

Department of Biosciences

Scheme & Syllabus of Examination

For

Ph.D. Course Work

(Environmental Science)

From The Academic Session 2024-25



GURUGRAM UNIVERSITY, GURUGRAM (HARYANA)

Devina

Scheme of Examination

Ph.D. Course work (Environmental Science)

Course code	Title of the course	Theory Marks	Internal Marks	Practical Marks	External Marks	Total Marks	Credits L+T+P	Time
PhD/EVS/101	Research Methodology	70	30	-	-	100	4+0+0	4 Hrs.
PhD/EVS/102	Environmental Technology	70	30	-	-	100	4+0+0	4 Hrs.
PhD/EVS/103	Review of Literature and Seminar	-	50	-	50	-	4+0+0	4 Hrs.
RPE-2020	Research and Publication Ethics	35	15	-	-	50	2+0+0	2 Hrs.
Total credits							14	

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Research Methodology
PhD/EVS/101

L	T	P/ D	Credits	Theory Marks	: 70 Marks
4	--	--	4	Internal Marks	: 30 Marks
				Total	: 100 Marks
				Duration of Examination	: 3 Hours

Note: *The question paper will contain four sections and eight questions in all. The candidates are required to attempt five questions in all selecting at least one from each section. All questions carry equal marks.*

Course Objectives:

1. To acquaint the knowledge of research or step by step process of research: identification of research problem, understanding research designs and data collection.
2. To instill skills of data analysis and interpretation, preparation and data presentation.
3. To train students with technical aspects of preparation and presentation of report.
4. To provide an insight into the application of analytical tools/software and techniques.

Course Outcome:

1. The scholar will have a better understanding of research that will guide the researcher at every step of his/her research journey.
2. Scholars will learn to apply research methodology to project work and selecting an appropriate research design.
3. Scholars will learn about quantitative methods and about reviewing published research.
4. Scholars will Learn about computer applications for implementing research.

Unit: 1

Introduction to Research Methodology: Meaning and role of research, types of research, motivation in research, plagiarism (types and consequences). Literature survey, defining research problem and objectives. Developing research design /plan. Sampling fundamentals, Methods and techniques in data collection. IPR & Patents in Environmental Sciences.

Unit: 2

Data Presentation and Analysis: Data processing - data presentation skills/techniques & plotting etc. through the use of spread and other application software, statistical measure such as probability distributions, measures of central tendency, dispersion, skews/relationship. Simple regression and correlation analysis. Univariate Analysis (Introduction to various parametric and non-parametric tests of Hypothesis and their application in research), introduction to multivariate analysis technique and applications. Interpretation of results.

Unit: 3

Technical reports writing: Significance of report writing. Different steps in writing reports. Layout of research report. Thesis organization (spatial, chronological, general & specific, order of decreasing importance) Oral presentation.

Unit: 4

Use of tools/techniques for Research: methods to search required information effectively, Reference Management Software like Zotero/Mendeley, Software for paper formatting like LaTeX/MS Office, Software for detection of Plagiarism, SPSS.

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Text books:

1. C.R. Kothari," Research Methodology: Methods and Techniques", New Age International (P) Ltd. Publishers, New Delhi, 2006.
2. M. Ashraf Rezvi," Effective Technical Communication"
3. MATLAB Manuals.
Lab view Manuals.

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PhD/EVS/102
ENVIRONEMNTAL TECHNOLOGY

L	T	P/ D	Credits	Theory Marks	: 70 Marks
4	--	--	4	Internal Marks	: 30 Marks
				Total	: 100 Marks
				Duration of Examination	: 3 Hours

Note: The question paper will contain four sections and eight questions in all. The candidates are required to attempt five questions in all selecting at least one from each section. All questions carry equal marks.

