



GONDWANA UNIVERSITY, GADCHIROLI

FACULTY OF SCIENCE & TECHNOLOGY

Program: FYUGP

SYLLABUS

FOR

B. Sc.

GEOLOGY

Semester I & II

**As per National Education Policy – 2020
(Session: 2024 – 25)**

BOS GEOLOGY



Gondwana University, Gadchiroli
NEP 2020 U.G. PROGRAMME SESSION 2024-25
Faculty of Science and Technology

Programme Name - B.Sc. Sem I (GEOLOGY) (Level 4.5) Revised Examination Scheme & Basket

Sr. No.	Course Category	Subject Name		Subject Code	Total Credit	Teaching Scheme (Hrs)			Examination Scheme								Total Marks	
						Theory	Practical	Total Hrs.	Theory				Practical					
									UA	CA	Total Mark	Min. Passing	Duration of Exam (Hrs.)	UA	CA	Total Mark		Min. Passing
1	Core Subject-I	Select any Two core group subject from Annesure-1	i) Subject –I General Geology and Mineralogy	STUG01 GEO01	02	02	--	02	40	10	50	20	02	--	--	--	--	50
			ii) Subject II-Major Subject from Science		02	02	-	02	40	10	50	20	02	-	-	-	-	50
			iii) Practical Based on Subject –I General Geology and Mineralogy	STUG01 GEOP01	02	-	04	04	-	-	-	-	-	30	20	50	25	50
			iv) Practical Based on Subject –II		02	-	04	04	-	-	-	-	-	30	20	50	25	50
2	OE	Group-A (Annexure –II)																
		1) Industrial Application of Rocks	STUG01 EGEO01	02	02	--	02	40	10	50	20	02	--	--	--	--	50	
		2) Fundamental of Topographic maps	STUG01 EGEO02															
3	VSC	Practical based on Group I: Megascopic Identification of Minerals (Annexure No. III)		STUG01 VSC GEO01	02	--	04	04	--	--	--	--	--	30	20	50	25	50
4	SEC	Basic Industrial Mineralogy (Annexure No. IV)		STUG01 SEC GEO01	02	02	--	02	40	10	50	20	02	--	--	-	-	50
5	VEC	(Any one from Annexure –V)			02	02	-	02	--	50	50	20	--	--	-	-	-	50
6	AEC	English/Marathi/Hindi/Bengali/Pali/ Supplementary English, Annexure-VI			02	02	--	02	40	10	50	20	02	--	--	--	--	50
7	IKS	Generic IKS			02	02	--	02	40	10	50	20	02	--	--	--	--	50
8	CC	NCC/NSS/Yoga/Sports (Any One)			02	--	04	04	--	--	--	--	--	--	50	50	25	50
Total					22	14	16	30	240	110	350	140	12	90	110	200	100	550

Bachelor of Science (Honors /Research) GEOLOGY- MAJOR

Program Outcomes (POs) for B. Sc. Programmes

The discipline of Geology involves the study of the earth. It is also known as geoscience or earth science, Geology is the primary earth science and looks at how the earth is formed, its structures and composition and the types of processes acting on it.

Many geology graduates enter professions directly related to their degrees, such as exploration and production, water supply, environmental planning and geological surveying, and teaching and research fields. Careers generally fall into several categories: Corporate: Oil, mining, environmental engineering.

PO1. Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

PO2. Problem Solving: Solve problems from the disciplines of concern using the knowledge, skills and attitudes acquired from sciences/ mathematics/ social sciences/ humanities.

PO3. Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.

PO4. Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in wide variety of settings.

PO5. Ethics: Understand multiple value systems including your own, the moral dimensions of your decisions, and accept responsibility for them.

PO6. Environment and sustainability: Understand the impact of technology and business practices in societal and environmental contexts, and sustainable development.

PO7. Self-directed and life-long learning: Demonstrate the ability to engage in independent and life-long learning in the broadest context socio-technological changes.

