

**PUNYASHLOK AHILYADEVJI HOLKAR
SOLAPUR UNIVERSITY, SOLAPUR**



NAAC Accredited-2015 'B' Grade (CGPA 2.62)

**Name of the Faculty: Science & Technology
CHOICE BASED CREDIT SYSTEM**

Syllabus: GEOLOGY

**Name of the Course: B.Sc. II (Sem.-III & IV)
(Syllabus to be implemented from w.e.f. June 2023)**

1) Preamble:

Syllabus for B.Sc. II Geology meets the needs of the students for building up its basics of mineralogy and petrology, its principles, properties of minerals and rocks, their environment and conditions of formation and importance in building the earth's crust. In the theory course student can also acquire the knowledge stratigraphy, geological time scale and methods of dispositions of various rock types. Emphasis has been given on the geology of India and Deccan Traps, which includes stratigraphical characters and geographical distribution of various systems and groups in the country. Theoretical knowledge coupled with extensive laboratory experiments and field training will help the students, to avail all opportunities available and even in start-up.

2) Objectives of the Course

1. To introduce students to mineralogy with their physico-chemical properties, classification and importance.
2. To introduce students to types of rocks with their physicochemical properties, classification and genesis.
3. To impart field-oriented knowledge by understanding basic concepts of stratigraphy and Indian Geology.
4. To provide students with opportunities to apply practical knowledge to build their career in various fields.

3) Outcome of the Course

1. Students acquire knowledge about various characters of minerals, classification and their applications in various industries like, gemstones, medicines, construction and interior designs.
2. Students understand various concepts related to formation and characteristics of various types of rocks and apply knowledge in various rock industries, mining and construction industries.
3. Students tends to explore various unmapped regions.
4. Students gain a sense of preservation and conservation of natural resources.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Science & Technology

Choice Based Credit System (CBCS)

(w.e.f.2020-21)

Draft Structure for B. Sc.- II

Subject/ Core Course	Name and Type of the Paper		No. of papers/ Practical	Hrs/week			Total Marks/ Paper	UA	CA	Credit s
	Type	Name		L	T	P				
Class:	B.Sc.- II Semester - III									
Core (*Students can opt any Three subjects among the Four Subjects offered at B.Sc.I. Out of Three Subjects offered One Subject will be the Core Subject OR	C-5	Paper-V	3.0	—	—	50	40	10	4.0	
		Paper-VI	3.0	—	—	50	40	10		
	C-6	Paper-V	3.0	—	—	50	40	10	4.0	
		Paper-VI	3.0	—	—	50	40	10		
	C-7 GEOLOGY	Paper-V Mineralogy	3.0	—	—	50	40	10	4.0	
		Paper-VI Igneous Petrology	3.0	—	—	50	40	10		
	SEC-1									
	GE-3									
Grand Total			18	--	--	300	240	60	12	
Class :	B.Sc.- II Semester - IV									
Core (*Students can opt any Three subjects among the Four Subjects offered at B.Sc.I. Out of Three Subjects offered One Subject will be the Core Subject OR Students can opt any Two subjects among the Four Subjects offered at B.Sc.I. Out of Two Subjects One Subject will be the Core Subject and any One Subject among the other will be Elective Subject	C-8	Paper-VII	3.0	—	—	50	40	10	4.0	
		Paper-VIII	3.0	—	—	50	40	10		
	C-9	Paper-VII	3.0	—	—	50	40	10	4.0	
		Paper-VIII	3.0	—	—	50	40	10		
	C-10 GEOLOGY	Paper-VII Sedimentary and Metamorphic Petrology	3.0	—	—	50	40	10	4.0	
		Paper-VIII Stratigraphy	3.0			50	40	10		
	SEC-2									
	GE-4									
	Environmental Studies		3.0	—	—	50	40	10	NC	
Total Sem-IV			18			300	240	60	12	
Total (Theory)			36	--	--	600	840	120	24	
Practical	C-5 & C-8	Pr. III&IV	—	—	8	200	160	40	8.0	
	C-6 & C-9	Pr. III&IV	—	—	8	200	160	40	8.0	
	C-7 & C-10	Pr. III&IV GEOLOGY	—	—	8	200	160	40	8.0	
Total (Practical)					24	600	480	120	24	
Grand Total			36		24	1200	960	240	48	

