

अंतरी पेटवू ज्ञानज्योत



(NAAC Re-Accredited)

**KAVAYITRI BAHINABAI CHAUDHARI
NORTH MAHARASHTRA UNIVERSITY,
JALGAON.**

Faculty of Science & Technology

SYLLABUS FOR CORE SUBJECT (DSC) GEOLOGY

**As Per the U G C Guidelines Based on
Choice Based Credit System (CBCS)**

At

F.Y.B.Sc.

Semester I and II

w.e.f. June, 2022

**KAVAYITRI BAHINABAI CHAUDHARI
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SYLLABUS FOR CORE SUBJECT (DSC)

GEOLOGY

**As Per the U. G. C. Guidelines Based on
Choice Based Credit System (CBCS)**

at

F. Y. B. Sc.

**SEMESTER-WISE SYLLABUS
(Theory and Practical)**

Semester-I:

GL- 101: Earth System Science

GL- 102: Mineral Science

GL- 103: Practical Based on GL- 101 & GL- 102

Semester-II:

GL- 201: Geochemistry and Petrology

GL- 202: Principles of Stratigraphy and Sedimentary Petrology

GL- 203: Practical Based on GL- 201 & GL- 202

w.e.f. June, 2022

OBJECTIVE

B.Sc. Geology or Bachelor of Science in Geology is a three year undergraduate course with Geology as a Principal subject offered by Kavayitri Bahinabai Chaudhari North Maharashtra University, Jalgaon established by State Act. Geology is the study of the solid Earth and its processes.

Geology is the core discipline of the Earth Sciences that provides opportunity for the students to learn the fundamentals with a general understanding of the subject such as Geodynamics, Mineralogy, Structural Geology, Stratigraphy, Petrology, Economic Geology, Geomorphology, Coal and Petroleum Geology, Hydrogeology, Geochemistry, Indian Geology, Environmental Geology, Engineering Geology, etc through a combination of lectures, lab work, and field observations.

The Titles of the Core Courses for F Y B Sc in Geology is as follows:

Sem	Course as per UGC	Core Course		No of Credits	Hours / Semester	Marks	
		Course code	Course Title			Int	Ext
I	GEOLOGY-DSC1 A (Credits: Theory-04, Prac.- 02)	GL- 101	Earth System Science	2	30	40	60
		GL- 102	Mineral Science	2	30	40	60
		GL- 103	LAB - I	2	30	40	60
	Geology Lab Prac.- 02						
Sem	Course as per UGC	Core Course		No of Credits	Hours / Semester	Marks	
		Course code	Course Title			Int	Ext
II	GEOLOGY-DSC2 A (Credits: Theory- 04, Prac.- 02)	GL- 201	Geochemistry and Petrology	2	30	40	60
		GL- 202	Principles of Stratigraphy and Sedimentary Petrology	2	30	40	60
		GL- 203	LAB – II	2	30	40	60
	Geology Lab Prac.- 02						

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NORTH MAHARASHTRA UNIVERSITY, JALGAON
F.Y.B.Sc. (CBCS) GEOLOGY SYLLABUS
SEMESTER I
(w. e. f. June-2022)
GL- 101: EARTH SYSTEM SCIENCE

UNIT I: Earth as a Planet

1. Introduction to Geology: Definition of Geology, branches, scope and importance of geology in Environment.
2. Historical Geology (Introduction).
3. Origin of the Universe (Big Bang Theory), Origin of the Solar System (Nebular, Tidal and Recent Hypothesis), Components of Solar system- Definition and classification of Planets (Jovian, Terrestrial), Meteorites and comets. Geochronology and age of the Earth (Solar system): A brief account of the historical methods. Determination of age by U/Pb, Th/Pb, K/Ar and Carbon Dating method.
4. Earth: Its size, shape (definition of geodesy) and density, temperature, pressure and magnetism within the Earth.