PO8. Design/Development of Solutions: Design solutions for complex science problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO9. Computational Thinking: Understand data-based reasoning through translation of data into abstract concepts using computing technology-based tools.

PO10. Effective Citizenship: Demonstrate empathetic social concern and equity centred national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

PO11. Global Perspective: Understand the economic, social and ecological connections that link the world's nations and people.

PO12. Aesthetic Engagement: Demonstrate and master the ability to engage with the arts and draw meaning and value from artistic expression that integrates the intuitive dimensions of participation in the arts with broader social, cultural and theoretical frameworks

Core Subject-I
Subject Name: General Geology and Mineralogy
Subject Code: STUG01GEO01

General Geology

Course Outcomes (COs)

- 1) Identify and describe various physical processes and understand branches of geology
- 2) Compare various domains of geological science.
- 3) Outline application of different terminologies of geological science.
- 4) Categorize applications and economic importance of geological science.
- 5) Justify selection of geological science to utilize in social benefit of human kind in terms of wealth and culture.
- 6) Create a base to understand geological hazards and cope-up policy.

Program Specific Outcomes (PSOs)

- (i) Understand fundamental concepts, principles and processes underlying the field of Geology, its different subfields and its linkage with related disciplinary areas/subjects
- (ii) Demonstrate an understanding of a wide range of geological processes (e.g. genesis of rocks and formation of geological structures, formation of minerals and their alteration.)
- (iii) Undertake field tour in any part of India with respect to lithology, structure and stratigraphy and produce geological maps.

Mineralogy

Course Outcomes (COs)

- 1) Identify and describe various physical properties of megascopic specimens and optical properties of minerals under microscope.
- 2) Compare various crystals based on symmetry, symmetry functions and explain crystal system, mineral groups based on physical and optical properties.
- 3) Outline application of different micro analytical tools used in mineral analysis.
- 4) Categorize industrial applications and economic importance of various minerals.
- 5) Justify selection of micro analytical technique selected for the mineral analysis.
- 6) Prepare a report on a mineral sample by performing the necessary tests and suggest its applications in various fields.

Program Specific Outcomes (PSOs)

- (i) Understand fundamental concepts, principles and processes of mineral forming processes and its linkage with related disciplinary areas/subjects
- (ii) Demonstrate an understanding of a wide range of rock forming minerals.
- (iii) Undertake the chemical compositions of various minerals, categorized as silicate mineral types.

Unit – I

Geology: Definition, branches, scope and relation to other sciences. Internal structure of the earth, Earth as a member of solar system: Origin of the earth. Radiometric methods of determination of the age of the earth: Uranium method, Rb-Sr method, K-Ar method and Carbon 14 method. Rock weathering. Geological work done by the wind, river, glaciers, underground water and oceanic currents.

Unit – II

Volcanoes: Definition, structure, types and products of volcano. **Earthquakes:** Definition, earthquake waves, causes and measurement of earthquake, effects of earthquake and tsunamis **Continental drift theory:** evidences and causes. Evolution of plate tectonic theory: nature and types of plate margins, sea floor spreading, origin and significance of mid-oceanic-ridges and trenches, origin and distribution of island arcs.

Unit – III

Definition of mineral, rock forming and ore minerals. Mineral composition of the earth's crust, Various physical properties of minerals: Form, colour, cleavage, luster, fracture, streak, hardness, specific gravity and its determination by Walker's steel yard balance.

Unit - IV

Properties dependent on magnetism, electricity and radioactivity. Silicate structure. Rock forming minerals-silicates, oxides and sulphides. Chemical and physical properties and geological occurrences of the mineral groups such as quartz, feldspars, feldspathoids, micas and zeolites. Chemical and physical properties and geological occurrences of the mineral groups, such as Pyroxene, Amphiboles, olivine, and aluminous silicates.

