

ST. XAVIER'S COLLEGE, MUMBAI



# Syllabus for B.Sc I<sup>st</sup> Semester Courses in Geology (June 2019 onwards)

## Contents:

- Theory Syllabus for Courses:
  - SGEO0101 - Introduction to Mineralogy and Crystallography
  - SGEO0102 - Introduction To Earth Science, Cartography and Structural Geology.
- Practical Course Syllabus for: SGEO01PR.
- Evaluation and Assessment guidelines.

**F.Y. B.Sc. Geology**  
**Title: Introduction To Mineralogy and Crystallography**

**Course: SGEO0101**

**Learning Objectives:**

**This is among the first exposure that a learner has to the subject of geology at the undergraduate level. The aim of this course is to develop in the learner, ability to understand and identify various minerals along with their characteristic crystallographic properties, as this forms one of the fundamental requirements in the later profession.**

**Number of lectures: 45**

**Unit 1**

**Mineralogy:**

**(15 Lectures)**

Chemical bonds and formation of compounds.

Minerals: definition, chemical compositions and classification.

Physical properties of minerals: colour, streak, luster, diaphaneity, form, habit, cleavage, fracture, hardness, specific gravity, and electrical and magnetic properties.

Isomorphism, polymorphism and pseudomorphism.

**Unit 2**

**Elementary Crystallography:**

**(15 Lectures)**

States of matter: crystalline state.

Elementary ideas about the crystal structure.

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.

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**

**Descriptive Mineralogy of Rock forming minerals:**

**(15 Lectures)**

Structural classification of silicates.

Feldspars, Silica, Pyroxene, Amphibole, Mica, Olivine.

**List Of Recommended Reference Books**

1. Dana J.D. and Ford W.E. (rev.ed.) (2010), Dana's Manual of Mineralogy, J. Wiley & Sons.
2. Read H.H. (Rev. ed. C.D. Gribble) (1988), Rutley's Elements of Mineralogy" (27<sup>TH</sup> Edition), CBS Publications.
3. Perkins D (2010). Mineralogy (3<sup>rd</sup> Edition), Prentice-Hall of India.

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**Practical Course:**

- I. Study of crystal models representing forms of seven normal classes of symmetry.
- II. Identification and description of the physical properties, composition, occurrences and uses of 30 rock forming minerals.

**F.Y. B.Sc. Geology**

**Course: SGEO0102**

**Title: Introduction To Earth Science, Cartography And Structural Geology**

**Learning Objectives:**

**The primary platform for any learner attempting to understand geology is our planet earth. As this course is among the introductory courses at the undergraduate level, it needs to communicate and also attempt at the learner becoming acquainted with the various theories about the origin of the universe and our solar system. After that the learner needs to know the theories that lead to the understanding about the planets interior and the energy systems that drive the various internal (sub-surface and deep interior) systems along with the linkages between the interior and the atmospheric circulation. This leads to an understanding about the internal and external processes on our planet and how various structures within rocks form due to earth's internal forces.**

**Number of lectures: 45**

**Unit-1:**

**15**

**Lectures**

**Earth in the Solar System:**

Geology and its perspectives.

Earth in the Solar System: Earth's Origin, size, shape, mass, density, rotational parameters.

**Earth's Internal structure:** core, mantle, and crust.

Hydrosphere, Atmosphere and Biosphere: characteristics and elemental abundance in each constituent. Convection in the earth's core and production of its magnetic field.

Age of the earth.

**Unit-2:**

**15**

**Lectures**

**Atmospheric circulation and Global climatic changes:**

Atmospheric circulation, weather and climate changes.

Land-air-sea interaction.

Earth's heat budget and global climatic changes.

**Ocean currents:**

Generation of oceanic currents, surface currents and global ocean conveyor system.

Ocean as a thermostat for the earth's surface heat balance.

**Cartography:**

Maps and Topographical maps; latitude – longitude concepts, Datum, map projections, types of maps, SOI map index, Contours and contour reading: Scales and Compass bearings, map grids (UTM).