***Core Subjects:**

Chemistry / Physics / Electronics / Computer Science / Mathematics / Statistics / Botany / Zoology / Microbiology / Geology / Geography / Psychology

Core Subjects- (Additional)-Geochemistry / Biochemistry / Meteorology / Plant Protection

Summary of the Structure of B.Sc. Programme

Class	Semester	Marks- Theory	Credits- Theory	Marks- Practical	Credits- Practicals	Total - credits
B.Sc.-II	III	300	12	--	--	12
	IV	350	12	--	--	12
Total		650	24	600	24	48

B.Sc. Programme:

Total Marks: Theory + Practical's = 650 + 600 = 1250

Credits: Theory + Practical's = 24 + 24 = 48

Number of Papers Theory: Ability Enhancement Course (AECC) : 00

Theory: Discipline Specific Elective Paper (DSE) : 00

Theory: CC : 06

Skill Enhancement Courses : 00

GE : 00

Total: Theory Papers : 06

Practical Papers : 02

Abbreviations:

L: Lectures

T: Tutorials

P: Practicals

UA: University Assessment

CA: College Assessment

DSC / CC: Core Course

AEC: Ability Enhancement Course

DSE: Discipline Specific Elective Paper

SEC: Skill Enhancement Course

GE: Generic Elective

CA: Continuous Assessment

ESE: End Semester Examination

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
CBCS Pattern Syllabus of B. Sc. (Part-II), (w.e.f. June 2023)

Geology
DSC/CC - Theory course

SEMESTER – III

Title of the Paper - **V MINERALOGY**

Contact hours - 30

Total Marks 50 (UA - 40 + CA - 10) (Credit 2)

UNIT – I	C. Hrs
Introduction to mineralogy. Definition of mineral.	02
Description of common physical properties of minerals - Colour, Streak, Lustre, Form, Cleavage, Fracture and Hardness. Silicate Structures, Isomorphism, Polymorphism and Pseudomorphism. Inclusions in minerals.	08
Ordinary and polarized Light, Parts and functioning of polarizing microscope. Optical properties of minerals in Plane Polarized Light -Colour, Pleochroism, Form, Relief and Cleavage.	05
Optical properties of minerals between crossed nicols - Isotropism / anisotropism, twinning, Extinction, Extinction angle, Interference Colours / Polarization colours.	05

UNIT – II	C. Hrs
Study of Physical properties, and chemistry of following mineral groups - 1. Olivine- Forsterite, Fayalite and Olivine 2. Pyroxene- Hypersthene, Diopside and Augite 3. Amphibole- Tremolite, Actinolite and Hornblende 4. Mica- Muscovite, Biotite, Phlogopite and Lepidolite 5. Feldspar- Orthoclase, Microcline and Plagioclase 6. Felspathoid – Leucite and Nepheline 7. Silica- Crystalline, Crypto-crystalline and Amorphous silica forms 8. Other minerals- Calcite, Kyanite, Chlorite, and Kolinite	10

Recommended Books

1. Berry, L.G., Mason, B. and Dietrich, R.V., 1982. Mineralogy. CBS Publ.
2. Nesse, D.W., 1986. Optical Mineralogy. McGraw Hill.
3. Read, H.H., 1968. Rutley's Element of Mineralogy (Rev. Ed.). Thomas Murby and Co.
4. Berry and Mason, 1961. Mineralogy. W.H. Freeman & Co.
5. Kerr, B.F., 1995. Optical Mineralogy 5th Ed. Mc Graw Hill, New York.

