

Raja Mahendra Pratap Singh State University, Aligarh

[Syllabus for the course of M.Sc. in Geology from session 2022-23 onwards]

Paper Code	Course Title	Credit	External	Internal	Max. Marks
Semester VII (Year I)					
RB090701T	Mineralogy	4	75	25	100
RB090702T	Structural Geology and Tectonics	4	75	25	100
RB090703T	Igneous Petrology	4	75	25	100
RB090704T	Geochemistry	4	75	25	100
RB090705P	Practical (Lab work)	4	75	25	100
RB090706T	Minor: Subject elective from other faculty	4	75	25	100
Credit Semester VII		24			
Semester VIII (Year I)					
RB090801T	Remote Sensing and Geomorphology	4	75	25	100
RB090802T	Sedimentology	4	75	25	100
RB090803T	Metamorphic Petrology	4	75	25	100
RB090804T	Economic and Mining Geology	4	75	25	100
RB090804aT	Geochronology	4	75	25	100
RB090805P	Practical (Lab work)	4	75	25	100
RB090806R	Research Project: Geological Field Training/ Survey report	8			100
Credit Semester VIII		28			
Semester IX (Year II)					
RB090901T	Stratigraphy	4	75	25	100
RB090902T	Palaeontology	4	75	25	100
RB090903T	Petroleum Geology	4	75	25	100
RB090904T	Engineering Geology	4	75	25	100
RB090904aT	Micropalaeontology	4	75	25	100
RB090905P	Practical (Lab work)	4	75	25	100
Credit Semester IX		20			
Semester X (Year II)					
RB091001T	Hydrogeology	4	75	25	100
RB091002T	Environmental Geology and Natural Hazards	4	75	25	100
RB091002aT	Disaster management	4	75	25	100

RB091003T	Climatology	4	75	25	100
RB091003aT	Geoheritage, Geoparks and Geotourism	4	75	25	100
RB091004T	Fundamentals of Geophysics	4	75	25	100
RB091004aT	Advanced Hydrogeology	4	75	25	100
RB091005P	Practical (Lab work)	4	75	25	100
RB091006R	Research Project: Geological Field Training/ Dissertation	8	100		
Credit Semester X		28			
Total Credit		100			

Semester VII / Year 1
Paper Title: MINERALOGY

Paper Code: RB090701T

MM: 100

Credit: 4

Unit-I

Systematic Mineralogy (Atomic Structure, Mineral Chemistry and their Pressure – Temperature Stability) of following Common Silicates Groups: (a) Quartz (b) Felspars (c) Felspathoids (d) Micas (e) Pyroxenes (f) Amphiboles (g) Garnets (h) Epidotes.

Unit-II

Chemistry, Atomic structures, characteristic physical properties and mode of occurrence of Common:

- Oxides and Hydroxides.
- Sulphides.
- Carbonates.
- Gem and Semi-precious Stones.

Unit-III

Basic Principles of Optics, Uniaxial and Biaxial Mineral: Construction and use of Gypsum and Mica Plates and Quartz-wedge: Pleochroism, Dichroism, Relief, Interference Colour and Their Determination: Concept of Convergent, Polarized Light, Interference Figures of Uni-axial and Bi-axial Minerals, determination of Positive and Negative sign.

Unit-IV

Sampling and Sample preparation, Thin-section and Polished Section marking. Sample etching, Staining and model Count Techniques. Principle and Geological application of Followings:

- Cathodo-luminescence.
- Thermo- luminescence.
- Atomic Absorption Spectrophotometry.
- Scanning Electron Microscopy.

Unit-V

Study of properties of the following important minerals:

- | | |
|-------------------|--------------------|
| (i) Quartz | (ii) Orthoclase |
| (III) Microcline | (IV) Albite |
| (V) Labradorite | (VI) Nepheline |
| (VII) Muscovite | (VIII) Biotite |
| (IX) Diopside | (X) Hypersthene |
| (XI) Augite | (XII) Hornblende |
| (XIII) Themolite | (XIV) Almendine |
| (XV) Epidote | (XVI) Piedmonite |
| (XVII) Riebeckite | (XVIII) Tourmaline |

(XIX) Apatite

(XXI) Calcite

(XXIII) Staurolite

(XXV) Sphene

(XXVII) Kaolinite

(XXIX) Wollastonite

(XX) Zircon

(XXII) Andalusite

(XXIV) Cordierite

(XXVI) Chlorite

(XXVIII) Glauconite

Books Recommended:

1. Deer, W.A., Howie, R.A. and Zussman, J., 1996: The Rock Forming Minerals. Longman.
2. Klein, C. and Hurlbut, Jr. C.S. 1993: Manual of Mineralogy. John Wiley.
3. Putnis, Andrew, 1992: Introduction to Mineral Sciences. Cambridge University Press.
4. Spear, F.S. 1993: Mineralogical Phase Equilibria and Pressure – Temperature – Time Paths. Mineralogical Society of American Publication.
5. Philips, Wm R. and Griffen, D.T., 1986: Optical Mineralogy. CBS Edition.
6. Hutchinson, C.S., 1974: Laboratory Handbook of Petrographic Techniques. John Wiley.

Paper Title: STRUCTURAL GEOLOGY AND TECTONICS

Paper Code: RB090702T

MM: 100

Credit: 4

Unit-I

Stress and its components: Analysis of Stress in two and three dimension, Mohr Diagrams. Mechanical properties of rock: Strain Concepts; Strain Ellipsoid; Coaxial and non-axial deformation; method of Strain measurement in naturally deformed rocks; Theories of Rock failure; Modern concept on the mechanism.

Unit-II

Fold and their Geometry, morphology and classification; Strain patterns in folds; superimposed folding; mechanics of folding-Geometry, Types, Genesis and significance of Lamination, Foliations and Cleavage.

Unit-III

Faults: Classification, recognition and Genesis; Thrust Geometry, Mechanics of Thrust emplacement and nappes; Joints: Nomenclature, origin and significance.

Unit-IV

The plate configuration of the Earth; Geomagnetic reversal, Geometry of Plate movement, Driving mechanisms of Plates Tectonics; recent evidences of plate tectonics, Dynamic evolution of Continental and Oceanic Crust.

Unit-V

Tectonic of Indian sub-continent, The Indian sub-continent in light of Plate tectonics; Structure tectonics and tectonic evolution of Himalaya, Tectonics of Precambrian Orogenic Belts of India, Tectonic framework of Indo-Gangetic Plain.

