UNIT - I

1.1 Magma - Definition, concept, generation in relation to plate tectonics
1.2 Crystal fractionation and Magmatic differentiation
1.3 Magma Mixing and Assimilation

Study of the following petrogenetically significant silicate systems -

1.4 a) Albite - Anorthite   b) Forsterite - Silica
1.5 a) Diopside - Albite - Anorthite   b) Diopside - Forsterite - Silica

UNIT - II

2.1 Fundamental concepts of thermodynamics; Laws of thermodynamics
2.2 Phase rule and its bearing in magmatic crystallization, fractionation and melting processes
2.3 Variation diagrams
2.4 Classification of igneous rocks
2.5 Texture of igneous rocks and their genetic significance

UNIT - III

3.1 Origin of Granitic magmas
3.2 Origin of Basaltic magmas
3.3 Origin of Alkaline magmas
3.4 Layered Intrusions - Bushveld, Still Water and Skærgaard
3.5 Petrogenic provinces of India

UNIT IV

Petrographic and Petrogenetic study of the following important volcanic rock associations -

4.1 Tholeiitic basalt
4.2 Alkaline Olivine basalt
4.3 Trachytic basalt - Trachyteandesite
4.4 Trachyte - Phonolite
4.5 Andesite - Rhyolite

UNIT V

Petrographic and Petrogenetic study of the following important plutonic rock associations -

5.1 Granite - Granodiorite
5.2 Diorite - Gabbro
5.3 Ophiolite - Peridotite
5.4 Syenites and related rocks including Carbonatites
5.5 Lamprophyres, Ultramafites, Anorthosites

Books Recommended:

### METAMORPHIC AND SEDIMENTARY PETROLOGY

#### Unit - I
1.1 Definition, scope, agents and types of metamorphism, mineralogical phase rule.
1.2 Textures of metamorphic rocks and their significance.
1.3 Concept of depth zones, systematic study of Barrovian zones of metamorphism
1.4 Concept of facies and facies series in metamorphism. Characteristics of Abukuma and Barrovian type of facies series.
1.5 Polymetamorphism, Regional metamorphism and paired metamorphic belts with reference to the theory of plate tectonics.

#### Unit - II
2.1 Nomenclature and Classification of Metamorphic rocks
2.2 Metamorphic differentiation, Retrograde metamorphism
2.3 Metasomatism - Definition, general characters and principal types

Petrographic and Petrogenetic study of the following rock types with particular reference to Indian occurrence:

2.4 Green Schists, Blue Schist belts and Amphibolites
2.5 Charnockites, Khondalites, Eclogites.

#### Unit III
3.1 Processes of sedimentation : weathering, erosion, transportation, deposition
3.2 Lithification and diagenesis
3.3 Depositional environments
3.4 Sedimentary differentiation and facies
3.5 Tectonics and sedimentation
3.6 Provenance and dispersal of sediments

#### Unit - IV
4.1 Textures of sedimentary rocks and their significance.
4.2 Sedimentary structures - Primary, Secondary and organic.
4.3 Mechanical analysis of clastic sediments.
4.4 Statistical parameters used for representation and interpretation of sedimentary data.
4.5 Applications of sedimentary petrology.

#### Unit - V
5.1 Classification of sedimentary rocks
5.2 Classification of detrital clastic rocks - sandstone, conglomerates and shale
5.3 Classification of chemical rocks - limestone, chalk and dolomite
5.4 Heavy minerals, light minerals and insoluble residue
5.5 Petrographic and petrogenetic study of important groups of sedimentary rocks: sandstones and limestones

### Books Recommended:
Unit I Palaeontology -I
1.1 Origin and evolution of life, fossilization and applications of fossils
   Study of morphology, classification, evolutionary trends, and geological history
   of the following:
   1.2 Brachiopods
   1.3 Mollusca
   1.4 Cephalopoda
   1.5 Echinoids