Books Recommended: (General Geology)

- Arthur Holmes (1978) Principles of Physical Geology
- Emmons, Thiel, Staffer and Allison: Geology principles and Processes.
- Gilluly, Water and Woodward: Principles of Geology
- Robinson, E.S.(1982): Basic Physical Geology
- Judson, Deffeyes and Hargrave, R.: Physical Geology.
- Sanders J.E., Anderson Jr., A.Z., Carola: Physical Geology.
- Cazen, Hatcher and Siemekowski : Physical Geology
- Borges, Gwalani and VeenaRao: Fundamentals of Geology.
- Patwardhan A.M.: The Dynamic Earth System.
- Howell : Introduction to Geophysics.
- Hamblin, Kenneth: The Earths' Dynamic System.
- Sawkins, Chase, Darby and Rapp: The Evolving Earth: A Text Book in Physical Geology.

- Mallory and Cargo: Physical Geology.
- Judson Kauffman and Leet: Physical Geology.
- Skinner and Porter: The Dynamic Earth: An introduction to Physical Geology.
- Tarbuck and Lutgens: The Earth: An introduction to Physical Geology.
- Manroe and Wicander: Physical Geology: Exploring the Earth.
- Arthur Holmes (1978) Principles of Physical Geology
- 2) Emmons, Thiel, Staffer and Allison: Geology principles and Processes.
- Gilluly, Water and Woodward: Principles of Geology
- Robinson, E.S.(1982): Basic Physical Geology
- 5) Judson, Deffeyes and Hargrave, R.: Physical Geology.
- Sanders J.E., Anderson Jr., A.Z., Carola: Physical Geology.
- Cazen, Hatcher and Siemekowski: Physical Geology
- Borges, Gwalani and Veena Rao: Fundamentals of Geology.
- Patwardhan A.M.: The Dynamic Earth System.
- Howell: Introduction to Geophysics.
- Hamblin, Kenneth: The Earth's Dynamic System.
- Sawkins, Chase, Darby and Rapp: The Evolving Earth: A Text Book in Physical Geology.
- Mallory and Cargo: Physical Geology.
- Judson Kauffman and Leet: Physical Geology.
- Skinner and Porter: The Dynamic Earth: An introduction to Physical Geology.
- Tarbuck and Lutgens: The Earth: An introduction to Physical Geology.
- Manroe and Wicander: Physical Geology: Exploring the Earth.

Books Recommended: (Mineralogy)

- Read: Rutley's Elements of Mineralogy.
- Berry, Mason and Dietrich: Mineralogy
- Dana and Ford: A Text book of Mineralogy
- Deer, Howie and Zussman: An introduction to rock forming minerals.
- Berry, L.G., Mason, B. and Dietrich, R.V., 1982. Mineralogy. CBS Publ.

Practical Based on core Subject –I

Subject Name: Mineralogy

Subject Code: STUG01GEOP01

1. Megascopic identification of major rock forming minerals groups such as Quartz, Feldspar, Feldspathoid, Amphibole, Pyroxene, Olivine and Mica.
2. Megascopic identification of minerals such as chlorite, asbestos, garnet, kyanite, sillimanite, topaz, staurolite, tourmaline, epidote, serpentine, talc, aragonite, calcite, magnesite, barites, gypsum, apatite, beryl, fluorite, corundum, kaolinite, zircon, halite, natrolite, apophyllite,

Books Recommended: (Mineralogy Practical)

- Read: Rutley's Elements of Mineralogy.
- Berry, Mason and Dietrich: Mineralogy
- Dana and Ford: A Text book of Mineralogy
- Deer, Howie and Zussman: An introduction to rock forming minerals.
- Berry, L.G., Mason, B. and Dietrich, R.V., 1982. Mineralogy. CBS Publ.

Open Elective (OE)
Subject Name: Industrial Application of Rocks
Subject Code: STUG01OEGEO01

Unit I:

Petrology: Definition, Crust and its composition, Primary and secondary origin of rocks, Classification of rock and Rock cycle.

Unit II:

Applications of rocks in building stone and Dimensional stone. Application of rocks in industries.