Books Recommended:

1. Badgeley, P.C., 1965: Structure and Tectonics. Harper and Row.
2. Ramsay, J.G. 1967: Folding and Fracturing of Rocks. McGraw Hill.
3. Hobbs, B.E., Means, W.D. and Williams, P.F. 1976: An outline of structural Geology. John Wiley.
4. Davis, G.R., 1984: Structural Geology of Rocks and Region. John Wiley.
5. Ramsay, J.G. and Huber, M.I., 1987: Modern Structural Geology, Vol. I & II Academic Press.
6. Price, N.J. and Cosgrove, J.W., 1990: Analysis of Geological Structure. Cambridge Univ. Press.
7. Bayly, B., 1992: Mechanics in Structural Geology. Springer Verlag.
8. Ghosh, S.K., 1995: Structural Geology, Fundamentals of Modern Developments. Pergamon Press.

9. Moores, E. and Twiss, R.J., 1995: Tectonics. Freeman.
10. Keary, P. and Vine, F.J., 1990: Global Tectonics. Blackwell.
11. Storetvedt, K.N., 1997: Our Evolving Planet: Earth's History in New Perspective. Bergen (Norway), Alma Mater Forlag.
12. Valdiya, K.S., 1998: Dynamic Himalaya, University Press, Hyderabad.
13. Summerfield, M.A., 2000: Geomorphology and Global Tectonics. Springer Verlag.

Paper Title: IGNEOUS PETROLOGY

Paper Code: RB090703T

MM: 100

Credit: 4

UNIT I

Classification of Granitoids and high Mg volcanic rocks in the light of IUGS recommendations; Classification and composition of Meteorites including introduction to Lunar and Martian meteorites.

UNIT II

Magma generation in the crust and mantle; mantle metasomatism; Mantle heterogeneities; Enriched and depleted mantle.

UNIT III

Gibb's phase rule; Lever rule; Tangent Rule; Phase equilibria studies in the silicate systems: Periclase–Silica; Albite–Orthoclase–Water; Albite–Potash feldspar–Silica–Water; Diopside–Forsterite–Silica; and Nepheline-Kalsilite-Silica.

UNIT IV

Large Igneous Provinces and mafic dyke swarms with Particular reference to Bushveld and Skaergaard complexes; Petrotectonic associations of rocks; Large Igneous Provinces through geological time.

UNIT V

Petrogenesis of Granite, Massif Anorthosite, Kimberlite, Lamprophyre, Komatiite, Basalt, Carbonatite, Ophiolite, Andesite with suitable Indian examples.

Books Recommended:

1. Cox, K. G., Bell, J. D. and Pankhurst, R. J. 1979. Interpretations of igneous rocks. George Allen and Unwin, London.
2. Wilson, M. 1989. Igneous Petrogenesis. London Unwin Hyman.
3. Anthony R. Philpotts and Ague, J. J. 2009. Principles of Igneous and Metamorphic Petrology. Cambridge.
4. Winter, J. D. 2001. Igneous and Metamorphic Petrology. Prentice Hall.
5. Gautam Sen, 2014. Petrology: Principles and Practice: Gautam Sen (Springer).
6. Best, M. G. 2013. Igneous and Metamorphic Petrology. Wiley Blackwell.
7. Don L. Anderson 2012 Theory of the Earth Blackwell Scientific Publications

8. Alexander R McBirney, 2006 Igneous Petrology, III edition: Alexander R McBirney
9. White, W. M. Isotope Geochemistry. Wiley Blackwell
10. Faure, G. and Mensing, T. M. 2009 Isotope principles and Applications.

Paper Title: GEOCHEMISTRY

Paper Code: RB090704T

MM: 100

Credit: 4

UNIT-I

Abundance of elements in Earth; Geochemical differentiation of the earth; Geochemical cycle; Chemical composition and characteristics of atmosphere, lithosphere, hydrosphere; geochemical cycles; meteorites- types and composition.

UNIT-II

Goldschmidt's classification of elements; fractionation of elements in minerals/rocks; Nernst's partition coefficient (compatible and incompatible elements), Nernst-Berthelot partition coefficient and bulk partition coefficient.

UNIT-III

Laws of Thermo-dynamics, Thermodynamic of non – ideal and dilute solution, Concept of free energy, activity, fugacity and equilibrium, Fick's laws of diffusion and activity composition relation (Roult's and Henry's law); application of trace elements in petrogenesis; principles of equilibrium and Rayleigh fractionation; REE patterns,

UNIT-IV

Half-life and decay equation; dating of minerals and rocks with potassium-argon, rubidium-strontium, uranium-lead and samarium-neodymium isotopes; petrogenetic implications of samarium-neodymium and rubidium-strontium systems.

UNIT V

Stable isotope geochemistry of carbon, oxygen and sulphur and their applications in geology. Eh and pH diagrams and mineral stability.

Books Recommended:

1. Mason, B. and Moore, C.B. 1991: Introduction to Geochemistry, Wiley Eastern.
2. Krauskopf, K.B., 1967: Introduction to Geochemistry. McGraw Hill.
3. Faure, G., 1986: Principles of Isotope Geology. John Wiley.
4. Hoefs, J., 1980: Stable Isotope Geochemistry. Springer Verlag.
5. Marshal, C.P. and Fairbridge, R.W. 1999: Encyclopaedia of Geochemistry. Kluwer Academic.
6. Govett, G.J.S. (ed) 1983: Handbook of Exploration Geochemistry. Elsevier.
7. Nordstrom, D.K. and Munoz, J.L., 1986: Geochemical Thermodynamics, Blackwell.
8. Henderson, P., 1987: Inorganic Geochemistry. Pergamon Press.

Paper Title: Practical (Laboratory work)

Paper Code: RB090705P

MM: 100

Credit: 4

1. Study of the physical properties of rock forming minerals in hand specimens, with special reference to their origin and distribution.
2. Study of the optical properties of rock forming minerals in thin sections.
3. Interpretation of geological maps and sections; Structural problems using stereographic methods.
4. Megascopic and microscopic study of important igneous rocks. Calculation of C.I.P.W. norms and Niggli values.

[Note: Every student shall be required to keep and maintain up-to-date record of practical work during the session, properly signed by the teachers concerned and submit it to the Head of the Department at the time of their Practical Examination.]