UNIT II: Structure of the Earth

1. Earth's Crust, Mantle and Core (Lithosphere, Asthenosphere, Barysphere and Cryosphere).
2. Evolution of the Earth's Crust, Mantle and Core (Earth's crustal evolution: Introduction, Early crust; Types of crust and crustal growth rates; concept of craton and continent).
3. Evolution of the Oceans (Introduction, Formation of the Oceans), Present day hypsographic curve.
4. Earth's Atmosphere: (Introduction, Classification of Atmosphere, Introduction to Atmospheric circulation, land-air-sea interactions), Hydrosphere (Introduction to ocean currents, types, causes and significance), Biosphere (Ecology and food chain) and Pedosphere.

UNIT III: Dynamic Processes

1. Definitions and examples of Exogenic and Endogenic processes of the earth.
2. Erosional and Depositional landforms of
 - a. Rivers (Fluvial):

Erosional Landforms: Valley (gully, gorge, rift valley), Waterfall, Potholes, River terraces, Meanders and Ox-bow lake.

Depositional landforms: Flood plain, Alluvial fan, Levees and Delta.
 - b. Oceans (Sea):

Erosional Landforms: Sea cliff, wave-cut platforms, sea arches and stacks.

Depositional landforms: Beaches, Ocean floor deposit (bathyal and abyssal)

c. Wind (Aeolian):

Erosional Landforms: Deflation armour, Ventifacts, Rock Columns, Pinnacles, Yardangs and Mushroom Rock.

Depositional landforms: Loess, Dunes and their types.

UNIT IV: Causes of Dynamic Processes

1. Plate Tectonics:

a. Definition of Plates.

b. Characters of plates.

c. List of plates.

d. Introduction to convergent, divergent and conservative plate boundaries.

e. Sea floor spreading and convection currents.

2. Volcanoes: Structure of volcano, Type, Products of volcano, Earth's volcanic belts.

3. Earthquakes: Elastic rebound theory, Earthquake waves, Mercalli scale and Richter's scale, Earthquake zones in India.

SUGGESTED READINGS:

1. Geology: Chakranarayan and Kulkarni, Nirali Prakashan, Pune.

2. Concepts in Geology: Chakranarayan & Others, Scientifica Pub. Pune.

3. A Text Book of Geology: Mukherjee P.K., The World Press Pub. Kolkatta.

4. General Geology: Radhakrishnan.

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F.Y.B.Sc. (CBCS) GEOLOGY SYLLABUS
SEMESTER I
(w. e. f. June, 2022)
GL- 102: MINERAL SCIENCE

UNIT I: Introduction

1. Introduction: Definition, branches and scope of Mineralogy.
2. Importance, uses and conservation of minerals.

UNIT II: Chemistry of Minerals

1. Major elements constituting minerals, Atoms and Ions.
2. Geochemical affinity and Geochemical classification of elements.
3. Isomorphism and polymorphism.
4. Silicate structures- Definition and types.

UNIT III: Rock Forming Minerals

1. Processes of mineral formation in Igneous, Sedimentary and Metamorphic rocks.
2. Composition of common rock forming minerals.
3. Physical properties of Minerals: Color, Streak, Lustre, Transparency, Translucency, Opaque, Forms, Hardness, Fracture, Cleavage, Piezoelectric property, Specific Gravity and Luminescence (Phosphorescence and Fluorescence).

UNIT IV: Optical Mineralogy

1. Nature of light- ordinary and plane polarized light.
2. Double refraction of light.
3. Nicol's prism and polaroids.
4. Petrological microscope- Its parts and uses.
5. Optical properties of Minerals:
 - a. In plane polarized light (IPL/PPL): Colour, Pleochroism, Form, Cleavage, Relief and Twinkling.
 - b. In between crossed Nicols (BXN): Isotropism, Anisotropism, Extinction Positions (straight, oblique and symmetrical), Extinction Angle and Interference Colours.

UNIT V: Crystallography

1. Definition and conditions conducive for the formation of crystals.
2. Crystal morphology: Faces, forms, hedrons, edges, solid angles, interfacial angle and its measurement by Contact Goniometer, law of constancy of Interfacial Angle.

