

**ANDHRA UNIVERSITY
DEPARTMENT OF GEOLOGY
COLLEGE OF SCIENCE AND TECHNOLOGY**



Scheme of Instruction and Examinations

M.Sc. GEOLOGY (I - SEMESTER)

(With effect from the admitted batch 2025-2026)

I – SEMESTER, M.Sc. GEOLOGY
Scheme of Instruction and Examinations
(With effect from the admitted batch of 2025-2026)

S.No	Course Code	Course	Teaching/ Lab Hours Per week	Duration of Examination hours	Allotment of Marks		Total Marks	Subject Credits
					Final	Mid- Exam		
01.	G-CC – 101(T)	Mineralogy	3	3	60	40	100	3
02.	G-CC - 102 (T)	Igneous and Metamorphic Petrology.	3	3	60	40	100	3
03.	G-CC – 103 a (T) G-CC – 103 b (T) G-CC – 103 c (T)	(Optional anyone) Structural Geology Crystallography Geomorphology	3	3	60	40	100	3
04.	G-SOC -104 (T) G-SOC -104 a (T)	(Optional anyone) Hydrogeology Statistical Geology and Computer applications	3	3	60	40	100	3
05.	G-SOC -105 (T) G-SOC -105 a (T)	(Optional anyone) Field Geology and Surveying Geological mapping Techniques	3	3	60	40	100	3
06.	G-OOTC-106 (T)	Open Online Transdisciplinary course	3	3	50		50	2
07.	G -107 (T) G -107a (T)	(Optional anyone) (Online Course) Indian Knowledge Systems 1 Indian Knowledge Systems 1a	3	3	75		75	0 AUDIT SCORE
08.	G-CC – 101 (P)	Mineralogy	2	3	25		25	1
09.	G-CC – 102 (P)	Igneous and Metamorphic Petrology	2	3	25		25	1
10.	G-CC – 103 a (P) G-CC – 103 b (P) G-CC – 103 c (P)	(Optional anyone) Structural Geology Crystallography Geomorphology	2	3	25		25	1
11.	G-SOC -104 (P) G-SOC -104 a (P)	(Optional anyone) Hydrogeology Statistical Geology and Computer applications	2	3	25		25	1
12.	G-SOC -105 (P) G-SOC -105 a (P)	(Optional anyone) Field Geology and Surveying Geological mapping Techniques	2	3	25		25	1
13.	G – CC–108 (P)	Viva Voce	-	-	25		25	1
TOTAL							775	23

SYLLABUS

I – SEMESTER, M.Sc. GEOLOGY

PAPER- I, MINERALOGY (G-CC-101)

(With effect from the admitted batch of 2025-2026)

UNIT –I

Introduction to Mineralogy. Classification of Silicate minerals. Structure, chemistry, physical and optical properties of (a) Olivine Group, (B) Garnet Group, (C) Epidote Group, (d) Aluminosilicate Group

UNIT –II

Structure, chemistry, physical and optical properties of (a) Pyroxene Group, (b) Amphiboles Group, (c) Clay minerals, (d) Mica Group.

UNIT –III

Isomorphism, Polymorphism, Pseudomorphism, Solid solutions, Structure, chemistry, physical and optical properties of (a) Feldspathoids Group, (b) Feldspars, and (c) Silica minerals

UNIT – IV

Classification of nonsilicates: Structure, chemistry, physical and optical Properties of Native elements, Oxides and Sulphides.

UNIT –V

Structure, chemistry, physical and Optical properties of carbonates, phosphates, halides, sulphates, gemstones and semi-precious stones.

PRACTICALS:

- a) Megascopic and microscopic identification of important silicate and nonsilicate minerals.
- b) Calculation of Mineral formulae
- c) Interpretation of X-ray diffractograms of common minerals and DTA curves.
- d) SEM photographs

(P.T.O)

TEXTBOOKS

1. Alexander, P. O. (2009): *Handbook of Rocks, Minerals, Crystals & Ores*
2. Babu, S. K. (1987): *Practical Manual of Crystal Optics*
3. Deer, W. A., Howie, R. A. & Zussman, J. (1966): *An Introduction to Rock Forming Minerals*
4. Deer, W. A., Howie, R. A. & Zussman, J. (1996): *The Rock Forming Minerals*
5. Dexter Perkins, *Mineralogy* 3e, Pearson Education India
6. Flint, F. (1964): *Essentials of Crystallography*
7. Kerr, P. (1977): *Optical Mineralogy*, McGraw- Hill Book Co.
8. Phillips, W. R. and Griffen, D. T. (1986): *Optical Mineralogy*
9. Ray, S. (1958): *Optical Mineralogy*
10. Winchell, A. N. (1939): *Elements of Optical Mineralogy*

MODEL QUESTION PAPER
I – SEMESTER, M.Sc. GEOLOGY
PAPER – I, MINERALOGY (G-CC-101)
(With effect from the admitted batch of 2025-2026)

Time: 3Hrs

Max. Marks: 60

Answer FIVE questions, choosing ONE from each Unit.
All questions carry equal marks.

