

CENTRAL UNIVERSITY OF SOUTH BIHAR



**Course Structure and Syllabus
for
Doctor of Philosophy in Geology
(Ph.D. in Geology)
(Effective from Academic Session 2024-2025)**

**Department of Geology
School of Earth, Biological and Environmental Sciences
Central University of South Bihar, Gaya-824236**

SEMESTER I				
Course Types	Course Code	Name of Course	(L+T+P)	Credits
Core Course	GEL101C0102	Research and Publications Ethics	2+0+0	2
Core Course	GEL101C0203	Fundamentals of Research Methodology	3+0+0	3
Core Course	GEL101C0303	Tools and Techniques of Research in Geological Sciences	2+1+0	3
Total Credits				08

Course Title: Research and Publications Ethics

Course Code	GEL101C0102	Credits	2
L + T + P	2 + 0 + 0	Course Duration	One Semester
Semester	I	Contact Hours	30 (L) Hours
Course Type	Core Course		
Nature of the Course	Theory & Practice		
Methods of Content Interaction	<i>Lecture, Tutorials, primary data collection & analysis, Hands-on Exercise</i>		
Assessment and Evaluation	<ul style="list-style-type: none"> • 100% - End Term External Examination (University Examination) 		

Course Objectives & Outcomes:

- ❖ This course is designed to provide an overview on ethics, and misconduct in scientific research particularly focusing on scientific research and publications. After completion of the course, the students will be able to develop a comprehensive understanding on ethical principles and scientific misconduct in scientific research and communication.

Course structure:

- ❖ This course focused on the basics of philosophy of science and ethics, research integrity, and publication ethics. Hands-on sessions are designed to identify research misconduct and predatory publications. Indexing and citation databases, open access publications, research metrics (citations, h-index, Impact Factor, etc.), and plagiarism detection tools are introduced in this course.

Course Contents (Research and Publications Ethics)	Weightage (%)
Unit-I Philosophy and Ethics	24 07 Lectures
Introduction to philosophy: definition, nature and scope, concept, branches; Ethics: definition, moral philosophy, nature of moral judgments and reactions; Ethical, legal, social and scientific issues in biological research: research ethics, importance of ethics in research, ethics: values and principles, some ethical issues, codes of ethics, costs and dealing with research misconduct, research ethics committees, general ethics, and ethical issues.	
Unit- II Scientific Conduct	24 07 Lectures
Ethics with respect to science and research; Intellectual honesty and research integrity; Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP); Redundant publications: duplicate and overlapping publications, salami slicing; Selective reporting and misrepresentation of data.	
Unit- III Publication Ethics	24 07 Lectures
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 contributor ship; Identification of publication misconduct, complaints and appeals; Predatory publishers and journals.	
Unit - IV Database and Research Metrics	28 09 Lectures
Open access publications and initiatives; SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies; Software tool to identify predatory publications developed by SPPU; Journal finder / journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggested, etc.; Subject specific ethical issues, FFP, authorship, Conflicts of interest; Complaints and appeals: examples and fraud from India and abroad; Use of plagiarism software like Turnitin, Urkund and other open source software tools; Indexing databases, Citation databases: Web of Science, Scopus, PubMed , IEEE etc.; Impact Factor of journal as per Journal Citation Report, SNIP, SIR, IPP, Cite Score; Metrics: h-index, g index, i10 index, altmetric.	

Text & Reference Books:

1. Bird, A. (2006). *Philosophy of science*. Routledge.
2. MacIntyre, Alasdair (1967)'A *Short History of Ethics*. London.
3. P. Chaddah, (201 8) *Ethics in Competitive Research: Do not get scooped; do not get plagiarized*, ISBN:978-9387480865
4. 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.

5. Resnik, D. B. (20 11). What is ethics in research & why is it important. *National Institute of Environmental Health Sciences*, 1-10. Retrieved from [https://wwsv.niehs.nih. Nov/research/resources/bioethics/whatis*index.cfm](https://wwsv.niehs.nih.gov/research/resources/bioethics/whatis*index.cfm)
6. Bcall, J. (2012). Predatory publishers are corrupting open access. *Nature*, 489(741 5), 179—179. <https://doi.org/10.1038/489179a>
7. Indian National Science Academy (INSA), Ethics in Science Education, Research and Governance (20 19), ISBN:978-8 1-939482- 1-7. [http //www.insaindio res.in/pdf/Ethics Book.pdf](http://www.insaindiares.in/pdf/Ethics Book.pdf) edited by. Muralidhar, K. Ghosh, A. Singhvi AK.