Books Recommended:

1. Principle of Engineering Geology by K. M. Bangar
2. Principle of Petrology by G. W. Terry
3. Textbook of Geology by G. B. Mahaptra.
4. Engineering Geology by N. Chenna Kesavulu
5. Textbook of Engineering Geology by Perbhin Singh
6. Courses in Mining Geology by R. N. P. Arogyaswami
7. MCDR 1988, UNFC classification

Open Elective (OE)
Subject Name: Fundamental of Topographic maps
Subject Code: STUG01OEGEO02

Unit I

Definition of cartography, Maps: Definition, types and uses. Topographic maps. Techniques of preparation of topographic map.

Unit II

Uses of topographic maps in geological mapping. Reading and interpretation of some topographic maps. Exercise of topographic map reading in the field.

Books Recommended:

1. Macmillan Publishers India Private Limited (2021)
2. Survey of India topographic sheets
3. Compton, R.R. (1962) Manual of Field Geology, John Wiley and Sons, Inc.
4. Forrester, J.D. (1957) Principles of Field Geology and Mining Geology, John Wiley.
5. Lahi, F.H. (1987) Field Geology, CBS Publishers.
6. Mathur, S.M. (2001) Guide to Field Geology, Prentice-Hall, New Delhi

Vocational Skill Course (VSC)
Practical based on Group I:
Practical Based on core Subject – Megascopic Identification of Minerals
Subject Code: STUG01 VSC GEO01

Study of physical properties of minerals such as forms, colour, streak, lustre, cleavage, fracture, hardness and specific gravity

Books Recommended: (Mineralogy Practical)

- Read: Rutley's Elements of Mineralogy.
- Berry, Mason and Dietrich: Mineralogy
- Dana and Ford: A Text book of Mineralogy
- Deer, Howie and Zussman: An introduction to rock forming minerals.
- Berry, L.G., Mason, B. and Dietrich, R.V., 1982. Mineralogy. CBS Publ.

Skill Enhancement Course (SEC)
Subject Name: Basic Industrial Mineralogy
Subject Code: STUG01 SEC GEO01

Unit I:

Definition of Minerals, Classification of Minerals. Physical properties of minerals.

Unit II

Major Mineral Families/Group. Industrials Applications of Minerals

Books Recommended: (Mineralogy)

- Read: Rutley's Elements of Mineralogy.
- Berry, Mason and Dietrich: Mineralogy
- Dana and Ford: A Text book of Mineralogy
- Deer, Howie and Zussman: An introduction to rock forming minerals.
- Berry, L.G., Mason, B. and Dietrich, R.V., 1982. Mineralogy. CBS Publ.



Gondwana University, Gadchiroli
NEP 2020 U.G. PROGRAMME SESSION 2024-25

Faculty of Science and Technology

Programme Name - B.Sc. Sem II (GEOLOGY) (Level 4.5) Revised Examination Scheme & Basket