UNIT-I

1. Write in detail about the classification of silicate minerals with neat sketches?

OR

2. Write short notes on **ANY TWO** of the following:
- a) Structure of olivine group of minerals
 - b) Chemistry of garnet group of minerals
 - c) Optical properties of kyanite and sillimanite

UNIT-II

3. Describe the structure, chemistry and optical properties of pyroxene group of minerals

OR

4. Write short notes on **ANY TWO** of the following:
- a) Di-Octahedral micas
 - b) Smectite group
 - c) Chemistry of amphiboles

UNIT-III

5. Write the classification of the feldspar group of minerals and add a note on its twinning?

OR

6. Write short notes on **ANY TWO** of the following:
- a) Classification of Feldspathoids
 - b) Structure of quartz, trypdamite and crystobalite.
 - c) Isomorphism

UNIT-IV

7. Write in detail about chemistry and paragenesis of the Sulphide group of minerals?

OR

8. Write short notes on **ANY TWO** of the following:
- a) Classification of non-silicates
 - b) Physical properties of Native metallic elements
 - c) Spinal group of minerals

UNIT-V

9. Describe the phosphate minerals in terms of its chemistry and paragenesis.

OR

10. Write short notes on **ANY TWO** of the following:
- a) Gemstone varieties of Quartz and their properties.
 - b) Halide group of minerals
 - c) Chemistry of carbonate minerals

SYLLABUS

I – SEMESTER, M.Sc. GEOLOGY

PAPER – II; IGNEOUS AND METAMORPHIC PETROLOGY (G-CC-102)

(With effect from the admitted batch of 2025-2026)

UNIT – I

Magma generation, Primary and modified magmas. Mantle Xenoliths, Differentiation and assimilation of magmas, Magma mixing. Plate tectonics in relation to petrology.

UNIT – II

Bowen's reaction series, phase equilibrium of single, binary and ternary silicate systems and crystallisation in the light of experimental works and petrogenetic importance. Criteria for classification of igneous rocks. Textural, mineralogical and chemical classification. Norm (CIPW) and Niggli values. Classification using multiple criteria, IUGS classifications.

UNIT – III

Petrographic provinces and associations. Mineralogy, texture and petrogenesis of major igneous rock types such as granites, basalts, ultramafic rocks, carbonatites, lamprophyres syenites, & nepheline syenites.

UNIT – IV

Metamorphic textures and structures. Recrystallisation, metamorphic differentiation, metamorphic condition, mineralogies of protoliths. Metamorphic phase diagrams – ACF, AKF and AFM, metamorphic facies with special reference to Indian Examples.

UNIT – V

Nature of metamorphic reactions. Pressure – temperature conditions of metamorphism. Anatexis and origin of migmatites. Regional metamorphism and paired metamorphic belts. P-T- paths, Clausius-Clapeyron-equation and slopes of metamorphic reactions. Fourier's Law of heat conduction, Geothermobarometry

PRACTICALS:

1. Megascopic and microscopic study of igneous rocks.
2. Calculation of CIPW norms. Preparation of variation diagrams.
3. Megascopic and microscopic study of metamorphic rocks.
4. Construction of ACF – AKF – AFM diagrams.
5. Geothermobarometric calculations.

TEXTBOOKS:

1. A.K. Gupta (1998): *Igneous Petrology*
2. Best, Myron G. (2002): *Igneous and Metamorphic Petrology*
3. Bose, Mihir K., (1997): *Igneous Petrology*.
4. Carmichael, I. S. E., Turner, F. J. & Verhoogen, J. (1971) *Igneous Petrology*
5. Ehlers, E.G. & Blatt, H. (1982): *Igneous, Sedimentary, and Metamorphic Petrology*
6. Philpotts Anthony R. (1992): *Principles of Igneous & Metamorphic Petrology*
7. S. C. Chatterjee (1974): *Igneous and Metamorphic Petrology*
8. Thomas, H. (2005): *Metamorphism and Crustal Evolution* (Edited)
9. Tyrell, G. W. (1963): *Principles of Petrology*
10. Tyrell, G. W. (1963): *Principles of Petrology*
11. Winkler, H. G. F. (1967): *Petrogenesis of Metamorphic Rocks*
12. Winter, J. D. (2012): *Principles of Igneous and Metamorphic Petrology*

MODEL QUESTION PAPER
I – SEMESTER, M.Sc. GEOLOGY
PAPER – II, IGNEOUS AND METAMORPHIC PETROLOGY (G-CC-102)
(With effect from the admitted batch of 2025-2026)

Time: 3Hrs

Max. Marks: 60

Answer FIVE questions, choosing ONE from each Unit.
All questions carry equal marks.

UNIT-I

1. Discuss about differentiation and Assimilation of Magmas.

OR

2. Write notes on **ANY TWO** of the following:

- a) Mantle xenoliths.
- b) Primary and modified magmas.
- c) Lithosphere and Asthenosphere.

UNIT-II

3. Write on phase equilibrium of single, binary and ternary systems crystallisation.

OR

4. Write notes on **ANY TWO** of the following:

- a) Textural classification of igneous rocks.
- b) Mineralogical classification of igneous rocks.
- c) Role of volatiles in Crystallisation.

UNIT-III

5. Describe the mineralogy, texture and petrogenesis of ultramafic rocks.

OR

6. Write notes on **ANY TWO** of the following:

- a) Petrographic provinces and associations.
- b) Basalts.
- c) Granites.

UNIT-IV

7. Write an essay on metamorphic facies concept. Give in detail about different metamorphic facies with examples.

OR

8. Write notes on **ANY TWO** of the following

- a) Metamorphic structures.
- b) ACF – AFM diagrams.
- c) Recrystallisation.

UNIT-V

9. Write about migmatites and their origin.

OR

10. Write notes on **ANY TWO** of the following:

- a) Metasomatism.
- b) Regional metamorphism.
- c) Petrogenetic aspects of metamorphic rocks of India.

SYLLABUS

I – SEMESTER, B.Sc. (HONOURS) GEOLOGY PAPER- III STRUCTURAL GEOLOGY (G-CC-103 a) (With effect from the admitted batch of 2025-2026)

UNIT – I

Mechanical principles and properties of rocks and their controlling forces. Concept of stress and strain. Composition and resolution of forces. Principles of failure by rupture relation of rupture to strain. Two-dimensional strain and stress analysis. Types of strain ellipses and ellipsoids, their properties and geological significance.

UNIT – II

Folds and their classification. Mechanics and causes of folding. Determination of top of beds by primary features.

UNIT – III

Fractures and Joints. Nomenclature, origin, significance and classification of faults. Causes and dynamics of faulting, strike-slip faults, normal faults, overthrust and nappe, etc.

