

## Department of Geology

## B.Sc. Semester I

There shall be two written papers.

Paper No.	Paper Title	Type	Written Test	Internal Assessment mark
Paper I:	Physical Geology	Theory Paper	80	20
Paper II:	Structural Geology	Theory paper	80	20
Total			200	

## Paper I: Physical Geology

## Unit I

Introduction to Geology; Radiometric dating methods of rocks: K/Ar, Rb/Sr, U/Pb, and  $^{14}\text{C}$ ; Geological time scale.

## Unit II

Mechanical and chemical weathering; Erosion, transportation and deposition by wind and their related landforms; Lakes: their types and origin.

## Unit III

Erosion, transportation and deposition by rivers and glaciers, and their related landforms; Glacial periods and causes of glaciations.

## Unit IV

Generation of oceanic currents; Coastal processes and landforms; Erosion and transportation by ocean currents; Wave erosion; Relief of ocean floor; Coral reefs.

## Paper II: Structural Geology

## Unit I

Introduction to structural geology; Crustal processes, behaviour of the crust during deformation; Sea-floor spreading; Basic concepts of plate-tectonics; Basic concepts of stress and strain.

## Unit II

Study of outcrop; Identification of bedding; Measurement of dip, strike and thickness of beds; Outliers and Inliers; Forms of igneous bodies: concordant and discordant; Unconformities: their classification, recognition and geological significance, onlap and offlap; Simple deformational structures: Fold morphology, their geometric and genetic classification.

## Unit III

Geometric and genetic classification of Faults (normal, reverse and strike-slip faults); Recognition of faults in the field; Effects of faults on folded beds; Geometric and genetic classification of Joints; Foliation:

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For the examination of 2018 and onwards

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descriptive terminology, origin and relation to major structures; Lineation: descriptive terminology, kinds and origin, and relation to major structures.

**Unit IV**

Interior of the Earth: internal structure and chemical composition of various layers; Recognition of top and bottom beds; Neotectonics.

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## Department of Geology

B.Sc. Semester II

There shall be one written paper and one practical paper

Paper No.	Paper Title	Type	Written Test	Internal Assessment mark
Paper I:	Crystallography and Mineralogy	Theory Paper	80	20
Paper II:	Practical Work	Practical	100	
Total			200	

## Paper I- Crystallography and Mineralogy

## Unit I

Basic idea about crystal, crystal growth and crystallisation; Laws of crystallography; Crystal morphology; Crystallographic axes; Elements of symmetry; Crystallographic notations; Symmetry and forms of Cubic (Galena type, Pyrite type and Tetrahedrite type), and Tetragonal (Zircon type) Crystal Systems.

## Unit II

Crystal forms; Habit and classification; Preliminary idea about various types of projection, Crystal aggregate; Twinning and common twin laws; Symmetry and forms of Hexagonal (beryl type and calcite type), Orthorhombic (Barytes type), Monoclinic (Gypsum type), and Triclinic (Axinite type) Crystal Systems.

## Unit III

Definition of mineral; Atomic bonding; Physical properties of minerals: colour, lustre, form, isomorphism, pseudomorphism, polymorphism, hardness, fracture, cleavage, specific gravity, and characters based on heat, electricity and magnetism; Physical properties, chemical composition, occurrences, and uses of minerals belonging to the Silica and Feldspar families, and clay minerals.

## Unit IV

Physical properties; chemical composition, occurrences, and uses of minerals belonging to the Feldspathoid, Amphibole, Pyroxene, Olivine, Mica and Garnet families; Silicate structure.

## LABORATORY WORK

## LAB -1:

Problems on dip, strike and thickness of beds; Contour maps and completion of outcrops; study and interpretation of topographical maps; Geological maps and cross-sections; Geological history; Use of Clinometer compass.

## LAB-2:

Verification of Euler's formula; Graphical construction of crystallographic axes of Cubic system; Clinographic projections of typical crystals of Cube, Rhombdodecahedron, Tetrahedron, Trapezohedron, Pyritohedron, Tetrahedron, Zircon, Calcite.

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LAB- 3:

Determination of physical properties of rock forming minerals; Identification of important rock forming minerals in hand specimens.

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**B.Sc. Syllabus**  
**Department of Geology**  
*B.Sc. Semester III*

There shall be one written paper (subjective-type) and one practical paper (inclusive of fieldwork).