Sr. No.	Course Category	Subject Name		Subject Code	Total Credit	Teaching Scheme (Hrs)			Examination Scheme								Total Marks	
						Theory	Practical	Total Hrs.	Theory				Practical					
									UA	CA	Total Mark	Min. Passing	Duration of Exam (Hrs.)	UA	CA	Total Mark		Min. Passing
1	Core Subject-I	Select any Two core group subject from Annexure-1	i) Subject –I Crystallography and Optical Mineralogy	STUG02 GEO01	02	02	--	02	40	10	50	20	02	--	--	--	--	50
			ii) Subject II-Major Subject from Science		02	02	-	02	40	10	50	20	02	-	-	-	-	50
			iii) Practical Based on Subject –I Study of Crystals, Microscopic Identification minerals	STUG02 GEOP01	02	-	04	04	-	-	-	-	-	30	20	50	25	50
			iv) Practical Based on Subject –II		02	-	04	04	-	-	-	-	-	30	20	50	25	50
2	OE	Group-A (Annexure –VII)		STUG02 OE GEO 01	02	02	--	02	40	10	50	20	02	--	--	--	--	50
		1. Introduction of Landforms																
		2. Groundwater Quality and Management		STUG02 OE GEO 02	02	02	--	02	40	10	50	20	02	--	--	--	--	50
3	VSC	Practical based on Group I: Study of Crystals, Microscopic Identification minerals and Field works (Based on Group II) (Annexure No. VIII)		STUG02 VSC GEO01	02	--	04	04	--	--	--	--	--	30	20	50	25	50
4	SEC	Fundamental of Hydrogeology (Annexure No. IX)		STUG02 SEC GEO01	02	02	--	02	40	10	50	20	02	--	--	-	-	50
5	VEC	(Any one from Annexure –)			02	02	-	02	--	50	50	20	--	--	-	-	-	50
6	AEC	English/Marathi/Hindi/Bengali/Pali/ Supplementary English, Annexure-VI			02	02	--	02	40	10	50	20	02	--	--	--	--	50
7	CC	NCC/NSS/Yoga/Sports (Any One)			02	--	04	04	--	--	--	--	--	--	50	50	25	50
Total					22	14	16	30	240	110	350	140	12	90	110	200	100	550

Shall be based on Group Subject-I

Note(s):

- 1) The Students shall undertake total three subjects which shall include one each from Group Subject –I, Group Subject-II and Group Subjects-III.
- 2) From Sem-III onwards out of the above three Subjects, the Students shall select one Subject as a major and one Subject as a minor as per Government letter No.Ø-,ubZih-2022@iz-Ø-09@fof'k&3 f'kdkukfnukad 13 ekpZ] 2024- As per AEC is concerned, those Students Selected English as a AEC in 1stSem, shall select Marathi/ Hindi/Bengali/Pali in the IIndSem and Vis-a Versa
- 3) As per open elective (OE)is concerned, students shall opt one subject from Group-A and one from Group-B

- 4) Generic IKS will be common for all Faculties in the first Semester as per Government letter No. Ø-,ubZih-2022@iz-Ø-09@fof'k&3¼f'kdkuk½fnukad25tkusokjh] 2024-
- 5) VSC Shall be based on Group Subject.

Core Subject-I

Subject Name: Crystallography and Optical Mineralogy

Subject Code: STUG02GEO01

Unit - I

Elementary ideas about crystal structure, crystal faces, edges, solid, angles and zones. Crystallographic axes and axial angles. Crystallography and Geometric symmetry. Laws of Crystallography: Constancy of Inter-facial angle, rationality of indices and symmetry, contact Goniometer and measurement of inter-facial angle. Crystal notations: Miller indices and Weiss parameters.

Unit - II

Crystal symmetry and classification of crystals into six systems. Study of crystals of galena class of cubic system, zircon class of tetragonal system, Baryte class of orthorhombic system,

Unit - III

Study of crystals of Beryl class of hexagonal system, Gypsum class of Monoclinic system and Axinite class of Triclinic system.

Unit - IV

Petrological microscope: Its parts and functioning. Elementary mineral optics: Nature of light, ordinary and plane polarized light, Reflection and Refraction, critical angle, refractive index by 1) Becke line method and 2) Abbe refractometer and Nicol prism. Properties under plane polarized light and crossed Nicol: colour, cleavage, relief, form, pleochroism, twinkling, isotrophism and anisotrophism, extinction and extinction angle, twinning, interference colours. Optical characters of the following rock forming minerals in ordinary and plane polarized light: Quartz, microcline, orthoclase, albite, labradorite, muscovite, biotite, chlorite, hornblende, augite, olivine, garnet, calcite, kyanite, sillimanite, tourmaline, epidote, tremolite and actinolite.

