

**Department of Earth and Planetary Sciences**  
**Prof. Rajendra Singh (Rajju Bhaiya) Institute of Physical Sciences for**  
**Study and Research**  
**V. B. S. Purvanchal University, Jaunpur**

**Pre- Ph.D. Course Work**  
**(Ordinance and Syllabus w.e.f. 2022-23)**

**Aim of the Course Work:** The Pre- Ph.D. course work is designed to develop investigative, evaluative, comprehensive, reasoning, statistical analyses and writing skills in students to create an in depth understanding of his/her area of research.

**General Instructions:**

1. All matters relating to admission to this course shall be dealt by the Ph.D. Admission Committee constituted for the purpose by the University.
2. As per the university ordinance, the research scholars who are provisionally registered for the Ph.D. Programme will undergo a Pre- Ph.D. Course work which is mandatory for all.
3. In Pre- Ph.D. Course work, the Ph.D. candidate has to pass three compulsory theory papers of total 16 credits that comprises two main papers from the subject (6 + 6 credits) in which the candidate has taken admission and one paper on Research Methodology (that includes topics on research ethics, plagiarism and computer applications) (4 credits).
4. For successful completion of the course work, the Ph.D. candidate is also required to complete one research project in addition to the three compulsory papers.
5. The duration of Pre-Ph. D. course work with three compulsory papers and one project will be of one semester (six month).
6. Normally examinations will be held two times in a year and will be notified by the Head of the Department. Every student will be required to fill up the examination form within the stipulated time notified by the Head of the Department.
7. The Ph.D. candidate has to obtain a minimum of 55% marks or equivalent Grades/CGPA in aggregate during the course work in order to be eligible to continue in the Ph.D. programme and submit the thesis.
8. The name of the candidates successful in the semester system in Pre- Ph.D. Course in Geology examination shall be arranged in the following grade system:

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लैटर ग्रेड	विवरण	अंको की सीमा	ग्रेड पॉइंट
O	Outstanding	91-100	10
A <sup>+</sup>	Excellent	81-90	9
A	Very good	71-80	8
B <sup>+</sup>	Good	61-70	7
B	Pass	55-60	6
F	Fail	0-54	0
AB	Absent	Absent	0
Q	Qualified		
NQ	Not Qualified		

9. The minimum attendance required during the course work period is 75% of the total courses.

### Scheme of the Course (All papers are compulsory)

Paper	Title	Credits
I	Introduction to Earth Sciences	6
II	Basic Analytical Techniques in Earth Sciences	6
III	Research Methodology in Earth Sciences	4

### Paper Setting and Evaluation Pattern (For Paper I, II and III)

Types of Question	Total Number of Questions	Questions to be attempted	Marks	Time
Objective Type	10	10	10x2=20	3 Hours
Short Type	8	5	5x8=40	
Long type	4	2	2x20=40	

**Total Marks: 100**

Note: As Per UP government direction teachers in service are allowed to attend their Pre PhD-Course Work class either in online or in offline mode.

### Syllabus

Programme/Class: <b>Pre-Ph.D.</b>	Year: <b>Sixth</b>	Semester: <b>Eleventh</b>
Course work		
Subject: <b>Geology</b>		
Course Code: <b>B091101T</b>	Course Title: <b>Introduction to Earth Sciences</b>	
Credits: <b>6</b>		
Max. Marks: <b>100</b>		Min. Passing Marks: <b>40</b>
Unit	Topics	
<b>I</b>	Evolution of the Earth and its internal structure. Basic concepts of plate tectonics, continental drift and sea-floor spreading. Structure, composition and evolution of the Earth's atmosphere. Minerals and Rocks, Classification of rock-forming minerals.	
<b>II</b>	Igneous rocks and their classification, Igneous textures, Detail studies of some common igneous rock types. Metamorphic Rocks: types, structure and textures, Concepts of metamorphic facies. Sedimentary rocks and their classification, Diagenesis of siliciclastic and carbonate rocks, sedimentary textures, composition and significance of different types of sedimentary rocks.	