Semester VIII/ Year 1

Paper Title: GEOMORPHOLOGY AND REMOTE SENSING

Paper Code: RB090801T

MM: 100

Credit: 4

Unit-I

Aims, Scope and basic concept of Geomorphology Geomorphic Cycle: Land forms, their types and development in relation to rock type, Structure and Tectonics: Mass Movements & Masswasting, Land Slides, Falls. Flows & Creep – Fluvial processes and related Land forms. Drainage basin analysis.

Unit-II

Erosion, Transportation and Deposition by sea: Classification of costal Landforms: Shorelines- their classification and evolution, Landforms resulted by the action of Ground Water, Arid Geomorphology.

Unit- III

Types of Glaciers, Glacial Motion, Law of Glacial Erosion, Erosional and Depositional features of Glaciers; Glacial Geomorphic Cycle; Concept of Ice age pre-glacial landscapes;

A brief Geological account of important Himalayan Glaciers of present day. Evidence of glaciation in geological past.

Unit-IV

A pre-elementary knowledge about electromagnetic spectrum, aerial photographs and their geometry; photo-geometry, Satellite Remote Sensing, Global and Indian Space Missions.

Different Satellite exploration programs and their characteristics: Landsat, Metoset, Seasat, Spot, IRS. Image interpretation and Digital processing techniques.

Unit-V

Image characters and their relations with ground objects based on tones, texture and patterns.

Evaluation of Ground Water Potential and rock type identification. Interpretation of photographs and tectonic features, Discrimination of Common land forms on Photos and Images, Principles and Applications of Geographic Information System.

Books Recommended:

1. Miller, V.C., 1961: Photogeology, McGraw Hill.
2. Sabbins, F.F., 1985: Remote Sensing – Principles and Applications, Freeman.
3. Ray, R.G., 1969: Aerial Photographs in Geologic Interpretations. USGC Prof. Paper 373.
4. Drury, S.A. 1987: Image Interpretation in Geology. Allen and Unwin.
5. Moffitt, F.H. and Mikhail, E.M., 1980: Photogrammetry, Harper and Row.
6. Lillesand, T.M. and Kieffer, R.W., 1987: Remote Sensing and Image Interpretation. John Wiley.

7. Paine, D.P. 1981: Aerial photography and Image Interpretation for Resource Management. John Wiley.
8. Pandey, S.N. 1987: Principles and Applications of Photogeology. Wiley Eastern, New Delhi.
9. Gupta, R.P. 1990: Remote Sensing Geology, Spring Verlag.
10. Thornbury William D.- Principles of Geomorphology.

Paper Title: SEDIMENTOLOGY

Paper Code: RB090802T

MM: 100

Credit: 4

Unit-I

Origin of Sediments, Physical and Chemical Concept of Compositional and Textural maturity, Classification of Sandstones and Conglomerates in the light of recent researches, Diagenesis of Mudstones and Sandstones, Chemistry of weathering processes, Flow regimes – ideal sequence of structure in flow regimes.

Unit-II

Origin, Hydrodynamic and Geologic significance of bedding, Planer and Trough Cross Bedding, Ripple Marks, Ripples Cross Laminations, Climbing Ripples Convolute Laminations, Sole Structure, Stromatolites. Erosional Channels and Geometry of Sandstone Bodies; Diagenesis and Classification of Limestone, Formation of Phosphorite Deposits; Tectonic and Climate Signification of Arkose, Greywacke and Quartz Arenites.

Unit-III

Sedimentary Facies; Walther's Facies Law; Vertical Facies relationship and Facies models. Cyclothem and their significance, Krynin's tectonic cycle and associate sediment types; Heavy minerals and their Sedimentologic significance; Dispersal pattern. Scalar and Vector properties of Sediments in reconstructing paleocurrent significance of Paleocurrents.

Unit-IV

Depositional Environment: Physical and Chemical parameters and geomorphic Classification; Environmental reconstruction and Facies model with ancient and recent example of Alluvial, Deltaic, Turbidite and Glacial environments.

Unit-V

Evolution of Sedimentary Basins: Tectonics and Sedimentation, Classification viz plate tectonics, Basin Models: Divergent Basin, Rifts, Alacogens and Failed rift.

Books Recommended:

1. Allen, J.R.I., 1985: Principles of Physical Sedimentation. George Allen & Unwin.
2. Allen, P. 1997: Earth Surface Processes. Blackwell.
3. Nichols, G. 1999: Sedimentology and Stratigraphy, Blackwell.
4. Reading, H.G. 1996: Sedimentary Environments. Blackwell.
5. Davis, R.A. Jr., 1992: Depositional Systems. Prentice Hall.
6. Einsele, G., 1992: Sedimentary Basins. Springer Verlag.
7. Reineck, H.E. and Singh, I.B., 1980: Depositional Sedimentary Environments. Springer Verlag.
8. Prothero, D.R. and Schwab, F., 1996: Sedimentary Geology, Freeman.
9. Miall, A.D., 2000: Principles of Sedimentary Basin Analysis. Springer-Verlag.

10. Pettijohn, F.J., Potter, P.E. and Siever, R. 1990: Sand and Sandstone. Springer Verlag.
11. Blatt, H. Murray, G.C. and Middleton, R.C., 1980: Origin of sedimentary Rocks.
12. Bhattacharya, A. and Chakraborti, C., 2000: Analyses of Sedimentary Successions. Oxford-IBH.
13. Boggs Sam Jr., 1995: Principles of Sedimentology and Stratigraphy, Prentice Hall.
14. Sengupta, S., 1997: Introduction to Sedimentology, Oxford-IBH.

Paper Title: METAMORPHIC PETROLOGY

Paper Code: RB090803T

MM: 100

Credit: 4

UNIT I

Limits of metamorphism; Geothermal gradients; Metamorphic processes; Structures and textures of metamorphic rocks; Isograds and reaction isograds; Metamorphic fluids.

UNIT II

Concept and classification of metamorphic facies; Metamorphic facies series; Metamorphism of carbonates, pelitic, mafic, ultramafic and quartzofeldspathic rocks.

UNIT III

Metasomatism; Metamorphic differentiation; Anatexis; Origin and structure of migmatites; Regional metamorphism and its relation to plate tectonics; Paired metamorphic belts; Concept of Pressure-Temperature-Time path.

UNIT IV

Mineralogical phase rule in closed and open systems; Graphic representation of mineral assemblages (ACF, AKF and AFM projections); Petrogenesis of eclogites and charnockites; Introduction to ultrahigh pressure (UHP) and ultrahigh temperature (UHT) metamorphism.