UNIT – IV

Concept of petrofabrics and symmetry. Field and laboratory techniques. Stereographic treatment, Types of fabrics, fabric elements.

UNIT – V

Plate tectonics, Dynamic evolution of continental and oceanic crust, Tectonics of Precambrian Orogenic Belts of India. Formation of Mountain Roots. Anatomy of orogenic belts with case examples such as Alpine Himalayan, the Andes, etc.

PRACTICALS:

- a) Preparation and interpretation of geological maps and sections.
- b) Structural problems concerning to economic mineral deposits.
- c) Recording and plotting of field data.
- d) Plotting and interpretation of petrofabric data on the stereographic nets.

TEXTBOOKS:

1. Billing, M.P. (1974): *Principle of Structural Geology*,
2. Ghosh, S. K. (1985): *Structural Geology- Fundamental & Modern Development*.
3. Hills, S. E. (1950): *Structural Geology*.
4. Jain, A. K. (2014): *Structural Geology*, Geol. Soc. of India, Bang
5. Ramsay, J. G. (1967): *Folding & Fracturing of Rocks*, Pergamon Press,
6. Ramsay, J. G. (1983): *Strain Analysis & Deformation*,
7. Ramsay, J. G. and Huber, M. I. (1993): *The Techniques of Modern Structural Geology*,
8. Saklani, P. S. (1983): *Structural & Tectonics of Himalaya*,
9. Seyfert, C. K. (1987): *Encyclopaedia of Structural Geology*,
10. Valdiya, K. S. (1980): *Geology Kumaun Himalaya*,

MODEL QUESTION PAPER
I – SEMESTER, M.Sc. GEOLOGY
PAPER – III, STRUCTURAL GEOLOGY (G-CC-103a)
(With effect from the admitted batch of 2025-2026)

Time: 3Hrs

Max. Marks: 60

Answer FIVE questions, choosing ONE from each Unit.
All questions carry equal marks.

UNIT-I

1. Define stress and strain. Explain how rocks behave under these conditions.

OR

2. Write notes on **ANY TWO** of the following:

- a) Boudinage structures
- b) Deformation mechanisms
- c) Mechanical properties of rocks

UNIT-II

3. Describe the different types of fold

OR

4. Write notes on **ANY TWO** of the following:

- a) Dome
- b) Basins
- c) Mechanics of folding

UNIT-III

5. Describe the criteria by which faults are recognized.

OR

6. Write notes on **ANY TWO** of the following:

- a) Slickenside
- b) Columnar Joints
- c) Nappe

UNIT-IV

7. Discuss the concept of petrofabrics and symmetry.

OR

8. Write notes on **ANY TWO** of the following:

- a) Tectonite
- b) Equal area net
- c) Planar and linear structures

UNIT-V

9. Explain the tectonics of the Precambrian Orogenic belts of India.

OR

10. Write notes on **ANY TWO** of the following:

- a) Wilson cycle
- b) Back- arc margins
- c) Continental platforms

SYLLABUS

I – SEMESTER, M.Sc. GEOLOGY

PAPER-III, CRYSTALLOGRAPHY (G-CC-103 b)

(With effect from the admitted batch of 2025-2026)

UNIT – I

General morphological & mathematical relations of crystals. Bravais Lattice, classification of crystal classes. Study of classes of crystal system, Derivation of Thirty-two (32) crystal classes.

UNIT – II

Measurement of the angles of crystals, Twinned crystals, Irregularities of crystals, and Crystal projections.

UNIT – III

Crystal Chemistry, Crystal Structures, Crystal Bonds, Coordination Number.

UNIT – IV

Uniaxial crystals: optic axial angle, optical accessories, uniaxial indicatrix and uniaxial crystals under the orthoscope and conoscope.

UNIT – V

Biaxial crystals: Crystals study under conoscope, biaxial indicatrix and biaxial crystals under orthoscope.

PRACTICALS:

Identification of crystals. Colour, Index of refraction, relief, Interference colours, pleochroism scheme, extinction, isotropism, Indicatrix, optical orientation, optic sign, sign of elongation.

TEXT BOOKS:

1. Alexander, P. O. (2009): *Handbook of Rocks, Minerals, Crystals & Ores*.
2. Babu, S. K. (1987): *Practical Manual of Crystal Optics*,
3. Deer, W. A., Howie, R. A. & Zussman, J. (1966): *An Introduction to Rock Forming Minerals*.
4. Deer, W. A., Howie, R. A. & Zussman, J. (1996): *The Rock Forming Minerals*,
5. Flint, F. (1964): *Essentials of Crystallography*,
6. Kerr, P. (1977): *Optical Mineralogy*,
7. Naidu, P. R. J. (1918): *Optical Mineralogy*,
8. Phillips, W. R. and Griffen, D. T. (1986): *Optical Mineralogy*, Etd.
9. Ray, S. (1958): *Optical Mineralogy*.
10. Winchell, A. N. (1939): *Elements of Optical Mineralogy*,

MODEL QUESTION PAPER
I – SEMESTER, M.Sc. GEOLOGY
PAPER-III, CRYSTALLOGRAPHY (G-CC-103 b)
(With effect from the admitted batch of 2025-2026)

Time: 3hours

Max marks 60

Answer ANY FIVE Questions, choosing one from each Unit
All questions carry equal marks.

UNIT-I

1. Describe briefly about the derivation of 32 crystal classes.

OR

2. Write short notes on **ANY TWO** of the following
- a) Bravais Lattice
 - b) Crystallographic axes.
 - c) crystal symmetry

UNIT-II

3. Write an essay on crystal Projections.

OR

4. Write short notes on **ANY TWO** of the following
- a) Twinned crystals
 - b) Irregularities in crystals
 - c) Interfacial angle

UNIT-III

5. Give a detailed note on crystal chemistry.

OR

6. Write short notes on **ANY TWO** of the following
- a) Crystal structure
 - b) Crystal bonds
 - c) Co ordination number

UNIT-IV

7. Write a descriptive note on the uniaxial crystals under the orthoscope.

OR

8. Write short notes on **ANY TWO** of the following
- a) Mineral examples for uniaxial crystals
 - b) Optic axial angle.
 - c) Uniaxial indicatrix.