Title of the Paper - **VI IGNEOUS PETROLOGY**

Contact hours – 30

Total Marks 50 (UA - 40 + CA - 10) (Credit 2)

<p>UNIT – I Definition of rock, types of rocks and rock cycle. Magma and lava: definition, composition, types and origin. Definition of igneous rock. Classification of igneous rocks based on: 1) mode of occurrence, 2) silica percentage and 3) silica saturation. Definition of textures and structures of igneous rocks: Description of textures: 1) crystallinity, 2) granularity, 3) shape of crystal and 4) mutual relations of crystals and glassy matter. Differentiation: liquid immiscibility, gravitational and filtration. Role of volatiles in differentiation. Reaction relationship - Bowen's reaction series. Crystallization of unicomponent (augite), bicomponent [two independent - (diopside - anorthite) and mix-crystals - albite - anorthite system)] and ternary magma (diopside - albite - anorthite system).</p>	<p>C. Hrs 02 02 04 02 01 06</p>
<p>UNIT – II Textures of igneous rocks: 1) Granitic, 2) porphyritic, 3) Ophitic, 4) sub-ophitic, 5) Poikilitic, 6) Intergranular, 7) Intersertal, 8) glassy and micro structures such as - 9) fracture forms – expansion cracks / fractures, perlitic and spherulitic, 10) reaction rim and 11) vermicular and myrmikite. Structures of igneous rocks: 1) Vesicular and amygdaloidal, 2) ropy, 3) flow, 4) pillow, 5) columnar. Forms of igneous rocks: concordant and discordant forms; Detailed petrographic description of granite, pegmatite, granodiorite, rhyolite, syenite, diorite, gabbro, basalt and dolerite</p>	<p>C. Hrs 04 02 02 05</p>

SEMESTER – IV

Title of the Paper – **VII SEDIMENTARY AND METAMORPHIC PETROLOGY**

Contact hours - 30

Total Marks 50 (UA - 40 + CA - 10) (Credit 2)

UNIT – I	C. Hrs
Sedimentary petrology: definition, processes of formation of sedimentary rocks – lithification and diagenesis.	02
Classification of sedimentary rocks:	
1. Based on products of weathering – Residual, sedimentary, chemical and organic deposits	02
2. Based on mineralogy – a) siliciclastic, b) carbonates (Limestone and dolomite), c) non carbonates - ironstones and banded iron formations (limonite, goethite and hematite and d) phosphorites, evaporites (rock salt, gypsum) and e) organic-rich (carbonaceous) deposits (coal) and	04
3. Based on size and shape of the grains.	01
A. Textures of sedimentary rocks – clastic, oolitic and pisolitic	01
B. Structures of sedimentary rocks – stratification, lamination, graded bedding, current bedding, Mud cracks and ripple marks.	02
Petrographic details of important siliciclastic and carbonate rocks such as - conglomerate, breccia, sandstone, Arkose, Grit, shale, Mudstone and limestones. Residual rocks – laterite and bauxite	03

UNIT – II	C. Hrs
Metamorphic petrology: definition and agents of metamorphism.	01
Zones and grades of metamorphism, Prograde, retrograde and Poly-metamorphism	01
Type of metamorphism – contact, regional, cataclastic, hydrothermal – with examples.	02
Classification of metamorphic rocks depending upon fabric and foliation.	02
stress and anti-stress minerals.	01
Structures of metamorphic rocks – granulose, slaty, schistose, gneissose and augen.	02
Introduction to metamorphic facies: zeolite, hornfels, blue schist, green schist, amphibolite, granulite and eclogite	03
Petrographic details of some important metamorphic rocks such as - slate, schists, gneiss, quartzite, marble and phyllite	03

Books Recommended:

1. Igneous & Metamorphic petrology. Turner, F.J. & Verhoogen, J., McGraw Hill Co.
2. Igneous petrology. Bose, M.K., World press
3. Principles of Petrology. Tyrell, G. W., Methuren and Co (Students ed.).
4. Petrology, Igneous, Sedimentary and Metamorphic rocks. Ehlers, WG, and Blatt, H., CBS Publishers
5. The study of rocks in thin sections. Moorhouse, WW., Harper and sons.
6. Principles of Sedimentology. Friedman & Sanders, John Wiley and sons.
7. Sedimentary rocks. Pettijohn, F.J., Harper & Bros. 3rd Ed.
8. A text book of sedimentology. Prasad, C.,
9. Introduction to sedimentology. Sengupta. S., Oxford-IBH.
10. Metamorphic petrology. Turner, F.J., McGraw Hill.
11. Petrology of Metamorphic Rocks. Mason, R., CBS Publ.
12. Petrogenesis of Metamorphic Rocks. Winkler, H.G.C., Narosa Publications

