



**SOMAIYA**  
**VIDYAVIHAR**

K J Somaiya College of Science & Commerce

Department: Geology



TRUST

F. Y. B.Sc. Syllabus

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**K.J. SOMAIYA COLLEGE OF SCIENCE & COMMERCE**

**Syllabus for the F.Y.B.Sc.**

**IN**

**GEOLOGY**

**UNDER AUTONOMY**

**(Credit Based Semester and Grading System with effect from the academic  
year 2018–2019)**



## Preamble

1. To understand the origin, evolution and preservation of life in sedimentary rocks through study of microfossils; Understanding the fundamentals of Stratigraphy, stratigraphic succession and stratigraphic correlation
2. To understand the fundamental processes involved in mineral formation and distribution of various ore minerals and resources
3. To learn the optics theory and understanding of mineral optics. To bring out the aspects of most common minerals and their petrological associations descriptively
4. To develop the ability to identify and understand the internal structure, external form, classification of crystals, intentional notation used and the application of crystallography in various fields
5. To develop skills for geological field mapping and preparation of topographical maps, geological maps and identification of geomorphic forms to help in geological mapping. Also to learn about groundwater movement and prospecting



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**SEMESTER I**

COURSE CODE	UNIT	TOPICS	CREDITS	L/WEEK
18USIGE1	Study of Earth, Atmosphere and Oceans			
	I	Solid Earth	2	1
	II	Hydrosphere and Atmosphere		1
	III	Physical Geology		1
18USIGEII	Mineralogy, Crystallography and Mineral Deposits			
	I	Mineralogy	2	1
	II	Crystallography		1
	III	Mineral Deposits		1
18USIGEP	Practical based on both the courses in theory		2	6

**SEMESTER II**

COURSE CODE	UNIT	TOPICS	CREDITS	L/WEEK
18US2GE1	Petrology, Structural Geology, Geo tectonics			
	I	Igneous and Sedimentary Petrology	2	1
	II	Structural Geology		1
	III	Metamorphism and Geo tectonics		1
18US2GEII	Stratigraphy, Palaeontology and Morphology of Fossils			



Department: Geology

	I	Stratigraphy	2	1
	II	Palaeontology		1
	III	Mineral Deposits		1
18US2GEP	Practical based on both the courses in theory		2	6

## FIRST SEMESTER

18US1GE1

### PAPER-I: Study of Earth, Atmosphere and Oceans

#### Unit-1: Solid Earth

(10 lectures)

Geology and its perspectives.

**Earth in the Solar system:** Origin, size, shape, mass, density, rotational parameters.

**Internal structure:** core, mantle, and crust.

Continental and Oceanic Crust, Introduction to Plate Tectonics and Mantle Convection

Convection in the Earth's core and production of its magnetic field

Radioactivity

Age of the earth

#### Unit-2: Hydrosphere and Atmosphere

(10 lectures)

Hydrological Cycle

General relief features of Ocean floor, beach and coastline, Ocean Currents

Climate and Weather associated hazards

Structure of Atmospheric circulation, Ocean currents

#### Unit-3: Physical Geology

(10 lectures)

Weathering and Erosion.



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**Soil:** definition, formation and functions; soil profile and soil types.

**Rivers:** development of a typical river system, source and surface flow; erosion, transportation and deposition.

**Wind:** erosion, transport and deposition; types of deserts and dunes; loess.

**Glaciers:** types, formation and morphology; erosion, transport and deposition

## FIRST SEMESTER

18US1GE2

### PAPER-II: Mineralogy, Crystallography and Mineral Deposits

#### Unit-1: Mineralogy

(10 lectures)

**Chemical bonds**, Chemical compositions and Classification, Silicate Structures Physical properties of minerals: colour, streak, luster, diaphaneity, form, habit, cleavage, fracture, hardness, specific gravity, and electrical and magnetic properties.

Isomorphism, polymorphism and pseudomorphism.

**Introduction to rock forming minerals:** Silica, Feldspars, Pyroxene, Amphibole,

Mica, Olivine. Ore-forming and industrial minerals

#### Unit-2: Crystallography

(10 lectures)

Concept of Crystal Lattice.

**External characteristics of crystals:** face, form, edge, solid angle, interfacial angle and its measurement, zone.

**Crystal symmetry:** planes, axes and center of symmetry.

Crystallographic axes and axial angles, parameters, indices and rational indices.



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Classification of crystals into seven systems.

Study of the normal classes belonging to following systems:

Isometric, Tetragonal, Hexagonal, Trigonal, Orthorhombic, Monoclinic and Triclinic.

### **Unit-3: Mineral Deposit**

**(10 lectures)**

Classification and brief study of following mineral deposits: Hydrothermal, Magmatic, Sedimentary (evaporites, strata-bound, bedded iron formations), Placer, Residual.

### **Introduction to Mineral Exploration and Mining**

**Methods of mineral exploration:** Surface methods – grid sampling. Sub-surface methods: Electrical, Magnetic and Electrical.

Basic ideas about the methods of mining.

## **FIRST SEMESTER**

**18USIGEP**

### **PRACTICAL-I**

1. Study of thirty crystal models representing forms of seven normal classes of symmetry.

### **PRACTICAL-II**

2. Identification and description of the physical properties, composition, occurrences and uses of 30 minerals comprising rock forming, industrial and ore minerals.