Books recommended:

(Crystallography and Optical Mineralogy)

- 1) Read : Rutley's Elements of Mineralogy.
- 2) Berry, Mason and Dietrich: Mineralogy
- 3) Dana and Ford: A Text book of Mineralogy
- 4) Deer, Howie and Zussman: An introduction to rock forming minerals.
- 5) Berry, L.G., Mason, B. and Dietrich, R.V., 1982. Mineralogy. CBS Publ.
- 6) Kerr, B.F., 1995. Optical Mineralogy 5th Ed. McGraw Hill, New York.
- 7) Flint, Y., 1975. Essential of crystallography, Mir Publishers

Practical Based on Subject –I

Subject Name: Crystals and Microscopic Identification minerals

Subject Code: STUG02GEOP01

1. Study of elements of symmetry and description of various forms of crystals from normal classes of six crystal systems.
2. Study of the optical characters of minerals listed for theory course using polarizing microscope.

Geological field work:

Student will be required to carry out field work of a short duration in an area of geological interest to study the elementary aspects of field Geology (study of Topographic Features, reading of Topographical maps, use of compass clinometer, making location on Toposheet) and submit a report thereon.

Books Recommended:

(Mineralogy)

1. Read: Rutley's Elements of Mineralogy.
2. Berry, Mason and Dietrich: Mineralogy
3. Dana and Ford: A Text book of Mineralogy

Geological field work:

1. Ma millan Publishers India Private Limited(2021)
2. Survey of India toposheets
3. Compton, R. R.(1962) Manual of Field Geology, John Wiley and Sons, Inc.
4. Forrester,J.D.(1957)PrinciplesofFieldGeologyandMiningGeology,JohnWiley.
5. Lahi, F. H.(1987)Field Geology, CBS Publishers.
6. Mathur, S. M.(2001) Guide to Field Geology, Prentice-Hall, New Delhi

Open Elective (OE)
Subject Name: Introduction to Landforms
Subject Code: STUG02OEGEO01

Unit I

Definition of landforms, Classification of landforms. Karst and Glacial landforms

Unit II

Wind and River Landforms, Coastal landforms, Drainage Patterns and its significance

Recommended Books

1. Savindrasingh (1998): Geomorphology, Prayag Pushpak Bhavan, Allahabad.
2. Thornbury William D.: Principles of Geomorphology, Wiley Eastern Reprint 1984.
3. Negi B.S.: Geomorphology, Kedernath Ramnath, Meerut.
4. Sharma V.K.: Geomorphology, Earth processes and forms, Tata McGraw Hill Publishing Co., New Delhi.
5. Worcester P.G.: Text book of Geomorphology.

Open Elective (OE)
Subject Name: Groundwater Quality and Management
Subject Code: STUG02OEGEO02

Unit I

Definition of Groundwater, parameters of groundwater quality, groundwater quality standards, Constituents in groundwater, groundwater quality index,

Unit II

Sources of contaminants of Groundwater Principle of groundwater management, Monitoring of groundwater quality,

Vocational Skill Course (VSC)

Subject Name: Crystals, Microscopic Identification minerals and Field works

Subject Code: STUG02VSCGEO01

1. Study of crystals: Face, Zone, Edges, Interfacial angle and solid angle.
Crystallographic notation.
2. Study of the microscopic properties of minerals

Student will be required to carry out field work of a short duration in an area of geological interest to study the elementary aspects of field Geology (study of Topographic Features, reading of Topographical maps, use of compass clinometer, making location on Toposheet) and submit a report thereon.

Books Recommended:

1. Read: Rutley's Elements of Mineralogy.
2. Berry, Mason and Dietrich: Mineralogy
3. Dana and Ford: A Text book of Mineralogy

Skill Enhancement Course (SEC)

Subject Name: Fundamental of Hydrogeology

Subject Code: STUG02SECGEO01

Unit I

Definition of Precipitation, percolation, runoff, evaporation and transpiration
Hydrologic cycle.

Unit II

Hydrologic properties of rocks. Aquifers and their classification.

Books recommended:

1. Todd: Ground water Hydrology
2. Karanth: Hydrogeology
3. Nagabhushaniah : Groundwater in Hydrosphere (Groundwater hydrology)
4. Karanth: Groundwater Assessment, Development and Management