UNIT-V

9. Discuss in detail about the biaxial crystal study under conoscope

OR

10. Write short notes on **ANY TWO** of the following
- a) Biaxial indicatrix
 - b) Biaxial crystals under orthoscope
 - c) Otic axis in biaxial crystals.

SYLLABUS

I – SEMESTER, M.Sc. GEOLOGY

PAPER III: GEOMORPHOLOGY (G-CC-103 c)

(With effect from the admitted batch of 2025-2026)

UNIT – I

Introduction: Fundamental Concepts of Geomorphology, Weathering, soil processes and mass wasting. Geomorphic cycle, Geomorphology of India. Morphology and its relation to structure and lithology.

UNIT – II

Fluvial Geomorphic cycle: Fundamental concepts, streams and valleys, stages of the cycle, the concept of the drainage basin. drainage patterns and slopes and their significance, erosional and depositional landforms in different stages of the fluvial cycle. Morphometric analysis, drainage basin analysis, long river profile and geomorphological mapping.

UNIT – III

Karst topography: Various features associated with the Karst region and Karst Cycle. Arid Cycle: Differences between arid and humid regions, origin of deserts, major arid landforms, aeolian landforms formed by erosion and depositional cycles, topographic effects of wind erosion.

UNIT – IV

Glacial cycle: Ice ages and past climates, geologic and palaeontological evidence, the Quaternary ice ages, Permo-Carboniferous ice ages, Pre-Cambrian ice ages. Types and characteristics of glaciers, mountain glaciation, major erosional and depositional landforms formed by glaciers.

UNIT – V

Coasts: marine erosion, the shore profile, resulting topographic features, Topography of ocean floors: Introduction – continental shelves, slopes, rises and abyssal plains and their geomorphic features. Volcanism: Landforms resulting from volcanism.

PRACTICALS:

Study of topographical maps, numbering system of Indian topographic maps, Contour Profiling, Stream Order numbering, shoreline change studies, and numerical problems in Geomorphology.

TEXTBOOKS:

1. Arthur Holmes (1993), *Principles of Physical Geology*, Springer
2. Barkbank, D. and Anderson, R. S. (2008): *Tectonic geomorphology*, Blackwell Science.
3. Ford, D. and Williams, P. (2007): *Karst hydrology and Geomorphology*. John Wiley and Sons.
4. Garner H. F. (1974): *Origin of Landscapes*, Oxford University Press.
5. Jain. S. (2014): *Fundamentals of Physical Geology*, Springer.
6. Leopold, L. B. (1964): *Fluvial processes in geomorphology*, Eurasia Publishing House.
7. Savindra Singh, *Physical Geography*, Pravallika Publications, Allahabad
8. Summerfield, M. A. (1999): *Global geomorphology- an introduction to the study of landforms*, Longman.
9. Thornbury, W. S: *Principles of Geomorphology*, Wiley Eastern New Delhi.

MODEL QUESTION PAPER
I – SEMESTER, M.Sc. GEOLOGY
PAPER III, GEOMORPHOLOGY (G-CC-103 c)
(With effect from the admitted batch of 2025-2026)

Time: 3hours

Max marks 60

Answer ANY FIVE Questions, choosing one from each Unit
All questions carry equal marks.

UNIT-I

1. Write an essay of the fundamental concepts of Geomorphology.

OR

2. Write short notes on **ANY TWO** of the following

- a) Weathering
- b) Mass wasting.
- c) Soil processes

UNIT-II

3. Write an essay on the concept of drainage basin.

OR

4. Write short notes on **ANY TWO** of the following

- a) Streams and valleys
- b) Fluvial depositional land forms
- c) Long river profile

UNIT-III

5. Explain about the various features associated with the Karst region

OR

6. Write short notes on **ANY TWO** of the following

- a) Arid cycle
- b) Aeolian depositional land forms
- c) Topographic effects of wind erosion.

UNIT-IV

7. Discuss in detail about the Quaternary ice ages.

OR

8. Write short notes on **ANY TWO** of the following

- a) Glacial erosional land forms
- b) Types of Glaciers
- c) Carbonic ferrous ice age

UNIT-V

9. Write a descriptive note on the topography of ocean floors

OR

10. Write short notes on **ANY TWO** of the following

- a) Volcanic land forms
- b) Marine erosion
- c) Sea Mount.

SYLLABUS

I – SEMESTER, M.Sc. GEOLOGY

Paper IV, HYDROGEOLOGY (G-SOC-104)

(With effect from the admitted batch of 2025-2026)

UNIT-I

Occurrence and distribution of Groundwater: Origin of Water; Hydrologic cycle; Vertical Distribution of water below ground; Types of Aquifers- Unconfined, Confined, Semi - Confined & Perched; Hydrological properties of rocks/ sediments – Porosity Specific Yield, Specific Retention Hydraulic conductivity, Specific storage, Storativity and Transmissivity, Springs; Hydrothermal phenomena.

UNIT-II

Groundwater Mechanics: Darcy's Law and its Application; Determination of Permeability in laboratory. Steady State, Unsteady State and Radial Flow equations; Tracer Studies; Pumping Tests-, Estimation of T & S by Theis, Jacob and Theis Recovery Methods, Specific Capacity by Slichter's Method.

UNIT-III

Exploration and Water Wells: Ground Water Exploration- Remote Sensing. Hydrogeological and Surface Geophysical Methods; Types of wells, Drilling Methods, Construction, Design and Maintenance of Shallow Wells, Deep Wells in Hard rocks, Soft rocks and in Unconsolidated Sediments; Well Rehabilitation; Pumping equipment.

