

Syllabus

1st SEMESTER

Core course

Paper Code:

Paper Name: GENERAL GEOLOGY AND STRUCTURAL GEOLOGY

Credits: 6 (THEORY - 4, PRACTICALS - 2)

THEORY

Marks = 60

Unit-1: General Geology

30

- Introduction to geology, its scope and its subdivisions and relation to other branches of science. **GLG-RC-1016**
- Earth and Solar System: Origin, size, shape, mass, density and age of the earth. Major surface features of the earth: continents and ocean basins and their evolution.
- Introduction to igneous, sedimentary and metamorphic rocks and their distinguishing characters.
- Weathering and Erosion: factors, types and their effects.
- Volcanoes and volcanism; Types and distribution of volcanoes; Earthquake: Causes of earthquake; Earthquake belts; Prediction of earthquake; Earthquake zones of India; Use of seismic waves in the study of earth's internal constitution.

Unit-2: Structural Geology

30

- Definition and scope of Structural Geology; Primary, secondary and penecontemporaneous structures.
- Concept of non-diastrophic and diastrophic structures. Non-diastrophic structures: stratification, current or cross bedding, graded bedding, ripple marks, unconformities, mud cracks and rain prints, flow layers, primary joints, vesicular and amygdaloidal structures and pillow structure.
- Elementary idea of types of deformation, Concept of Stress and Strain, Mohr's stress circle; Elasticity, plasticity and brittleness; Diastrophic structures: Planar and linear structures; Strike direction, dip angle, dip direction, Basic concepts of Lamination, Foliation, Fold, Fault and Joints: their origin.

PRACTICAL

Marks = 20

Unit-1: General Geology

10

- Study of contours: Pattern of contours to indicate various topographical features;
- Reading of topographical maps of the Survey of India; Interpretation of topographic maps; Drawing of profile
- Study of geomorphological features from topographic maps.
- Model study of different geomorphic features.

Unit-2: Structural Geology**10**

- Study of Clinometer and Brunton Compass, Identification of different types of folds/faults from models. Preparation of cross-section profile from geological map.
- Use of Stereographic net (Wulf's net or Schmidt's net) in: (i) Plotting of planes. (ii) Plotting of poles to the planes. (iii) Plotting of lines. (iv) Determination of plunge and bearing of the line of intersection between two planes. (v) Determination of angle between two planes. (vi) Determination of apparent dip/dips in different directions in a plane. (vii) Determination of strike and true dip of a plane from apparent dip/dips.

2nd SEMESTER**Core Courses****Paper Code: GLG-RC-2016****Paper Name: CRYSTALLOGRAPHY AND MINERALOGY****Credits: 6 (THEORY - 4, PRACTICALS - 2)****THEORY****Marks = 60****Unit-1: Crystallography****20**

- Definition of crystal and amorphous substance; Crystallization and crystal growth; Unit cell; Symmetry operations and elements; Crystallographic axes and angles, Axial ratio; Crystal forms and habit; Face, Interfacial angle, solid angle, Parameters and indices.
- Study of the Normal class of Isometric, Tetragonal, Hexagonal, Orthorhombic, Monoclinic and Triclinic systems.

Unit-2: Mineralogy**20**

- Scope of Mineralogy; Definition of mineral; Physical properties of mineral, Mineral classification.
- Study of chemical composition and diagnostic physical properties of the following minerals: Quartz, Orthoclase, Microcline, Hypersthene, Hornblende, Garnet, Muscovite, Biotite, Enstatite, Olivine, Kyanite, Sillimanite, Calcite, Plagioclase.

Unit-3: Optical Mineralogy**20**

- Nature of light; Reflection and refraction of rays; Refractive index, Polarization of light; Polarising Microscope, Double refraction by Nicol prism, Pleochroism.
- Cleavage, Extinction, Interference colour, Accessory plates (Mica Plate, Gypsum Plate and Quartz Wedge) and their uses.

- Isotropic and Anisotropic minerals: Uniaxial and Biaxial; Optic axis; Interference figure, Optic sign.

- Study of optical properties of the following minerals: Quartz, Orthoclase, 13 Microcline, Hypersthene, Hornblende, Garnet, Muscovite, Biotite, Enstatite, Olivine, Kyanite, Sillimanite, Calcite, Plagioclase.

PRACTICAL

Marks = 20

Unit-1: Crystallography

7

- Study of the forms and symmetry elements of crystals belonging to the holohedral classes of Isometric, Tetragonal, Hexagonal, Orthorhombic, Monoclinic and Triclinic systems with the help of either natural crystals or wooden and glass models;
- Drawing of crystals in clinographic projections.

Unit-2: Physical Mineralogy

6

- Identification of following minerals in hand specimen: Quartz, Orthoclase, Microcline, Hypersthene, Hornblende, Garnet, Muscovite, Biotite, Enstatite, Olivine, Kyanite, Sillimanite, Calcite, Plagioclase.

