



Accredited by the NAAC

Department of Marine Geology

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Ph.D. Course Work Syllabus in Marine Geology

Programme outcomes

Candidates admitted to the Ph.D. course in Marine Geology or Geoinformatics shall have to qualify the Course Work. However, scientists-D and above cadre are exempted from attending the course work. After a successful completion Course Work Examination and fulfilling all requirements, students shall be allowed to submit the thesis for the award of the Ph.D. Degree. Students who are qualified can either pursue further studies as Post-Doctoral Research/seek employment in universities/research & development institutions/organizations, CSIR Labs, private institution, multinational corporations and overseas labs/universities or opportunities to join universities.

Programme specific outcomes

Students get Ph.D. degree in specific subject/areas of the research problem that they have chosen, such as, petrology, geochemistry, meteorology/climatology, oceanography, paleoclimate/paleoceanography, CZMS, Remote Sensing & GIS, and related fields.

Course outcomes

Course 1	Research Methodology It is the most important aspect of research. Students will get an idea about how to progress in research. Knowledge of different research methods, scope and objectives of research in earth, atmospheric and ocean science will enhance student's research skills. In addition, principles of sampling, analysis, collection of research data, laboratory investigations, computation, and data interpretations will be covered in this section. The research methodology perhaps the most comprehensive one that can be generalized for students who take up
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	research. Nevertheless, students are exposed the research methodologies followed in their research work.
Course 2	Research and Publication Ethics (RPE) This course is aimed at creating awareness about the publication ethics and publication misconducts as per the directions of the UGC. This aspect was usually practiced and followed by most of the researchers during the research work and after completion of the Ph.D. degree. Although it is mandatory for the Ph.D. students, the RPE serves as principles to abide by the researchers not only during their study, but even after the Ph.D. degree.
Course 3	Review of Literature This is related to review of literature connected to the research topics that the candidates chose for the Ph.D. degree. The review of literature is an essential part of the research for not only updating the knowledge about new findings at international and national levels, but also helps in selecting the research problem. The experience gained by the students upon discussions with their respective research guides during the preparation of the review report, will help them to improve their writing and editorial skills. These will strengthen students to prepare research papers as well as their theses. Review Report The report submitted by the student forms an essential component of their research work which will a base to peruse research. This would serve as a complement to the thesis work upon revising the research innovations at the time of thesis writing. Viva The presentation of review report during the viva-voce of the course work is not just to fulfill the formality, but it is an opportunity for students to gain experience about how to face the experts/ participants/ audience in the seminars, symposia, workshops and interviews during appointment.

Scheme of Examination for the PhD Course Work

Course	Particulars	Hours of instruction per week	Duration of exam (hours)	Marks			Credits
				IA	Theory	Total	
Course 1	Research Methodology	4	3	30	70	100	4
Course 2	Research and Publication Ethics (RPE)	2	3	30	70	100	2
Course 3	Review of Literature	14	-	-	-	150	6
	Review Report Viva		-	-	-	50	2
Total Marks				400			14

Course 1. Research Methodology

- 1. Introduction** – Scope and objectives of research in earth, atmospheric and ocean science. Principles, tools and techniques followed in the above mentioned areas of research.
- 2. Research Data:** Types of data / information and their sources. primary, secondary and tertiary data. Methods of collection of primary data. Field observations and measurements. questionnaire and interviews. Methods of sampling of different materials of the earth, labeling and packing / storage and transportation to the lab. Equipment's, tools and techniques used in offshore sampling. Field survey - Compass, Theodolite, Total station, GPS, Spectro-radiometer, Resistivity meter etc. Types of maps / illustrations used to represent various spatial and non-spatial information.
- 3. Laboratory Investigations:** Principles of sedimentological and chemical analytical techniques followed in the earth, atmospheric and ocean science. Methods of sample collection, their pre-treatment and preservation for

measurements of sedimentological, physico-chemical and geochemical analyses. Analytical techniques followed in geochemistry based on direct chemical analysis (titrimetric and gravimetric) and instrumental methods (spectrophotometry, radiometry, X-ray and neutron activation analysis).

4. **Computation, Analysis and Interpretation:** Tools and Techniques used in computation, analysis and interpretation of spatial and non-spatial data. Statistical and computer techniques, remote sensing and GIS applications. Fundamentals of RS – Electromagnetic spectrum. Platforms – airborne and space borne sensors. RS data acquisition and analysis. Multispectral, optical, thermal, microwave and hyperspectral sensors. Important RS satellites. Data analysis - visual and digital image analysis. Principles of Geographical Information Systems. Theory of GIS supported by extensive practical exercises. Geographic Information and spatial data types. Hardware and software; Raster and Vector GIS. Data base management system. DEM and its applications. RS and GIS applications in geology, geomorphology, water resources, land use / land cover, oceanography, meteorology etc.

Suggested reference:

1. Field Geology – F.H. Lahee – CBS Publications
2. Surveying and Fieldwork - Williamson, J – Constable and Co.
3. Handbook of Applied Geo-statistical Ore Reserve Estimation – M. David – Elsevier
4. Prospecting and Exploration of Mineral Deposits – M. Kuzvart and M. Bohmer – Elsevier
5. Principles of Geochemical Prospecting – Ginzberg, I.I. - Pergamon Press
6. Geographical Information System: A Guide to Technology – John C. Antenucci – Van Norstr and Reinhold Publications
7. Computers: Concepts and Uses - Mary Summer - Prentice Hall
8. Remote Sensing and Image Interpretation – T.M. Lillesand and R.W. Kiefer – John Wiley and Sons
9. Analytical Chemistry – Vogel I and II Editions.

Course 2: Research and Publication Ethics (RPE)

THEORY

1.: 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.

2. SCIENTIFIC CONDUCT (5 hrs.)

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.

3.: 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

4.: 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.

5.: PUBLICATION MISCONDUCT (4 hrs.)

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.

6.: DATABASES AND RESEARCH METRICS (7 hrs.)

A. Databases(4hrs.)

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, i10index, 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: Donot get scooped; donot 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/EthicsBook.pdf>

Course 3.: Review of Literature

1. **Sources of literature:** Reference work in the library, browsing Internet & e-journals, books and websites. Methods and importance of citation and impact factor of research publications.
 - a. **Review of literature:** Material available from the scholar websites, subject sites conference/workshop/seminar proceedings.
 - b. **Selection of the research topic:** Format & method of writing research synopsis, thesis, and research papers.
2. **Literature survey:** Reference books/volumes/edition, journals, seminar, conference volumes, technical manuals and reports. Protocols in followed in research publication.

Planning of the proposed areas of research: Selection of hypothesis. Definition of the concept and objectives. Review of previous work. Logistics and technology to be followed in research.
3. **Research Data:** Generation of primary data via sampling and analytical techniques. Ancillary data and data to be extracted from literature. Data storage, analysis and interpretation.
4. **Research Publications:** Types of research publication including the peer reviewed journals. Preparation prior to the submission of research publication for having background knowledge including theoretical and scientific with regard to the chosen area of the research.

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