UNIT-IV

Groundwater Chemistry: Quality of Ground Water, Physical and Chemical properties; Quality criteria for domestic, irrigation and industrial uses; Graphical presentation of Water quality data; Sources of pollution; Sea water intrusion and its control; Problems of Arsenic, Fluoride and Nitrate; Radioisotopes in Ground Water Studies.

UNIT-V

Groundwater Management: Water Table Contour maps; Water Table fluctuation and causative factors; Overexploitation and Ground Water Mining; Groundwater Management in Urban and Rural areas – supply side and demand side management Artificial Recharge, Rainwater Harvesting and Micro Irrigation. Renewable and Non-renewable Ground Water resources; Concept of Basin Management, Land Subsidence; Conjunctive Use of Groundwater and Surface Water. Modelling Techniques; Ground Water Provinces of India; Ground Water Legislation.

PRACTICALS:

Hydrogeological surveys. Problems on well hydraulics, vertical electrical sounding and interpretation of the data. Pumping test. Processing of data for T & S by Theis. Jacob and Theis recovery methods. Specific capacity of wells by Slichter's method and graphical presentation of chemical data.

(P.T.O)

TEXTBOOKS:

1. Alley, W.M., (1993): ***Regional Ground Water Quality***
2. Davies, S.N. & De Wiest, R.J.M. (1966): ***Hydrogeology***
3. Fetter, C.W. (1990): ***Applied Hydrogeology***
4. Freeze, R. A. and Cherry, J. A. (1979): ***Groundwater***.
5. Karanth, K.R., (1987): ***Groundwater Assessment-Development and Management***
6. Patrick, A. (1972): ***Concepts and models in groundwater hydrology***.
7. Raghunath, N.M., (1982): ***Ground Water-Wiley Eastern***
8. Ramakrishnan, S. (1998): ***Groundwater***
9. Sharma, R. K. (1979): ***A textbook of hydrology & water resources***,
10. Todd, D. K. (1980): ***Groundwater hydrology***,
11. Tolman, C. F. (1937): ***Groundwater***
12. Walton, W. C. (1970): ***Groundwater resource evaluation***.

MODEL QUESTION PAPER
I – SEMESTER, M.Sc. GEOLOGY
PAPER – III, HYDROGEOLOGY (G-SOC-104)
(With effect from the admitted batch of 2025-2026)

Time: 3Hrs

Max. Marks: 60

Answer FIVE questions, choosing ONE from each Unit.
All questions carry equal marks.

UNIT-I

1. What are aquifers? Bring out their salient features along with their classification. Explain the geological framework of an artesian aquifer.

OR

2. Write short notes on **ANY TWO** of the following:
- a) Precipitation.
 - b) Evaporation and transpiration.
 - c) Vertical distribution of ground water.

UNIT-II

3. Describe the occurrence of groundwater in sedimentary formations,

OR

4. Write short notes on **ANY TWO** of the following:
- a) Hydraulic conductivity.
 - b) Storage coefficient.
 - c) Specific yield.

UNIT-III

5. State Darcy's law. Describe differential equations governing steady and unsteady state of groundwater flow.

OR

6. Write short notes on **ANY TWO** of the following:
- a) Boundary conditions.
 - b) This method of pumping tests.
 - c) Flow net analysis.

UNIT-IV

7. Explain in detail the different drilling methods.

OR

8. Write short notes on **ANY TWO** of the following:
- a) Well maintenance.
 - b) Well development.
 - c) Tube wells.

UNIT-V

9. Give a brief account of ground water pollution.

OR

10. Write short notes on **ANY TWO** of the following:
- a) Diagrammatic representation of chemical data.
 - b) Bacteriological parameters.
 - c) Classification of irrigation waters.

SYLLABUS

I – SEMESTER, M.Sc. GEOLOGY

Paper IV, STATISTICAL GEOLOGY AND COMPUTER APPLICATIONS

(G-SOC-104 a)

(With effect from the admitted batch of 2025-2026)

UNIT - I

Introduction to statistics, Frequency distribution; Measures of central tendency measures of dispersion, skewness and kurtosis, probability their, theoretical distributions theory of simple sampling.

UNIT - II

Graphical presentation of Frequency distribution - histogram, frequency polygon and Ogives for the given set of geological data. Box Plots, Tree –leaf diagrams

UNIT - III

Concept of correlation and regression; exact tests and confidence intervals; chi-square test; t-test and F-test; Analysis of variance (one-way); Time series analysis; introduction to factor analysis; cluster analysis and their use in geology.

UNIT - IV

Fundamentals of Organization of Computer hardware - Processor, Input and Output devices. Operating systems Windows, Lynix. Basic functions of an operation system. Introduction to computer languages – Machine languages- Assembly languages –High level languages.

UNIT - V

Application of computers in earth sciences; Introduction to software packages used in earth science Use of computers in the mineral industry; computerisation of mineral preparation process, mineral exploration and mining. Application of Spatial data sets in geosciences. Introduction to geographic information systems. Raster and Vector Data Analysis in Geology.

PRACTICALS:

Introducing personal computer. Exercises to familiarise the operating systems - Windows. Exercises to familiarise the popular word processing softwares. Introducing the packages for creating graphics. Introducing popular statistical packages,

TEXTBOOKS:

1. John C (1986), *Statistics and data analysis in geology*.
2. Richard B (1975). McCammon- *Concepts in Geostatistics*, Ed.
3. Roger Till (1980)-*Statistical methods for earth scientist and introduction*
4. Gupta and Kapoor (1989), *Textbook of Statistics* (1989)
5. *Introduction to personal computers*-Schaum's outline series, 1990;

MODEL QUESTION PAPER

I – SEMESTER, M.Sc. GEOLOGY

Paper IV a - STATISTICAL GEOLOGY AND COMPUTER APPLICATIONS (G-SOC-104a)

(With effect from the admitted batch of 2025-2026)

Time: 3Hrs

Max. Marks: 60

**Answer FIVE questions, choosing ONE from each Unit.
All questions carry equal marks.**

UNIT-I

1. Discuss the various measures of central tendency.

OR

2. Write short notes on **ANY TWO** of the following:

- a) Standard deviation.
- b) kurtosis.
- c) Normal Distribution.