UNIT V

Metamorphism in: Southern Granulite Terrain; Eastern Ghats Belt; Singhbhum Craton; Central India Tectonic Zone; Bastar Craton; Bundelkhand Craton; Darjeeling-Sikkim Himalaya.

Books Recommended:

1. Barker, A.J. 2004, Introduction to Metamorphic Textures and Microstructures, Routledge.
2. Bucher, K. and Grapes, R. 2011, Petrogenesis of Metamorphic Rocks, Springer.
3. Kretz, R. 1994, Metamorphic Crystallization, Wiley-Blackwell.
4. Mason, R. 1990, Petrology of the Metamorphic Rocks, Unwin Hyman Ltd.
5. Philpotts, A. and Ague, J. 2009, Principles of Igneous and Metamorphic Petrology, Cambridge University Press.
6. Spear, F. S. 1993, Metamorphic Phase Equilibria and Pressure–Temperature–Time Paths, Mineralogical Society of America.
7. Spry, A. 1969, Metamorphic Textures, Pergamon Press.
8. Vernon, R.H. and Clarke, G.L. 2008, Principles of Metamorphic Petrology, Cambridge University Press.
9. Walther, J.V. and Wood, B.J., 1986, Fluid-Rock Interactions during Metamorphism, (Advances in Physical Geochemistry Book 5), Springer

10. Winter, J.D. 2009, Principles of Igneous and Metamorphic Petrology, Pearson.
11. Yardley, B.W.D. 1996, An introduction to Metamorphic Petrology, Prentice Hall.
12. Yardley, B.W.D., MacKenzie, W.S. and Guilford, C. 1990, Atlas of Metamorphic Rocks and their textures, Longman Scientific & Technical.

Paper Title: ECONOMIC AND MINING GEOLOGY

Paper Code: RB090804T

MM: 100

Credit: 4

Unit-I

Modern concept of ore genesis, Classification, characteristics and mode of occurrence of mineral deposits/ore bodies. Ore deposits and plate tectonics, Structural, physicochemical and stratigraphic control of ore localization. Fluid-inclusion in ores: Principles, assumptions, limitations and applications.

Unit-II

Texture paragenesis and zoning of ore and their significance, Concept of ore bearing fluids, their origin and migration, Wall rock alteration, Petrological ore association with Indian examples wherever possible; Ortho-magmatic ores of mafic-ultramafic associations- diamonds in kimberlite and REE in carbonatites, Cyprus type Cu-Zn ore silicious igneous rocks, Ores of sedimentary affiliation: Mn, Fe and non-ferrous ores.

Unit-III

Mineralogy, genesis, Indian distribution and use of ore minerals related to Copper, Lead, Zn, Gold and Magnesium.

Unit-IV

Mineralogy, genesis, Indian distribution and use of ore minerals related to Iron, Manganese, Aluminum, Chromium and Tungston; Study of the following industrial mineral deposits with reference to their mode of occurrence, Indian distribution and use; Mica deposits; Asbestos deposits; Minerals used in ceramic and glass industries; Minerals used in fertilizers and cement industries; Basic concept of conservation and utilization of minerals.

Unit-V

Principal methods of mining, sampling, ore dressing and beneficiation, Exploration for placer deposits, Open pit mining, Types of drilling methods

Books Recommended:

1. Craig, J.M. & Vaughan.D.j.,1981: Ore Petrography and Minrology. John Wiley.
2. Evens. A.M., 1993: Ore Geology and Industrial Minerals.Blackwell.
3. Sawkins, E.J., 1984: Metal deposits in relation to plate tectonics. Spinger Verlag.
4. Stantion. R.L., 1972; Ore Petrology, McGraw Hill.
5. Torling, D.H., 1981: gEO
6. The Geology of ore deposits – J.M.Guilbert and C.F.Park, Jr.2007, Waveland Press, 985pp.
7. Ore Geology and Industrial Minerals – A.M. Evans,2013, john wiley and Sons, 213pp.

Paper Title: GEOCHRONOLOGY

Paper Code: RB090804aT

MM 100

Credit:4

UNIT I

Concept of Isotopes: Stable and Radioactive Isotopes; Principles and Laws of radiometric decay; Relationship between parent and daughter elements; Half-life and decay constant.

UNIT II

Concept and Methods of radiometric dating techniques: K-Ar, Ar-Ar, Rb-Sr isochron methods and their Merits and limitations.

UNIT III

Fundamental principles of Sm - Nd isochron method; Epsilon Nd; CHUR and their applications: Merits and limitations

UNIT IV

Basic principles of U - Th – Pb system; Concordia and Discordia diagrams; Fission track dating techniques and its geological applications: merits and limitations

UNIT V

Fundamentals of Radiocarbon dating, OSL Dating, Dendrochronology; Lichenometry; Geological and Geo-archaeological significance: Merits and limitations

Suggested Readings:

1. Faure, G., 1986. Principles of Isotope Geology, John Wiley & Sons
2. Das H. A., Faanhof A., Van Der Sloot, H. A., 1989. Radioanalysis in Geochemistry, Elsevier Publishers
3. Dickin Alan P., 2018. Radiogenic isotope geology, Cambridge University Press

Paper Title: Practical (Laboratory work)

Paper Code: RB090805P

MM 100

Credit: 4

1. Optical Experiments and Petrographic techniques.
2. Study of the physical properties of ore-forming minerals in hand specimens, with special reference to their origin and distribution. Ore microscopy and study of the following metallic ores under the ore-microscope: pyrite, chalcopyrite, magnetite, hematite, chromite, pyrolusite and psilomelane.
3. Megascopic and microscopic study of important metamorphic rocks.
4. Study of Primary Sedimentary Structures, Grain size analysis, Statistical parameters and interpretation. Megascopic and Petrographic study in thin section of following: Quartz Arenites, Arkosic Arenites, Graywakes.

[Note: Every student shall be required to keep and maintain up-to-date record of practical work during the session, properly signed by the teachers concerned and submit it to the Head of the Department at the time of their Practical Examination.]

Paper Title: Research Project/ Geological Field Training

Paper Code: RB090806R

MM:100

Credit: 8

Students will be allotted a topic of Geology in the VII Semester for their Research Project. This topic will be inline with the geological field work to be conducted. Students need to do literature survey and the related studies of the area.

They will require to submit a well-prepared Project report. The evaluation will be performed by both external and internal examiner based on their performance in the field studies/ Project report and viva-voce.

