

# Solapur University, Solapur

## Syllabus for B.Sc. II- Geology (Semester System)

To be implemented from Academic Year- 2011-12

### Course Structure

Sr. No.	Semester	Paper No.	Title	No. of Lecture	Total Marks
1	Semester III	V	Optics and Mineralogy	40	50
		VI	Structural Geology	40	50
2	Semester IV	VII	Igneous Petrology	40	50
		VIII	Sedimentary & Metamorphic Petrology	40	50
3	At the end of IV Semester		Practical Examination (Annual Pattern)		100
				Total	300

# Solapur University, Solapur

## Syllabus for B.Sc.II- Geology

### Semester System

To be implemented from Academic Year, 2011-12

### Theory

### SEMESTER – III

**Paper –V: - Optics and Mineralogy. (50 Marks)**  
**(40 periods)**

**Optics:** Petrological Microscope, Behaviour of light under petrological microscope, Study of the following optical properties - Colour, form, cleavage, fracture, inclusion, alteration, relief, twinkling, pleochroism and absorption, isotropism and anisotropism, extinction- types of extinction and extinction angle, twinning, zoning, birefringes and interference colours.

(15 Periods)

**Mineralogy:** Silicate structures, Isomorphism, Polymorphism and Pseudomorphism, Physical properties, optical properties, mode of occurrence, structure and chemistry of the following mineral groups:

1. Olivine- Forsterite, Fayalite
2. Pyroxene – Enstatite, Hypersthene, Diopside, Augite, Jaedite
3. Amphibole – Anthophyllite, Tremolite, Actinolite, Hornblende, Glaucophane.
4. Mica – Muscovite, Biotite, Phlogopite, Lepidolite
5. Feldspar - Orthoclase, Microcline, Plagioclase
6. Silica- Minerals with crystalline, crypto-crystalline and amorphous silica
7. Alumino Silicates - Sillimanite, Andalusite, Kyanite
8. Carbonates - Calcite, Aragonite, Magnesite
9. Chlorite - Chlorite.
10. Garnet - Common Garnet.
11. Feldspathoid – Leucite , Nephelene.
12. Clay minerals–Kaolinite

(25 periods)

### Reference Books:

1. Rutley's Elements of Mineralogy –H.H. Read.
2. Optical Mineralogy- Paul Kerr.
3. Introduction to Rock Forming Minerals - Deer, Howie & Zussman.

**Paper –VI:- Structural Geology.****(50 Marks)  
(40 Periods)**

1. Concept of rock deformation & tectonics, Dip and Strike, Outcrop, width of outcrop, Inlier and outlier, Lineation and foliation (8periods)
2. Fold - Types and nomenclature, Criteria for their recognition in field (10periods)
3. Faults - Classification, recognition in field, effects on outcrops (10periods)
4. Unconformity - Types, recognition in field (6periods)
5. Joints - Types, geometric and genetic classification (6periods)

**Reference Books:**

1. Structural Geology - M.P. Billing
2. Fundamentals of Structural Geology- N.W.Gokhale.

**SEMESTER – IV****Paper-VII: -- Igneous Petrology.****(50 Marks)  
(40 periods)****Igneous Petrology:**

1. Crystallization processes of uni component, binary and ternary magma compositions.  
Formation of glass and crystals. (12 periods)
2. Reaction relationships. Textures and Micro-structures. (10 periods)
3. Classification of Igneous rocks - based on mode of occurrence, mineralogy, chemistry-  
Shand's, and tabular classification. (10 periods)
4. Processes of differentiation in magma and assimilation. Xenolith formation. (8 periods)

**Paper-VIII: - Sedimentary & Metamorphic Petrology.****(50 Marks)  
(40periods)  
(20periods)****Sedimentary Petrology:**

1. Classification of Sedimentary rocks- based on mineralogical composition and characters of  
the sediments (size and shape) (6 periods)
2. Description of sedimentary rock – Rudaceous group, (Conglomerate, Breccia), Arenaceous  
group, (sandstones, grit, arkose, greywacke) Argillaceous group (shales), Calcareous group  
(limestones, dolomites) Oxides-Hydroxides group (laterite, bauxite). (8 periods)
3. Processes and environments of sedimentation. (6 periods)

**Metamorphic Petrology:****(20periods)**

1. Brief outline of characters of standard metamorphic facies ( Greenschist, Amphibolite,  
Granulite and Eclogite). (5 periods)
2. Fabric of metamorphic rocks. (5 periods)
3. Classification of metamorphic rocks based on fabric - strongly foliated, weakly foliated and  
non foliated. Description of metamorphic rock types- Strongly foliated (slate, phyllite,  
schists), Weakly foliated (mylonite, gneisses, migmatite), Non foliated (quartzite, marble,  
scarn, hornfelse, argillite, granulite). (5 periods)
4. Introduction to retrograde metamorphism, Polymetamorphism, Metasomatism. and Anatexis.  
(5periods)