**Unit-3:**

**15 Lectures**

**Structural Geology:**

Stratification; Dip and Strike; Clinometer compass its use.

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, doubly plunging, structural dome and basin, monocline, structural terrace, chevron, fan, anticlinorium, synclinorium, Importance of folds.

Joints: Definition, geometric classification and importance.

Faults: morphology; geometric classification based on relation to affected rocks, angle of dip, apparent movement and relative movement; distributive faulting: horst, graben and step faults; nappes.

Unconformities: nature, types and importance; overlap and off-lap.

### **List Of Recommended Reference Books**

1. Compton R.R. (1985), Geology in The Field., J. Wiley& Sons
2. Skinner B.J., Porter S.C. and Botkin D.B. (1999), The Blue Planet., 2nd edn. J. Wiley & Sons.
3. Holmes A. (1993), Principles of Physical Geology., ed by David Duff, Nelson Thornes Ltd
4. Billings M.P. (1987), Structural Geology., 3rd edn, Prentice-Hall, India Pvt. Ltd
5. Robinson. A, Morrison. J, Muehrcke. P, Kimerling. A, Guptill. S (1995), Elements of Cartography, 6 ed, J. Wiley & Sons.
6. Siddhartha K., (1999 ) , Oceanography - A Brief Introduction., Kosalaya Publ., India
7. Butz S. (2007) Science of Earth Systems., 2nd edn., Thomas Delmar.

### **Practical Course:**

- I. Use of Clinometer and Brunton compasses
- II. Description and drawing of vertical cross section of simple geological maps involving horizontal or dipping strata with vertical faults, folded (non-plunging and non-faulted) strata and strata involving angular unconformity.
- III. Graphical solution of structural geology problems involving
  - a. Strike, true dip and apparent dip
  - b. Thickness and width of outcrop.

**Evaluation and Assessment: SGEO0101 and 102 courses**

**Evaluation (Theory): Total marks per course - 100.**

**Continuous Internal Assessment (CIA) - 40 marks**

CIA 1: Written test -20 marks

CIA 2: One day Geological Field work around Mumbai with field report and viva on the fieldwork. -20 marks

**End Semester Examination – 60 marks**

One question from each unit for 20 marks, with internal choice. Total marks per question with choice -28 to 30.

**Evaluation of SGEO01PR (Practicals) Total marks for Practical course - 100.**

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**Template for SGEO courses End Semester examination in Semester 1**

UNITS	KNOWLEDGE	UNDERSTANDING	APPLICATION and ANALYSES	TOTAL MARKS- Per unit
1	10	06	04	20
2	10	06	04	20
3	10	06	04	20
<b>-TOTAL - Per objective</b>	30	18	12	<b>60</b>
<b>% WEIGHTAGE</b>	50	30	20	<b>100%</b>

**St. Xavier's College, Mumbai**

**Department of Geology**

**Course: SGEO0101/102**

**Roll Number: \_\_\_\_\_**

**UID Number: \_\_\_\_\_**

**MARKS: \_\_\_/20**

**Date: \_\_\_\_\_**

**Assessment Grid for Course: SGEO0101/102 CIA 2 (Field Work)**

<b>Parameters Category</b>	<b>Details of Assessment</b>	<b>80 – 100 % Excellent</b>	<b>60 – 80 % Good</b>	<b>40 – 60 % Satisfactory</b>	<b>20 –40 % Poor</b>	<b>0 - 20 % Very Poor</b>
<b>Field Work (30 %)</b>	1. Equipment – field diary, hammer, chisel, hand lens, map, Field discipline.(02)					
	2. Sample Collection and Instrument handling (01)					
	3. Prior Preparation (03)					
<b>Field Report (60 %)</b>	1. Field Diary (04)					
	2. Content, Presentation and Technical correctness (08)					
<b>Viva Voce (10 %)</b>	1. Ability to answer questions. (02)					
<b>Total Marks/20</b>						

**Name, Signature of Course Instructor**

**Date:**