Title of the Paper – **VIII STRATIGRAPHY**

Contact hours - 30

Total Marks 50 (UA - 40 + CA - 10) (Credit 2)

UNIT – I	C. Hrs
Stratigraphy: definition, principles of stratigraphy and methods of stratigraphic correlation.	03
Unconformity: Types of unconformities and their significance in stratigraphy.	01
Physiographic divisions of India, Geological Time Scale.	01
Stratigraphic classification – litho-stratigraphy, chrono-stratigraphy and bio-stratigraphy and their units.	02
Study of following Precambrian successions: Dharwar, Cuddapah, Vindhyan and Delhi Supergroups with their classification, lithology, age, stratigraphic succession, distribution and economic importance.	08

UNIT – II	C. Hrs
The Gondwana System. Brief idea of Palaeozoic and Mesozoic successions of Triassic of Spiti, Jurassic of Kutch and Cretaceous of Tiruchirapalli;	08
Study of Deccan Volcanic Province.	04
Palaeogene – Neogene sequence of Siwalik supergroup	03

Books Recommended:

1. Geology of India. Wadia, D., Mc Graw Hill Book co.
2. Geology of India and Burma, 6th Edition. Krishnan, M.S., CBS Publ.
3. Fundamentals of Historical Geology & Stratigraphy of India. Ravindra Kumar, Wiley Eastern.
4. Stratigraphy – Weller
5. Essentials of Earth's History – Stokes
6. Principles of Stratigraphy – Dumar and Rogers
7. Geology of Maharashtra - Edited by G.G. Deshpande
8. Geology of India. Vol. 1 and 2. M. Ramakrishnan and R. Vaidyanathan, Geol. Soc. of India.

LABORATORY COURSE

Contact hours – 60
40)

Total Marks: 200 (UA – 160 CA –

Credit – 08

CC – V – Mineralogy

- A. Study of Polarizing Microscope - Parts and functions
- B. Study of Physical of following mineral groups –
 - 1. Olivine – Olivine
 - 2. Pyroxene – Hypersthene and Augite
 - 3. Amphibole – Tremolite, Actinolite and Hornblende
 - 4. Mica – Muscovite, Biotite, Phlogopite and Lepidolite
 - 5. Feldspar – Orthoclase, Microcline and Plagioclase
 - 6. Felspathoid – Nepheline, Lucite
 - 7. Garnet – Garnet
 - 8. Al-Silicates – Sillimanite, Kyanite and Staurolite
 - 9. Silica- Crystalline, Crypto-crystalline and Amorphous silica forms
 - 10. Other minerals- Calcite, Chlorite, Lucite and Kaolinite
- C. Study of optical properties of following mineral
 - 1. Olivine – Olivine
 - 2. Pyroxene – Hypersthene and Augite
 - 3. Amphibole – Tremolite and Hornblende
 - 4. Mica – Muscovite, Biotite,
 - 5. Feldspar – Orthoclase, Microcline and Plagioclase
 - 6. Felspathoid – Nepheline, Lucite
 - 7. Silica – Quartz
 - 8. Garnet – Garnet
 - 9. Al-Silicates – Sillimanite, Kyanite and Staurolite
 - 10. Other minerals- Calcite and Chlorite

CC – VI – Igneous Petrology

- A. Megascopic and microscopic identification and description of igneous rocks.
 - 1. Megascopic: granite, porphyritic granite, graphic granite, pegmatite, rhyolite, syenite, gabbro, dolerite, basalt, pitchstone / obsidian and dunite.
 - 2. Microscopic: granite, graphic granite, rhyolite, syenite, gabbro, dolerite, basalt and dunite.
- B. Megascopic and microscopic identification and description of textures and structures of igneous rocks.
 - 1. Megascopic: granitic, porphyritic, graphic, glassy, flow, vesicular and amygdaloidal, columnar and pillow.
 - 2. Microscopic: granitic, porphyritic, graphic, glassy, intersertal (Intergranular) and ophitic.