Unit II Palaeontology -II
2.1 Study of morphology, classification, evolutionary trends, and geological history
   of Trilobita
2.2 Gondwanan fossil flora
2.3 Concept of vertebrate palaeontology, Study of evolution of man and horse
2.4 Extraction techniques and applications of microfossils
2.5 Foraminifera

Unit III Stratigraphy -I
3.1 Stratigraphy - Correlation, stratigraphic code, Lithostratigraphy, Biostratigraphy and Chronostratigraphy
3.2 Magnetostratigraphy, Seismic stratigraphy, Event stratigraphy, Cyclostratigraphy, and Sequence stratigraphy
3.3 Study of Palaeogeography and palaeoclimates of Indian subcontinent
3.4 Development of stratigraphic records with special reference to India from Azotic to Palaeozoic
3.5 Precambrian – Archaean, Archaean-Proterozoic boundary

Unit IV Stratigraphy -II
4.1 Cuddapah Super Group: Distribution, Classification, Correlation and economic importance
4.2 Vindhyan Super Group: Distribution, Classification, Correlation and economic importance
4.3 Problems of correlation of Precambrian formations of the Peninsular and Extra Peninsular India.
4.4 Palaeozoic – Cambrian boundary.
4.5 Palaeozoic Brief outline of Palaeozoic of India
4.6 Gondwanan Super Group, Perm Triassic boundary

Unit V Stratigraphy – III
5.1 Mesozoic Brief outline of Mesozoic of India (Triassic, Jurassic, Cretaceous)
5.2 Deccan traps – Distribution, Classification, age; Cretaceous Tertiary boundary
5.3 Cenozoic – Quaternary stratigraphy
5.4 Siwalik Super Group; Distribution, Classification and importance
5.5 Palaeogene – Neogene and Neogene – Quaternary boundaries

Books Recommended:
Geo-technical Engineering - I

Unit I

Importance of geology in engineering projects - hydel, thermal and mining projects.
1.1 Engineering properties of rocks - specific gravity, sorption, porosity, unit weight.
1.2 Strength of rocks - compressive, tensile and shear. Elasticity of rocks.
1.3 Elements of soil mechanics - soil profile, classification, aseherb limits, pressure in earth masses.
1.4 Rock as construction materials.

Geo-technical Engineering - II

Unit II

Dams - Types and Parts. Forces acting on dam.
2.1 Geotechnical problems of dams and their remedial measures.
2.2 Case histories of some important dams in India.
2.3 Bridges - types and problems. Caissons.
2.4 Canals - problems and preventive measures.

Geo-technical Engineering - III

Unit III

Tunnels - Terminology, excavation and classification.
3.1 Problems during tunneling operations and their remedial measures.
3.2 Building - types of foundation problems.
3.3 Shorline engineering - waves, currents and tides (construction of shore lines).
3.4 Landslides - types, mechanism and causes: prevention of landslides, slope creep and flow.

Unit IV Environmental Geology - I

4.1 Definition, scope and concept of environmental geology. Forms of environments - physical environments, interaction between man and natural system.
4.2 Environmental impact associated with Earthquakes, Volcanoes, landslides and subsidence.
4.3 Environmental impact associated with River flooding, erosion and sedimentation, coastal hazards.
4.4 Contamination of surface and sub-surface water, pollution of atmosphere.
4.5 Mining hazards and pollution due to mineral based industries.

Unit V Environmental Geology - II

5.1 Environmental impact of engineering construction - dams and reservoirs.
5.2 Waste (solid, liquid, gases) - their impacts, disposal, management and control.
5.3 Environmental impact of mineral development, conservation and substitution.
5.4 Environmental impact associated with various types of energy resources, utilization.
5.5 Planning and management of land, soil erosion and conservation.

Books Recommended
Bell, F.G., 1985: Geological Hazards, Rutledge.
Bryant, E., 1983: Natural Hazards, Cambridge University Press.
Smith, K., 1992: Environmental Hazards, Rutledge.