Paper No.	Paper Title	Type	Written Test	Internal Assessment mark
Paper I	Palaeontology	Theory Paper	80	20
Paper II	Laboratory work (inclusive of field work)	Practical	80 (Labwork) + 20 (Fieldwork)	00
Total			200	

**PAPER I – PALAEOLOGY:**

**UNIT I**

Introduction to palaeontology; processes of fossilisation; Preliminary idea of the origin of life; Basic idea of trace fossils and their uses.

**UNIT II**

Morphology and geological history of Bivalvia, Gastropoda and Brachiopoda.

**UNIT III**

Morphology and geological history of Cephalopoda, Echinoidea and Anthozoa.

**UNIT IV**

Morphology and geological history of Trilobita and Graptolithina; Introduction to Palaeobotany; Important Lower and Upper Gondwana plant fossils.

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**PAPER II – LABORATORY WORK (INCLUSIVE OF FIELD WORK):**

**LAB - 1:**

Study of the morphology of representative fossil invertebrates of Mollusca (Bivalvia, Gastropoda and Cephalopoda), Brachiopoda, Echinodermata (Echinoidea) and Cnidaria (Anthozoa); Study of important Gondwana plant fossils.

**LAB - 2:**

Petrological microscope and its use; Optical properties of common rock forming minerals.

Study of rock types in hand specimens and thin sections: Granite, Syenite, Diorite, Dolerite, Gabbro, Dunite, Rhyolite, Basalt, Quartzite, Marble, Schist and Charnockite.

Study of rock types in hand specimens only: Pegmatite, Sandstone, Limestone, Conglomerate, Shale, Phyllite, Slate and Gneiss.

**LAB - 3:**

Study of geological maps, and preparation of cross-sections; Simple dip-strike problems by stereographic projection.

**SESSIONAL WORK:**

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.

**FIELDWORK:**

Every student shall be required to attend the field training and submit to the Head of the Department, a record of field observations and specimens collected, properly labelled and arranged; and a *viva-voce* examination based on the fieldwork shall also be conducted at the time of the Practical Examination. The marks assigned to the fieldwork shall be on the basis of the field records and collections, and performance in the field.

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PAPER II – PETROLOGY:

**UNIT I:**

Nicol prism; Optically isotropic and anisotropic minerals; Polarisation of light; Optical properties of minerals under polarised light and crossed polars: refractive index, pleochroism, relief, twinkling, birefringence, interference colours, extinction and twinning; Classification of minerals into uniaxial and biaxial minerals.

**UNIT II:**

Brief introduction to rocks; Magma: definition, composition and origin; Bowen's reaction series; Magmatic differentiation and assimilation; Textures of igneous rocks; IUGS classification of igneous rocks.

**UNIT III**

Phase Rule; Laws of thermodynamics; Phase equilibria studies in  $\text{SiO}_2$ , Diopside-Anorthite, Albite-Anorthite, Leucite-Silica and Diopside-Albite-Anorthite systems; Brief petrographic description of common igneous rocks.

**UNIT IV**

Origin and classification of sedimentary rocks; Definition, agents, types and grades of metamorphism; Metamorphic rocks: texture, structure and classification; Concept of index minerals, isograds and metamorphic facies; Regional metamorphism of pelitic, calcareous and basic rocks; anatexis; Brief description of common metamorphic rocks.

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Department of Geology

B.Sc. Semester V

There shall be Two written papers (subjective type) and one Practical

Paper No.	Paper Title	Type	Written Test	Internal Assessment mark
Paper I	Sedimentology	Theory Paper	80	20
Paper II	Mesozoic to Quaternary Stratigraphy	Theory Paper	80	20
Paper III	Laboratory work (inclusive of field work)	Practical	70 (Labwork) + 30 (Fieldwork)	00
Total			300	

PAPER I – SEDIMENTOLOGY:

UNIT I

Introduction to sedimentary rocks and their origin; Flow dynamics; Froude number; Reynolds number; Flow regime; Types of flow.

UNIT II

Sediment characteristics; Diagenesis; Textures of sedimentary rocks; Sedimentary structures.

UNIT III

Classification of sedimentary rocks: clastic and non-clastic; Classification of sandstone and carbonates; Sedimentary basins in different tectonic settings.

UNIT IV

Concept of facies and Walther's law of facies; Transgression and regression; Depositional environments; Shallow marine environments; Fluvial environment; Deltaic environment; Deep sea environment.

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**PAPER II – MESOZOIC TO QUATERNARY STRATIGRAPHY:**

**UNIT I:**

Marine Triassic and Jurassic successions of India; Marine and non-marine Cretaceous successions of Trichinopoly.

