COURSE WORK SYLLABUS

DOCTOR OF PHILOSOPHY
in
GEOLOGY

(With effect from 2020-21 batch admitted in 2021)

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

FAKIR MOHAN UNIVERSITY
Ph.D. IN GEOLOGY COURSE WORK EXAMINATION

COURSE STRUCTURE

Paper Code	Paper title	Paper Type	Total Marks (Internal + End Term)	Credit Hours
GL701	Research Methodology and Computer application	Theory	100 (40+60)	06
GL702	Recent advances in Geology	Theory	100 (40+60)	06
GL703	Research and Publication ethics	Theory	50 (20+30)	02
GL704	Literature Review (Including Book Review related to the proposed topic)	Project	100	06
GL705	Preparation of Research Proposal/Synopsis	Project	50	04
		Total	**400**	**24**

MARKING PATTERN

Paper	Internal Evaluation				End Term Examination				Total
	Home Assignment	Presentation	Quiz	Written	Written*	Presentation	Report	Viva-Voce	
GL701	10	NA	10	20	60	NA	NA	NA	**100**
GL702	10	NA	10	20	60	NA	NA	NA	**100**
GL703	10	05	05	NA	30	NA	NA	NA	**50**
GL704	NA	NA	NA	NA	NA	20	60	20	**100**
GL705	NA	NA	NA	NA	NA	10	30	10	**50**

**** Includes experiments in case of practical papers***

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	
Total	**I – IV**	**40**	**(Q-10) + (HA-10) + (W-20)**

BOARD OF EXAMINERS

Sl. No.	Section	Examiner(s)
01	Home Assignment and Quiz	Internal Course Teacher/ Instructor from the University P. G. Department
02	Seminar Presentation	Faculty Members of the University P. G. Department, as nominated by the Head of the Department including the RAC. The proposed Supervisor, if from outside the University Campus, may be coopted as a member examiner.
03	Written (Mid Term)	Internal Course Teacher/ Instructor from the University P. G. Department
04	Report	Department Research Committee (DRC) and Research Advisory Committee (RAC)
05	Viva-Voce	Department Research Committee (DRC) and Research Advisory Committee (RAC)
06	Written (End Term)	Examiner as appointed by the Board of Studies

Sub. Code	Subject Name	Credit	Int. Mark	End Term
GL701	Research Methodology and Computer application	6	40	60

Objectives	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.
Pre-Requisites	Basic Knowledge on computer
Teaching Scheme	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; Research proposal and concepts.	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., 7th edition, 2000, Addison-Wesley Longman, Massachusetts.
R12. An Introduction to Operating Systems: Concepts and Practice by Bhatt, Pramod Chandra P., 2nd 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, 2nd 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.

Course Outcome	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) Know what research and research ethics is 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
GL702	Recent advances in Geology	6	40	60

Objectives	The main objective of studying this subject to know the recent advances in Geology and to accrue idea about various research tools and instruments.
Pre-Requisites	Basic knowledge of ore, mineral, mining, prospecting, exploration
Teaching Scheme	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 evaluation 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 & 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. Levorson, A.I. Geology of Petroleum.
R6. Mookherjee, A. (2000): Ore Genesis-A Holistic Approach, Allied Publisher.
R7. Selley, R.C., 1998: Elements of Petroleum Geology. Academic press.
R8. Singh, M.P. (Ed.) 1998: Coal and organic Petrology. Hindustan Publishing Corporation, New Delhi.

Course Outcome	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.

Sub. Code	Subject Name	Credit	Int. Mark	End Term
GL703	Research and Publication Ethics	2	20	30

Objectives	The basic objectives of this units are to know about the research and publication ethics
Pre-Requisites	Knowledge of writing abstract and full papers
Teaching Scheme	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

Unit	Topics	Hours
I	**Philosophy and Ethics (Theory):** Introduction to Philosophy: definition, nature and scope, concept, branches Ethics: Definition, moral philosophy, nature of moral judgments and reactions.	4
II	**Scientific Conduct (Theory):** 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	**Publication Ethics (Theory):** 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	**Open Access Publishing (Practice):** 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	**Publication Misconduct (Practice)** **A. Group discussions (2 hrs)** Subject specific ethical issues, FFP, authorship, Conflicts of interest, Complaints and appeals: examples and fraud from India and abroad **B. Software tools (2 hrs)** Use of reference management software like Mendeley, Zotero etc. and anti-plagiarism software like Turnitin, Urkund	4

Suggested Readings:

Beall, J. (2012). Predatory publishers are corrupting open access. Nature, 489(7415), 179-179. https://doi.org/10.1038/489179a

Bird, A. (2006). Philosophy of Science. Routledge.

Chaddah, P. (2018). Ethics in Competitive Research: Do not get Scooped; do not get Plagiarized. ISBN: 978-938748086

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

MacIntyre, Alasdair (1967). A Short History of Ethics. London.

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

Course Outcome	At the end of the course, the students will be able to: i) Find out what is research ethics ii) How to publish papers in Impact Factor/open access journals.

Sub. Code	Subject Name	Credit	Int. Mark	End Term
GL704	Literature Review (Including Book Review related to the proposed topic)	6	40	60
The Scholar have to do the literature Review work with the guidance of his proposed guide.				

Sub. Code	Subject Name	Credit	Int. Mark	End Term
GL705	Preparation of Research Proposal/Synopsis	4	20	30
The Scholar have to prepare his research proposal/synopsis with the guidance of his proposed guide.				