UNIT-II

3. Describe various graphical presentation of Frequency distribution data

OR

4. Write short notes on **ANY TWO** of the following:

- a) Box plot
- b) Tree -leaf diagrams
- c) Determination of median using Ogives

UNIT-III

5. Describe briefly cluster analysis and its application in Geology

OR

6. Write short notes on **ANY TWO** of the following:

- a) Correlation
- b) Chi-Square test.
- c) ANOVA (one way).

UNIT-IV

7. Describe briefly the Organization of computer Hardware

OR

8. Write short notes on **ANY TWO** of the following:

- a) Assembly Language.
- b) High level Languages.
- c) Basic functions of Operating Systems.

UNIT-V

9. Describe briefly the application of Computers in Geological Sciences.

OR

10. Write short notes on **ANY TWO** of the following:

- a) GIS
- b) Raster Data Analysis
- c) Application of Spatial Data sets in Geo Sciences

SYLLABUS

I – SEMESTER, M.Sc. GEOLOGY

Paper V: FIELD GEOLOGY AND SURVEYING (G-SOC-105)

(With effect from the admitted batch of 2025-2026)

UNIT – I

Field Techniques: Field Equipment, Basic measurements and data collection, Field sketches and logs for sedimentary, metamorphic and igneous terrains.

UNIT – II

Identification of litho units, interrelationship of various litho units, identification of structures, sequence of structural events, and Geological sections.

UNIT – III

Study of Topographic maps: Topographic maps & types, scales, Interpretation of contours identification of topographic features slope measurements, surveying techniques, coordinate systems – projections.

UNIT – IV

Chain surveying, Compass surveying, Prismatic surveying, Abney level.

UNIT – V

Theodolite surveying, Dumpy level, optical Alidade, Total station, DGPS survey and Drone survey

PRACTICALS:

Preparation of Geological sections & panel diagram reading of toposheets, extraction of features Toposheet. Chain surveying, compass surveys, Abney level, Theodolite dumpy level, Optical Alidade, Total station, DGPS survey.

TEXTBOOKS:

1. F.H. Lahee: *Field Geology*, Sixth edition, CBS publishers and Distributors Pvt.Ltd.
2. Compton, R.R. (1962) *Manual of Field Geology*, John Wiley and Sons, Inc. 8.
3. Mathur, S.M. (2001) *Guide to Field Geology*, Prentice-Hall, New Delhi

MODEL QUESTION PAPER

I – SEMESTER, M.Sc. GEOLOGY

Paper V: FIELD GEOLOGY AND SURVEYING (G-SOC-105)

(With effect from the admitted batch of 2025-2026)

Time: 3hours

Max marks 60

**Answer ANY FIVE Questions, choosing one from each Unit
All questions carry equal marks.**

UNIT-I

1. Explain in detail about field techniques.

OR

2. Write short notes on **ANY TWO** of the following
- Field Equipment
 - strike and dip measurements
 - Field sketches and logs for sedimentary terrain.

UNIT-II

3. Explain the procedure of Identification of litho-units.

OR

4. Write short notes on **ANY TWO** of the following
- Identification of structures
 - sequence of structural events
 - Geological cross-sections

UNIT-III

5. What is topographic Map and Explain it types?

OR

6. Write short notes on **ANY TWO** of the following
- Identification of topographic features
 - Surveying techniques
 - coordinate systems – projections

UNIT-IV

7. Write a detail note on chain surveying

OR

8. Write short notes on **ANY TWO** of the following
- Procedure of Compass surveying
 - Prismatic surveying
 - Explain the procedure of Abney level for elevation measurement.

UNIT-V

9. Explain the principle and procedure of DGPS Survey and its Applications.

OR

10. Write short notes on **ANY TWO** of the following
- Theodolite surveying
 - Total Station
 - Drone Survey.

SYLLABUS

I – SEMESTER, M.Sc. GEOLOGY

Paper V a- GEOLOGICAL MAPPING TECHNIQUES (G-SOC-105 a)

(With effect from the admitted batch of 2025-2026)

UNIT I

Introduction to field geology, Objectives of fieldwork, Importance of field safety. The Field Notebook: Purpose of Field Notes, Field Notebook Layout, Field Sketches. Written Notes: Recording Data. Scale of observation: Regional context, Whole exposure, Hand specimens. Instruments used in the field: GPS, Brunton compass, Geological Hammer & altimeter. Parts, functions and use of Brunton compass, GPS. Preparedness for field survey: Base map, Geological maps, toposheets and Indian numbering system, Reading toposheets, interpretation of contour patterns

UNIT II

Concept of dip and strike, Recording orientation of planar and linear features. Reporting orientation data: Azimuth, Quadrant reading. Stereographic projections of geological structures. Establishment of relative ages: cross-cut relations, xenoliths. Recognition of folds, faults and unconformities in the field. Measuring the thickness of inclined strata. Locating position on toposheet and concept of forward bearing. Field report writing

UNIT III

Observations and Recording of important field information. Recording features of sedimentary: Recording sedimentary lithology, Recording sedimentary structures, Graphic logs.

UNIT-IV

Recording Igneous Rocks: Relationships with surrounding rocks, Internal architecture: Joints, veins, and other exposure-scale fabrics. Mineralogy and small-scale textures of igneous rocks. Recording Features of Metamorphic Rocks: Field relations and context, Textures, Identifying common metamorphic minerals. Pre-kinematic features, Syn-kinematic features, Post-kinematic features.