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<b>III</b>	Fold, Faults and joints, their origin and classification, different types of unconformities. Physiographic division of Indian subcontinent; Brief idea about paleogeographic, paleoclimatic and tectonic set up of India during Precambrian, Paleozoic, Mesozoic and Cenozoic Eras. Concept of erosion cycles. Geomorphology of India; Peninsular, extra-peninsular and Indo-Gangetic Plains. Basics of Remote Sensing and Geographic information systems (GIS), their applications in various geological aspects.
<b>IV</b>	Causes and impact of climate change on the society. Green House gases and effect, Global warming, Pollution in the atmosphere. Floods: their causes and control. Landslide hazards: causes and investigations; Applications of stable and radiogenic isotopes in Geology. Basic principles of geophysical exploration. Gravity methods, Magnetic methods, Electrical methods and Seismic methods. Hydrological cycle, Pollution of groundwater. Ground Water Exploration and Management.
<b>Suggested Readings:</b>	
<ol style="list-style-type: none"> <li>Gass I.G., Smith, J. Peter, and Wilson R. C. L. (1982); Understanding the Earth. Artemis Press (Pvt.) Ltd. U.K.</li> <li>Dana, E. S. and Ford, W. E. (2002): A Textbook of Mineralogy. Wiley Eastern Limited, New Delhi.</li> <li>Sengupta, S.M. (2007): Introduction to sedimentology. C.B.S. Publication, New Delhi.</li> <li>Best, Myron G. (2002): Igneous and Metamorphic Petrology, Blackwell Science, C.B.S. publishers, Delhi.</li> <li>Ghosh S.K. (1993): Structural Geology, Fundamentals and Modern Developments. Pergamon Press.</li> <li>Krishnan, M.S. (1982): Geology of India and Burma, C.B.S. Publ, Delhi, John Wiley and Sons, New York.</li> <li>Kale, V.S. and Gupta, Avijit (2010): Introduction to geomorphology. University Press.Holmes, A. (1992): Holmes Principles of Physical Geology Edited by P. McL. D. Duff. Chapman and Hall, London.</li> <li>Gupta, R.P. (1991): Remote Sensing Geology. Springer, Berlin.</li> <li>Subramaniam, V. (2001): Textbook in Environmental Science. Narosa International.</li> <li>Krynine, D.H. and Judd, W.R. (1998): Principles of Engineering Geology., C.B.S. Publishers.</li> <li>Gunter Faure (1977) Principles of Isotope Geology. John Wiley &amp; Sons Ltd.</li> <li>Lowrie, William (2007): Fundamentals of Geophysics (2nd Edition). Cambridge University Press.</li> <li>Todd, David K. and Mays, Larry W. (2005): Groundwater Hydrology (3rd edition). Wiley India Pvt Ltd.</li> </ol>	

Programme/Class: <b>Pre-Ph.D.</b>		Year: <b>Sixth</b>	Semester: <b>Eleventh</b>
Course work		Subject: <b>Geology</b>	
Course Code: <b>B091102T</b>		Course Title: <b>Basic Analytical Techniques in Earth Sciences</b>	
Credits: <b>6</b>			
Max. Marks: <b>100</b>		Min. Passing Marks: <b>40</b>	
<b>Unit</b>	<b>Topics</b>		
<b>I</b>	Handling and uses of GPS, Brunton and compass. Geological mapping and procedures to collect samples and specimens in different types of terrains for structural, sedimentological, petrological, palaeontological, geochemical and economic geology studies.		
<b>II</b>	Various sample preparation techniques in mineralogy, Historical development of Xray crystallography and Bragg's equation. Introduction to Instrumental Techniques involved in mineral characterization (Powder X-Ray diffraction Analysis, Electron Microprobe Analysis and scanning electron microscopy, FTIR and Laser Raman Spectroscopy-principle, application and their utility in mineral sciences).		
<b>III</b>	Some basic laboratory techniques in sedimentology: Grain-size analysis, Heavy mineral analysis, Identification of clay minerals, Roundness and shape analyses of clastic grains.		
<b>IV</b>	Various sample preparation techniques in geochemical analyses; Historical development of Mass Spectrometers, principle, application and their utility in geosciences.		
<b>Suggested Readings:</b>			
<ol style="list-style-type: none"> <li>Mathur S.M. (2001): Guide to Field Geology. Prentice-Hall of India Pvt. Ltd., New Delhi, 220p. ISBN: 81-203-1915-X.</li> <li>Bhattacharyya A. and Chakraborty C. (2005): Analysis of Sedimentary Successions: A Field Manual. Oxford &amp; IBH Publishing Co. Pvt. Ltd., New Delhi-Kolkata, 445p.</li> </ol>			

