

**M.Phil Syllabus**

# **GEOLOGY**

(With effect from 2021)



**P.G. Department of Geology  
Fakir Mohan University  
Vyasa Vihar, Balasore – 756089  
2021-22**

**FAKIR MOHAN UNIVERSITY, BALASORE**  
**M.Phil. IN GEOLOGY, 2021**

1. Candidates with at least 1<sup>st</sup> class in M.Sc. Geology/Applied Geology/Earth Science are eligible to apply for admission into the course.
2. The course is of one year duration comprising two Semesters.
3. The duration of the theory examination will be 3 hours. Students must present minimum 02 presentations in presentation papers. There will be a dissertation/ project of 200 marks in 2<sup>nd</sup> semester.
4. The Semester system of Examination will have internal as well as external valuation for theory papers.
5. In order to be eligible to appear the University Examination, attendance will be taken into account as per University Rules. The attendance will be calculated every month by the Department and the students are to collect information from the office.

**M.Phil Course (SFC MODE) in P.G. Department of Geology**

<b>M.Phil. in Geology</b>		
<b>Semester</b>	<b>Full Marks</b>	<b>Credit</b>
First semester	300	24
Second semester	300	24
<b>Total</b>	<b>600</b>	<b>48</b>

<b><u>First Semester</u></b>						
<b>Paper Code</b>	<b>Paper Name</b>	<b>Paper type</b>	<b>Marks</b>			<b>Credit</b>
			<b>Internal</b>	<b>End Term</b>	<b>Total</b>	
GL501	Research Methodology and Computer Application	Theory	40	60	100	08
GL502	Recent Advances in Geology	Theory	40	60	100	08
GL503	Research Publication Ethics	Theory and Practical	25	25	50	02
GL504	Practical related to paper GL501 and GL502	Practical	--	50	50	06
<b>Total</b>			<b>105</b>	<b>145</b>	<b>300</b>	<b>24</b>

<b><u>Second Semester</u></b>					
<b>Paper Code</b>	<b>Paper Name</b>	<b>Mark</b>			<b>Credit</b>
		<b>Internal</b>	<b>End Term</b>	<b>Total</b>	
GL601	Review/Proposal submission for Project	--	50	50	04
GL602	Pre-M.Phil. Presentation	--	50	50	04
GL603	Project Dissertation and Viva Voce	--	200	200	16
<b>Total</b>		<b>100</b>	<b>200</b>	<b>300</b>	<b>24</b>

## MARKING PATTERN

Paper	Internal Evaluation				End Term Examination				Total
	Home Assignment	Presentation	Quiz	Written	Written*	Presentation	Report	Viva-Voce	
<b>GL-501</b>	10	NA	10	20	60	NA	NA	NA	<b>100</b>
<b>GL-502</b>	10	NA	10	20	60	NA	NA	NA	<b>100</b>
<b>GL-503</b>	10	05 (GD)	05	NA	30	NA	NA	NA	<b>50</b>
<b>GL-504</b>	NA	NA	NA	NA	NA	10	30	10	<b>50</b>
<b>GL-601</b>	NA	NA	NA	NA	NA	10	30	10	<b>50</b>
<b>GL-602</b>	NA	NA	NA	NA	NA	10	30	10	<b>50</b>
<b>GL-603</b>	NA	NA	NA	NA	NA	40	120	40	<b>200</b>

*\* Includes experiments in case of practical paper*

### **Scheme of Internal Evaluation (Theory):**

Each theory paper consists of five units and irrespective of the credit hours assigned, will be of 100 marks, out of which, 40 will be internal marks (continuous evaluation) and 60 will be end term examination marks. There will be three components of internal evaluation – Quiz, Mid Term Written Test and Home Assignment as per the details below.

Component	Unit(s)	Marks	Remarks
Quiz – I	I	10	Best of the two quizzes will be considered
Quiz – II	III	10	
Mid Term (Written)	I & II	20	There will be no internal evaluation for the last unit (V)
Home Assignment	IV	10	
<b>Total</b>	<b>I – IV</b>	<b>40</b>	<b>Quiz-10 + Home Assignment - 10 + Mid term (Written) -20</b>

Sub. Code	Subject Name	Credit	Int. Mark	End Term
GL501	Research Methodology and Computer Application	08	40	60

<b>Objectives</b>	The basic objective of this course is to introduce students the basic ideas about what is research and need of research and ideas and techniques of use of computer and various software related to research in Geology.
<b>Pre-Requisites</b>	Basic Knowledge on computer
<b>Teaching Scheme</b>	Regular classroom lectures with use of ICT tools as and when required, sessions are planned to be interactive with focus on problem solving and practical activities.

