

SHIVAJI UNIVERSITY, KOLHAPUR.



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Revised Syllabus For

Bachelor of Science in Geology

(B. Sc. Part I)

(Subject to the modifications to be made from time to time)

Syllabus to be implemented from June -2013 onwards.

9. STRUCTURE OF COURSE

B. Sc. I Geology (Semester I and II)

No. of Papers – 4 (Two papers per semester)

Semester	Subjects	Marks
I	Paper I: General Geology	50
	Paper II: Mineralogy and Crystallography	50
II	Paper III: Physical Geology	50
	Paper IV: Petrology	50
	Total theory papers - 4	200
	Practical (Annual)	50

10. SCHEME OF TEACHING

Semester	Subject /Paper	Teaching Scheme		
		Periods / Semester		
		L	P	Total
I	Paper I: General Geology	40		
II	Paper II: Mineralogy and Crystallography	40		
	Total	80		
	Practical		4	4 (Hrs/Week)

11. SCHEME OF EXAMINATION :-

- Question Paper will be set in the view of the /in accordance with the entire syllabus and preferably covering each unit of syllabi.

12. STANDARD OF PASSING:-

As Prescribed under rules & regulation for each degree/programme of Shivaji University, Kolhapur.

13. EQUIVALENCE IN ACCORDANCE WITH TITLES AND CONTENTS OF PAPERS - (FOR REVISED SYLLABUS)

Equivalence of new syllabus given to old syllabus.

Old syllabus

Semester I

Paper I – General Geology

Paper II – Mineral and Crystallography

Semester II

Paper III – Physical Geology

Paper IV – Petrology

New syllabus

Semester I

Paper I – General Geology

Paper II – Mineral and Crystallography

Semester II

Paper III – Physical Geology

Paper IV – Petrology

B. Sc. I

Theory Syllabus

B. Sc. syllabus to be implemented from June 2013

The structure of syllabus for B.Sc. I (semester I and Semester II) Geology is suggested as follows

There will be in all **four theory** paper. There will be two theory papers for each semester. Each paper will be of 50 marks. The practical course will be of Annual pattern. Practical Examination will be conducted at the end of semester II of B. Sc. I class.

B.Sc. Part I

Theory papers - Total 200 marks

Practical - 50 marks

B. Sc. I Semester I & II

Semester I

Paper I – General Geology

Paper II – Mineral and Crystallography

Semester II

Paper III – Physical Geology

Paper IV – Petrology

Detailed draft syllabus of B. Sc. I (Semester I) Geology

Paper I : General Geology (Marks 50)

(Total Period 40)

Unit I – Introduction to General Geology (6 Periods)

1. Introduction – Meaning, Scope and Significance of Geology
2. Brief outline of Universe – Origin – Big Bang Theory, Galaxies and Nebula
3. Solar System - Characteristics, Member, Constitution and mechanism of the systems; Planetary Laws.

Unit II – Origin and Age of the Earth (13 Periods)

1. Laplace and Kant Nebular Hypothesis; Buffon, Chamberlain and Moulton Planestimal Theory; Jean and Jeffery's Tidal Theory;
2. Physical data of the Earth – shape, size, mass, density, rotation, revolution, Galactic movements; solstices, equinox, precession of Earth's Axis.
3. Age of the Earth – Physical, Chemical, Biological and radioactive methods.
4. Geological Time-Scale

Unit III – Earthquake and interior of the Earth (15 Periods)

1. Seismology: - Definition, Focus, Epicenter, Seismic waves, Iso-seismal lines; Measurement of Earthquake- Seismographs and Seismograms, Intensity and Magnitude, Earthquake Scales: Mercalli scale and Richter scale; Classification of Earthquakes according to depth;
2. Causes of Earthquake- Natural and Man made; Elementary ideas of concepts of Continental Drift and Plate Tectonics; Effects of Earthquake; Prediction of Earthquakes ; precautions during earthquakes;
3. Earthquake belts of the world ; Seismic zones of India;
4. Interior of the earth: Use of seismic waves in understanding the internal structure of the Earth – Inner core, Transition zone, Outer core, Mantle – Asthenosphere, Mesosphere, Lithosphere – Sial and Sima (Crust) and Main Discontinuities;

Unit IV- Volcano (6 Periods)

1. Definition and structure of volcano, Two major types of volcano, their characteristics; Causes of volcano, Products of volcano;
2. Classification of central type of volcano on the basis of- Cones, State and Modes of eruption; Associated features like fumaroles, solfatras, hot springs and geysers; Submarine volcano.