Course Objectives:

1. To provide understating cf various aspects of chemicals and chemistry, which are particularly valuable to environmental scientific practice.
2. To familiarize the students with the types of environmental pollutants, their origin, mode of action and tackling the treatments of pollutants.
3. To introduce students about the applicability, limitations, and description of advance environmental treatment technologies.
4. To train students to use analytical methods to study the various study samples and identify contaminants.

Course Outcomes:

On completion of this subject, students should be able to:

1. Explain the chemistry of environmental systems, including the interactions between contaminants with water, air and soil quality.
2. Acquire a theoretical understanding of a diverse range of analytical techniques crucial for environmental monitoring.
3. Apply analytical skills to effectively identify, quantify, and assess environmental contaminants in real-world samples using a range of analytical techniques.
4. Develop problem-solving skills to address complex environmental challenges, propose evidence-based solutions, and contribute to sustainable environmental practices.

Unit 1:

Basics of Environmental Chemistry: Chemical equilibria and kinetics fundamentals, Acids and base, titration, acidity, alkalinity. Chemical equilibrium calculation, PC-pH diagram, Solubility diagram, oxidation and reduction reactions. Chemical composition and structure of atmosphere, the changing global atmosphere, chloro- flouro carbons with their nomenclature, sources substituent and effects, photochemical smog, ozone layer depletion, residence time, acid rain, atmospheric brown cloud.

Unit 2:

Pollution and its control: Causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution; The scope of environmental biotechnology; Biotechnological approaches for solid waste management, Heavy metal pollution. National & international policies for Environmental Protection.

Unit 3:

Advanced Environmental Remediation Technologies: Nanotechnology, Advanced oxidation processes (AOPs), Photocatalysis and ozonation, Hydrogen Production from Photo-

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electrolysis, Bioremediation, Biological Process & Bio-Fuels.

Unit 4:

Instrumentation in Environmental Research: Particle size analysis, X-ray diffraction in minerals, Fourier Transform Infrared Spectroscopy, Chromatographic techniques, Chromatography - Principles and methodology of Chromatographic Techniques: Paper, Thin layer, Column, Gel, Gas and HPLC; Scanning Electron Microscopy, Transmission Electron Microscopy, Optical and Phase Contrast Microscopy; Spectrophotometry – Principles, Atomic UV-Vis Spectrophotometry, Absorption Spectrophotometry, Flame Photometry.

Recommended Books

1. Environment chemistry by Manahan.
2. Environment chemistry by AK De.
3. Introduction to environmental science and engineering by Gilbert McMasters.
4. Chemistry for Environmental Engineering, Clair N. Sawyer & Mc Carty, TATA, Mc Graw Hill International Publication III Edition 1986.
5. Environmental Chemistry by Donald L. Sparks.
6. Environmental Chemistry by B.K Sharma.
7. Composition, chemistry and climate of the Atmosphere by H.B Singh.
8. Industrial Water Pollution Control by W. Wesly Eckenfelder.
9. Fundamental of Analytical chemistry by Skoog, West & Holler.
10. Environmental Chemistry by Colin Baird.

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PhD/EVS/103: Review of Literature and Seminar

Max. Marks: 100
Internal Marks: 50
External marks: 50
Credits: 4

Note:- 1. The research scholar is required to prepare a concept paper/ working paper/ review paper by reviewing at least 30 research papers/ reference books/ unpublished dissertations/ other reports etc. in the area of research.

2. The research scholar is required to make a presentation based on the review paper as above and also to participate in the Viva Voce before the Evaluation Committee to be constituted by the Dean/Director (with one external expert) and be evaluated.

3. This course has no written theory end-term examination

S.No.	Course Assessment Components	Marks/Weightage (%)
1.	Writing of Concept Paper/ Working Paper/ Review article and report Submission	50 (50%)
2.	Presentation & Viva – Voce (End-Term)	50 (50%)
Total Marks		100

Instruction for Viva - Voce

Viva - Voce of 50 marks must be conducted by inviting an external examiner.

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