### Detailed Syllabus

Unit	Topics	Hours
I	Concept and Definition of Research; Academic Research, Basic and Fundamental Research, Applied Research, Theoretical, Conventional and Experimental Research. Concepts and needs of Research Hypothesis. Objective Processes and steps in Research Methodology	10
II	Literature Survey and Review, Research Literatures and Electronic Media including Internet, Use of Digital Library, Online Resource; Necessity of Review of Literatures. Developing Research Proposal in the Field of Geosciences.	10
III	Research Approach and identifying gap areas from Literature Review; Problem Formulation and Statement of Research Objectives; Developing of Bibliography using Software. Concepts on Plagiarism, ISSN and ISBN numbers, Impact Factors and Citation Index of Research Articles and Assessing the Quality of Research Articles.	10
IV	Parts of Computers, Hardware, BIOS, Operating Systems, Binary System, Application Software: Spreadsheet Applications, Word Processing Applications, Presentation Applications, Learning Software Packages specific to Applied Geology.	10
V	Introduction on the Techniques of Data Representation, Documentation and Representation Tools, Basic Presentation Structures, Writing a Scientific Paper, Developing Arguments, Abstract and Summary Writing and Organizing Thesis, Project Reports; Formulation of Research Proposals. Scientific Research Funding Organizations in India.	10
Total		50

### **Reference Books:**

- R1. Against Method: Outline of an Anarchist Theory of Knowledge by Paul F., 1975, New Left Books, London.
- R2. Computer Applications in the Social Sciences by Edward, E.B., 1990, Temple University Press, Philadelphia.
- R3. Power/Knowledge: Selected Interviews and Other Writings by Michel, F., edited by Colin Gordon, 1980, Vintage, New York.
- R4. Principles of Writing Research Papers by Lester, James, D. and Lester Jr. J. D., 2007, Longman, New York.
- R5. Qualitative Research Methods for Social Sciences by Bruce, L. B. 2001, Allyn and Bacon, Boston.
- R6. Research Design: Qualitative, Quantitative and Mixed Methods Approaches by John, W. C., 2011, Sage Publications, Thousand Oaks.
- R7. Social Research Methods by Bryman, A. 2008, Oxford University Press, New York.
- R8. Social Research Methods: A Reader by Seale C., 2004, Routledge, London.
- R9. Survey Methodology by Robert, M. B, et al., 2009, Wiley, New Jersey.
- R10. The Structure of Scientific Revolutions by Thomas K., 1996, University of Chicago Press, Chicago.
- R11. An Introduction to Database Systems by Date C. J., 7<sup>th</sup> edition, 2000, Addison-Wesley Longman, Massachusetts.
- R12. An Introduction to Operating Systems: Concepts and Practice by Bhatt, Pramod Chandra P., 2<sup>nd</sup> edition, 2008, PHI Learning Pvt. Ltd., New Delhi.
- R13. Analyzing talk and text. In N. Denzin and Y. Lincoln, eds. Handbook of Qualitative Research by Silverman D., 2000, Sage Publications, Thousand Oaks, CA.
- R14. Database Management System by Narang R., 2006, PHI Learning Pvt. Ltd., New Delhi.
- R15. DOS The Easy Way: Complete Guide to Microsoft's MS DOS by Murdock, Everett E., 1993, HOT Press, Easy Way Downloadable Books.
- R16. DOS: The Pocket Reference by Jamsa, Kris A., 1993, Berkeley: Osborne McGraw-Hill.
- R17. Elementary Statistics for Geographers by Burt J. E. Barber. G.E. Rigby D. L., 2009, Guilford Press, New York.
- R18. Fundamentals of Computers by Rajaraman V., 2003, PHI Learning Pvt. Ltd., New Delhi.
- R19. Fundamentals of MS Office 2007 by Douglas, Gretchen and Mark Connell, 2<sup>nd</sup> edition, 2007, Kendall Hunt Publication Company, Dubuque.
- R20. Information Technology: Inside and Outside by David Cyganski, John, A. Orrand R. F. Vaz, 2000, Prentice Hall, New Jersey.
- R21. MS Excel for Dummies by Harvey, G. 2007, Wiley.
- R22. MS Word for Dummies by Gookin, D. 2007, Wiley.