**Reference Books :**

1. Principles of Petrology - G.W. Tyrrell.
2. Igneous and metamorphic Petrology- Best M.G.
3. Igneous Petrology -Mihir K. Bose.
4. Igneous and Metamorphic Petrology- Turner and Verhoogen.
5. Igneous petrology - Anthony Hall.
6. Metamorphic petrology - Turner.
7. Petrogenesis of Metamorphic Rocks- Winkler H.G.F.
8. Petrology of Metamorphic Rocks- Mason Roger.
9. Sedimentary Rocks- Petijohn F.J.
10. Introduction to Sedimentology - Sengupta S.
11. Fundamentals of Sedimentary rocks – N.W.Gokhale.

**Syllabus of B Sc. (Part-II) Geology Practical Course  
(Annual Pattern)**

**Practical - I**

(Course for Paper-III)

**Unit I- Optics and Mineralogy**

**Optics**

**1) Study of petrological microscope.**

- i) Study of optical properties of minerals in polarized light
- ii) Study of optical properties of minerals between crossed nicol prisms.

**2) Microscopic study of minerals.**

- 1) Quartz, 2) Orthoclase, 3) Microcline, 4) Plagioclase, 5) Muscovite, 6) Biotite, 7) Hornblende, 8) Actinolite, 9) Tremolite, 10) Augite, 11) Hypersthene, 12) Olivine, 13) Garnet, 14) Staurolite, 15) Calcite, 16) Chlorite

**3) Megascopic Study of following minerals.**

- 1) Silica Group-Quartz, Rock Crystal, Amethyst, Chalcedony, Agate, Flint, Jasper, Chert, Opal
- 2) Feldspar Group- Orthoclase, Microcline, Plagioclase
- 3) Feldspathoid Group- Nepheline, Leucite, Sodalite
- 4) Mica Group- Muscovite, Biotite, Lepidolite, Phlogopite
- 5) Amphibole Group - Hornblende, Actinolite, Tremolite, Asbestos
- 6) Pyroxene Group - Augite, Diopside, Hypersthene
- 7) Olivine Group- Olivine
- 8) Epidote Group- Epidote
- 9) Chlorite Group – Chlorite
- 10) Garnet Group- Garnet
- 11) Alumino-Silicates- Kyanite, Andalusite, Sillimanite
- 12) Carbonate Group- Calcite, Dolomite, Magnesite
- 13) Zeolite Group- Natrolite, Stilbite
- 14) Apophyllite Group- Apophyllite
- 15) Corundum, Beryl, Staurolite, Tourmaline, Talc, Serpentine.

**Unit 2- Structural Geology:**

1. Study of geological maps and drawing of geological sections of following types

- A) Horizontal Series
- B) Inclined series
  - 1) With intrusions - sill, vertical dyke, two intersecting vertical dykes
  - 2) With vertical fault
- C) An unconformity separating inclined series with horizontal series.

2. Study of structural problems -involving strike, true and apparent dips, and width of outcrop by graphical method.

## Unit 3 - Petrology

**1) Megascopic Study of following rocks:**

- A) Igneous:** 1) Granite, 2) Hornblende granite, 3) Graphic granite, 4) Syenite, 5) Diorite, 6) Gabbro, 7) Dunite, 8) Porphyritic granite, 9) Pegmatite, 10) Dolerite, 11) Rhyolite, 12) Pitchstone, 13) Obsidian, 14) Pumice Trachyte, 15) Andesite, and 16) Basalt,
- B) Sedimentary:** 1) Sandstone, 2) Ferruginous sandstone, 3) Arkose, 4) Breccia, 6) Conglomerate, 7) Limestone, 8) Oolitic limestone, 9) Fossiliferous limestone, 10) Shale, 11) Laterite and 12) Bauxite.
- C) Metamorphic:** 1) Slate, 2) Phyllites, 3) Mica schist, 4) Marble hornblende Schist, 5) Mica garnet Schist, 6) Mica staurolite schist, 7) Chlorite Schist, 8) Tremolite Schist, 9) Granite Gneiss, 10) Biotite Gneiss, 11) Hornblende Gneiss, 12) Augen Gneiss, 13) Amphibolite, 14) Banded Iron Formation, 15) Charnockite, 16) Marble and 17) Quartzite.

**2) Study of Textures and structures with formation:**

- A) Igneous:** 1) Granitic Texture, 2) Porphyritic Texture, 3) Intergrowth, 4) Graphic Texture, 5) Glassy texture, 6) Flow Structure, 7) Vesicular, 8) Amygdaloidal Structure, 9) Ropy Structure, 10) Pillow Structure, 11) Columnar Structure and 12) Xenolithic Structure.
- B) Sedimentary:** 1) Graded bedding, 2) Current bedding, 3) Lamination, 4) Ripple marks, 5) Mud cracks, 6) Clastic structure, 7) Oolitic, 8) Pisolitic structure and 9) Stractification.
- C) Metamorphic:** 1) Slaty Cleavage, 2) Schistose Structure, 3) Granulose Structure, 4) Gneissose Structure, 5) Augen Structure, 6) Banded Structure and 7) Granular / Granoblastic Structure.

