

pre-PhD course work Geology

SHRI GURU RAM RAI UNIVERSITY
PATEL NAGAR DEHRADUN, UTTARAKHAND

(Established under Shri Guru Ram Rai University and UGC, Act No.3 of 2017)



SYLLABUS for Pre-Ph.D. Course Work

Department of GEOLOGY

School of Applied and Basic Sciences, SGRRU,

(w. e. f. 2023 – 2024)

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STUDY & EVALUATION SCHEME
Choice Based Credit System
Pre-PhD Geology

SEMESTER WISE CREDIT REQUIREMENT for Pre- Ph. D Course Work

FIRST SEMESTER

Total Credits: 18

S. No	Course Type	Course Code	Course Title	Credits	L-T-P	Total Marks
1	Core	PRMC 101	Research Methodology	4	3-1-0	80
2	Core	PRPE 102	Research & Publication Ethics	2	1-1-0	40
3	Core	PGLC 103	Knowledge of modern instruments in Earth Science	4	2-2-0	80
Elective		PGLE 104	Student must select anyone elective subject			
4	Elective-I		Petrology	4	3-1-0	80
5	--do-		Structure and Tectonics	4	3-1-0	80
6	--do-		Geochemistry	4	3-1-0	80
7	--do-		Environmental Geology and Geomorphology	4	3-1-0	80
8	--do-		Geohydrology	4	3-1-0	80
9	--do-	PGLF105	Fieldwork (Seminar/Workshop/Assignment/Publication etc.)	4	0-2-2	80
Total				18		360

*Student will study any one elective subject

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**Pre PhD coursework
Semester I**

Course code: PRMC 101				
Course Name: Research Methodology				
Semester /Year: I				
	L	T	P	C
	3	1	0	4

L - Lecture T – Tutorial P – Practical C – Credit

Course Objective:

The main purpose of the course is to familiarize students for meaningful knowledge for conducting quantitative and qualitative research methods. Students will gain knowledge in understanding design, methodology and technique, data management, presentation, and data analysis.

Unit 1- Concept & Types of Research

Meaning and importance of Research – Types of Research – Selection and formulation of Research Problem –Research Design, Classification of Research, Pure and Applied Research, Exploring or Formulative Research, Descriptive Research, Diagnostic Research/Study, Evaluation research/Studies, Action Research, Experimental Research, Analytical Study of Statistical Method, Historical Research. History and basic concepts (validity, reliability, objectivity and subjectivity) characteristics and format. Steps to better writing, flow method, organization of material and style.

Unit 2 - Methods Research

Surveys, Case Study, Field Studies General Survey of various Methods including Survey Method, Interdisciplinary Method, Case Study Method, Sampling Method, Statistical Method, Observation Method, Interview Method, Schedule Method, Questionnaire Method, Documentary Method, Library Method, Historical Method and Scientific Method. Characteristic Features of Scientific Method; Empirical Verifiable, Cumulative, Self - Correcting, Deterministic, Ethical & Ideological neutrality (Value Free), Statistical Generalizability.

Unit 3 - Data Collection and Data Analysis

Collection, Objectives and Classification of Data, Aims, Methods and Objects of Tabulation of Data, Forms and Processes of Interpretation and Presentation of Data. Primary, Secondary and Tertiary Data. Construction and adaptation of instruments, administration of questions and tests. Data organization in SPSS & Excel, Graphical representation of data. Definition and Aims of Content Analysis, Problems of Content Analysis, Computer and Content Analysis Discussion and Interpretation of results, Testing of Hypothesis: Logical and Statistical Techniques.

Unit 4 - Report Writing

Locating Information on a Topic of Interest, Acquiring Copies of Articles of Interest, The Nature of Scientific Variables, Conceptual Versus Operational Definitions of Variables, Levels of Measurement, Various Paradigms, The Basic Format for a Research Report, Identification of the Parts of a Research Report, Citation and Referencing Styles, Essentials of Report Writing, Aids for Writing Good Research Report.

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Text book:

1. Ganesan R, Research Methodology for Engineers, MJP Publishers, Chennai. 2011
2. C.R.Kothari, "Research Methodology", 5th edition, New Age Publication,
3. Cooper, "Business Research Methods", 9th edition, Tata McGraw hills publication

Reference books:

1. Anderson B.H., Dursaton, and Poole M.: Thesis and assignment writing, Wiley Eastern 1997.
2. Bordens K.S. and Abbott, B.b.: Research Design and Methods, McGraw Hill, 2008.
3. Morris R Cohen: An Introduction to logic and Scientific Method (Allied Publishers) – P 197-222; 391–403.