3. Symmetry of crystals: Plane, Axis and Center of symmetry, Crystallographic and Geometric Symmetry. Crystallographic axes- lettering and ordering of crystallographic axes, parameters, axial ratio, indices, Parameter System of Weiss, Index System of Miller and Law of rational indices.
4. Descriptive Crystallography: Introduction to 32 point groups and crystal classification into six systems.
5. Study of crystallographic axes, elements of symmetry, forms present with indices of
 - a. Cubic/ Isometric System, Galena Type.
 - b. Tetragonal System, Zircon Type.
 - c. Orthorhombic System, Barytes Type.

SUGGESTED READINGS:

1. Geology: Chakranarayan and Kulkarni, Nirali Prakashan, Pune.
2. Concepts in Geology: Chakranarayan & others, Nirali Prakashan, Pune.
3. Rutley's Elements of Mineralogy: Gribble, CBS Pub., New Delhi.
4. Text Book of Mineralogy: Dana, J. D. Wiley Eastern, New Delhi.
5. Optical Mineralogy: Kerr, P. F. (1959), McGraw-Hill.
6. An introduction to the Rock Forming Minerals (Vol. 696): Deer, W. A., Howie, R. A., & Zussman, J. (1992), London: Longman
7. A Handbook of Minerals, Crystals, Rocks and Ores: Alexander, P. O., New India Publishing Agency, New Delhi.

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F.Y.B.Sc. (CBCS) GEOLOGY SYLLABUS**

SEMESTER I

(w. e. f. June, 2022)

GL- 103: PRACTICAL BASED ON GL- 101 AND GL- 102

UNIT I: Study of Physical Properties of Minerals

1. Introduction to physical properties of Minerals and Ore Minerals

UNIT II: Descriptive Mineralogy

1. Rock forming minerals: Quartz crystal, Amethyst, Milky Quartz, Rosy quartz, Chalcedony, Flint, Jasper, Agate, Opal, Orthoclase, Muscovite, Biotite, Garnet, Hornblende, Olivine, Talc, Appophyllite, Fluorite, Calcite, Barytes, Gypsum, Apatite and Corundum.
2. Ore Minerals: Graphite, Galena, Pyrite, Magnetite and Magnesite.

UNIT III: Crystallography

1. Study of crystal models of following crystal system w.r.t. crystallographic axes, elements of symmetry, forms present with indices of
 - a. Cubic system- Galena type.
 - b. Tetragonal system- Zircon type.
 - c. Orthorhombic system- Baryte type.
2. Measurement of interfacial angle by contact goniometer.

UNIT IV: Optical Mineralogy

1. Study of petrological microscope to understand behavior of light through minerals.
2. Study optical properties of minerals.
3. Optical properties of minerals- Quartz, Biotite, Hornblende, Garnet, Plagioclase and Augite.

SUGGESTED READINGS:

1. Rutley's Elements of Mineralogy: Gribble, CBS Pub., New Delhi.
2. Text Book of Mineralogy: Dana, J. D. Wiley Eastern, New Delhi.

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F.Y.B.Sc. (CBCS) GEOLOGY SYLLABUS
SEMESTER II
(w. e. f. June, 2022)
GL- 201: GEOCHEMISTRY AND PETROLOGY

UNIT I: Geochemistry

1. Introduction to concepts in Geochemistry
2. Periodic table
3. Geochemical classification of elements, Geochemical Cycle
4. Elemental composition of Sun, Meteorite and Earth's Crust, Mantle and Core
5. Definitions of Gibbs free energy, Enthalpy and Entropy; First and Second law of thermodynamics w.r.t. petrogenesis.
6. Geochemical characteristics of Igneous, Sedimentary and Metamorphic Rocks

UNIT II: Introduction to Petrology

1. Definition of Petrology and Rock Cycle

UNIT III: Magma

1. Magma and its composition and physico-chemical components of magma.
2. Mineral composition of Igneous rocks.
3. Formation of crystal and glass.
4. Crystallisation of Unicomponent Magma and Definition of Bi-component magma.