Course Title: Fundamentals of Research Methodology

Course Code	GEL101C0203	Credits	3
L + T + P	3 + 0 + 0	Course Duration	One Semester
Semester	I	Contact Hours	45 (L) Hours
Course Type	Core Course		
Nature of the Course	Theory & Practice		
Methods of Content Interaction	<i>Lecture, Tutorials, primary data collection & analysis, Hands-on Exercise</i>		
Assessment and Evaluation	<ul style="list-style-type: none"> • 100% - End Term External Examination (University Examination) 		

Course objectives and Outcomes:

- ❖ This course is designed to provide an overview on fundamentals of doing research including scientific terminology, literature, methods, analysis and interpretation of data, preparation of research report and presentation, future aspects of research as a career, importance and applications of scientific research to the society. It will help the students to develop core research skills relevant to a wide spectrum of Geological research, including written and oral communication, field work and verification, skills in making scientific observations and analyzing data by participating in discussions or through presentations or group research project associated with a discipline of interest.

Course Contents (Fundamentals of Research Methodology)	Weightage (%)
Unit-I Perspectives of Scientific Research	28 12 Lectures
Science and Technology, Meaning and Characteristic of Research, Importance and Types of Research Activities, Principles of Quality Research Work, Problems Encountered in Research, Scientific Attitude and Temper, Qualities of Good Researcher, Contribution of Indian Scientists in Global Research.	
Unit- II Getting started with Research	21 10 Lectures
Planning and Designing of Research, Criteria, and Validity of Good Research, Reliability in Research, Artefacts and Bias, Managerialism and Scientific Research, Leadership in Scientific Research.	
Unit- III Scientific Methodology and Geostatistics	28
Rules and Principles of Scientific Method, Hypothesis and Testing of	

Hypothesis, Data Collection and Analysis/Sampling, Interpretation of Results and Generalization, Descriptive Statistics, Random Variable, Distribution of Random Variables, Binomial and Normal Distribution, Non-Parametric Tests, Correlation and Regression, Linear Programming, Student's t test, Chi square test, Fisher test and Z- test. Analysis of variance: One way & two ways ANOVA.	12 Lectures
Unit - IV Research in Practice and Scientific Writing and Scientific Presentation	23
Literature Review, Journals, Conference Proceedings, Journal Impact Factor, Citation Index, Research index, Reading a Scientific Paper, Seminar, Conference and Workshops, Scientific Paper, Writing a Scientific Paper, Communicating to a Journal, Writing a Grant for Funding, Preparation of Research Presentation, Presenting in PowerPoint, Open Presentation.	11 Lectures

Text & Reference Books:

1. C R Kothari, Research Methodology: Methods and Techniques.
2. Khanal Arun, Bhadra Mahajan'S Methods In Biostatistics For Medical Students And Research Workers.

Course Title: Tools and Techniques of Research in Geological Sciences

Course Code	GEL101C0303	Credits	3
L + T + P	2 +1 + 0	Course Duration	One Semester
Semester	I	Contact Hours	30 (L) + 15 (T) Hours
Course Type	Core Course		
Nature of the Course	Theory & Practice		
Methods of Content Interaction	<i>Lecture, Tutorials, primary data collection & analysis, Hands-on Exercise</i>		
Assessment and Evaluation	<ul style="list-style-type: none"> • 100% - End Term External Examination (University Examination) 		

Course Objectives

- ❖ To make critical and independent inquiry in the geosciences including: the ability to gather and evaluate peer-reviewed literature; identify a research question; design and conduct a research plan to collect laboratory and/or field data; and interpret research results.
- ❖ To Demonstrate competence in fundamental geological skills including: mineral, rock and soil identification; interpretation of topographic maps, geologic maps, and various forms of imagery; construction of geologic maps and cross sections; three-dimensional conceptualization; and collection of organized field and laboratory data.
- ❖ To develop students with fundamental strength in core areas of geology and environmental geology, and interpret a wide range of earth processes on different temporal and spatial scales.

- ❖ To demonstrate the competence in collecting scientific data, including field observation and analytical measurements.
- ❖ To promote students to improve the skills of interpretive analysis and critical thinking with respect to geological problems involving temporal and spatial relationships.