Unit-3: Optical Mineralogy

7

- Study of optical properties of the following minerals in thin section: Quartz, Orthoclase, Microcline, Hypersthene, Hornblende, Garnet, Muscovite, Biotite, Enstatite, Olivine, Kyanite, Sillimanite, Calcite, Plagioclase.

3rd SEMESTER

Core Courses

Paper Code: GLG-RC-3016

Paper Name: PETROLOGY

Credits: 6 (THEORY - 4, PRACTICALS - 2)

THEORY

Marks = 60

Unit-1: Igneous Petrology

20

- Magma: Composition, origin and types; Crystallisation of Magma, Bowen's reaction; Magmatic differentiation; Assimilation.
- Igneous rocks: Definition; Mode of occurrence; Textures and structures; Classification of igneous rocks on textural, mineralogical and chemical criteria.
- Petrography of Granite, Dolerite, Gabbro, Rhyolite, Syenite, Basalt and Diorite.

Unit-2: Sedimentary Petrology**20**

- Introduction; Processes of formation of sedimentary rocks—weathering, transportation, deposition, diagenesis.
- Textures and structures of sedimentary rocks; Sedimentary structures: lamination, ripple marks, current bedding, graded bedding, mud cracks, rain prints.
- Classification of sedimentary rocks; Petrographic description of: sandstone, siltstone, shale, limestone, breccia and conglomerate.

Unit-3: Metamorphic Petrology**20**

- Metamorphic rocks: Definition; Factors or Agents of Metamorphism; Types of Metamorphism; Grade of Metamorphism, Zones of Metamorphism; Textures and Structures of Metamorphic rocks.
- Descriptive petrography of Slate, Phyllite, Schist, Gneiss, Quartzite and Marble.

PRACTICAL**Marks = 20****Unit-1: Igneous Petrology****5**

- Hand specimen study of the following rocks: Granite, granodiorite, gabbro, diorite, pegmatite, rhyolite, dolerite, basalt.
- Study and identification of following rocks in thin sections under petrological microscope: Granite, Dolerite, Gabbro, Rhyolite, Syenite and Diorite.

Unit-2: Sedimentary Petrology**5**

- Hand specimen study of the following rocks: Conglomerate, Sandstone, Shale, Fossiliferous limestone.
- Study and identification of following rocks in thin sections under petrological microscope: Sandstone, Shale, Limestone, Conglomerate.

Unit-3: Metamorphic Petrology**5**

- Hand specimen study of the following rocks: Slate, phyllite, schists, gneiss, marble, quartzite, mylonite, migmatite and Amphibolite.
- Study and identification of following rocks in thin sections under petrological microscope: Chlorite schist, Biotite schist, Sillimanite schist, Amphibolite/ Hornblende schist, Quartzite, Granulite, Granite Gneiss.

Unit-4: Field Training and Viva Voce**5**

- Students will be required to carry out 03 days field work in a suitable geological area to study the elementary aspects of field geology and submit a report there on

4th SEMESTER

Core Courses

Paper Code: GLG-RC-4016

Paper Name: STRATIGRAPHY AND PALAEOLOGY

Credits: 6 (THEORY - 4, PRACTICALS - 2)

THEORY

Marks = 60

Unit-1: Principles of Stratigraphy

15

- Definition and Scope, Principles of Stratigraphy: Superposition of strata; Neptunism, Uniformitarianism; Catastrophism, Smith and Applied Stratigraphy; Lyell's Principles of Geology.
- Standard Geological time scale; Stratigraphic classification – concepts of Time (Chronological), Time-Rock (Chronostratigraphic), Rock (Lithostratigraphic) and Biostratigraphic units. Concept of sedimentary facies; Principles of Stratigraphic Correlation.

Unit-2: Indian Stratigraphy

25

- A brief study of the Precambrian stratigraphy of India of the following areas with respect to lithology, tectonics and igneous activity: a) Dharwar Province (Karnataka) b) Assam-Meghalaya plateau (Shillong plateau) c) Delhi Super Group d) Cuddapah Super Group of Cuddapah basin e) Vindhyan Super Group of Sone Valley.
- Phanerozoic Succession of India: a) Triassic of Spiti b) Jurassic of Kutch c) Cretaceous of Trichinopoly d) Gondwana Super Group e) Cenozoic stratigraphy of NE India f) Deccan Traps g) Paleogene-Neogene sequence of NW Himalaya and Assam

Unit-3: Palaeontology

20

- Palaeontology: definition and kinds of fossils; Mode of preservation of fossils. Broad divisions of invertebrates into different phyla (binomial nomenclature and taxonomy) and their major characteristics. Significance of fossils.
- A study of the morphological characters and brief geological distribution of the following phyla/classes - Brachiopoda, Lamellibranchia, Cephalopoda, Trilobita and Echinoidea. • Evolutionary history of Horse.
- A general idea on the plant fossils of Gondwana Flora, its distribution and palaeogeographic significance.

PRACTICAL

Marks = 20

Unit-1: Indian Stratigraphy

8

- Preparation of lithostratigraphic maps of India showing distribution of important geological formations:
- Dharwar Province, Shillong Group of rocks, Cuddapah Super Group, Vindhyan Super Group, Jurassic of Kutch, Cretaceous of Trichinopoly, Gondwana Super Group, Deccan Traps.