Semester IX/ Year 2

Paper Title: STRATIGRAPHY

Paper Code: RB090901T

MM:100

Credit: 4

UNIT I

Stratigraphy – Fundamental concepts; History of Stratigraphy; Lithostratigraphy, Biostratigraphy, Chronostratigraphy; Magnetostratigraphy; Event Stratigraphy

UNIT II

Evolution of the Indian Continental Crust; Dharwar Craton, Unmetamorphosed Proterozoic successions of India – General idea, Vindhyan Supergroup, Cuddupah Supergroup, Chhattisgarh Supergroup, Kaladgi Supergroup.

UNIT III

Kurnool Group, Bhima Group, Marwar Supergroup, General Geology and evolution of the Himalaya, Stratigraphy of the Lesser Himalayan sedimentary belts – Inner and Outer (The Krol belt), Precambrian-Cambrian boundary

UNIT IV

Palaeogeography and important events of the Palaeozoic Era, Marine Triassic sequences of the Himalaya with special reference to Spiti Valley, Gondwana -Supergroup, Permian – Triassic boundary, Palaeogeography and important events of the Jurassic and Cretaceous periods, Jurassic successions of Western India, Cretaceous successions of Cauvery basin and Narmada valley

UNIT V

Cretaceous-Tertiary (K–T) boundary, Palaeogene and Neogene global events, Tertiary successions in India, Neogene-Quaternary boundary, Anthropocene Epoch and Meghalayan Age.

Books Recommended:

1. Doyle, P. and Bennett, M.R., 1996. Unlocking the Stratigraphic Record, John Willey.
2. Dunbar, C.O. and Rodgers, J., 1957. Principles of Stratigraphy. John Wiley & Sons.
3. Krishnan, M.S., 1982. Geology of India and Burma, C.B.S. Publishers, Delhi
4. Naqvi, S.M. 2005. Geology and Evolution of the Indian Plate: From Hadean to Holocene 4 Ga to 4 Ka. Capital Pub., New Delhi.
5. Pascoe, E.H., 1968. A Manual of the Geology of India & Burma (Vols.IN), Govt. of India Press, Delhi.
6. Pomeroy, C., 1982. The Cenozoic Era - Tertiary and Quaternary. Ellis Harwood Ltd., Halsted Press.
7. R. Vaidyanathan & M. Ramakrishnan, 2008. Geology of India, Geological Society of India.

Credit: 4

UNIT I

Bivalvia, Gastropoda and Cephalopoda: Classification, Hard and soft part morphology, Evolution and modes of life.

UNIT II

Brachiopoda and Echinoidea: Classification, Hard and soft part morphology, evolution and mode of life.

UNIT III

Trilobita and Cnidaria: Classification, Hard and soft part morphology, evolution and geological history; biological affinities and evolution of Graptolithina.

UNIT IV

Evolution of elephant, horse and man and their fossils localities in India; Evolution and extinction of Dinosaurs; Siwalik Vertebrate fauna.

UNIT V

Biostratigraphy; Palaeobiogeography; Palaeoecology; Devonian flora, Gondwana flora, and Deccan Inter-trappean flora; Trace fossils

Books Recommended:

1. Cowen, R. (2000) History of Life, Blackwell Science.
2. E. N. K. Clarkson (2013) Invertebrate palaeontology and Evolution, Blackwell Science
3. Rhona M. Black, (1989) The Elements of Palaeontology, Cambridge University Press
4. Michael Benton, (2005) Vertebrate Palaeontology, Blackwell Publishing
5. Patrick Wyse Jackson, (2019) Introducing Palaeontology: A Guide to Ancient Life, Dunedin Academic Press Ltd.
6. Raymond Enay (2012) Palaeontology of Invertebrates, Springer-Verlag.
7. Peter Doyle, Understanding Fossils: An Introduction to Invertebrate Palaeontology.
8. Morley Davies (2008) An Introduction to Palaeontology, Read Books.
9. Sreepat Jain (2017) Fundamentals of Invertebrate Palaeontology: Macrofossils, Springer India
10. Roland Goldring, (2014) Field Palaeontology, Routledge

11. Johansson, C. Z., Underwood, M. Richter, (2019) Evolution and development of Fishes, Cambridge University Press.
12. Pratul Kumar Saraswati, M.S. Srinivasan, (2016) Micropaleontology: Principles and Applications, Springer International Publishing Switzerland.
13. Michael Benton, David A. T. Harper, (2009) Introduction to Paleobiology and the Fossil Record, Wiley-Blackwell.
14. Colbert, E.H. and Minkoff, Eli C. (2001) Evolution of vertebrates, Wiley Liss

Credit: 4

UNIT I

Introduction to Petroleum Geology, History of Petroleum, Energy Resources, Renewable Energy, Non-Renewable Energy; Fossil fuels.

UNIT II

Generation of Petroleum, Migration of Petroleum: primary and secondary; Reservoir Characteristics: Porosity and permeability.

UNIT III

Hydrocarbon Traps: Structural Traps, Stratigraphic traps, hydrodynamic traps; Combination traps, Oil Exploration, Application of microfossils in petroleum

UNIT IV

Well logging: SP log, Gamma Log, Sonic log, gas drive, gas cap drive, gas hydrate.

UNIT V

Oil producing basins of India: Assam, Krishna-Godavari, Bombay, Cambay, and Rajasthan.

Books Recommended:

1. North, F. K. 1985, Petroleum geology Petroleum Geology. Published by Kluwer Academic Publishers.
2. Levorsen, I., 2001, Geology of Petroleum AAPG SPECIAL PUBLICATION. American Association of Petroleum Geologists.
3. Chapman, R.E.,2004, Petroleum Geology, Elsevier.

Paper Title: ENGINEERING GEOLOGY

Paper Code: RB090904T

MM: 100

Credit: 4

Unit I

Role of Engineering Geology in Civil Construction and Mining Industry, Various stages of engineering geological investigation for civil engineering projects, Engineering properties of rocks, Physical characters of common building stones, metal (chiefly iron rods) and concrete aggregates.

Unit-II

Mass movements with special emphasis on landslides and cause of hill slope instability, Earthquakes and seismicity, Seismic zones of India, A seismic design of building, Influence of geological conditions on foundation and design of building.