Course Outcomes

- ❖ The students will acquire knowledge on various modern techniques to find out rocks and minerals characteristics.
- ❖ The student will get-well in knowledge on Remote Sensing, Geochemical, and Hydrological applications in different fields of Geology.
- ❖ The students will able to do the modeling and data analysis
- ❖ The students will develop the expertise in research and; skills to design and conduct experiments, analyze data and interpret the results.
- ❖ The students will acquire field knowledge and technical skills in different Geological arena.

Course Contents (Tools and Techniques of Research in Geological Sciences)	Weightage (%)
Unit-I Microscopic Techniques	24 07 Lectures
Microscope and U-stage Techniques-Determination of Anorthite content in Plagioclase and Twin laws-Optic Orientation-Extinction angle-Pleochroic scheme-Birefringence-Principles and basics of X-ray diffraction in methods of mineral investigation.	
Unit- II Geochemical and Isotopic analysis of rock samples technique	28 09 Lectures
Geochemical analysis, data interpretation and instrumentation of basic fundamentals of mass spectroscopy. Working principles of X-ray Fluorescence (XRF), Inductive Couple Plasma Mass Spectrometry (ICP-MS) and Thermal Inductive Mass Spectrometry (TIMS) for geochemical elements data interpretation and isotope dating methods. Basic ideas for Scanning Electron Microscope (SEM) and X-ray Diffraction (XRD) for microscopic studies of rock samples.	
Unit- III Sedimentological, Palaeontological and Micropaleontological Techniques	24 07 Lectures
Sedimentological techniques-Size and shape determination of grains in Clastic rocks and their graphic representations. Palaeontological and Micropaleontological techniques pertaining to microfossils (Foraminifera, Ostrocooda, Spores and Pollen grains)-Field sampling and collection Separation of microfossils.	
Unit - IV Advances in Space Technology in Geological Studies	24 07 Lectures
Applications of Remote Sensing in Geology, Groundwater management, Landslides & floods, Land use and urban planning, Watershed Delineation and groundwater recharge and potential modeling. Geochemical modeling and groundwater quality assessment. Nature based solution for groundwater management.	

Text & Reference Books:

1. Brasier, M.D- Introduction to Micropaleontology – Chapman and Hall, UK, (1985).
2. Bignot – Elements of Micropaleontology – Chapman and Hall, UK, (1985).
3. Kummel. B., and Raup. D – Handbook of palaeontological Techniques, W.H. Freeman and Co., (1965).
4. Aswathanarayana. U, Principles of Nuclear Geology – Oxford & IBH Ovt.Ltd., New Delhi, (1985).
5. Faure. G-Principles of Isotope Geology – John Wiley and Sons, New York, (1987).
6. Pandey S.N – Principles and Applications of Photogeology-Wiley Eastern, New Delhi, (1994).
7. Curran P.J – Principles of Remote Sensing-Longman, London, (1985).
8. Sabins. F.Jr – Remote Sensing – Principles and Interpretation, Freeman, Sanfranciso.

SEMESTER II				
Course Types	Course Code	Name of Course	(L+T+P)	Credits
Core Course	GEL102C0404	Preparation and Presentation of Research Proposal	3+1+0	4
Total Credits				04

Course Title: Preparation and Presentation of Research Proposal

Course Code	GEL102C0404	Credits	4
L + T + P	3 + 1 + 0	Course Duration	One Semester
Semester	II	Contact Hours	45 (L) + 15(T) Hours
Course Type	Core Course		
Nature of the Course	Theory, Review of Literature, Research Proposal Preparation, Preliminary Experiments		
Methods of Content Interaction	<i>Lecture, Review of Literature, Tutorials, primary data collection & analysis, Hands-on Exercise, presentations</i>		
Assessment and Evaluation	<ul style="list-style-type: none"> ● 100% - End Term External Examination (University Examination) ● Submission of Research Proposal and Presentation to Research Advisory Committee (PhD student specific) and Department Research Degree Committee (DRDC). The student is required to present periodically before Research Advisory Committee consisting of 2 external faculties along with the guide. 		

Course Objectives and Outcomes:

- ❖ This course is designed to prepare students for the research topic that he/she will take for Ph.D degree. Ph.D. Research Scholars will identify the research problem.

Course Contents (Preparation and Presentation of Research Proposal)	Weightage (%)
Review of Literature; Identifying the Gap Area of Research; Identification of Research Objectives; Defining Research Methodology; Presentation by scholars on various topics related their research field; Preparation of synopsis or research proposal.	100 45 Lectures