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3. McClay K.R. (2005): The Mapping of Geological Structures. John Wiley & Sons, Chichester, 161p.
4. Barnes J.W. and Lisle R.J. (2004): Basic Geological Mapping (Geological Field Guide). John Wiley & Sons Inc., 378p. ISBN: 978-0-470-84986-6.
5. Perkins, D. (2013): Mineralogy. Prentice Hall.
6. Ramana Murty, V.V. (2012): Operational Hand book of mineral Processing. Denett & Co.
7. Woolfson, M. M., An introduction to X-ray crystallography, 1997, Cambridge University Press.
8. X-ray crystallography. [https://en.wikipedia.org/wiki/X-ray\\_crystallography](https://en.wikipedia.org/wiki/X-ray_crystallography).
9. Dhanaraju, R. (2009) Handbook of geochemistry: techniques and applications in mineral exploration. Geological Society of India.
10. Reed, S.J. B. (1996): Electron Microprobe Analysis and Scanning electron Microscopy in Geology. Cambridge University press.
11. Watson, J. T. and Sparkman O. D., Introduction to Mass Spectrometry: Instrumentation, Applications and Strategies for Data Interpretation, Fourth Edition, 2007, John Wiley & Sons, Ltd.
12. Analysing Biomolecular Interactions by Mass Spectrometry, First Edition. Edited by Jeroen Kool and Wilfried M.A. Niessen. Published 2015 by Wiley-VCH Verlag GmbH & Co. KGaA.

Programme/Class: <b>Pre-Ph.D.</b>		Year: <b>Sixth</b>	Semester: <b>Eleventh</b>
<b>Course work</b>			
Subject: <b>Geology</b>			
Course Code: <b>B091101T</b>		Course Title: <b>Research Methodology in Earth Sciences</b>	
Credits: <b>6</b>			
Max. Marks: <b>100</b>		Min. Passing Marks: <b>40</b>	
Unit	Topics		
<b>I</b>	Literature Survey, defining the question and formulating hypothesis/hypotheses, Methods: Collection of research data, tabulating and cataloguing, Sampling and methods of data analysis, Record keeping and analysis: Generation of data, interpreting results/ data and drawing conclusions. Recording and storage/ retention of recorded materials, Maintenance of equipments, proper storage and disposal of hazardous materials, Management and user responsibilities in proper utilization of the facilities.		
<b>II</b>	Ethical issues in science research and reporting: objectivity and integrity, the problem of plagiarism and related issues, international norms and standards, Scientific temper and virtues; expectations from scientific community, Desired temper of scientists: truthfulness, simplicity, humility, open mindedness; attitude of service towards social and human well-being.		
<b>III</b>	Nature and importance of Communication in Science, Preparation of manuscripts: review articles, research papers, books, monograms, research projects; review of manuscripts, Survey of literature, and presentation of data, Popularization of Science, Socio – Legal issues: Originality, Integrity, IPR, Patents, Plagiarism.		
<b>IV</b>	Computer application in geosciences, study of different softwares (MS-Excel, Power Point, Adobe Illustrator, Corel Draw and Adobe Photoshop). Advanced techniques in the study of minerals and rocks, identification, classification and interpretation of petrographic observations.		
<b>Suggested Readings:</b>			
<ol style="list-style-type: none"> <li>1. Good Laboratory Practice. <a href="http://en.wikipedia.org/wiki/Good_Laboratory_Practice">http://en.wikipedia.org/wiki/Good_Laboratory_Practice</a></li> <li>2. What is scientific method? <a href="http://www.experiment-resources.com/">http://www.experiment-resources.com/</a></li> <li>3. Research methodology resources. <a href="http://edutechwiki.unige.ch/en/Research_methodology_resources">http://edutechwiki.unige.ch/en/Research_methodology_resources</a></li> <li>4. Overview of research methods. <a href="http://www.answer.com/topic/overview-of-research-methods">www.answer.com/topic/overview – of - research –methods</a>.</li> <li>5. David B. Resnik, 1998, The Ethics of Science: An Introduction. Routledge publisher, USA.</li> <li>6. Callahan D. &amp; Bok S., 1996, Ethics Teaching in Higher Education. Plenum Press, New York, USA.</li> <li>7. Kapur J.N., 1996, Ethical Values for Excellence in Education and Science, Vishwa Prakashan, New Delhi.</li> </ol>			

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*Shashi Kant*  
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8. Tripathi A.N., 2008, Human Values. New Age International Publishers, New Delhi.  
9. Wilson: Handbook of Science Communication, 1998, Institute of Physics Publishing, Bristol, Philadelphia.  
10. Science Communication: Theory & Practice; Stocklmayer, Gore MM, Bryant C (Eds.), 2002, Springer.  
11. Laszlis P: Communicating Science: A practical Guide, 2006, Springer.

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