Unit-III

Dams: Basic dam types; geological consideration of dam site, Reservoirs: Geological consideration for evaluation of reservoir site, Tunnels: Definition and importance, geotechnical evaluation of tunnel alignments and transportation routes, method of tunneling, some Indian examples of problems faced in tunnels, Case history of following Indian Engineering Projects:(a) Bhakra Nangal Dam (b) Banihal Tunnel (J&K)

Unit-IV

Essentials of Geological Prospecting and exploration techniques.Geomagnetic field of Earth. Magnetic properties of Rock, Working principal of Magnetometers, Magnetic anomalies due to Single pole and Dipole, Introduction to Aeromagnetic Survey.

Unit-V

Seismic method; Basic concept of wave propagation, Seismic Velocity and interpretation of seismic data, Principals of Electrical Logging and its application in petroleum Groundwater and mineral exploration.

Books Recommended:

1. Sharma, P.V., 1986: Geophysical Methods in Geology, Elsevier.
2. Sharma, P.V., 1992: Environmental and Engineering Geophysics, Cambridge Univ. Press.
3. Vogelsang, D., 1995: Environmental Geophysics – A Practical Guide, Springer Verlag.
4. Dobrin, M.B., 1976: Introduction to Geophysical Prospecting, McGraw Hill.
5. Parasnis, D.S. 1975: Principles of Applied Geophysics, Chapman and Hall.
6. Krynine, D.H. and Judd, W.R., 1998: Principles of Engineering Geology, CBS Edition.

Paper Title: MICROPALAEONTOLOGY

Paper Code: RB090904aT

MM 100

Credit: 4

Unit-I

History of micropalaeontological research with special reference to India, Surface and subsurface collection of samples for micropaleontological analysis, Treatment of samples, separation of microfossils, picking, mounting and preparation of microfossil slide, Preparation of samples for Scanning Electron Microscopy and shell geochemistry, Environmental significances of microfossils and their use in interpretation of paleoenvironments, Application of microfossils in hydrocarbon exploration.

Unit-II

Foraminifera: living animal, life cycle and dimorphism, Test morphology of smaller foraminifera: composition, evolution of different test types, sutures, apertures and their modifications, Test ultrastructures: Lamellar characters, pores and canals, Ecology and palaeoecology of foraminifera, Geologic history of foraminifera, Outline of modern foraminiferal classification up to order level.

Unit-III

Larger foraminifera: living cell and test morphology, brief classification, Major groups of larger foraminifera and their morphological features and geological distribution, Ecology paleoecology and evolutionary trends larger foraminifera, Detailed carapace morphology of ostracoda, Ecology and Palaeoecology of Ostracoda, Geologic history of ostracoda

Unit-IV

Conodonts: origin, morphology of skeletal elements, Brief classification of conodonts, Mode of growth and function of skeletal apparatus, Paleoecology, evolutionary trends and biostratigraphy of conodonts, Calcareous nanofossils: morphology of coccolithophores, Ecology and biogeography of coccolithophores, Biostratigraphy of coccolithophores

Unit-V

Morphology of Radiolaria, Ecology and biostratigraphy of Radiolaria, Palynofossils: morphology of spores and pollens, Use of palynofossils in paleoclimatic and paleogeographic interpretation, Morphology, ecology and geologic history of diatoms, Stable isotopes and trace element studies on foraminifera and their paleoecologic and paleoclimatic significance, Use of foraminifera in palaeomonsoonal studies.

Books Recommended:

1. Haq, B.V. and Boersma, A., 1998: Introduction to Marine Micropalaeontology. Elsevier.
2. Haynes, J.R., 1981: Foraminifera. John Wiley.
3. Bignot, G., 1985: Elements of Micropalaeontology Graham and Trouman.

4. P. K. Kathal, 2012: Applied Geological Micropaleontology. Scientific Publishers, India
5. P. K. Saraswati and M.S. Srinivasan, 2016: Micropaleontology – Principles and Applications. Springer.

Paper Title: Practical (Laboratory work)

Paper Code: RB090905P

MM: 100

Credit: 4

- Exercises on stratigraphic column: recognition of age and stratigraphic horizons on the basis of geological specimens, and location of important fossils and formations on the map of India. Study of stratigraphic distribution of some age-diagnostic fossil forms of Indian sedimentary sequences.
- Study and illustration of representative specimens of invertebrate fossils (Mollusca, Brachiopoda, Anthozoa, Echinoidea, Graptolithina and Trilobita). Study of important trace fossils and their ecological significance. Study of important vertebrate fossils; Study of Gondwana plant fossils.

[Note: Every student shall be required to keep and maintain up-to-date record of practical work during the session, properly signed by the teachers concerned and submit it to the Head of the Department at the time of their Practical Examination.]

Semester X/ Year 2

Paper Title: HYDROGEOLOGY

Paper Code: RB091001T

MM: 100

Credit: 4

Unit-I

Groundwater: Origin, types, occurrence, reservoir and movement, Renewable and non-renewable groundwater resources, A preliminary account of Hydrographs, water table contour maps and hydrostratigraphic units.

Unit-II

Hydrogeological properties of rock: Porosity, permeability, specific yield, specific retention, hydraulic conductivity, transmissivity and storage coefficient, Groundwater provinces of India.

Unit-III

Well hydraulics: Confined, unconfined, steady, unsteady and radial flow, Aquifers: Types and evaluation of aquifer parameters, Water level fluctuations: Causative factors and their measurements.

Unit-IV

Well types, drilling methods, construction, design, development and maintenance of wells, Methods of pumping test and analysis of test data, Surface and subsurface geophysical and geological methods of groundwater exploration.

Unit-V

Artificial recharge of groundwater, Consumptive and conjunctive use of surface and groundwater, Problem of overexploitation, Groundwater legislation, Water management in rural and urban areas.

BOOK RECOMMENDED:

1. Todd, D.K., 1980: Groundwater Hydrology, John Wiley.
2. Davis, S.N. & De Wiest, R.J.M. 1966: Hydrogeology, John Wiley.
3. Freeze, R.A. and Cherry, J.A. 1979: Groundwater Prentice Hall.
4. Petter, C.W., 1990: Applied Hydrogeology, Merill Publishing.
5. Raghunath, N.H. 1982: Groundwater Wiley Eastern.
6. Karanth, K.R., 1987: Groundwater Assessment Development and Management, Tata McGraw Hill.
7. Alley, W.M., 1993: Regional Groundwater Quality, V.N.R., New York.
8. Subramaniam, V. 2000: Water Kingston Publ. London.