<b>Course Outcome</b>	At the end of the course, the students will be able to:  i) Know various parts of a computer ii) Use of Internet for research iii) Use of software for research iv) Understand the research and research ethics v) Know the benefits of research vi) Know the preparation of writing reports vii) Know the funding agencies
-----------------------	---

Sub. Code	Subject Name	Credit	Int. Mark	End Term
GL502	Recent advances in Geology	08	40	60

<b>Objectives</b>	The main objective of studying this subject to know the recent advances in Geology and to accrue idea about various research tools and instruments.
<b>Pre-Requisites</b>	Basic knowledge of ore, mineral, mining, prospecting, exploration
<b>Teaching Scheme</b>	Regular classroom lectures with use of ICT tools as and when required, sessions are planned to be interactive with special focus on Indian minerals.

### Detailed Syllabus

Unit	Topics	Hours
I	Sample Preparation Techniques of Ore Sample for Microscopic Study. Use of XRD, SEM and EPMA in Mineral Characterization. Sampling, Assaying, Ore Evaluation and Reserve Estimation.	10
II	Application of Remote Sensing Techniques in Geological and Geomorphological Mapping, Land Use and Land Cover Studies, Terrain Evaluation, Mineral Exploration and Groundwater Resources Evaluation, Petroleum Exploration. Engineering Site Selection for Dam, Reservoir, Tunnel and Highways.	10
III	Groundwater Problems Related to Foundation Work, Canals, Mining and Tunnels. Problems of Over-Exploitation, Groundwater Estimation, Groundwater Budgeting, Groundwater Balance, Groundwater Legislation.	10
IV	Surface Water and Ground Water Pollution and Their Treatment, Environmental Impact of Groundwater Pollution and Extraction of Groundwater. Diseases due to various Chemical Constituents and Trace Metals in Groundwater and their Mitigation Measures.	10
V	Distribution of Elements in Core, Mantle, Crust, Hydrosphere and Atmosphere, Geochemical Cycle, Geochemical Differentiation. Geochemical Classification of Elements. Radioactivity: Stable and Radiogenic Isotopes, Dating Methods, Interpretation and Geological Significance of Ages.	10
Total		50

### **Reference Books:**

- R1. Chandra, D., Singh, R.M. Singh, M.P., 2000: Textbook of Coal (Indian context). Tara Book Agency, Varanasi.
- R2. Evans, A.M. (1993): Ore Geology and Industrial Minerals, Blackwell.
- R3. James R. Craig and David J. Vaughan (1994): Ore Microscopy and Petrography.
- R4. Klemm, D.D. and Schnieder, H.J. (1977): Time and Strata Bound Ore Deposits, Springer-Verlag.
- R5. Bhatta B, 2011: Remote Sensing and GIS 2nd Edition, Oxford University Press
- R6. Davis, J.C. (1984) Statistics and data analysis in geology. John Wiley, New York
- R7. Gupta, R.P. (1991) Remote Sensing Geology. Springer-Verlag. 356pp.

- R8. Lillesand, T.M. and Kiefer, R.W., 1987. Remote sensing and Image Interpretation, John Wiley.
- R9. Jensen, J. R. Introductory digital image processing a remote sensing perspective, Prentice Hall series in geographic information science.
- R10. Davis, S.N. & De Wiest, R.J.N. 1966. Hydrogeology. John Wiley & Sons, New York.
- R11. Ground Water and Wells (1977): UOP, Johnson, Div. St. Paul. Min. USA
- R12. Raghunath, H.M. 1983. Groundwater. Willey Eastern, Calcutta.
- R13. Todd, D.K. 1988. Groundwater Hydrology. John Willey and Sons.
- R14. Alan P. Dickins (2005) Radiogenic Isotope Geology, Cambridge University Press.
- R15. Hoefs, J. (1980): Stable Isotope Geochemistry, Springer and Verlag.
- R16. Hugh R. Rollinson (2007) Early Earth Systems: A Geochemical Approach by Blackwell Publishing Ltd.
- R17. Gunter Faure (1977) Principles of Isotope Geology by John Wiley & Sons Ltd.
- R18. Hugh R. Rollinson (1993) Using Geochemical Data: Evaluation, Presentation and Interpretation, Pearson Prentice Hall.
- R19. Albarde Francis (2003): Geochemistry- Introduction. Cambridge University Press.
- R20. Kula C Misra (2012) Introduction to Geochemistry: Principles and Applications, Wiley-Blackwell.

