

**IPP- 501**

**Inter School Level  
(Aryabhata School of Earth Sciences)  
Title of the Course: Research Methodology**

**Marks: 100**

**Unit-I**

1. Methods of acquiring knowledge: traditional, empirical, rational, interpretative, dialectical and scientific.
2. Meaning of role assumption, constructs, laws, theory, hypothesis, propositions, axioms and postulates.
3. Types of research: basic research, applied research, action research.
4. Methods of research: theoretical, descriptive, experimental and analytical.

**Unit-II**

Research Problem, selection of problem, process of designing a research proposal, steps to be followed in formulating a research proposal, objective of research, sources of research materials, Review of literature, Rationale of the study, Research questions, Statement of the problem, objective of the study, operational definition of the terms.

**Unit-III (Computer Applications)**

1. Introduction to Computer Hardware and Software.
2. Application of MS-Office in research.
3. Introduction to databases (PubMed) required for literature.
4. Data Analysis using MS-Excel and related softwares.

**Unit-IV**

1. Intellectual Property Rights (IPR) Issues and Bio safety.
2. Ethics in Science.
3. History of Science and National Science Policies.
4. Preparation of the research report.

IPP : 502

**Inter Departmental Level  
(Aryabhata School of Earth Sciences)**

Marks: 100

**Title of the Course: Inter Disciplinary Studies**

**Unit-I:** Principles of Stratigraphy and Sedimentology, Petrogenesis of sandstones, Graywacke and graywacke problem, Argillaceous rocks, their classification and genesis. Fluid flow mechanics and formation of sedimentary bedforms. Carbonate rocks – an overview. Tectonics and sedimentation

**Unit-II:** Petrogenetic modelling using various phase diagrams. Evolution of mantle isotopic reservoirs with time. Thermodynamics of magma genesis within mantle.

**Unit-III:** Remote sensing and GIS – an overview; Digital Image Processing (DIP). Land use / land cover mapping. Digital Elevation Model (DEM). Application of Remote sensing in Earth Sciences.

**Unit-IV:** Slope stability and its basic concepts, factors affecting slope stability, role of slope stability in economic design, different types of slope failures, factor of safety, stabilization and strengthening of slope. Landslides – causative factors of landslides, prediction, prevention and monitoring,. Earthquakes – terminologies and mechanism. Seismicity in Northeast India.

**Suggested Reading:**

**Unit-I**

1. Nichols, G. (1999): Sedimentology and Stratigraphy. Blackwell
2. Boggs, Sam Jr. (1995): Principles of Sedimentology and Stratigraphy. Prentice Hall
3. Blatt, H., Middleton, G.V. and Murray, R.C. (1980): Origin of sedimentary rocks, Prentice-Hall.
4. Emery, D. (1996): Sequence Stratigraphy, Blackwell Scientific Publ.
5. Miall, A.D. (1997): The Geology of Stratigraphic Sequence, Springer-Verlag.
6. Selley, R. C. (2000) Applied sedimentology, Academic Press.
7. Tucker, M.E. (1981): Sedimentary petrology: An Introduction, Wiley and Sons.
8. Tucker, M.E. (1990): Carbonate sedimentology, Blackwell Scientific Publ.

**Unit-II**

9. Bose, M.K., 1997. Igneous Petrology, World Press, Kolkata
10. Philpotts, A.R. 1994 : Principles of Igneous and Metamorphic Petrology, Prentice Hall
11. Wilson, M., 1993: Igneous Petrogenesis. A global Tectonic Approach by Chapman & Hall, London.
12. Yoder, H.S.: Modern Igneous Petrology
13. Isotope Geology, C.J. Allegre, Cambridge University Press.

**Unit-III**

14. Burrough P.A. Principles of Geographic Information Systems for Land Resource Assessment.
15. Gupta, R.P. 1990: Remote Sensing Geology. Springer Verlag
16. Ian Heywood, Sarah Cornelius, Steve Carver. An introduction to Geographic Information
17. Lillesand, T.M. and Kieffer, R.W. 1987: Remote Sensing and Image Interpretation. John Wiley
18. Peter Burrough and Rachael M Medwell. Principles of Geographic Information Systems
19. Sabbins, F.F. 1985: Remote Sensing – Principles and Applications.