Paper Title: ENVIRONMENTAL GEOLOGY AND NATURAL HAZARDS

Paper Code: RB091002T

M.M.: 100

Credit: 4

UNIT I

Concepts and scope of Environmental Geology; Earth System Science; Global Biogeochemical cycle; Environmental Impact Assessment (EIA); Environmental Protection Law.

UNIT II

Environmental Impact of Mining; Sediment pollution; Groundwater pollution; Nitrate hazard, Fluoride, Mercury and Arsenic pollution; Radioactive Waste Management.

UNIT III

Application of Geology for sustainable development; Medical Geology; Pollution in Ganga and Gomati Rivers

UNIT IV

Natural hazards; Floods, their type and distribution; flood hazard zonation; Mitigation of flood-prone areas; Storms and Tsunamis: Causes and distribution; Cyclones in the Indian seas; Cyclone and Tsunami-prone zones of India.

UNIT V

Landslides: their types and controlling factors; Landslide hazard zonation mapping; Seismic zonation map of India; Earthquake resistant structures; Avalanches.

Books Recommended:

1. Environmental Geology by E. A. Keller, Prentice Hall publication
2. Environmental Geology by K. S. Valdiya, McGraw Hill publication

Paper Title: DISASTER MANAGEMENT

Paper Code: RB091002aT

MM 100

Credit: 4

UNIT I

Introduction on Disaster; Different Types of Disaster: A) Natural Disaster such as: flood, drought, cyclone, earthquakes, landslides, GLOF, avalanche, extreme weather events; B) Man-made Disaster such as: Fire, Dam failure, Industrial Pollution, Nuclear Disaster, Biological Disasters.

UNIT II

Disaster Management Act 2005; Prime Minister's 10-point agenda on Disaster Risk Reduction; Sendai Framework on Disaster Risk Reduction; Geo-meteorological hazard risk assessment; Climate change and Geo-meteorological hazard risk; Risk and Vulnerability Analysis: concept and analysis of risk; Risk Reduction; Vulnerability: Its concept and analysis, Strategic Development for Vulnerability Reduction.

UNIT III

Disaster Preparedness: Concept and Nature, Disaster Preparedness Plan, Prediction, Early Warnings and Safety Measures of Disaster; Role of Information, Education, Communication, and Training; Buildings for seismic hazards.

UNIT IV

Disaster Response: Introduction, Disaster Response Plan Communication, Participation, and Activation of Emergency Preparedness Plan, Search, Rescue, Evacuation and Logistic Management, Role of Government, International and NGO Bodies; Relief and Recovery, Medical Health Response to Different Disasters.

UNIT V

National Disaster Management Plan; Reconstruction and Rehabilitation as a Means of Development, Damage Assessment, Post Disaster effects and Remedial Measures; Community Based Disaster Risk Management (CBDRM); Psychological Response and Management (Trauma, Stress, Rumour and Panic); Long-term Counter Disaster Planning, Role of Educational Institute; Disaster management: initiatives and actions in India.

Suggested Readings

1. Ahmad, A. (2010): Disaster Management: Through the New Millennium, Anmol Publications, New Delhi.29
2. Bryant Edwards (2005). Natural Hazards, Cambridge University Press, U.K.
3. Bureau of Indian Standards (2002). Indian Standards: Criteria for Earthquake Resistant Design of Structures, Part I, Fifth Revision.
4. Burton, I., Kates, R.W. and White, G.F. (1993). Environment as Hazard, 2nd edition, Guilford Press, New York.
5. Central Water Commission (1989). Manual of Flood Forecasting, New Delhi.

6. Goel, S.L., (2006): Encyclopedia of Disaster Management, Deep and Deep Publications, New Delhi.
7. Gosh, G.K., (2012): Disaster Management, A.P.H. Publishing Corporation, New Delhi 8.
8. Government of India, (2004): Disaster Management in India -A Status Report.
9. Government of India (1997). Vulnerability Atlas of India (New Delhi: Building Materials and Technology Promotion Council, Ministry of Housing & Urban Poverty Alleviation).
10. Government of India, (2005): Disaster Management in India, <http://www.unisdr.org/2005/mdgs-drr/national-reports/Indiareport.pdf>.
11. Gupta, H.K., (2003): Disaster Management, Universities Press (India) Private Limited, Hyderabad.
12. Kapur, A (2005). Disasters in India: Studies of Grim Reality, Rawat Publications, Jaipur.
13. Kapur, A. (2010). Vulnerable India: A Geographical Study of Disasters, Sage Publications, New Delhi.
14. NDMA (2009): National policy on Disaster Management, http://nidm.gov.in/PDF/policies/ndm_policy2009.pdf.

Credit: 4

UNIT I

Climatology, scope, aims and objects, Climate and weather, Structure of the atmosphere, troposphere, stratosphere, mesosphere, ionosphere, exosphere. Composition of the atmosphere. Atmospheric boundary layers and, lapse rate. Insolation, Solar radiation, Heat Budget, Factors affecting distribution of insolation, latitudinal and seasonal variation of insolation,

UNIT II

Temperature of the atmosphere, distribution of temperature, inversion of temperature, Air pressure, distribution of air pressure, variation in air pressure, General circulation of the atmosphere, surface wind system, wind belts, humidity, fog and clouds, cloud formation, types of precipitation.

UNIT III

Air masses, Monsoon, Jet streams, Coupled ocean-atmosphere system, El Nino Southern Oscillation (ENSO), Cyclones, and Anticyclones, Tropical meteorology: Trade wind inversion, ITCZ; Western disturbances; SW and NE monsoons. Weather elements like thunderstorms, tornadoes.

UNIT IV

Climatic and sea level changes on different time scales, General weather systems of India, Distribution of precipitation over India, Classification of climates, Koppen's and Thornthwaite's scheme of classification.

UNIT V

Climate change. Causes of Climate Change, Green House gases and effect, Pollution in the atmosphere, Arctic and Antarctic Indian Expeditions. Climate Change Natural/Anthropogenic, Impact of climate change in the society, Climate change in the earth history.