Paper II

Mineralogy and crystallography

Marks 50

(Total Periods 40)

Unit I – Introduction to Mineralogy

(10 Periods)

1. Definition of mineral; Chemical Bonding in minerals.
2. Properties of minerals like form, chemical composition, colour, lustre, streak, hardness, cleavage, fracture, specific gravity and transparency

Unit II – Study of mineral groups

(12 Periods)

1. Study of following minerals groups with reference to general physical properties; Chemical composition, and occurrence in rocks: Olivine group, Pyroxene group, Amphibole group, Mica group, Feldspar group and Silica group

Unit III – Introduction to Crystallography

(10 Periods)

1. Definition of crystal; Crystal Elements- Faces, Edges, Solid Angles, Forms (Open and Closed), Zones;
2. Interfacial Angles, Law of Constancy of Interfacial Angles; Contact Goniometer.
3. Crystallographic Axes; Axial Angles; Parameters and Indices; Law of Rational indices.
4. Elements of Symmetry, planes of symmetry, axis of symmetry and centre of symmetry

Unit IV- Study of Crystal System

(8 Periods)

1. Elements of symmetry; Classification of crystals into symmetry classes; Study of following Normal Symmetry Classes of -
 1. Isometric/Cubic System (Galena type),
 2. Tetragonal System (Zircon type),
 3. Hexagonal System (Beryl type),
 4. Orthorhombic System (Barytes type),
 5. Monoclinic System (Gypsum type),
 6. Triclinic System (Axinite type)

Detailed draft syllabus of B. Sc. 1(Sem II) Geology

Paper III

Physical Geology

marks 50

(Total Periods 40)

Unit I –Weathering

(10 Periods)

1. Definition; Types; Agents and factors controlling weathering.
2. Weathering Processes- Mechanical Weathering; Chemical Weathering; Biological Weathering.
3. Product of Weathering – Tors, Cliffs, Talus and Scree, Regolith; Soil formation, Soil Profiles.

Unit II – Geological work of Stream

(10 Periods)

1. Hydrological cycle, Genetic Classification of Streams
2. Headward, Downward and Lateral Erosion by stream. Erosional Features – River piracy, water falls, rapids, cascades, potholes, river terraces, meanders and ox bow lake, graded profile and base level of Erosion.
3. Transportation and deposition by streams, Depositional Features – point bar, natural levees, alluvial fans and cones, delta and their types
4. Drainage Patterns – Dendritic, Trellis, Rectangular, Annular and Radial.

Unit III – Geological work of Ocean / Sea

(8 Periods)

1. Movement of sea water- waves, tides, currents, tsunamis; Generation of oceanic currents and global oceanic conveyor systems.
2. Erosion features- wave cut terrace, sea notch, sea caves, blowholes, cove and headland, stacks, sea arch.
3. Transportation and Depositional features developed by oceans- beaches and barriers, wave built terrace spits, bars, hooks and Lagoons

Unit IV-Geological work of glacier and wind

(12 Periods)

1. Definition of glaciers, Snowcaps, snow lines; Types of glaciers, movement of glaciers; Surface features of glaciers.

2. Glacial erosion; Erosional features like striations, grooves and polished surfaces; U and V shaped valley, Hanging Valley, Cirque, Aretes, Mountain horns, Fjords.
 3. Glacial and Glaciofluvial Deposition. Depositional features like Boulder clays, Erratics, Moraines, Drumlins, Eskers, Kames and Kettle Holes, Out wash plains and Varves.
 4. Transportation and Erosion by wind- Deflation, Abrasion and Attrition; Erosional features produced by wind – Deflation basins and hollows, Deflation armours, Deflation pavements, Ventifacts, Yardangs, Pedestal rocks, Striated and Grooved rocks,
 5. Causes of wind deposition, Depositional features like- Sand dunes and their types, Loess, Playas, Bajadas and Pediments.
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Paper IV

Petrology

Marks 50

(Total Periods 40)

Unit I –Introduction to Petrology

(7 Periods)

1. Introduction of Petrology; Definition of Rocks; Major sub-divisions of Petrology;
2. The rock cycle.

Unit II – Igneous petrology

(11 Periods)

1. Definition, composition and origin of magma and lava; Types of Magma - Basic and Acidic.
2. Pyrogenetic minerals; Primary – Essential and Accessory minerals; Secondary Minerals.
3. Extrusive forms of Igneous Rocks- Central type and Fissure type eruption; Intrusive forms- Concordant Intrusions- Sills, Laccoliths, Lopoliths, Phacoliths ; Discordant Intrusions- Dykes, Ring Dykes, Cone Sheets, Volcanic plugs, Batholiths
4. Megascopic Structure - Vesicular, Amygdaloidal, Ropy, Block, Flow and Pillow Structures, Columnar Structure; Textures- Granitic texture, Porphyritic texture, Graphic texture and Glassy texture

Unit III –Sedimentary Petrology

(11 Periods)

1. Formation of secondary rocks; Erosion, transportation, Deposition, Consolidation and Cementation of sediments;
2. Source of material for secondary rocks; Classification of secondary rocks;
3. Sedimentary structures – Bedding and lamination, Current Bedding, Graded Bedding, Stratification, Lamination, Ripple Marks, Rain Prints, Mud cracks (Sun cracks), Concretionary and

Nodular structure, Stalactite and stalagmite, Oolitic and Pisolitic Structures.

