

Total Marks : 200

PAPER - I (Marks:100)

Course Outline

1. **General Geology:** Earth as a planet, its origin and age. Internal structure of the earth and lithospheric plates. Internal and external geological processes such as earth-quakes, volcanism, weathering, erosion and deposition, Geomorphic cycles.
2. **Structural Geology:** Primary sedimentary structures. Mechanical properties of rocks. Description and classification of secondary structures. Structures in Metamorphic rocks. Orogeny and geosynclines in plate tectonic framework. Major tectonic features of the earth. Geodynamics of Pakistan.
3. **Palaeontology:** Fossils and their preservation. Morphology, evolution and geologic distribution of major invertebrate phylla. Micro-paleontology of Foraminifera. Vertebrate and plant fossils.
4. **Stratigraphy:** Stratigraphic nomenclature, and stratigraphic codes. Principles of correlation. Sedimentary basins of Pakistan and detailed stratigraphy of type sections.
5. **Mineralogy:** Chemical composition of the earth crust. Minerals. their physical and chemical properties. Space lattice. symmetry classes and crystal systems. Crystal optics. Atomic structure of crystals and X-Ray diffraction. Detailed study of important rock forming minerals.
6. **Petrology:** Origin and evolution of magma. Binary and Ternary silicate systems. Description of important plutonic and volcanic associations. Sedimentary environments and processes. Petrography of major types of sedimentary rocks. Metamorphism. metamorphic zones and facies. Description of principle types of metamorphic rocks. Metamorphism and magmatism in relation to plate tectonics.

PAPER - II (Marks: 100)

1. **Economic Geology:** Processes of formation of mineral deposits. Detailed study of metallic and non-metallic mineral deposits of Pakistan. Mineral based industries. Metallogeny of Pakistan.
2. **Energy Resources:** Constitution and kinds of coal. Geology of Pakistan coal fields. Origin, migration and accumulation of natural hydro carbons. Oil well drilling and drilling muds. Oil and gas fields of Pakistan. Origin and occurrence of radioactive minerals. Pakistan resource of atomic energy minerals. Geothermal energy: recovery and uses.
3. **Engineering Geology:** Geological factors in the construction of civil engineering projects. Geology of Dam Sites of Pakistan. Landslides and stability of slopes. Open and subsurface excavations. Construction materials and building stones. Site investigation and foundation analysis.
4. **Hydrogeology:** Groundwater occurrence and types of aquifers. Movement of groundwater. Salinity and water-logging. Water resources of Pakistan.
5. **Exploration Geology:** Geological mapping and tradition prospecting methods. Photogeology and remote sensing mineral exploration. Dispersion of trace elements and geochemical surveys. Geophysical techniques for prospecting of solid minerals, oil and water.

Suggested Books

Title	Author
1. The Evolving Earth	Sawkins & others
2. Physical Geology	Skinner & Porter
3. Structural Geology	Park
4. Geodynamics of Pakistan	Farah & Dejong
5. Invertibrate Palaentology	Moore, Laliker & Fisher
6. Stratigraphy and Sedimentation	Krumbein & Sloss
7. Stratigraphy of Pakistan	Ibrahim Shah
8. Mineralogy	Berry & Manson
9. Igneous & Metamorphic Petrology	Turner & Verhoogen
10. Sedimentary Rocks	Pettjohn
11. Mineral Directory of Pakistan	Zaki Ahmed

12. Industrial Rocks and Minerals	Lefond
13. Geology of Petroleum	Leverson
14. Energy Resources	Brown & Skipsey
15. Engineering Geology	Beavis
16. Groundwater Hydrology	Todd
17. Geological Prospecting	Kreiter
18. Techniques in Mineral Exploration	Reedman