**3) Microscopic Study of following rocks:**

- A) Igneous:** 1) Granite, 2) Hornblende granite, 3) Graphic granite, 4) Syenite, 5) Gabbro, 6) Diorite, 7) Dunite, 8) Basalt, 9) Trachyte and 10) Rhyolite.
- B) Sedimentary:** 1) Sandstone, 2) Ferruginous Sandstone, 3) Arkose, 4) Limestone, 5) Oolitic Limestone and 6) Fossiliferous Limestone.
- C) Metamorphic:** 1) Hornblende Schist, 2) Chlorite Schist, 3) Tremolite Schist, 4) Mica schist, 5) Mica Garnet Schist, 6) Mica Staurolite Schist, 7) Granite Gneiss, 8) Biotite Gneiss, 9) Hornblende Gneiss, 10) Charnockite, 11) Quartzite and 12) Marble

**4) Study of Textures and Microstructures in Rocks with formation:**

- A) Igneous:** 1) Granitic Texture, 2) Ophitic Texture, 3) Porphyritic Texture, 4) Intergrowth, 5) Graphic Texture, 6) Intergranular Texture, 7) Flow Structure, 8) Reaction Rim Structure
- B) Sedimentary:** 1) Clastic Structure, 2) Oolitic & Pisolitic Structure.
- C) Metamorphic:** 1) Slaty Cleavage, 2) Schistose Structure, 3) Granulose Structure, 4) Gneissose Structure, 5) Porphyroblastic.

**Unit 4 – Study Tour - Field Studies and Practical Record****1) Study tour - Field Studies**

Study tour in the areas of geological interest up to 7 days - long tour or short tours to nearby places to teach the students various rock types and their field characters and relations. Submission of field report and field collection at the time of practical examination is necessary.

**2) Practical Record**

Record of the practical done by the student should be maintained as a journal and must be submitted at the time of annual practical examination.

## -Examination Structure-

1 The **Entire Theory examination** will consists of **Four Papers**.

**Two Papers in Each Semester.**

2 **Each paper of 50 marks**

3 **Nature of Theory Question Paper: (All questions are compulsory)**

**Time: 2hours**

**Total marks: 50**

- |                |   |             |
|----------------|---|-------------|
| <b>Q.No.1)</b> | <b>Multiple choice questions.</b>                   | <b>(10)</b> |
|                | 1) -----<br>a)        b)        c)        d)        |             |
|                | 2)<br>3)<br>4)<br>5)<br>6)<br>7)<br>8)<br>9)<br>10) |             |
| <b>Q.No.2)</b> | <b>Answer any Five of the following</b>             | <b>(10)</b> |
|                | i)<br>ii)<br>iii)<br>iv)<br>v)<br>vi)               |             |
| <b>Q.No.3)</b> | <b>A) Answer any Two of the following</b>           | <b>(06)</b> |
|                | i)<br>ii)<br>iii)                                   |             |
|                | <b>B) Write the Answer/Solve/Problem/Note</b>       | <b>(04)</b> |
| <b>Q.No.4)</b> | <b>Answer any Two of the following</b>              | <b>(10)</b> |
|                | i)<br>ii)<br>iii)                                   |             |
| <b>Q.No.5)</b> | <b>Answer any Two of the following</b>              | <b>(10)</b> |
|                | i)<br>ii)<br>iii)                                   |             |



## Annual Practical examination at the end of year (4<sup>th</sup> semester)

### Practical Examination

Practical examination will be conducted annually i.e. at the end of fourth semester only.  
It will be conducted for total 100 marks  
on Two separate days for Two Practical (Each practical with 50 marks)

#### 1<sup>st</sup> day – Practical I

**Total-50 marks**

1) Mineralogy		
	Megascopeic -	10
	Microscopic -	10
2) Petrology		
	Megascopeic – Igneous	06
	Microscopic – Igneous	04
	Megascopeic – Sedimentary	06
	Microscopic – Sedimentary	04
	Megascopeic – Metamorphic	06
	Microscopic – Metamorphic	04

#### 2<sup>nd</sup> day- Practical II

**Total-50 marks**

1) Textures and Structures in rocks		
	Microscopic- Igneous, Sedimentary and Metamorphic (1 each)	06
	Megascopeic - Igneous, Sedimentary and Metamorphic (3each)	09
2) Structural Geology – Geological Map with Section Drawing		10
3) Structural Problem-		05
4) Certified Journal		10
5) Tour Report with field collection.		10