**UNIT II:**

Stratigraphy of the Deccan Traps and Intertrappean beds.

**UNIT III:**

Cenozoic stratigraphy: Cenozoic formations of India.

**UNIT IV:**

Rise of the Himalayas and development of Siwalik Group; Quaternary Period and Meghalayan Stage.

**PAPER III – LABORATORY WORK (INCLUSIVE OF FIELD WORK):**

**LAB - 1:**

Study of aerial photo-pairs using pocket stereoscope delineating geomorphic features (aeolian, fluvial and glacial) and structural features (fold, faults, joints and lineaments); Introduction to GPS.

Study of important economic minerals in hand specimens.

**LAB - 2:**

Study and interpretation of Geological maps; Simple survey problems using Clinometer, Brunton and Prismatic compass; Introduction to toposheet.

**LAB - 3:**

Study of sedimentary rock types in hand specimens and thin sections: Quartz-arenite, Arkose, Glauconitic-sandstone, Oolitic limestone, Pellet limestone, Fossiliferous limestone.

Study of sedimentary rock types in hand specimens only: Conglomerate, Breccia, Stromatolitic limestone, Siltstone and Shale.

Study of sedimentary structures in hand specimens such as ripple marks, cross-bedding, graded-bedding, mud cracks, salt pseudomorphs, rain prints etc.

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**SESSIONAL WORK:**

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**FIELD WORK:**

Every student shall be required to attend the field training and submit to the Head of the Department, a record of field observations and specimens collected, properly labelled and arranged; and a *viva-voce* examination based on the fieldwork shall also be conducted at the time of the Practical Examination. The marks assigned to the fieldwork shall be on the basis of the field records and collections, and performance in the field.

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Department of Geology

B.Sc. Semester VI

There shall be Three written papers (objective type)

Paper No.	Paper Title	Type	Written Test	Internal Assessment mark
Paper I	Economic Geology	Theory Paper	80	20
Paper II	Applied Geology and Global Tectonics	Theory Paper	80	20
Paper III	Remote Sensing and Environmental Geology	Theory Paper	80	20
Total			300	

PAPER I – ECONOMIC GEOLOGY:

**UNIT I**

Classification of mineral deposits; Processes of formation of ores: magmatic, hydrothermal, oxidation and supergene enrichment; Concept of critical, essential and strategic minerals.

**UNIT II**

Occurrence, origin and distribution of the important mineral deposits of India: Copper, Iron, Manganese, Aluminium, Chromium, Lead and Zinc.

**UNIT III**

Conventional energy resources: Coal, Petroleum, Radioactive minerals (Uranium and Thorium).

**UNIT IV**

Non-conventional energy resources: Geothermal energy – hot springs; Non-metallic minerals related to refractory and cement industry.

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**PAPER II – APPLIED GEOLOGY AND GLOBAL TECTONICS:**

**UNIT I**

Concepts of Geophysical, Geochemical and Geobotanical mineral exploration; Concept of surface and subsurface mining.

**UNIT II**

Introduction to geotechnical properties of rocks; Geological consideration for geo-engineered structures; Landslides: classification and mitigation.

**UNIT III**

Physical and chemical characteristics of Crust, Mantle and Core; Active and Passive continental margins; Wilson Cycle.

**UNIT IV**

Geomagnetic reversals; Tectonic events in the Himalaya; Suspect Terranes, Hot-spots and Mantle plumes; Triple junctions.

**PAPER III – REMOTE SENSING AND ENVIRONMENTAL GEOLOGY:**

**UNIT I**

Types and acquisition of aerial photograph; Scale and resolution; Black and white, colour and infrared film; Principles of stereoscopy; Elements of aerial photo interpretation.

**UNIT II**

Physical principles of Remote Sensing; Early history of space imaging; Earth resources Satellite characteristics and applications of imageries; Introduction to GPS; Indian Remote Sensing Satellite missions; Use of Remote Sensing in identification of landforms.

**UNIT III**

Concept of Environmental Geology; Geological Hazards: Earthquakes, Floods, Tsunamis and Cyclones; Processes of soil formation; types of soils; soil degradation; Environmental changes due to influence of anthropogenic activity.

**UNIT IV**

Atmosphere and air pollution; Soil contamination due to urbanization, industrialization and mining; Environmental laws; Groundwater and its vertical distribution; Aquifers and the geological considerations; Rainwater harvesting; River and groundwater pollution.

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