UNIT IV: Textures, Structures and Classification of Igneous Rocks

1. Texture: Definition and Factors controlling Texture
2. Types of Textures: Equigranular and Inequigranular- Porphyritic, Poikilitic (Ophitic, Sub-Ophitic) and Glassy.
3. Structures- Vesicular, Amygdaloidal, Columnar, Ropy and Flow.
4. Classification of Igneous Rocks:
 - a. Tabular classification based on- Depth of Formation, Silica Percentage, Feldspars Present and Colour Index.

UNIT V: Metamorphic Petrology

1. Definition of Metamorphism, General Characteristics of Metamorphism.
2. Agents of Metamorphism.
3. Types of Metamorphism.

4. Tabular classification of Metamorphic rocks based on zones, agents and types of metamorphism.
5. Structures: Granulose, Schistose and Gneissose.
6. Descriptive Metamorphic Petrology:
 - a. Thermal Metamorphism of Siliceous Sandstone, Pure and Impure Limestone.
 - b. Dynamic/Cataclastic Metamorphism of Argillaceous rocks.
 - c. Regional Metamorphism of Argillaceous rocks.

SUGGESTED READINGS:

1. Geology: Chakranarayan and Kulkarni, Nirali Prakashan, Pune.
2. Concepts in Geology: Chakranarayan & others, Nirali Prakashan, Pune.
3. Petrology of Igneous, Sedimentary & Metamorphic: Ehelrs & Blatt, CBS Pub., New Delhi.
4. Principles of Petrology: Tyrell G. W., CBS Pub. New Delhi.
5. A Handbook of Minerals, Crystals, Rocks and Ores: Alexander, P. O., New India Publishing Agency, New Delhi.
6. Igneous and Metamorphic Petrology: Best, M. G., Blackwell Science
7. Igneous and Metamorphic Petrology: Turner and Verhoogen, CBS Pub., New Delhi.
8. Principles of Geochemistry (3rd Edition): Mason, B. (1986), Wiley New York.
9. Using geochemical data – evaluation, presentation and interpretation (2nd Edition): Rollinson, H. (2007), Publisher Longman Scientific & Technical.
10. Essentials of geochemistry: Walther, J. V. (2009), Jones & Bartlett Publishers.
11. Geochemistry: an introduction: Albarède, F. (2003). Cambridge University Press.

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F.Y.B.Sc. (CBCS) GEOLOGY SYLLABUS
SEMESTER II
(w. e. f. June, 2022)

GL- 202: PRINCIPLES OF STRATIGRAPHY AND SEDIMENTARY PETROLOGY

UNIT I: Introduction

1. Introduction, definition, importance of Stratigraphy

UNIT II: Principles of Stratigraphy

1. Uniformitarianism
2. Order of Superposition
3. Faunal Succession

UNIT III: Stratigraphic Time Scale

1. Concept of Time in Geological studies
2. Standard Stratigraphic / Geological time scale

UNIT IV: Stratigraphic classification and Nomenclature

1. Stratigraphic classification and Nomenclature, Study of stratigraphic elements, Lithostratigraphy and its units, Chronostratigraphy and its units, Biostratigraphy and its units.
2. Inter-relationship between lithostratigraphic, chronostratigraphic and biostratigraphic units.

UNIT V: Introduction to Sedimentary Petrology

1. Endogenous and Exogenous Processes
2. Weathering (mechanical and chemical), Erosion, Denudation, Sediments, Sedimentation and Formation of sedimentary rocks- Transportation, Deposition, Compaction, Cementation and Lithification.
3. Classification of sedimentary rocks based on products of weathering.

UNIT VI: Geochemistry and Petrography

1. Geochemical characters of clastic/detrital sediments and cement
2. Textures: Definition, Clastic, Non-clastic and Bio-clastic.
3. Primary sedimentary structures- Lamination and bedding, graded bedding, ripple marks and mud cracks.

UNIT VII: Descriptive Sedimentary Petrology

1. Study of following secondary deposits with respect to sedimentary environments, definition, texture/structure, mineral composition and their varieties.

- a. Residual- Laterite, Bauxite
- b. Rudaceous- Conglomerate, Breccia
- c. Arenaceous- Sandstone (Freestone, Flagstone and Siliceous)
- d. Argillaceous- Mudstones, Shale (Ferruginous, Siliceous, Carbonaceous and Calcareous)
- e. Chemical deposits- Carbonates (Limestones).
- f. Biochemical- Organic Limestone.