Course outcomes (COs):

Upon successful completion of the course student will be able to

CO1	To develop understanding of the basic framework of research process.
CO2	To develop an understanding of various research designs and techniques
CO3	To identify various sources of information for literature review and data collection.
CO4	To develop an understanding of the ethical dimensions of conducting applied research
CO5	Appreciate the components of scholarly writing and evaluate its quality.
CO6	To create the research design and experimental approaches to conduct research.

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Course code: PRPE102				
Course Name: Research and Publication Ethics				
Semester/Year: I				
	L	T	P	C
	1	1	0	2

L - Lecture T – Tutorial P – Practical C – Credit

PRPE-102: Research & Publication Ethics Credit 2(1-1-0)

Course Objective:

The main aim of this course to convey the principles of ethical research. Students will gain the knowledge of hands-on experience to identify research misconduct and predatory publications.

Theory

• **RPE 01 Philosophy and Ethics**

1. Introduction to philosophy: definition, nature and scope, concept, branches.
2. Ethics: definition, moral philosophy, nature of moral judgements and reactions.

• **RPE 02 Scientific Conduct**

1. Ethics with respect to science and research
2. Intellectual honesty and research integrity
3. Scientific misconducts: Falsification, and Plagiarism (FFP)
4. Redundant publication: duplicate and overlapping publication, salami slicing
5. Selective reporting and misrepresentation of data

• **RPE 03 Publication Ethics**

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

• **RPE 04: Open Access Publishing**

1. Open access publications and initiatives
2. SHERPA / ROMEO online resource to check publisher copyright and self-archiving policies
3. Software tools to identify predatory publications developed by SPPU
4. Journal finder / journal suggestion tools viz. JANE, Elsevier journal Finder, Springer, Journal Suggester, etc.

• **RPE 05: Publication Misconduct**

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- **A. Group Discussion**

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**

Use of plagiarism software like Turnitin, Urkund and other open-source software tools.

- **RPE 06: Databases and Research Metrics**

- **A. Databases**

1. Indexing databases
2. Citation databases: Web of Science, Scopus, etc.

- **B. Research Metrics**

1. Impact factor of journal as per journal Citation report, SNP, SJR, IPP, Cite score
2. Metrics: h-index, g index, i10 index, altmetrics

Recommended Books:

Text book:

1. Todorovich M, Kurtz P, The Ethics of Teaching and Scientific Research, Sidney Hook.
2. Michael P Marder (2004) Research Methods for Science. Oxford Press
3. Murthy, SN, BhojannaU (2008) Business Research Methods Excel Books

Reference books:

1. Kambadur M K, GhoshA, Singhvi, A K, (2019) ETHICS in, Science Education, Research and Governance, Indian National Science Academy New Delhi, India
2. Erlbaum J LL,(2003) Ethics and Values in Industrial-Organizational Psychology.
3. Barbara H. S., Joan E. Sieber; Gary B. Melton Research Ethics: A Psychological Approach

Course outcomes (COs):

Upon successful completion of the course student will be able to

CO1	To develop an understanding of research ethics, publications misconduct and plagiarism.
CO2	To develop Intellectual honesty and research integrity.
CO3	To identify various sources of information for data bases and research matrices.
CO4	To develop an understanding of Open access publications and initiatives.
CO5	Appreciate the components of scholarly writing and evaluate its quality.
CO6	To create the research matrices based on cite score.

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Course code: PGLC103				
Course Name: - Knowledge of modern instruments in Earth Science				
Semester/Year: I				
	L	T	P	C
	3	1	0	4

PGLC103- Knowledge of modern instruments in Earth Science

Unit 1: Technique for Refractive Index, introduction to the making samples for various geochemical analysis and petrogenesis of Igneous and metamorphic rocks (XRF, XRD, ICPMS, EPMA). Method to learn mineral chemistry through EPMA. Basic concept of method of Geochronology and tectonic geomorphology.

Unit: 2 Some fundamental concept and techniques for strain measurement using Rf/Phi method to calculate strain in deformed rocks. Use of Image J software to do fractal and other strain measurement analysis. Concept and learn technique of Anisotropy of magnetic susceptibility (AMS) to understand the deformation statistics.

Unit 3: Learn Idea of water sampling and processing, learn techniques for water chemistry and graphic representation of chemical data; groundwater hardness, water quality standards; groundwater issues due to urbanization; solid and liquid waste disposal; application of isotopes (H, C, O) in groundwater; Stratigraphic column preparation. Basic concept of heavy mineral separation, Distribution chart, Statistical method of fossil analysis.

