



# **BACHELOR OF SCIENCE (B.Sc.)**

**(THREE YEAR DEGREE COURSE)**

**SUBJECT**

**GEOLOGY**

# **B.Sc. (GEOLOGY)**

## **COURSE STRUCTURE**

### **FIRST YEAR**

PAPER – 101: PHYSICAL GEOLOGY	50 MARKS
PAPER – 102: STRUCTURAL GEOLOGY	50 MARKS
PAPER – 103: CRYSTALLOGRAPHY AND MINERALOGY	50 MARKS
PAPER – 104: PRACTICAL (BASED ON PAPER 101, 102, 103)	50 MARKS
(i) Laboratory Work	40
(ii) Record	05
(iii) Viva-Voce	05

### **SECOND YEAR**

PAPER – 201: STRATIGRAPHY	50 MARKS
PAPER – 202: PALAEOONTOLOGY	50 MARKS
PAPER – 203: PETROLOGY	50 MARKS
PAPER – 204: PRACTICAL (BASED ON PAPER 201, 202, 203)	50 MARKS
(i) Laboratory Work	35
(ii) Field Work and Record	10
(iii) Viva-Voce on field work	05

**THIRD YEAR**

PAPER – 301: STRATIGRAPHIC PALAEOLOGY AND SEDIMENTOLOGY	50 MARKS
PAPER – 302: ECONOMIC GEOLOGY	50 MARKS
PAPER – 303: APPLIED GEOLOGY AND GLOBAL TECTONICS	50 MARKS
PAPER – 304 : PRACTICAL (Based on Paper 301, 302, 303)	50 MARKS
(i) Laboratory Work	35
(ii) Field Work and Record	10
(iii) Viva-Voce on field work	05

**B.Sc. (GEOLOGY)**  
**FIRST YEAR DETAILED SYALLBUS**

**PAPER – 101**

**Physical Geology**

UNIT I

Geology and its scope; Origin of Earth; Radiometric dating methods of rocks: K/Ar, Ar/Ar, Rb/Sr, U/Pb, and <sup>14</sup>C; Geological time scale; Concept of Rock and Time units, Volcanoes: their types and distribution.

UNIT II

Mechanical and chemical weathering; Soil formation, soil profile, and soil types of India; 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

Earthquakes, Definition, Earthquake waves, intensity scale and distribution; Coastal processes and landforms; Relief of ocean floor; Coral reefs.

**B.Sc. (GEOLOGY)**  
**FIRST YEAR DETAILED SYLLBUS**

**PAPER – 102**

**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: 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 of beds; Neotectonics.

**B.Sc. (GEOLOGY)**  
**FIRST YEAR DETAILED SYALLBUS**  
**PAPER – 103**  
**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 projections; 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, 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.

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## **FIRST YEAR DETAILED SYLLBUS**

### **PAPER – 104**

### **PRACTICAL**

### **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:**

Graphical construction of crystallographic axes of Cubic system; Clinographic projections of typical crystals of Cube, Octahedron Rhombdodecahedron, Tetrahedron, Trapezohedron, Pyritohedron, Tetrahedron, Zircon, Calcite, Benyl.

#### **LAB - 3:**

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

**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.*

**B.Sc. (GEOLOGY)**  
**SECOND YEAR DETAILED SYALLBUS**

**PAPER – 201**

**Stratigraphy**

UNIT I

Principles of stratigraphy: Lithostratigraphic, Chronostratigraphic and Biostratigraphic units; Stratigraphic correlation; Physical and structural subdivisions of the Indian subcontinent and their characters.

UNIT II

Brief idea of Archaean successions of Peninsular India with special reference to the Dharwar Supergroup; Unmetamorphosed Proterozoic successions: Cuddapah and Vindhyan Supergroups.

UNIT III

Marine Palaeozoic sequences of the Himalaya and Peninsular India; Gondwana Supergroup; Marine Triassic and Jurassic successions of India.

UNIT IV

Marine, and non-marine Cretaceous successions of Trichinopoly; Deccan Traps and Intertrappean beds; Tertiary successions of India; Siwalik Group.

**B.Sc. (GEOLOGY)**  
**SECOND YEAR DETAILED SYLLBUS**

**PAPER – 202**

**Palaeontology**

UNIT I

Introduction to palaeontology; processes of fossilisation; Distribution of organisms in marine environment, their modes of life; Preliminary idea of origin of life and Precambrian fossil records; 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 Gondwana plant fossils.