**Unit-IV**

20. Hudson, J. A. (1993) Comprehensive Rock Engineering, Vol.3&5, Pergamon Press, Oxford.
21. Hoek and Bray, Rock slope Engineering, Fourth Edition.
22. Krynine, D.H. and Judd, W.R. (1998.) Principles of Engineering Geology, CBS Edition.

23. Thorne Lay & Terry C. : Wallace Modern Global Seismology, Academic Press  
 24. Ota Kulha'nek: Anatomy of Seismograms  
 25. Peter M. Shearer: Introduction to Seismology, Cambridge University Press

**IPP: -503**

**Departmental Level  
 (Department of Earth Science)**

**Marks: 100**

**Title of the course: Modern Topics in Earth Science**

**Unit-I:** Implication of facies in environmental interpretation and basin analysis. Facies analysis – field measurements and recordings; sample collection, modern laboratory techniques and statistical treatment of data. Facies models and architectural analysis: Fluvial system, Lacustrine system, Deltaic system and deep marine systems. Palaeoclimate indicators. Sequence Stratigraphy-Principles & applications.

**Unit-II:** Analytical techniques in Geochemistry, data quality and interpretation. Geochemical characteristics of igneous rocks as petrological indicators. Petrogenetic modelling of magmatic evolution by Trace and Rare Earth Elements chemistry, Low temperature geochemical processes and their applications.

**Unit-III:** Water table, water level fluctuations: secular, seasonal and diurnal variation, drawdown and cone of depression. Chemical classification of groundwater. Quality criteria for drinking, irrigation and industrial use. Application of remote sensing and GIS in hydrogeology.

**Unit-IV:** Underground excavation, purpose of tunnelling, methodologies of investigations of different types of tunnels, effects of tunnelling on the ground, lining of tunnels, overbreak in tunnel, stress-distribution in and around openings, failures in underground excavation, stabilization and strengthening of structures.

**Suggested Reading:-**

**Unit-I**

1. Reading, H.G. (1997): Sedimentary environments and facies, Blackwell Scientific Publ.
2. Reineck, H.E. and Singh, I.B. (1980): Depositional sedimentary environments, Springer-Verlag.
3. Miall, A.D. (2000): Principles of basin analysis, Springer-Verlag.
4. Einsele, G. (1992): Sedimentary basins. Springer Verlag
5. Tucker, M.E. (1981): Sedimentary petrology: An Introduction, Wiley and Sons.
6. Leeder, M. (1999): Sedimentology and Sedimentary Basins, From turbulence to Tectonics. Blackwell Publ.

**Unit-II**

7. Wilson, M., 1993: Igneous Petrogenesis. Chapman & Hall, London
8. McSween, H.Y., Richardson, S.M., Uhle, E. Maria, Columbia Univ. Press : Geochemistry: Pathways and Processes
9. Zou, H: Quantitative Geochemistry,
10. Rollinson, H. 1993: Using geochemical data: evaluation, presentation and interpretation. Longman

**Unit-III**

11. Alley, W.M. 1993: Regional Groundwater Quality. VNR, New York.
12. Black, W. et al (Eds), 1989: Hydrogeology. Geol. Soc. Am. Publications.

13. Davies, S.N. and Dewiest, R.J.M. 1966: Hydrogeology. John Wiley.
14. Fetter, C.W. 1990: Applied Hydrogeology. Merrill Publishing.
15. Freeze, R.A. and Cherry, J.A. 1979: Groundwater. Prentice Hall.
16. Karanth, K.R. 1987: Groundwater Assessment - Development and Management. Tata McGraw Hill.
17. Mahajan, G. 1990: Evaluation and Development of Ground Water. D.K. Publishers.
18. Raghunath, N.M. 1982: Groundwater. Wiley E
19. Todd, D.K. 1980: Groundwater Hydrology. John Wiley.

**Unit-IV**

20. Brown, E.T. and Brady, D.D.(1978). Underground Excavation, The Institute of Mining and Metallurgy, London,.
21. Goodman, R.E. Engineering Geology, ( 1994) John Wiley & Sons, New York.
22. Hudson, J.A. and Harrison, J.P ,Engineering Rock Mechanics,( 1989) John Wiley and Sons, New York,.

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**DEPARTMENTAL TERM PAPER**

**MARKS 100**

**Title of the Course: Term Paper in Earth Science**

This paper comprises of assignments, tutorials, formulation of research proposal and seminars. A candidate is required to undertake all such activities as and when assigned by the Department.

At the end of the semester, students will submit their assignment (s) to the Department for evaluation.