<b>Course Outcome</b>	At the end of the course, the students will be able to:  i) Get idea about the research tools and Instruments ii) Find out the use of remote Sensing in Geology iii) Find out the problem in Groundwater and its mitigation.
-----------------------	--

<b>Sub. Code</b>	<b>Subject Name</b>	<b>Credit</b>	<b>Int. Mark</b>	<b>End Term</b>
GL503	Research and Publication Ethics	02	25	25

<b>Objectives</b>	The basic objectives of this units are to know about the research and publication ethics
<b>Pre-Requisites</b>	Knowledge of writing abstract and full papers
<b>Teaching Scheme</b>	Regular classroom lectures with use of ICT tools as and when required, sessions are planned to be interactive with focus on hands on practices.

### Detailed Syllabus

<b>Unit</b>	<b>Topics</b>	<b>Hours</b>
I	<b>Philosophy and Ethics (Theory):</b> Introduction to Philosophy: definition, nature and scope, concept, branches Ethics: Definition, moral philosophy, nature of moral judgments and reactions.	4
II	<b>Scientific Conduct (Theory):</b> 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.	4

III	<b>Publication Ethics (Theory):</b> 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 behavior and vice versa, types, Violation of publication ethics, authorship and contributorship, Identification of publication misconduct, complaints and appeals, Predatory publishers and journals	7
IV	<b>Open Access Publishing (Practice):</b> 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: UGC-CARE list of journals, Journal finder/journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggester, etc.	4
V	<p><b>Publication Misconduct (Practice)</b></p> <p><b>A. Group discussions (2 hrs)</b></p> <p>Subject specific ethical issues, FFP, authorship, Conflicts of interest, Complaints and appeals: examples and fraud from India and abroad</p> <p><b>B. Software tools (2 hrs)</b></p> <p>Use of reference management software like Mendeley, Zotero etc. and anti-plagiarism software like Turnitin, Urkund</p>	4

### Suggested Readings:

- R1. Beall, J. (2012). Predatory publishers are corrupting open access. Nature, 489(7415), 179-179. <https://doi.org/10.1038/489179a>
- R2. Bird, A. (2006). Philosophy of Science. Routledge.
- R3. Chaddah, P. (2018). Ethics in Competitive Research: Do not get Scooped; do not get Plagiarized. ISBN: 978-938748086
- R4. Indian National Science Academy (INSA) (2019). Ethics in Science Education, Research and Governance. ISBN: 978-81-939482-1-7. [http://www.insaindia.res.in/pdf/Ethics\\_Book.pdf](http://www.insaindia.res.in/pdf/Ethics_Book.pdf)
- R5. MacIntyre, Alasdair (1967). A Short History of Ethics. London.
- R6. 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.
- R7. Resnik, D.B. (2011). What is Ethics in Research & Why is it Important. National Institute of Environmental Health Sciences, 1-10.
- R8. Lester, James, D. and Lester Jr. J. D., (2007). Principles of Writing Research Papers, Longman, New York
- R9. Bruce, Allyn and Bacon, Boston (2001). Qualitative Research Methods for Social Sciences
- R10. John, W. C., (2011). Research Design: Qualitative, Quantitative and Mixed Methods Approaches by, Sage Publications, Thousand Oaks

<b>Course Outcome</b>	At the end of the course, the students will be able to: <ol style="list-style-type: none"> <li>i) Understand the research ethics</li> <li>ii) Publishing papers in Impact Factor/open access journals.</li> </ol>
-----------------------	---



<b>Sub. Code</b>	<b>Subject Name</b>	<b>Credit</b>	<b>Int. Mark</b>	<b>End Term</b>
GL504	Practical	06		50
The practical will be related to papers GL501 and 502				

**SECOND SEMESTER**

<b>Sub. Code</b>	<b>Subject Name</b>	<b>Credit</b>	<b>Marks</b>
GL601	Review/Proposal Submission for Project	04	50
GL602	Pre-M.Phil. Presentation	04	50
GL603	Project and Viva Voce	16	200
<b>Total</b>		<b>24</b>	<b>300</b>