UNIT V

Importance of field photographs. Sampling: Selecting and labelling samples, Samples for thin sections, and oriented samples. Samples for geochemical analysis. Recording Palaeontological information: Sampling Strategies & Estimating abundance. Mapping techniques: traverse mapping, contact mapping, exposure mapping. Map symbols. Structural measurements and notations, Brittle structures: Faults, joints

(P.T.O)

PRACTICALS

Geological Field Survey: Field work including geological and structural mapping. Preparation of field report based on the recorded data, mapping data as well as laboratory work on the rock samples collected during the fieldwork

TEXTBOOKS:

1. McClay, K.R. 2013. *Mapping of Geological Structures* (Geological Society of London Handbook)
2. Angela L. Coe, Tom W. Argles, David A. Rothery, Robert A. Spicer, 2010. *Geological Field Techniques*.
3. Roger Marjoribanks, 2010. *Geological Methods in Mineral Exploration and Mining*,

MODEL QUESTION PAPER

I – SEMESTER, M.Sc. GEOLOGY

Paper V a- GEOLOGICAL MAPPING TECHNIQUES (G-SOC-105 a)

(With effect from the admitted batch of 2025-2026)

Time: 3hours

Max marks 60

**Answer ANY FIVE Questions, choosing one from each Unit
All questions carry equal marks.**

UNIT-I

1. Describe the objectives of field geology

OR

2. Write short notes on **ANY TWO** of the following
- Brunton compass
 - Geological maps
 - Toposheets

UNIT-II

3. Describe the stereographic projections of structures

OR

4. Write short notes on **ANY TWO** of the following
- Xenoliths
 - Recognition of faults in the field
 - unconformities

UNIT-III

5. What are the different recording sedimentary structures.

OR

6. Write short notes on **ANY TWO** of the following
- Field observations
 - Sedimentary lithology
 - Graphic logs

UNIT-IV

7. Describe the mineralogy and small –scale textures of Igneous

OR

8. Write short notes on **ANY TWO** of the following
- Recording features of Metamorphic rocks
 - Joints
 - Post-kinematic features

UNIT-V

9. Describe the mapping techniques and different mapping

OR

10. Write short notes on **ANY TWO** of the following
- Sampling Strategies
 - Palaeontology information.
 - Thin section

**ANDHRA UNIVERSITY
DEPARTMENT OF GEOLOGY
COLLEGE OF SCIENCE AND TECHNOLOGY**



**Scheme of Instruction and Examinations
M.Sc. GEOLOGY (II - SEMESTER)**
(With effect from the admitted batch 2025-2026)

II – SEMESTER, M.Sc. GEOLOGY
Scheme of Instruction and Examinations
(With effect from the admitted batch of 2025-2026)

S. No.	Course Code	Course	Teaching/ Lab Hours Per week	Duration of Examination hours	Allotment of Marks		Total Marks	Subject Credits
					Final	Mid- Exam		
01.	G-CC – 201 (T)	Stratigraphy and Indian Geology	3	3	60	40	100	3
02.	G-CC – 202 (T)	Sedimentology and Sedimentary Petrology	3	3	60	40	100	3
03.	G - CC -203 a (T) G - CC -203 b (T) G - CC -203 c (T)	(Optional any one) Geochemistry and Isotope Geology. Sedimentary Basins of India. Geodynamics	3	3	60	40	100	3
04.	G-SOC -204 (T) G-SOC-204 a (T)	(Optional any one) Economic Geology and Indian Mineral Deposits. Instrumentation in Geology.	3	3	60	40	100	3
05.	G-SOC-205(T) G-SOC-205 a (T)	(Optional any one) Paleontology Petroleum Geology	3	3	60	40	100	3
06.	G-OOTC-206 (T)	Open Online Transdisciplinary course	3	3	50		50	2
07.	G -207 (T) G -207 a (T)	(Optional any one) (Online Course) Indian knowledge systems 2 Indian knowledge systems 2 a	3	3	75		75	0 AUDIT SCORE
08.	G-CC – 201 (P)	Stratigraphy and Indian Geology	2	3	25		25	1
09.	G-CC – 202 (P)	Sedimentology and Sedimentary Petrology	2	3	25		25	1
10.	G - CC -203 a (P) G - CC -203 b (P) G - CC -203 c (P)	(Optional any one) Geochemistry and Isotope Geology. Sedimentary Basins of India. Geodynamics	2	3	25		25	1
11.	G-SOC -204 (P) G-SOC-204 a (P)	(Optional any one) Economic Geology and Indian Mineral Deposits. Instrumentation in Geology.	2	3	25		25	1
12.	G-SOC-205(P) G-SOC-205 a (P)	(Optional any one) Paleontology Petroleum Geology	2	3	25		25	1
13.	G-CC-208- (P)	Viva Voce	-	-	25		25	1
TOTAL							775	23

SYLLABUS

II – SEMESTER, M.Sc. GEOLOGY

PAPER – I, STRATIGRAPHY & INDIAN GEOLOGY (G-CC-201)

(With effect from the admitted batch of 2025-2026)

UNIT – I

Importance and Principles of Stratigraphy, Geological Time Scale, Hutton's Uniformitarianism – Controls and Development of Stratigraphic Record, Lithostratigraphic Correlation and Stratigraphic Code.

UNIT – II

Biostratigraphy: Review of Current Trends, Zonation and Time Significance. Magnetostratigraphy, Cyclostratigraphy and Event Stratigraphy.

UNIT – III

Seismic Stratigraphy and Sequence Stratigraphy, Geochronology and Chronostratigraphy, Chemostratigraphy, Completeness and Incompleteness of Stratigraphic Records.

