

**PUNYASHLOK AHILYADEVI 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 2020)

1) Preamble:

Syllabus for B.Sc. II Geology meets the needs of the students for building up its basics of petrology, its principles, properties of 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 which includes stratigraphical characters and geographical distribution of various systems and groups in the country. The branch palaeontology is introduced to understand the origin and evolution of ancient life forms on the earth.

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 types of rocks with their physicochemical properties, classification and genesis.
2. To impart field-oriented knowledge by understanding basic concepts of stratigraphy and Indian Geology.
3. To orient students to understand the evolution and distribution of early life on the earth.
4. To provide students with opportunities to apply practical knowledge to build their career in various fields.

3) Outcome of the Course

1. 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.
2. Students tend to explore various unmapped regions.
3. 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	Credits
	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 Igneous Petrology	3.0	--	--	50	40	10	4.0	
		Paper-VI Sedimentary and Metamorphic 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 Stratigraphy	3.0	--	--	50	40	10	4.0	
		Paper-VIII Palaeontology	3.0			50	40	10		
	SEC-2									
	GE-4									
	Environmental Studies		3.0	--	--	50	40	10	NC	
Total (Theory)				21	--	--	350	280	70	12
Practical	C-5 & C-8	Pr. III&IV	--	--	8	100	80	20	4.0	
	C-6 & C-9	Pr. III&IV	--	--	8	100	80	20	4.0	
	C-7 & C-10	Pr. III&IV GEOLOGY	--	--	8	100	80	20	4.0	
	GE-3 & GE-4									
Total (Practical)						24	300	240	60	12
Grand Total				39		24	950	760	190	36

***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	300	12	36

B.Sc. Programme:

Total Marks: Theory + Practical's = 650 + 300 = 950

Credits: Theory + Practical's = 12 + 24 = 36

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 2020)

Geology

DSC/CC – Theory course

SEMESTER – III

Title of the Paper – **V. IGNEOUS PETROLOGY**

Contact hours – 30

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

Unit-I:

C. hrs.

Igneous rocks: definition; Magma: definition, composition, types and origin;

Forms of igneous rocks: concordant and discordant forms;

Points required to describe textures of igneous rocks: 1) crystallinity, 2) granularity,

3) shape of crystal and 4) mutual relations of crystals or of crystal and glassy matter;

Textures of igneous rocks: 1) Granitic, 2) porphyritic, 3) Ophitic, 4) Poikilitic, 5)

Intergranular and 6) glassy. Structures of igneous rocks: 1) Vesicular and

amygdaloidal, 2) ropy, 3) flow, 4) pillow, 5) columnar

08

Differentiation: liquid immiscibility, gravitational and filtration. Role of volatiles in differentiation

03

Assimilation: reaction between basaltic magma and acid igneous rocks, basaltic magma and sedimentary rocks, granitic magma and basic igneous rocks, granitic magma and sedimentary rocks. Bowen's reaction series.

04

Unit-II:

Classification of igneous rocks based on: 1) mode of occurrence, 2) colour index, 3) silica percentage and 4) silica saturation

02

Crystallization of unicomponent (augite),

02

bicomponent [two independent – (diopside – anorthite) and mix-crystals – albite – anorthite system)] and

06

ternary magma (diopside – albite – anorthite system).

03

Detailed petrographic description of granite, pegmatite, granodiorite, rhyolite, syenite, diorite, gabbro, basalt and dolerite

02

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
Textures of sedimentary rocks – clastic, oolitic and pisolitic	01
Structures of sedimentary rocks – stratification, lamination, graded bedding, current bedding and ripple marks.	02
Petrographic details of important siliciclastic and carbonate rocks such as - conglomerate, breccia, sandstone, greywacke, shale and limestones. Residual rocks – laterite and bauxite	03
Unit-II:	
Metamorphic petrology: definition and agents of metamorphism.	01
Zones and grades of metamorphism,	01
Type of metamorphism – contact, regional, cataclastic, hydrothermal – with examples	02
Classification of metamorphic rocks based on fabric – foliated and non-foliated, stress and anti-stress minerals.	02
Structures of metamorphic rocks – granulose, slaty, schistose, gneissose and augen.	03
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

DSC/CC – Theory course
SEMESTER – IV

Title of the Paper – **VII. STRATIGRAPHY**

Contact hours – 30

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

Unit-I: Lectures: 18-19

C. hrs.

Stratigraphy: definition, principles of stratigraphy; methods of stratigraphic correlation; Geological Time Scale. **04**

Stratigraphic classification – litho-stratigraphy, chrono-stratigraphy and bio-stratigraphy and their units. Physiographic divisions of India. **03**

Study of following Precambrian succession: Dharwar, Cuddapah, Vindhyan and Delhi Supergroups with their classification, stratigraphic succession, distribution and economic importance **08**

Unit-II: Lectures: 18-19

Brief idea of Palaeozoic and Mesozoic successions of Triassic of Spiti, Jurassic of Kutch and Cretaceous of Tiruchirapalli; **06**

