 3 hrs.
L T P Credit
2 0 0 2

Sesssional : 30
ESE: 70
Pass Marks: 55%

NOTE: Question paper is divided into two sections A & B. Section A consists ten short answer type questions and student has to attempt any five questions in about 150 words each. Each question carries six marks. Section B consists eight long answer type questions and answer any four questions in detail. Each question carries ten marks.

UNIT-I

Philosophy and ethics: Introduction to philosophy, definition, nature and scope, concept, branches. Ethics, definition, moral philosophy, nature of moral judgements, and reactions. Intellectual property rights (IPR).

UNIT-II

Scientific conduct: Ethics with respect to science and research. Intellectual honesty and research integrity, scientific misconduct: falsification, fabrication and plagiarism (FFP). Redundant publications, duplicate and overlapping publications, salami slicing. Selective reporting and misrepresentation of data.

UNIT-III

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 behaviour and vice-versa, types. Violation of publication ethics, authorship and contributorship. Identification of publication misconduct, complaints and appeals, predatory publishers and journals. Use of plagiarism software like Turnitin, Urkund (Ouriginal) and other open-source software tools.

UNIT-IV

Open access publishing: Open access publications and initiatives. SHERPA/RoMEO online resource to check publisher, copyright and self-archiving policies. Software tool to identify Predatory publications developed by SPPU. Journal finder/journal suggestion tools *viz.* JANE, Elsevier journal finder, Springer journal suggester, etc.

UNIT-V

Databases and research metrics: Indexing databases, citation databases, Web of science, Scopus etc. Metrics: Impact factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score. h-Index, g index, i10 index, altmetrics.

10/9/21

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10/9/21

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10/9/21

10/9/21

PRE- Ph.D. COURSE

ZOOLOGY AND ENVIRONMENTAL SCIENCE

W.E.F. 2021-22

PAPER-III: ENVIRONMENTAL AND BIOLOGICAL ANALYTICAL TECHNIQUES
PAPER CODE : PZE 103

MM :100
Time: 3 hrs
L T P Credit
4 2 0 6

Sesssional : 30
ESE:70
Pass Marks: 55%

NOTE: Question paper is divided into two sections A & B. Section A consists ten short answer type questions and student has to attempt any five questions in about 150 words each. Each question carries six marks. Section B consists eight long answer type questions and answer any four questions in detail. Each question carries ten marks.

UNIT-I

Instrumentation: Principles and functioning of Gas chromatography, GLC, HPLC, Electron microscopy: Transmission Electron Microscope & Scanning Electron Microscope. Atomic Absorption Spectrophotometry, Flame photometry, LUX meter, Flow cytometry.

UNIT-II

Molecular biology techniques: Gel Electrophoresis, PCR, RT-PCR, Screening techniques; Southern, Northern, Western, blotting, Sequencing of DNA & RNA, DNA finger printing, Phylogenetic tree, Molecular hybridization and cloning.

UNIT-III

Air quality analysis: Air sampling methodologies and instruments, analysis of CO, NO_2, SO_2, Particulate matters: PM2.5 and PM10. **Water and wastewater quality analysis:** Water sampling methodologies and instruments, analysis of DO, BOD and COD, SPC and MPN. **Soil quality analysis:** Soil sampling methodologies and instruments, analysis of heavy metals (Cu, Pb, Cr, Zn) and selected pesticides.

UNIT-IV

Aquatic biology: Habitat ecology of Ganga and Yamuna rivers in Himalayan region, collection and identification of plankton (phytoplankton and zooplankton) and benthic organisms, taxonomic identification of fish species (mahseer, schizothorax, trout, and common carps), *In-situ* and *ex-situ* conservation methods of endemic fish species in aquatic ecosystem of Himalayan region.

UNIT-V

Wildlife biology: IUCN categorization of wildlife in Himalayan region, study of wildlife population census (water hole survey, point count, line transect, pug mark count, camera trap and King census method), feeding sign and animal drooping, habitat suitability indices for Elephant, Tiger & Deer. *In-situ* and *ex-situ* conservation methods of endemic wildlife species of Himalayan region. Biodiversity indices (Shannon-weiner index, dominance index, Simpson index).

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SUGGESTED READINGS:

1: RESEARCH METHODOLOGY

1.Jo U. Smith, Pete Smith, 2007. Introduction to Environmental Modeling, Oxford University Press.

2.C.R. Kothari and G. Garg, 2019. Research Methodology: Methods and Techniques. New Age International Publisher, New Delhi.

3. Y.K. Singh, 2006. Fundamentals of Research Methodology. New Age International Publisher, New Delhi.

4. S.P. Gupta, 2019. Statistical Methods. S. Chand & Sons Publisher, Meerut.

5. Michael Miller (2015). Computer Basics Absolute Beginner's Guide, Windows 10 Edition, Eighth Edition. Que.

6. Stillman Gloria, Blum Werner, Kaiser Gabriele (2017). Mathematical Modelling and Applications. Springer International Publishing. eBook ISBN 978-3-319-62968-1. 10.1007/978-3-319-62968-1.

2: RESEARCH PUBLICATION ETHICS

1.Santosh Kumar Yadav, 2020. Research and Publications Ethics. Ane Books Pvt. Ltd. New Delhi.

2.C.R. Kothari and G. Garg, 2019. Research Methodology: Methods and Techniques. New Age International Publisher, New Delhi.

3.Sumanta Dutta, 2021, Research & Publication Ethics. Bharti Publications, New Delhi.

4.Y.K. Singh, 2006. Fundamentals of Research Methodology. New Age International Publisher, New Delhi.

5. Understanding Research Matrix, Retrieved from https://editorresources.taylorandfrancis.com/wp-content/uploads/2018/11/Understanding-research-metrics.pdf

6. Francis L. Macrina, 2014. Scientific Integrity: Text and Cases in Responsible Conduct of Research, ASM Publisher

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10/9/21 10/9/21 10/9/21 10/9/21 10/9/21

3: ENVIRONMENTAL AND BIOLOGICAL ANALYTICAL TECHNIQUES

1. AOAC, 2005. Official Methods of Analysis of the Association of Official Analytical Chemists, 13th edition. pp. 545–567.

2. APHA, AWWA, WEF, 2017. Standard Methods for the Examination of Water and Wastewater, 21st ed. American Public Health Association, pp. 2462–2480.

3. Buurman, P. B., Van Langer, and E. J. Velthrost. 1996. In *Manual of soil and water analysis*. Leiden, the Netherlands: Backhuys.

4. Carter, M. R. 1993. Soil sampling and method of analysis. Boca Raton, Fl.: Lewis Publishers.

5. Chaturvedi, R.K. and K. Sankar. 2006. Laboratory manual for the physico-chemical analysis of soil, water and plant. Wildlife Institute of India, Dehradun, India.

6. Stanley E. Manhan, 2001. Fundamentals of Environmental Chemistry, Lewis Publishers, New York.

7. Wilson & Walker, 2006. Principles and Techniques of Biochemistry and Molecular Biology, Cambridge University Press.

8. R.Wetzel 1956 . Limnology: Lake and river ecosystem, 3rd Edition. Academic press.

9.Agrawal N.K. and Singh, G. 2019. The Ganga in the Himalayas: fish diversity and Environment, Narendra publication, New Delhi.

10. Saha and Mazumdar 1980. Wild life Biology, PHI, Learning Press

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