SUGGESTED READINGS:

1. Geology: Chakranarayan and Kulkarni, Nirali Prakashan, Pune.
2. Concepts in Geology: Chakranarayan & others, Nirali Prakashan, Pune.
3. Stratigraphic Principles and Practices: Weller, J. M,
4. Principles of Sedimentology and Stratigraphy: Boggs S., Prentice Hall
5. Stratigraphy and Sedimentation: Krumbein and Sloss,
6. Sedimentary rocks: Pettijohn, CBS Publ., New Delhi.
7. Introduction to Sedimentology: Sengupta. S. (1997), Oxford-IBH.
8. Principles of Petrology: Tyrell G. W., CBS Pub. New Delhi.
9. A Handbook of Minerals, Crystals, Rocks and Ores: Alexander, P. O., New India Publishing Agency, New Delhi.

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SEMESTER II

(w. e. f. June, 2022)

GL- 203: PRACTICAL BASED ON GL- 201 AND GL- 202

UNIT I: Geochemical Petrography

1. Average geochemical characteristics of following rocks:

a. Geochemical Petrography of Igneous Rocks:

1. Granite 2. Diorite 3. Gabbro 4. Pegmatite 5. Rhyolite 6. Obsidian 7. Basalt.

b. Geochemical Petrography of Sedimentary Rocks:

1. Laterite 2. Bauxite 3. Conglomerate 4. Breccia 5. Siliceous Sandstone 6. Ferruginous Sandstone 7. Mudstone 8. Shale 9. Limestone 10. Shell Limestone.

c. Geochemical Petrography of Metamorphic Rocks: 1. Quartzite 2. Marble 3. Slate 4. Augen Gneiss 5. Biotite Schist 6. Mica Garnet Schist 7. Biotite Gneiss.

UNIT II: Topographic and Geologic Maps

1. Study of Contour Maps showing landforms at least 5

2. Geological Maps with horizontal beds at least 2

SUGGESTED READINGS:

1. Practical Approach to Petrology: Hota, Rabindra Nath., CBS Publishers & Distributors Pvt. Ltd., New Delhi.

Equivalence Courses

Sem	Course as per UGC	Core Course		No of Credits	Hours / Semester	Marks		Old Syllabus Code
		Course code	Course Title			Int	Ext	
I	GEOLOGY-DSC1 A (Credits: Theory-04, Prac.- 02)	GL- 101	Earth System Science	2	30	40	60	GL- 101
		GL- 102	Mineral Science	2	30	40	60	GL- 102
		GL- 103	LAB - I	2	30	40	60	GL- 103
	Geology Lab Prac.- 02							
Sem	Course as per UGC	Core Course		No of Credits	Hours / Semester	Marks		Old Syllabus Code
		Course code	Course Title			Int	Ext	
II	GEOLOGY-DSC2 A (Credits: Theory- 04, Prac.- 02)	GL- 201	Geochemistry and Petrology	2	30	40	60	GL- 201
		GL- 202	Principles of Stratigraphy and Sedimentary Petrology	2	30	40	60	GL- 202
		GL- 203	LAB – II	2	30	40	60	GL- 203
	Geology Lab Prac.- 02							

Table of Equivalence for F.Y.B.Sc. (CBCS) Geology

Sem	Old Syllabus w.e.f. June, 2018	New Syllabus w.e.f. June, 2022
I	GL- 101 Earth System Science	GL- 101 Earth System Science
	GL- 102 Mineral Science	GL- 102 Mineral Science
	GL- 103 Practical based on GL- 101 and 102	GL- 103 Practical based on GL- 101 and 102
II	GL- 201 Elements of Geochemistry	GL- 201 Geochemistry and Petrology
	GL- 202 Structural Geology	GL- 202 Principles of Stratigraphy and Sedimentary Petrology
	GL- 203 Practical based on GL- 201 and 202	GL- 203 Practical based on GL- 201 and 202