Study of Deccan Volcanic Province. **04**

Palaeogene – Neogene sequence of Siwalik supergroup. **05**

Title of the Paper – **VIII. PALAEOONTOLOGY**

Contact hours – 30

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

Unit-I: Lectures: 18-19

C. hrs.

Palaeontology: definition, Fossils: definition, characters, binomial nomenclature in taxonomy, modes of preservation of fossils, condition of fossilization and significance of fossils. **06**

Morphology of hard parts and geological distribution of:

Brachiopoda – *Spirifer*, *Productus*, *Terebratula* **03**

Lamellibranchia: *Cardita*, *Cardium*, *Pectene* **03**

Cephalopoda: *Nautilus*, *Goniatites* **03**

Unit-II: Lectures: 18-19

Morphology of hard parts and geological distribution of:

Trilobite: *Ogygia*, *Paradoxide*, *Trinucleus* **03**

Echinoidea: *Echinus*, *Micraster*, *Hemiaster* **03**

Gastropoda: *Conus*, *Turritella*, *Voluta*, *Physa* **03**

Evolutionary history of horse; **03**

Morphology, distribution and significance of Gondwana flora – *Glossopteris*, and *Gangamopteris* **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. Principles of Invertebrate Paleontology. Shrock, R.R. & Twenhoffel, W.H., CBS Publ.
5. Outlines of Paleontology. Swinerton, H.H., Edward Arnold Publishers
6. Paleontology: Evolution & Animal Distribution. Jain, P.C. Vishal Publications.
7. Fossil Invertebrate. Lehmann, U., Cambridge Univ. Press.
8. Organic evolution. Rastogi, Kedarnath and Ramnath Publ.
9. Palaeontology Invertebrate. Woods, Henry. CBS Publishers & Distributors.

P – III IGNEOUS PETROLOGY

Contact hours – 60
20)

Total Marks: 100 (UA – 80, CA –

Credit – 04

CC – V LABORATORY COURSE

PETROLOGY:

Study of optical properties of following minerals present in all types (igneous, sedimentary and metamorphic) of rocks: quartz, orthoclase, plagioclase, microcline, hornblende, augite, muscovite, biotite, olivine, garnet, hypersthene, calcite and chlorite.

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 – VI LABORATORY COURSE

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 – VII LABORATORY COURSE

STRATIGRAPHY:

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

CC – VIII LABORATORY COURSE

PALAEONTOLOGY:

Study of morphological characters of hard parts with description of fossil genera and age of following phylum:

A. PHYLUM MOLLUSCA:

1. Class Pelecypoda (Lamellibranchia): *Cardita*, *Cardium* and *Pectene*.
2. Class Gastropoda: *Conus*, *Turritella* and *Voluta*.
3. Class Cephalopoda: *Nautilus*, *Orthoceras* and *Goniatites*.

B. PHYLUM BRACHIOPODA: *Spirifer*, *Terebratulite* and *Productus*.

C. PHYLUM ECHINODERMATA: *Echinus*, *Micraster* and *Hemiaster*

D. PHYLUM ARTHROPODA:

Class Trilobita: *Ogygia*, *Paradoxida* and *Trinucleus*.

E. PLANT FOSSILS: *Glossopteris* and *Gangamopteris*

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Syllabus for B.Sc. II- Geochemistry - (IDS)

Semester System

Choice Based Credit System (CBCS) Pattern

To be implemented from Academic Year- 2020 - 21

Course Structure –Total Credit 12 - (Theory (4 x 2) = 12+Practical (1 x 4) = 4)

Sr. No.	Semester	Paper No.	Title	No. of Contact Hrs/sem.	Credit Point	Total Marks (UA + CA)
1	Semester III	V	Igneous Petrology	30	02	50 = 40+10
		VI	Sedimentary and metamorphic petrology	30	02	50 = 40+10
2	Semester IV	VII	Stratigraphy	30	02	50 = 40+10
		VIII	Palaeontology	30	02	50 = 40+10
3	Semester III and IV	Practical Course	Practical Examination (Two Days) (Annual Pattern)	60	04	100 = 80 + 20
				Total	12	300 = 240 +60

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

2. Distribution of each Theory paper (Marks 50)

University Assessment (UA) :40 Marks

College Assessment (CA) :10 Marks

3. Distribution of each Practical Marks (100)

Practical examination will be conducted annually i.e. at the end of fourth semester. It will be conducted for 80 marks (UA) and 20 marks (CA).

80 (UA) + 20 (CA) = 100 marks

University Practical Examination for 80 Marks (UA):

Scheme of Marking for University Practical Examination

Total Marks: 80

Session – I

Q.No.		Marks
1	Identification and description of minerals under thin section. Table 1 to 5	10
2	Identification and description of fossils kept on table nos. 6 to 15	10

Session – II

3	Microscopic identification and description of rocks from table no. 1 to 5	10
4	Identification and description of rocks megascopically from table no. 6 to 15.	10

Session – III

5	Microscopic identification and description of textures and structures of rocks from table no. 1 to 3	06
6	Identification and description textures and structures of rocks megascopically from table no. 4 to 13.	10
7	Identify and mark following two geological formations on the Map of India. Table nos. 14 and 15 1. _____ 2. _____ _____	04
8	Certified Journal	10
	Field work report / Project / Seminar / Group discussion / Oral	10
	Total	80

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 / Oral / Seminar / Group discussion should be submitted before annual practical examination.