CC – VII – Sedimentary and Metamorphic Petrology

Sedimentary Petrology –

- A. Megascopic and microscopic identification and description of sedimentary rocks.
 - 1. Megascopic: conglomerate, breccia, sandstone, ferruginous sandstone, shale, arkose, grit, limestone, fossiliferous limestone, laterite and bauxite.
 - 2. Microscopic: sandstone, arkose, limestone, oolitic limestone and fossiliferous limestone.
- B. Megascopic and microscopic identification and description of textures and structures of sedimentary rocks.
 - 1. Megascopic: clastic, stratification, lamellar, cross bedding, graded bedding, ripple marks and mudcracks.
 - 2. Microscopic: clastic, oolitic and pisolitic.

Metamorphic Petrology –

- A. Megascopic and microscopic identification and description of metamorphic rocks.
 - 1. Megascopic: quartzite, marble, chlorite schist, hornblende schist, mica garnet schist, granite gneiss, hornblende gneiss, augen gneiss, banded hematite quartzite, slate and phyllite.
 - 2. Microscopic: quartzite, marble, chlorite schist, mica garnet schist, granite gneiss and hornblende gneiss.
- B. Megascopic and microscopic identification and description of textures and structures of metamorphic rocks.
 - 1. Megascopic: granulose, schistose, gneissose, augen and slaty
 - 2. Microscopic: granulose, schistose, gneissose and slaty

CC – VIII – Stratigraphy

Preparation of lithostratigraphic map of India showing distribution of important geological formations such as Dharwar, Cuddapah, Gondwana, Vindhyan and Deccan Traps.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur.

Syllabus for B.Sc. II- Geology

Semester System

Choice Based Credit System (CBCS) Pattern

To be implemented from Academic Year- 2023 – 24

Sr. No.	Semester	Paper No.	Title	No. of contact hrs/semester	Credit points	Total Marks (UA+CA)
1	III	V	Mineralogy	30	02	50 = 40+10
		VI	Igneous Petrology	30	02	50 = 40+10
2	IV	VII	Sedimentary and metamorphic petrology	30	02	50 = 40+10
		VIII	Stratigraphy	30	02	50 = 40+10
3	III and IV	Practical Course	Practical Examination (Two Days) (Annual Pattern)	60	08	200=160+40
				Total	16	400=320+80

IMPORTANT TO NOTE:

- 40 marks for university examinations (UA) + 10 marks internal examinations (CA) = 50 marks**
- Minimum passing percentage = 40%**
- Separate passing for both university (UA) and internal examinations (CA) in Theory and Practical examinations**
- Distribution of each Theory paper (Marks 50)**
University Assessment (UA) :40 Marks
College Assessment (CA) :10 Marks
- Distribution of each Practical Marks (200)**
Practical examination will be conducted annually i.e. at the end of fourth semester. It will be conducted for 160 marks (UA) and 40 marks (CA).
160 (UA) + 40 (CA) = 200 marks
University Practical Examination for 160 Marks (UA):

Scheme of Marking for University Practical Examination

Total Marks: 160

Session – I

Q. No.		Marks
1	Identification and description of minerals megascopically from Table ----- to -----.	15
2	Identification and description of minerals under thin section. Table ----- to -----.	20

Session – II

3	Identification and description textures and structures of rocks megascopically from table no. ----- to -----.	15
4	Microscopic identification and description of textures and structures of rocks from table no. ----- to -----.	20

Session – III

5	Identification and description of rocks megascopically from table no. ----- to -----.	15
6	Microscopic identification and description of rocks from table no. ----- to -----.	20
7	Identify and mark following two geological formations on the Geological map of India. Table nos. ----- to -----.	15
	1. _____ 2. _____	
	3. _____ 4. _____	
	5. _____	

Session – IV

8	Certified Journal	10
9	Oral	10
10	Tour report / seminar / project report / group discussion	20
	Total =	160

Practical Record

- Certified 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.
- Certified report of Field visit / Project / Seminar / Group discussion should be submitted before annual practical examination.

Equivalent Subject for Old Syllabus

Sr. No.	Name of the Old Paper	Name of the New Paper
1.	PV – Igneous Petrology	PV – Mineralogy
2.	PVI – Sedimentary and metamorphic petrology	PVI – Igneous Petrology
3.	PVII – Stratigraphy	PVII – Sedimentary and metamorphic petrology
4.	PVIII – Palaeontology	PVIII – Stratigraphy

Three courses (Papers) from old and new syllabus are same. Hence, there NO equivalence between old and new syllabus.