# ENS-415 RESEARCH METHODS IN ENVIRONMENTAL SCIENCE 3(3+0)

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| **COURSE CODE:** | ENS-415 | | |
| **COURSE NAME:** | Research Methods in Environmental Science | | |
| **CREDIT HOURS:** | Theory = 03 | Practical = 0 | Total = 03 |
| **CONTACT HOURS:** | Theory = 48 | Practical = 0 | Total = 48 |
| **PREREQUISITE:** | None | | |
| **MODE OF TEACHING:** | 3 hours of Lecture per week (100%) | | |

**COURSE DESCRIPTION:**

The course provides students with a foundational understanding of the principles, methodologies, and ethical considerations of scientific research in environmental studies. It covers the conceptualization and design of research projects, development of research questions, literature search strategies, and the use of qualitative and quantitative methods. Students will learn sampling techniques, data collection methods, and basic data analysis, including statistical tools and graphical presentation. Emphasis is placed on critical thinking, research ethics and integrity, and effective communication of findings. By integrating knowledge with skills in research design and analysis, the course prepares students to undertake independent research and contribute to evidence-based environmental decision-making.

**COURSE LEARNING OUTCOMES:**

By the end of this course, students will be able to:

a) Understand basic principles and methodologies of scientific research.
b) Describe methods for designing and conducting research projects in environmental sciences.
c) Analyze data and communicate research findings effectively.

**TOPICS COVERED:**

**Theory:**

| Week | Topics |
|---|---|
| 1-2 | Types of research (observational, experimental, modeling, qualitative, quantitative). Research Project Conceptualization, Choice of Methods. Research ethics (plagiarism, data integrity, field ethics) |
| 2-3 | Spatial and temporal scales in environmental research. Research Questions, Scientific Methods, Techniques & Pre-requisites for Scientific Research, Critical Thinking and Developing the Research Question: Defining the Research Problem;. |
| 4-5 | Research Proposal: its importance- Research Proposal Writing Techniques: Importance of Research Design, |
| 6-8 | How to write various components of a research proposal; Objectives, Introduction, Material Methods, Review of Literature, Bibliography,. |
| 9 | Mid Semester Exam |
| 10-11 | Literature Search: Database, Search Engines; Analytical tools in |

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| | research: qualitative and quantitative methods; Finding credible sources (Google Scholar, Web of Science) |
| 12-13 | Sampling: the logic of sampling, concepts and terminologies, population and sampling frames, types of sampling design/; Data Collection: Techniques in data collection: Quantitative & Qualitative Data; |
| 14 | Experimental Research, Case Studies, Surveys, Interviews, Questionnaire; |
| 15-16 | Data Analysis: Inference based on findings; Data and research presentation techniques |
| 17 | Excel/R/Google Sheets for simple analysis<br>Interpreting results<br>Descriptive statistics (mean, SD, variance)<br>Basic graphs (histograms, scatter plots, box plots) |
| 18 | End Semester Exam |

**TEXT AND MATERIAL**:

**Textbooks:**

1. The Craft of Research by Wayne C. Booth, Latest Edition, Univ. of Chicago Press. USA.
2. Designing and Conducting Mixed Methods Research, Creswell, J. W. & Plano Clark, V.L. Thousand Oaks, Latest edition, Sage CA, USA.

**Reference Books:**

1. Kanazawa, M. (2023). Research methods for environmental studies: A social science approach. Routledge..
2. Ruth, M. (Ed.). Handbook of research methods and applications in environmental studies. Latest edition, Edward Elgar Publishing.
3. Gibson, L., & Sauma, J. (Eds.). (2025). The Ethics of Participation in Environmental Field Research: Inclusion, Collaboration, and Transformation. Taylor & Francis.
4. Designing and Conducting Mixed Methods Research, Creswell, J. W. & Plano Clark, V.L. Thousand Oaks, Latest edition, Sage CA, USA.

**ASSESSMENT SYSTEM:**

| **Theoretical/ Instruction** | | |
|---|---|---|
| **Assessment Category** | **Marks Distribution (%)** | |
| | **Without Project** | **With Project** |
| Quiz | 15 | 10-15 |
| Assignment | 10 | 5-10 |
| MSE | 25 | 25 |
| Project | - | 5-10 |
| ESE | 50 | 45-50 |