ENSC-304: RESEARCH METHODS IN ENVIRONMENTAL SCIENCES (03 Credit Hrs)

PRE-REQUISITES: ENSC-301

LEARNING OUTCOMES

- Understand research, its major types and methods in Environmental Sciences
- Be aware of the ethical principles of research,
- Identify the components of a literature review process
- Understand synopsis, research design and data acquisition in environmental studies
- Describe quantitative, qualitative and mixed methods approaches to research
- Understand data analysis through statistical and mapping tools
- Understanding research publications and editorial process

CONTENTS

This course will provide an opportunity for participants to establish their basic understanding about research, its types and methods used in environmental studies. Secondly, the participants will be able to learn about developing scientific questions, developing synopsis and applying variety of research designs in environmental studies. Further, the participants will be able handle and analyze data through statistical and mapping tools/software. Further, understanding about writing publications, and editorial process will also be a part of this course. The course introduces the language of research, ethical principles and challenges, and the elements of the research process within quantitative, qualitative, and mixed methods approaches. Participants will use these theoretical underpinnings to begin to critically review literature relevant to their field or interests and determine how research findings are useful in forming their understanding of their work, social, local and global environment.

Unit-1: Fundamentals of Research methods

1.1. Introduction to research and research methods in Environmental Sciences
1.2. Types of research in environmental sciences
1.3. Significance of research in environmental sciences

Unit-2: Research planning

2.1. Identification of research questions
2.2. Introduction to research synopsis
2.3. Literature review process
2.4. Pilot surveys

Unit-3: Research design

3.1. Qualitative and quantitative research
3.2. Deductive and inductive research
3.3. Descriptive, explanatory, predictive, empirical research

Unit-4: Data acquisitions in Environmental studies

4.1. Primary and secondary data
4.2. Environmental survey data
4.3. Experimental designs
4.4. Field sampling for water, dust, soil, air sampling
4.5. Sampling of living organisms
4.6. Ethics in sampling

Unit-5: Data analysis and report writing

5.1. Data input and analysis
5.2. Application of descriptive and inferential statistical tools
5.3. Mapping tools in Environmental studies
5.4. Contents of reports and reports compilations
5.5. Referencing

Unit- 6: Research Publications

7.1. Introduction to Research publication

7.2. Types of research publications
7.3. Preparation of Research publications
7.4. Introduction to Journals, publisher, impact factor, h-index etc.
7.5. Editorial process of research publications

TEACHING – LEARNING STRATEGIES

- Lecture based examination
- Presentation/seminars
- Class discussion
- Quizzes

ASSIGNMENTS – TYPE AND NUMBER WITH CALENDAR

It is continuous assessment. The weightage of Assignments will be 25% before and after midterm assessment. It includes:

- classroom participation,
- attendance, assignments and presentation,
- homework
- attitude and behavior,
- hands-on-activities,
- short tests, quizzes etc.

ASSESSMENT AND EXAMINATIONS:

Sr. No.	Elements	Weightage	Details
1.	Mid Term Assessment	35%	It takes place at the mid-point of the semester
2.	Formative Assessment	25%	It is continuous assessment. It includes: classroom participation, attendance, assignments and presentation, homework, attitude and behavior, hands-on-activities, short tests, quizzes etc.
3.	Final Assessment	40%	It takes place at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.

RECOMMENDED TEXT BOOKS / SUGGESTED READINGS

1. Tjora, A. (2018). *Qualitative Research as Stepwise-Deductive Induction.* Routledge Publisher.
2. Alley, M. (2018). *The Craft of Scientific Writing.* Springer-Verlag New York.
3. Bartels, K.P.R. and Wittmayer, J.M. (2018). *Action Research in Policy Analysis: Critical and Relational Approaches to Sustainability Transitions.* Routledge Publisher.
4. Smith, R.L., Nychka, D., Waller, L.A. and Schmidt, A. (2018). *Applied Environmental Statistics.* CRC Press, Taylor and Francis Group.
5. Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.
6. Cook, E. R., & Kairiukstis, L. A. (Eds.). (2013). *Methods of dendrochronology: applications in the environmental sciences.* Springer Science & Business Media.
7. Walliman, N. (2010). *Research methods: The basics*. Routledge.
8. Blackwell, J. and Martin, J. (2011). *A Scientific Approach to Scientific Writing.* Springer-Verlag New York.
9. Manly, B.F.J. (2008). *Statistics for Environmental Science and Management.* Chapman and Hall/CRC Press.