Unit IV- Metamorphic petrology

(11 Periods)

1. Definition of metamorphism; Agents and Types of Metamorphism; Depth zones – epizone, mesozone and katazone, Stress and anti-stress minerals
2. Types of metamorphism – Thermal or Contact metamorphism, Cataclastic metamorphism, Dynamothermal metamorphism, Plutonic metamorphism;.
3. Megascopic structures in metamorphic rocks- Slaty cleavage, Granulose structure, Schistose structure, Gneissose structure, Augen Structure, Banded Structure.

Recommended books - Sem. I and Sem. II

1. **Textbook of Mineralogy – E. S. Dana**
2. **Rutley's elements of Mineralogy – H. H. Read**
3. **Principles of Petrology – G. W. Tyrrell**
4. **Igneous and metamorphic petrology (IInd Edition) – F. J. Turner and J Verhoogan**
5. **Sedimentary Petrology (IIIrd edition) – F. J. Pettijohn**
6. **Igneous petrology – Mihir K Bose**
7. **Metamorphic petrology – C B Rao**
8. **Sedimentary rocks – R. K. Sukhatankar**
9. **Concepts in Geology – Dr. A. B. Chakranarayan, Dr. U. B. Kulkarni & others.**

Practical

Detailed Draft Syllabus of a Practical Course in B.Sc. Part – I (Geology)

There are in all 24 practicals. 1 practical is of 4 periods. The practical course is based on the theory papers, practical experiments and field training. The practical course is sub divided in to five units as follows. Each unit carries 10 marks. Thus the practical course is of 50 marks.

Unit I: General Geology and Physical Geology **10 Marks.**

1. Study of important and common geomorphological models
2. Reading of Toposheets: Introduction of toposheets, Definition and Function of Contours, Contour interval, Map symbols, Scales.
* Identification of natural physical features like- Hill, Hill Range, Mountains, Peaks, Cliffs, Divides, Bench Marks, Streams and Stream Patterns, Catchment Areas of Streams, Basins, Lakes, Slopes, Flood Plains, Islands in River courses, Rocky and Sandy Beaches, Deltas and Tributaries, Sand dunes, Deserts, Marshy lands Marine Transgression Areas with their Latitudes and Longitudes.
* Identification of Man- Made Features: Settlements, Roads, Railways, Canals, Transmission Lines, Dams and Reservoirs, Tanks, Aerodromes, Post Offices, Temples, Mosques and Church etc. With their Latitudes and Longitudes.
3. Drainage Analysis: Stream Ordering (Strahler's Method), Stream Numbers, Stream Lengths, Bifurcation Ratio, Basin Area, Drainage Density with identification of order of the basin and Drainage Pattern.
4. Geological maps - Horizontal beds

Unit II: Mineralogy (Megascopic) **10 marks**

1. The study of Physical properties of Minerals- Form, Colour, Streak, Lustre, Transparency, Cleavage, Fracture, Hardness. Determination of Specific Gravity by Walker's steelyard balance.
2. The study of individual minerals: Quartz, Rock Crystal, Amethyst, Flint, Agate, Chalcedony, Chert, Jasper, Opal, Natrolite, Stilbite, Apophyllite, Muscovite, Biotite, Orthoclase, Microcline, Plagioclase, Hornblende, Hypersthene, Olivine, Beryl, Barytes, Tourmaline, Fluorite, Corundum, Calcite, Garnet, Talc and Kyanite.

Unit III: Crystallography **10 marks**

Crystal System Type Dana's Crystal Number

1. Isometric/Cubic Galena Type 110,111,112,114,121,122,128,129,131 and 139. (10)
2. Hexagonal Beryl Type 238,240,242,244,875,876,1009,1015, 1016 and 1017 (10)
3. Tetragonal Zircon Type 58, 59,188,190,191,192,193,198,201 and 205 (10)
4. Orthorhombic Barytes Type 316,317,323,325,328,330,331,333,887 and 1040 (10)
5. Monoclinic Gypsum Type 353,354,358,868 and 985 (5)
6. Triclinic Axinite Type 379,383, 827,860 and 938 (5)

Unit IV: Petrology**10 Marks**

Identification, description and classification of hand specimen of following rocks on the basis of their megascopic texture, structure, mineral composition.

Igneous Rocks:

Structures and Textures: Vesicular, Amygdaloidal, Flow Banding, Ropy, Pillow, Granular, Columnar Structures, Granitic texture, Porphyritic texture, Graphic texture and Glassy texture.

