# Department of Geology
# School of Human & Environmental Sciences
## SYLLABUS FOR Ph.D. COURSE WORK

1. The total duration of the Ph.D. Course work in Geology shall of one semester, total of 14 credits.

2. Candidates having a postgraduate degree with minimum 55% marks or as per university rules in Geology or cognate and allied subjects shall be eligible to take admission in Ph.D. programme.

**Duration of the Course: ONE Semester** **Total Credits: 14**

| Paper | Name of the paper | Paper No. | Credit |
|---|---|---|---|
| **1.** | Research Methodology | GELC – 501 | 4 |
| **2.** | Review of literature & Report Writing | GELC – 502 | 4 |
| **3.** | Research Problems in Geoscience | GELC – 503 | 4 |
| **4.** | Research and Publication Ethics (RPE) | GELC – 504 | 2 |

| GELC – 501: Research Methodology | 100 Marks (4 Credits) |
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| **UNIT I** | Planning Research: Research Problem; Technique involved in defining a problem; Techniques involved in solving the problem; Different methods used to solve a problem. |
| **UNIT II** | Identification of geological research problem, formulating work plan, Dos and Don'ts for selecting a research problem. Quantitative methods of Research in Geology: Methods of data collection – experimental data, field data, data from secondary sources. |
| **UNIT III** | Relation between variables: correlation (both continuous & binary data), regression (both linear & non-linear) for two variables. Test of significance including one-way-anova; Errors and analysis of errors. Computer application in research: Data analysis – use of software like MS Excel/MATLAB/Mathematica/SPSS, Databases – use of software like MS Access/MySQL. Introduction to Computer Network: Network Protocol and Topology. |
| **UNIT IV** | Principles and Application of Analytical Techniques in Geology: ICP-MS/OES; AAS; XRD, SEM, EDAX, EPMA; 14C dating; OSL/ TL dating. |
| **Suggested Readings:** | |
| **Duane, C. Hanselman and Bruce, L. Littlefield., 2011: Mastering MATLAB.** | |
| **Khandpur, R. S., 2015: Handbook of Analytical Instruments, McGraw Hill Education; 3rd Ed.** | |
| **Kothari, C. R., 2008: Research Methodology-Methods and Techniques, New Age International, 2nd Ed. (New Delhi).** | |
| **Kumar, R., 2005: Research Methodology: A step-by-step guide for beginners, SAGE Publications.** | |
| **Mishra, R. P., 1980: Research Methodology, Handbook Concept Publishing Company, New Delhi.** | |
| **Stallings, W., 1976: Data and computer communications; Mc Millan Pub. Co. New York** | |
| **Tanebaum, A., 1981: Computer Network, Prentice Hall Ind. Englewood cliffs N.J.** | |

| GELC – 502: Review of literature & Report Writing | 100 Marks (4 Credits) |
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| | Review of literature: Premise, objectives, principles, and procedure; Reference Pattern. |
| | Report Writing: Purpose & Methods of writing a Detailed Project Report (DPR) (The research scholar has to carry out the review of literature and present research plan based on the theme of research proposal). |
| **Suggested Readings:** | |
| **Harris, D., 2019: Literature Review and Research Design (A guide to effective research practice)** | |
| **Kothari, C. R., 2008: Research Methodology-Methods and Techniques, New Age International, 2nd Ed. (New Delhi).** | |
| **Kumar, R., 2005: Research Methodology: A step-by-step guide for beginners, SAGE Publications.** | |