Course outcomes (COs):

Upon successful completion of the course student will be able to

CO1	To gain the knowledge of different mineral composition to understand the source rock and petrogenesis.
CO2	To understand the relevance of applied aspects of different techniques in various fields of earth science.
CO3	To apply the knowledge about crystallography and to infer the environment of formation of minerals.
CO4	To analyses and interpret the data to understand the deformation of the rocks.
CO5	Students will be able differentiate field and lab methods to collect data and samples to plot logs and prepare maps.
CO6	To analyze collected samples and laboratory data to solve a problem and to understand the source.

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Text books:

- Ramsay, J. Modern Tectonics of Strain analysis.
 Macburney, Introduction to geochemistry.
 Todd, D.K. Text book of Hydrology.
 Hruoda, F. A textbook on Anisotropy of magnetic susceptibility.

Course code: PGLE104				
Course Name: Elective Paper				
Semester/Year: I				
	L	T	P	C
	3	1	0	4

L - Lecture T – Tutorial P – Practical C – Credit

PGLE104- Elective-1 (candidates may choose any one of the following subjects)

Paper 1: Igneous and Metamorphic Petrology:

- Pure and applied petrology,
- Origin and composition of magma, Crystallization of magma, Classification and types of Igneous rocks, Relation between magmatism and tectonism.
- Hot spot and magmatic plume. Details characteristics of different types of metamorphism. Crustal evolution. Himalayan Metamorphism.
- Metamorphic Facies, metamorphic belts, use of texture in interpretation of metamorphic history. Phase diagram (ACF, AKF...etc.), laboratory synthesis of metamorphic minerals.

Paper 2: Geochemistry:

- Basic concept of Geochemistry for rock classification.
- Modern work in pure and applied geochemistry including element distribution and migration in igneous, sedimentary, and metamorphic rocks,
- Hydrocarbon occurrence and organic studies.

Paper 3: Structure and tectonics:

- Definition of Structure, Structural Geology and Tectonics, Stress and strain in the rocks, factors controlling the strength of the rocks.
- Details study of brittle and ductile deformation, Field techniques in structural mapping and laboratory interpretation, Unconformity, Deformation in Himalaya.
- Evolution of concept in tectonics, Geosyncline, Continental drift, plate tectonics, geomagnetism, Iceland arc,

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- crustal tectonics fronts, sedimentary basins, ocean tectonics, Earthquake and volcanics, relation between climate and tectonics

Paper 4: Geohydrology:

- Source of water, water cycle, vertical distribution of water, Hydrological properties of rocks,
- type of aquifers, modern methods of characterization of aquifers, water chemistry and its application in monitoring the ground water quality,
- Ground water flow and well hydraulics. Ground water investigation. Ground water pollution.
- Ground water Recharge and over exploitation of ground water. Ground water legislation in India. Impact of Climate change in ground water availability.

Paper 5: Environmental Geology and Geomorphology:

- Definition of Environment, Types of Environments, current issue related with the environment, IPCC,
- Current environmental issues viz. water, air, soil contamination/ pollution issues, causes, remedial measures.
- Geological hazards: seismicity, landslides, their causes and migration, land use planning development, use remote sensing and GIS in the preparation of hazards zonation maps.
- Elementary ideas about modern techniques of geomorphology, Role of geomorphology in societal development.
- Evolution of land forms in the context of tectonics and climate, Definition and significance of Quaternary period, Quaternary Stratigraphy, Methods of dating of Quaternary samples.

Course outcomes (COs):

Upon successful completion of the course student will be able to

CO1	To gain the knowledge of modal analysis, reflectivity, micro hardness, cathode luminescence, chemical and x-ray analysis and their application in natural minerals, systems and assemblages.
CO2	To gain the knowledge and apply in igneous and metamorphic petrology, including recent development in research methodology and instrumentation concerning the investigation of crustal inorganic and/ or organic material.
CO3	To understand the differentiation between internal and external stress and the resultant strain feature in rocks including mathematical analysis and analogue computer studies, geodynamics and deep earth processes, Himalayan tectonics.
CO4	To analysis the modern work in pure and applied geochemistry including element distribution and migration in igneous, sedimentary and metamorphic rocks
CO5	To understand the concept of environment geoscience and its relation with the climate.
CO6	To understand the evolution of land forms in the context of tectonics and climate, various techniques used in the study of quaternary records, understanding the quaternary

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deposits in India, elementary ideas about modern techniques of geochronology.

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April