Megascopic Identification: Granite, Diorite, Gabbro, Dunite, Pegmatite, Pitchstone, Rhyolite, Obsidian, Trachyte and Basalt.

Secondary Rocks:

Structures: Porous, Oolitic, Pisolitic, Lamination, Bedding, Graded Bedding, Current Bedding, Ripple Marks, Mud cracks, Clastic structure.

Megascopic Identification: Laterite, Bauxite, Breccia, Conglomerate, Grit, Sandstone and its varieties, Shale, Limestone and its varieties.

Metamorphic Rocks:

Structures: Slaty, Schistose, Granulose, Gneissose, Augen, Banded .

Megascopic Identification: Slate, Phyllite, Mica-Garnet- Schist, Hornblende Schist, Granite Gneiss, Hornblende Gneiss, Quartzite, and Marble.

Unit V: Fieldwork and Practical Records:**10 Marks**

1. Fieldwork Report or Study Tour Report- Study tour to places of geological importance for about three days. The Study Tour is compulsory for every student. Field trips to near by quarries and mines are to be conducted to get acquainted with field conditions.

Submission of Study Tour Report is compulsory. 3 Marks

2. A Journal (Laboratory Record) is Compulsory. 2 Marks

Note:

To appear for the practical examination a certified journal and a certified Field Report or Study Tour Report is compulsory.

Nature and Marking System for Examination**B.Sc. Part I Geology (Theory)****Semester I**

Paper I – General Geology	50 marks
Paper II – Mineral and Crystallography	50 marks
Total	100 Marks

Semester II

Paper III – Physical Geology	50 marks
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Paper IV – Petrology

50 marks

100 Marks

B.Sc. Part- I Geology (Practical)

One practical of 50 Marks

Unit I: General Geology and Physical Geology	15
Unit II: Mineralogy	10
Unit III: Crystallography	10
Unit IV: Petrology	10
Unit V: Fieldwork Report and Practical Record	05
(Fieldwork Report 3 Marks, Journal 2 Marks)	_____
Total Marks	50

B.Sc. Part I Geology (Practical)

The Practical examination will last for one day. The examination will be of total 50 marks. The practical will be divided into five units and will be conducted in two sessions of three hours each.

Session I	Marks
Unit I : Mineralogy	10
Unit II : Crystallography	10
Total Marks	20

Session II	Marks
Unit III : Petrology	10
Unit IV : General and Physical Geology	15
Unit V : Fieldwork report and Practical record	05
Total Marks	30

OTHER FEATURES :

1. INTAKE CAPACITY / NUMBER OF STUDENTS:-

As per University Norms

2. TEACHERS QUALIFICATIONS:-

- As prescribed by norms .
- Work load details should be as per Apex body/UGC/State Govt./University norms.

(A) LIBRARY :

----- List of books has been mentioned paper wise in the syllabi.

(B) SPECIFIC EQUIPMENTS : Necessary to run the Course.

Rocks and minerals specimens, field equipments, maps, charts, models, slide projector, OHP/LCD, Computers and necessary softwares and operating systems etc.

(C) LABORATORY SAFETY MEASURES :

General Safety Rules For Laboratory Work.

I. List Of Equipments Needed For Laboratory Safety

1. Fire extinguisher
2. First Aid Kit
3. Good earthing and insulated wirings for electrical supply
4. Standard operated procedure manuals for instrument, map, specimens etc.

II. Instructions For Safety In Laboratory

1. Any injury while handling rocks and mineral must be reported to teacher in charge of practically immediately.
2. In case of fire, switch off all electric connections.
3. Make your workplace clean before leaving the laboratory.
4. Know the place of fire extinguisher, first aid box.
5. Do not use cell phones in laboratory.

III. Do's

1. Always wear shoes in the laboratory.
2. Maintain separate record book for practical work.
3. Maintain silence, cleanliness and discipline in the laboratory.
4. Handle the laboratory equipment, rock, and mineral specimens carefully.
5. Follow the standard operation procedure of instrument.

IV. DON'T

1. Don't take apparatus out of laboratory.
2. Don't eat or drink any food in laboratory.
3. Don't enter or leave the laboratory without permission.

Guidelines for Field Work

1. During study tour, more emphasis be given to field relations of rocks, collection of specimens, their labeling and mapping.
2. Students are advised to carry field equipments – viz. hammers, clinometers / Brunton compass, magnifying lens, tape, maps / toposheets, field note books, writing and drawing material as well as haversack for collection of specimens.
3. Field notes should be taken under the guidance of teacher in-charge incorporating photographs, sketches and measurement of different features.
4. Strict discipline and safety measures must be followed under the guidance of teacher in-charge.

5. Preparation of the study tour report and its presentation along with field collection at the time of practical examination is compulsory.