Books Recommended:

1. Willett, S. D., 2006. Tectonics, Climate, and Landscape Evolution, Geological Society of America Publication.
2. Bradley, R.S., Paleoclimatology: Reconstructing Climates of the Quaternary, Academic. Press.
3. Lal, D.S.2003. Climatology. Sharda Pustak Bhawan
4. C. Donald Ahrens, 2001. Essentials of Meteorology: An Invitation to the Atmosphere. Publisher: Brooks/Cole/Thomson Learning

Paper Title: GEOHERITAGE, GEOPARKS and GEOTOURISM

Paper Code: RB091003aT

MM 100

Credit: 4

UNIT I

Introduction and importance of Geodiversity, Geoheritage, Geoconservation; Geoparks and Geotourism; History of the concept

UNIT II

Geological outcrops and society; Threats to geodiversity; Conservation, protection, maintenance of geological sites and related features of National importance; Conservation of geosites as a tool to protect geoheritage.

UNIT III

Potential geoparks and geosites in India; Rajasthan, Odisha, Karnataka, Andhra Pradesh, Madhya Pradesh, Telangana, Tamil Nadu, Kerala, Gujarat, Himachal Pradesh

UNIT IV

UNESCO geoparks, Geopark networks across the globe; Geotourism and National geological Monuments.

UNIT V

Guidelines for selection of Geosites; Geoheritage laws, Role of local, state and national governments; Current status of Geoheritage protection in the country; Global geoheritage and protection laws.

Suggested Readings

- 1) A Monograph on National geoheritage monuments of India, Indian National Trust for Art and Cultural Heritage, Natural Heritage Division, New Delhi
- 2) Ranawat, P. S., George, S., 2016 Potential Geoheritage & Geotourism Sites in India International Journal of Scientific and Research Publications, Volume 9, Issue 6, June 2019
- 3) Ezzoura Errami, Margaret Brocx (Ed.) 2009. Geoheritage, Geoparks and Geotourism- Conservation and Management Series Springer. P 268.

Paper Title: FUNDAMENTALS OF GEOPHYSICS

Paper Code: RB091004T

MM 100

Credit: 4

UNIT I

Introduction to Seismic waves; Seismic waves through earth's interior; Geoid, Isostasy: Modern Concepts.

UNIT II

Gravity–Densities of Rocks and Gravity Anomalies; Geomagnetism and Palaeomagnetism, Magnetic survey;

UNIT III

Electrical Properties: Resistivity surveying; Vertical Electrical Sounding (VES); Electrical Imaging.

UNIT IV

Spontaneous (Self) Potential Method; Induced Polarisation; Magneto-telluric Surveying (MT), Ground Penetration Radar.

UNIT V

Apparent Polar Wander, Continental Drift; Plate Motion, Geothermics; Heat Flow pattern of the Earth

Books Recommended:

1. Dobrin, M. B and Savit, C. H., 1988. *Introduction to Geophysical Prospecting*, i. McGraw-Hill.
2. Grant, F.S. and West, G.F., 1965. *Interpretation Theory in Applied Geophysics* i. McGraw Hill, New York.
3. Murthy, L. Y. R. and Mishra, D. C., 1989. *Interpretation of Gravity and Magnetic Anomalies in Space and Frequency Domain*, AEG publication, Hyderabad, India
4. Nettleton, L. L., 1976. *Gravity and Magnetics in Oil Prospecting*, McGrawHill.
5. Parasnis, D. S., 1966. *Mining Geophysics*, Elsevier.
6. Patra,H. P. and Mallick, K.,1980. *Geosounding Principles Vol. II Time/arying Geoelectric Soundings*. Amsterdam: Elsevier.
7. Telford, W. M., Geldart, L.P. and Sheriff, R. E., 1990. *Applied Geophysics*, i. Cambridge
8. Lowri, W. *Fundamentals of Geophysics*, Cambridge University Press.
9. Alan E. Mussett, Khan, M. A. 2000. *Looking into the earth: An introduction to geological geophysics*, Cambridge University Press.

Paper Title: ADVANCED HYDROLOGY

Paper Code: RB091004aT

MM: 100

Credit: 4

Unit-I

Hydrologic cycle, Hydrographic analysis, Water balance studies, Groundwater in hydrological cycle, Distribution of water in the Earth's crust.

Unit-II:

Springs (including thermal): origin and movement of water. Geologic structures favouring groundwater occurrence. Methods of identification of groundwater reservoir properties. Force and laws of groundwater movement.

Unit-III:

Groundwater recharge: artificial and consumptive use of groundwater: Fluctuation of groundwater level.

Unit-IV:

Groundwater in arid and semiarid, coastal and alluvial regions. Groundwater in hard rocks and limestones terrain with reference to Indian situation.

Unit-V:

Chemical characteristics of groundwater in relation to various uses – domestic, industrial and irrigation purposes. Water pollution and treatment. Environmental impact of groundwater extraction. Wells – their construction and design Prospecting for groundwater.

Books Recommended:

1. Chow, M.T., 1988: Advances in Hydroscience, McGraw Hill.
2. Walton, W.C., 1988: Groundwater Resouce Evaluation McGraw Hill.
3. Black, W. & Others (Ed.) 1989: Hydrogeology, Geol. Soc. of America Publ.
4. Mahajan, G., 1990: Evaluation and Development of Groundwater, D.K. Publisher.
5. Singhal, B.B.S., 1986: Engineering Geoscience, Savita Prakashan

Paper Title: Practical (Laboratory work)

Paper Code: RB091005P

MM: 100

Credit: 4

- Environmental interpretation from topographical and geological maps.
- Delineation of hydrogeological boundaries on water-table contour maps and other related simple exercised to hydrogeology.
- Simple exercises based on water analysis.
- Study and interpretation of geological maps related to coalfields of India and other civil engineering construction problems such as landslides/slope instability etc.
- Study of some representatives of Foraminifera to understand the morphology and taxonomy under stereo-binocular microscope.
- Study and interpretation of palaeogeographic map of Precambrian and Cenozoic times.
- Surveying: Use of Clinometer and Brunton Compasses, Chain and Plane Table Method and Plotting.

[Note: Every student shall be required to keep and maintain up-to-date record of practical work during the session, properly signed by the teachers concerned and submit it to the Head of the Department at the time of their Practical Examination.]

Paper Title: Research Project/ Geological Field Training/ Dissertation

Paper Code: RB091006R

MM 100

Credit: 8

Students will be allotted a topic of Geology in the IX Semester for their Research Project. This topic will be inline with the geological field trip to be conducted. Students need to do literature survey and the related studies of the area.

They will require to submit a well-prepared Project report. The evaluation will be performed by both external and internal examiner based on their performance in the field studies/ Project report and viva-voce.

[Note: The syllabus of PG programme may be thoroughly scrutinized by the Board of Studies from time to time to improve it further in near future.]