Unit-2: Palaeontology

12

- Identification of the following genera of fossils by their external morphology. Their stratigraphic ranges will also have to be studied: a) Cidaris, Hemiaster, Micraster, Echinolampus, Clypeaster, Stygmatopygus b) Orthis, Productus, Spirifer, Terebratula, Pentamerus, Rhynchonella, Syringothyris c) Arca, Cardita, Exogyra, Glycemeris, Pecten, Plicatula, Ostrea, Trigonia d) Baculites, Belemnites, Ceratites, Hamites, Goniatite, Nautilus, Perisphinctes e) Calymene, Phacops f) Glossopteris, Gangamopteris, Ptillophyllum, Vertebraria

5th SEMESTER

Discipline Specific Elective (DSE 1)

Paper Code: GLG-RE-5016

Paper Name: Economic Geology and Hydrogeology

Credits: 6 (THEORY - 4, PRACTICALS - 2)

THEORY

Marks = 60

Unit-1: Economic Geology and Prospecting

30

- Definition of ore, gangue and tenor; Metallic and non-metallic ore minerals; Strategic, critical and essential minerals.
- Processes of formation of economic mineral deposits: Magmatic, contact metasomatic, hydrothermal, sedimentation processes (with Indian examples).
- Study of mineralogy, mode of occurrence, origin and uses of the following economic mineral deposits with reference to Indian occurrences: a) Metallic mineral deposits: Aluminium, Copper, Manganese, Iron, Lead, Zinc and Gold. b) Non-metallic mineral deposits: Limestone, Gypsum, Mica, Magnesite, Sillimanite, Asbestos.
- Origin and occurrence of coal and petroleum in India.

Unit-2: Hydrogeology**30**

- Definition, Hydrological parameters: precipitation, evaporation, transpiration, infiltration; Hydrologic cycle, Origin of ground water; Vertical distribution of Groundwater, types of Aquifers.
- Water bearing properties of rocks: Porosity, Permeability, Specific yield, Specific retention.
- Surface and sub-surface geophysical and geological methods of groundwater exploration.
- Groundwater provinces of India.

PRACTICAL**Marks = 20****Unit-1: Economic Geology****12**

- Recognition of the following economic minerals in hand specimens: Calcite, Dolomite, Graphite, Malachite, Chalcopyrite, Pyrite, Haematite, Magnetite, Pyrolusite, Psilomelane, Sphalerite, Bauxite, Laterite, Asbestos, Gypsum, Galena, Cuprite, Zincite, Gypsum, Coal.
- Preparation of map showing distribution of important metallic (Aluminium, Copper, Manganese, Iron, Lead, Zinc and Gold) and non-metallic (Limestone, Gypsum, Mica, Magnesite, Sillimanite, Asbestos) mineral deposits and important oil and coal fields of India.

Unit-2: Hydrogeology**8**

- Study of hydrogeological models, estimation of porosity and permeability from the given data.
- Preparation and interpretation of water table maps

6th SEMESTER

Discipline Specific Elective (DSE-2)

Paper Code: GLG-RE-6016

Paper Name: ELEMENTS OF APPLIED GEOLOGY

Credits: 6 (THEORY - 4, PRACTICALS - 2)

THEORY

Marks = 60

Unit-1: Elements of Applied Geology

60

- Definition of soil, processes of soil formation, Engineering properties of rocks and soil, Soil types of India.
- Dam: definition and types of dam, geological and environmental considerations of dams, geological problem of reservoirs
- Tunnels: definition; geological considerations of tunnel, seepage problem and role of water table.
- Landslides: definition and classification of landslides; its causes and mitigation.
- Mineral exploration: Elementary idea of geological, geophysical and geochemical prospecting.
- Concept of Mining, types of mining, impact of mining on environment.

PRACTICAL

Marks = 20

Unit-1: Elements of Applied Geology

20

- Surveying by plane table/ prismatic compass/ theodolite.
- Preparation of engineering geological maps, engineering properties and identification of building stones.
- Identification of various types of landslide and dams from given representative models/ figures/ photographs.
- Study of soil profiles.

2) **Teaching Method for each Unit**

Chalk and Board Method and Laptop.

3) **Assessment Method for each Unit**

Home Assignment, Sessional Examination

4) **Learning Level Assessment, Slow and Advanced Learners**

By Class Test

5) **Unit to be covered with experimental/ Participating Learning**

All experiments included in the Syllabus

6) **Course Handouts/ Lecture Schedule**

Included in Teaching Plan

7) **Assignments/ Tutorial Questions with solutions**

To be distributed among students

8) **Class Test/ Mid/ End Sessional Exams question papers with solution**

To be distributed among students and kept one copy of each in a file.

9) **Consolidated attendance sheet of students**

10) **Consolidated semester grade of students**

11) **Result Analysis**

12) **Sample copies of evaluated answer scripts of class test, assignments, tutorials, lab records, mid, end semester exams (Highest average and marginal pass)**