## SECOND SEMESTER

18US2GE1

### PAPER-I: Petrology, Structural Geology and Geo tectonics

#### Unit-1: Igneous and Sedimentary Petrology

(10 lectures)

**Igneous Rocks:** Definition, their classification.

Magma: definition, composition, Mode of occurrences, Intrusive and Extrusive forms, textures and structures.

Classification based on grain size and mineral composition.

Origin, magmatic differentiation

Volcanoes

**Sedimentary Rocks and Processes:** Weathering, erosion, transport, deposition, consolidation, diagenesis.

Textures and Structures.

**Classification:** Terrigenous and Chemical, Residual, Biogenic sedimentary rocks.

#### Unit- 2: Structural Geology

(10 lectures)

**Stratification;** Dip and Strike; True dip and Apparent dip,

Outcrop pattern of horizontal, dipping and vertical strata on various types of topography. Outliers, Inliers.

**Folds:** Definition, Morphology, anticline and syncline.

Types of folds: symmetrical, asymmetrical, recumbent, overturned, isoclinal, plunging, anticlinorium, synclinorium, Importance of folds.

**Joints:** Definition, geometric classification and importance.



**Department: Geology**

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**Faults:** morphology; Normal fault, Reverse, fault Thrust fault, Step fault, Nappes.

Apparent movement and relative movement; Horsts, Grabens

Concept of **Unconformities**,

Introduction to **Joints, Shears and fractures**

### **Unit 3 Metamorphism and Geo tectonics**

**(10 lectures)**

Metamorphism and Geotectonics

Metamorphism: definition, agents and types of metamorphism. textures and structures.

Metamorphic facies and isograds,

**Geotectonics: Isostasy. Earthquakes** causes, effects, measurement of earthquakes, seismic belts, seismic zonation in India.

Subduction zones, Continental Drift

## **SECOND SEMESTER**

**18US2GE2**

### **PAPER-II: Stratigraphy, Palaeontology, Morphology of Fossils**

#### **Unit-1: Stratigraphy**

**(10 lectures)**

Principles, correlation of strata, Unconformities and their significance

Stratigraphic Units: Definition of Lithostratigraphic, biostratigraphic and chronostratigraphic units

Geological Time Scale

#### **Unit-2: Palaeontology**

**(10 lectures)**

Definition and scope of Palaeontology



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Processes of fossilization, preservation potential of organisms.

Uses of fossils, zone fossils, Taxonomy, Mass Extinction

### **Unit-3: Morphology of Fossils**

**(10 lectures)**

Systematic study of morphological characters, environmental factors and geological distribution of the following groups: **Arthropoda:** Trilobites, **Coelenterata:** Corals, **Brachiopoda,** **Mollusca:** Lamellibranchs, Gastropods, Cephalopods, **Graptoloidea.****Echinodermata:** Regularia and Irregularia

## **SECOND SEMESTER**

**18US2GEP**

### **PRACTICAL-I**

1. Identification of group characteristics of 30 common rocks and their classification into major rock groups. Identification and systematic description, of the megascopic features of these rocks.
2. Identification, classification, and geological of 15 fossils belonging to the phyla included in the theory syllabus. Study of Plant Fossils

### **PRACTICAL II**

1. Reading of topographical maps.
2. Use of Clinometer compass (Strike, Dip, Fore Bearing and Back Bearing)
3. Description and drawing of vertical cross section of simple geological maps involving horizontal strata, inclined, folded strata and strata involving angular unconformity with vertical dykes and vertical faults.
4. Graphical solution of structural geology problems involving
  - a. Strike, true dip and apparent dip
  - b. Thickness and width of outcrop



## FIELD WORK

In addition to the requisite number of lectures and Practical, students are required to undertake local geological excursion to study at first hand geological structures and lithology under the guidance of a teacher. The field work shall aim at developing individual skills of observation, description and interpretation of geological features. Each student shall maintain a field-diary for this purpose and shall write area-wise report.

## LIST OF RECOMMENDED BOOKS

- The Blue Planet” (II Edition), Skinner B.J., Porter S.C. and Botkin D.B. (J. Wiley & Sons)
- “Physical Geology” (VII edition), Judson, Kauffman and Leed (Prentice Hall).
- “Rutley’s Mineralogy”; Read H.H. (CBS)
- Mineralogy (II Edition) Dexter Perkins PHI Learning Pvt. Ltd. New Delhi.
- “Oceanography – A brief Introduction”, Siddhartha. K., (Kislaya Publications, India)
- “Elements of Cartography”, Robinson. A, Sale. R, Morrison. J, 6 ed, J. Wiley & Sons.
- “Structural Geology”; Billings M.P. (Prentice Hall)
- “Fundamentals of Historical Geology & Stratigraphy of India”; Ravindra Kumar, (Wiley Eastern India).
- Historical Geology Spencer
- “Holmes’ Principles of Physical Geology”, Holmes D.L;(ELBS & Nelson)
- “Invertebrate Paleontology”; Wood; (CBS)
- “Principles of invertebrate Paleontology”; Shrock & Twenhofel, (CBS)
- “Principles of Paleontology”; Raup & Stanley, (CBS)
- “The Principles of Petrology”; Tyrell G.W.
- “Principles And Practices of Mineral Exploration”; P.K.Raman (Geol, Soc. India, Bangalore)(1989)
- “Mining of Ores and Non-metallic Minerals”; M. Agoskhov S. Borisov & V.Layansky, (Mir Publications, Moscow)(1988) Ch.2 & Ch. 17
- “Courses in Mining Geology”; Arogyaswami, (Oxford & IBH).