# **B.Sc. (GEOLOGY)**

## **SECOND YEAR DETAILED SYLLBUS**

### **PAPER – 203**

#### **Petrology**

##### UNIT I

Petrological microscope and its use; Polarised light; Isotropic and Anisotropic minerals; Uniaxial and Biaxial minerals; Optical properties of minerals: refractive index, pleochroism, relief, birefringence, interference colours, extinction and twinning. Optical properties of common rock forming minerals. Eg. Quartz, Orthoclase, Labradorite, Nephelene, Biotite, Muscovite, Hornblende, Augite, Hypersthene, Olivine and Tourmaline.

##### UNIT II

Introduction to Petrology: Igneous, Sedimentary and Metamorphic rocks; Magma: definition, composition and origin; Bowen's Reaction series; Magmatic differentiation and assimilation; Textures of igneous rocks; Classification of igneous rocks with special reference to the IUGS classification.

##### UNIT III

Phase rule; Laws of thermodynamics; Phase equilibria studies in the systems: SiO<sub>2</sub>, Albite-Anorthite, Leucite-Silica, Diopside-Albite-Anorthite; Mineralogical characteristics of acidic, basic, alkaline and ultramafic igneous rocks.

UNIT IV

Origin and classification of sedimentary rocks. Definition, agents and types of metamorphism; Metamorphic rocks: texture, structure and classification; Concept of Metamorphic facies and grades; Barrovian index minerals; Metamorphism of pelitic and calcareous rocks.

# **B.Sc. (GEOLOGY)**

## **SECOND YEAR DETAILED SYLLBUS**

### **PAPER – 204**

### **PRACTICAL**

### **Laboratory 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; Preparation and study of stratigraphic maps: exercises on plotting of major stratigraphic and litho-tectonic units on the map of India.

#### **LAB - 2:**

Study of the optical properties of common minerals found in igneous, sedimentary and metamorphic rocks; Study of the following rock types *in thin sections*: Granite, Syenite, Diorite, Dolerite, Gabbro, Dunite, Basalt and Charnockite.

Study of the following rock types *in hand specimens only*: Pegmatite, Sandstone, Limestone, Conglomerate, Breccia, Shale and Gneiss, Quartzite, Marble, Schist.

#### **LAB - 3:**

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

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**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 labeled and arranged; and a Viva –Voce examination based on the field work 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.***

**B.Sc. (GEOLOGY)**  
**THIRD YEAR DETAILED SYALLBUS**

**PAPER – 301**

**Stratigraphic Paleontology and Sedimentology**

UNIT I

Brief idea of concept of species; Classification of organisms; Principles of marine ecology, palaeoecology; Principles of stratigraphy; Microplaeontology and its use with special reference to morphology of a foraminiferal test

UNIT II

Introduction to sedimentary rocks and their origin; Diagenesis; Texture of sedimentary rocks; Sedimentary structures.

UNIT III

Terrigenous clastics and chemically precipitated rocks and their classification; Sedimentary basins in different tectonic settings.

UNIT IV

Concept of facies and depositional environments; General idea about shallow marine environments; Fluvial system; Delta system.

**B.Sc. (GEOLOGY)**  
**THIRD YEAR DETAILED SYALLBUS**

**PAPER – 302**

**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 following important mineral deposits of India: Copper, Iron, Manganese, Aluminium, Chromium, Lead and Zinc, and non metals related to refractory and cement industries.

UNIT III

Conventional and Non-conventional Energy resources: Coal, Petroleum, Radioactive minerals (Uranium and Thorium), and Geothermal energy – hot springs.

UNIT IV

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

**B.Sc. (GEOLOGY)**  
**THIRD YEAR DETAILED SYALLBUS**

**PAPER – 303**

**Applied Geology and Global Tectonics**

UNIT I

Remote Sensing: concepts; Application of Remote Sensing in geology; Ground water and its vertical distribution; Types of aquifers; Rain water harvesting.

UNIT II

Concept and definition of Environmental Geology; Geological hazards namely, Earthquakes, Landslides, Floods and Tsunamis; Impact of anthropogenic activities on environment.

UNIT III

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

UNIT IV

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

**B.Sc. (GEOLOGY)**  
**THIRD YEAR DETAILED SYALLBUS**

**PAPER – 304**

**PRACTICAL**

**Laboratory Work**

**LAB - 1:**

Study of the sedimentary rock types *in thin sections*: such as Quartz-arenite, Arkose, & Greywacke.

**LAB - 2:**

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

**LAB - 3:**

Study of the following sedimentary rock types *in hand specimens*: Quartz-arenite, Arkose, Glauconitic-sandstone, Oolitic limestone, Pellet limestone, Fossiliferous limestone, Conglomerate, Breccia, Stromatolitic limestone, Siltstone and Shale.

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

Study of important economic minerals in hand specimens.

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