| GELC – 503: Research Problems in Geoscience | 100 Marks (4 Credits) |
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| **UNIT I** | **The Earth and the Solar System:**<br>Modern theories on the origin of the Earth and solar system; Earth's orbital parameters; Kepler's laws of planetary motion and Milankovitch time scale; Radioactive isotopes and their applications in Geochronology; Basic concepts of seismology and internal structure of the Earth; Continental, and Oceanic Crusts; Physico-chemical and seismic properties of Earth's interior; Earth's gravity and magnetic fields and its thermal structure, thermal gradient, and thermal heat flow map; Concept of Geoid and, spheroid. |
| **UNIT II** | **Structural Geology and Tectonics:**<br>Concept of stress and strain; Theories of rock failure; Causes and dynamics of faulting; Concept of strain, two-dimensional strain analysis; Mechanics of folding and buckling, superposed folding patterns.<br>Brittle and ductile shear zones, geometry, and products of shear zones; Palaeomagnetism, polar wandering and reversal of earth's magnetic field; Concept of plate tectonics, nature and types of plate margins, geometry and mechanism of plate motion. |
| **UNIT III** | **Mineralogy and Petrology:**<br>Crystalline and amorphous structures; Crystal structure in common Oxides, Sulphides, and Silicates; Structural states of minerals.<br>Genesis, properties, emplacement, and crystallization of magmas; Phase equilibrium studies of simple systems; Application of thermodynamics in Geological research; P-T-t path; thermobarometers; Metamorphic structures, and textures; Isograd, Facies concept.<br>Classification of sediments and sedimentary rocks; Flow regimes and processes of sediment transport; Sequence Stratigraphy; Basin Tectonics; Sedimentary environments and development of Sedimentary facies. |
| **UNIT IV** | **Geochemistry and Geophysics:**<br>Chemical composition of crust and upper mantle, oceanic and continental crust and its characteristics; Fundamentals of Geochemical exploration, type of Geochemical Survey and Pathfinder elements.<br>Principles of geophysical exploration; Electrical and Electromagnetic Methods: Elements of SP, IP and resistivity methods, Wenner and Schlumberger configurations; Methods of resistivity profiling and sounding; Seismic Method: Elementary Principle of reflection and refraction methods. |
| **Suggested Readings:** | |
| **Blatt, H., Middleton, G.V., and Murray, R.C., 1980: Origin of Sedimentary Rocks, Prentice-Hall Inc.** | |
| **Collins, J.D., and Thompson, D.B., 1982: Sedimentary Structures. George Allen & Unwin, London.** | |
| **Dobrin, M.B., and C.H. Savit, 1988: Introduction to Geophysical Prospecting, McGraw Hill, New York.** | |
| **Fossen, H., 2010: Structural Geology, Cambridge University Press;** | |
| **Gass I.G. et al., 1982: Understanding the Earth. Artemis Press (Pvt) Ltd. U.K.** | |
| **Ghosh, S.K., 1993: Structural Geology: Fundamental and Modern Developments. Pergamon Press.** | |
| **Nesse, D.W., 2000: Introduction to Mineralogy, McGraw Hill.** | |

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| **Perkins, D., 2013: Mineralogy, Prentice Hall** |
| **Philpotts, A., and Ague, J., 2009: Principles of Igneous and Metamorphic Petrology, Cambridge University Press.** |
| **Reineck, H.E. and Singh, I.B., 1978: Depositional Sedimentary Environments, Springer- Verlag.** |
| **Sharma, P.V., 1986: Geophysical Methods in Geology, Elsevier, NY.** |
| **Wilson, M., 1989: Igneous Petrogenesis: A Global Tectonic Approach. Chapman and Hall publishing.** |


| **GELC – 504: Research and Publication Ethics (RPE)** | **50 Marks (2 Credits)** |
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| **UNIT I** | **Research Ethics:**<br>Ethics: definition, ethics in research, ethics and morality, intellectual honesty and research integrity, scientific misconducts: falsification, fabrication and plagiarism; selective reporting and mis – representation of data.<br>**Practical:** Use of software tools to identify predatory publications |
| **UNIT II** | **Publications Ethics:**<br>Definition, introduction, and importance; Publication misconduct: definition, concept, problems that lead to unethical behavior, types of misconducts; Violation of publication ethics, authorship and contributor – ship; identification of publication misconduct, complaints and appeals; and predatory publishers and journals.<br>**Practical:** Use of plagiarism software |

**Suggested Readings:**


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| **Beall, J. 2012. Predatory publishers are corrupting open access. *Nature* 489 (7415), 179.** |
| **Chaddah, P. 2018. *Ethics in Competitive Research*. Pothi.com** |
| **National Academy of Sciences, National Academy of Engineering and Institute of Medicine 2009. *On Being a Scientist: A Guide to Responsible Conduct in Research*. National Academics Press** |
| **Otrel-Cass, K., Andrée, M., & Ryu, M. (2020). Ethics in Contemporary Science Education Research. In *Examining Ethics in Contemporary Science Education Research* (pp. 1-11). Springer, Cham.** |
| **Resnik, D.B. 2008. What is ethics in research and why is it important. *University of Arizona Program in Research Integrity Education Monthly Newsletter*, 8(8), August 1.** |


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