UNIT – IV

Characteristics of Archean Granite-Greenstone Belts; Indian Stratigraphy- Geological Evolution of Archean Nuclei (Dharwar, Bastar, Singhbhum Aravalli and Bundelkhand); Proterozoic Mobile Belts-Eastern Ghats Mobile Belt, Southern Granulite Terrain, Central Indian Tectonic Zone, Aravalli- Delhi Belt, North Singhbhum Mobile Belt; Proterozoic Sedimentary Basins (Cuddapah and Vindhyan)

UNIT – V

Phanerozoic Stratigraphy- Paleozoic (Spiti, Kashmir and Kumaon), Mesozoic (Spiti, Kutch, Narmada Valley and Trichinopoly), Gondwana supergroup, Cenozoic (Assam, Bengal Basins, Garhwal- Shimla Himalayas); Siwalik; Boundary Problems in Indian Stratigraphy.

(P.T.O)

PRACTICALS:

- a) Preparation of Stratigraphic Cross Sections, Development of Stratigraphic Panel (Fence) Diagrams and Intertonguing Diagrams.
- b) Construction of Biostratigraphic Range Charts and Paleoenvironmental Analysis of Well Sections.
- c) Study of Paleogeographic Maps.
- d) Interpretation of Seismic Sections and Seismic Sequence Analysis.

TEXT BOOKS:

1. Boggs, Sam JR. (1995): *Principles of Sedimentology and Stratigraphy*, Prentice Hall.
2. Brenner, R.E and MC Hargue, T.R. (1988): *Integrative Stratigraphy Concepts and Applications*, Prentice Hall.
3. Doyle, P and Bennet, M.R. (1996): *Unlocking the Stratigraphic Record*, John Wiley.
4. Haq, B.U and Boersma, A. (1978): *Introduction to Marine Micropaleontology*, Elsevier.
5. Marwin Weller, J. (1960): *Stratigraphic Principles and Practice*, Harper and Row Publisher.
6. Prothero, D.R. (1988): *Bringing Fossils to Life. An Introduction to Paleobiology*, MC Graw Hill.
7. Ramakrishnan, M and Vaidyanadhan, R. (2010): *Geology of India (Vol. 1&2)*, Geological Society of India.
8. Ravindra Kumar. (1985): *Fundamentals of Historical Geology and Stratigraphy of India*, New age International Publishers Fourth edition.

MODEL QUESTION PAPER

II – SEMESTER, M.Sc. GEOLOGY

PAPER – I, STRATIGRAPHY & INDIAN GEOLOGY (G-CC-201)

(With effect from the admitted batch of 2025-2026)

Time: 3Hrs

Max. Marks: 60

**Answer FIVE questions, choosing ONE from each Unit.
All questions carry equal marks.**

UNIT-I

1. Write an essay on principle of correlation.

OR

2. Answer any **TWO** of the following
- Uniformitarianism.
 - Geologic time scale.
 - Lithostratigraphy.

UNIT-II

3. Write an essay on cyclostratigraphy and event Stratigraphy.

OR

4. Answer any **TWO** of the following
- Zonation.
 - Magnetostratigraphy.
 - Biostratigraphy.

UNIT-III

5. Discuss about seismic Stratigraphy and sequence Stratigraphy.

OR

6. Answer any **TWO** of the following:
- Completeness of stratigraphic records.
 - Geochronology.
 - Chronostratigraphy

UNIT-IV

7. Describe the stratigraphy of Dharwars.

OR

8. Answer any **TWO** of the following:
- Easter Ghats Mobile Belt
 - Stratigraphy of Cuddapah System
 - Vindhyan system

UNIT-V

9. Describe the Triassic success of Spiti.

OR

10. Answer any **TWO** of the following:
- Bengal Basin
 - Siwalik
 - K-T Boundary

SYLLABUS

II – SEMESTER, M.Sc. GEOLOGY

PAPER – II, SEDIMENTOLOGY AND SEDIMENTARY PETROLOGY (G-CC-202)

(With effect from the admitted batch of 2025-2026)

UNIT - I

Earth Surface System: History and Development of Sedimentology. Liberation and Flows of Sediments, Processes of Transport and Generation of Mechanical, Chemical and Biogenic Sedimentary Structures and Controls on the Sedimentary Rock Record.

UNIT –II

Origin of Sedimentary Rocks, Sedimentary Textures, Frame Work Matrix and Cement of Terrigenous Sediments. Definition, Measurement and Interpretation of Grain Size Sieving and Grain Size Parameters. Diagenesis.

UNIT – III

Sedimentary Environments and Facies. Characteristics of Continental Environments: Desert, Fluvial, Glacial, Lacustrine, Deltaic and Transitional- Lagoonal, Littoral and Barrier Complex.

UNIT- IV

Clastic Sediments- Gravel, Sand and Mud. Biogenic, Chemical and Volcanogenic Sediments. Classification, Petrography, Diagenesis and Petrogenesis of Conglomerates, Sandstones, Mudstones and Carbonate Rocks.

UNIT-V

Sedimentary Basin Filling, Basin Morphology. Basin Mapping Methods, Basin Analysis, Provenance.

(P.T.O)

PRACTICALS:

- a) Study Primary, Secondary and Biogenic Sedimentary Structures in Hand Specimens, Photographic Atlases, Field Photographs and Wherever Possible on Outcrops.
- b) Pipette Analysis – Sand, Silt and Clay Separation and Estimation of Percentages.
- c) Size Analysis – (Sieving), Calculation of Grain Size Parameters.
- d) Heavy Mineral- Liquid Separation-Bromoform Method.
- e) Graphical Representation of Data-Preparation of Histograms, Triangular Coordinate Diagrams and Shepard's Classification Chart.
- f) Microscopic Study of Heavy Minerals and Sedimentary Rocks.

TEXT BOOKS:

1. Allen, J.R.L. (1985): *Principles of Physical Sedimentation*, George Allen & Unwin.
2. Allen, P. (1997): *Earth Surface Processes*, Blackwell.
3. Bhattacharya, A and Chakraborti, C. (2000): *Analyses of Sedimentary Successions*, Routledge Taylor & Francis Group
4. Blatt H, Murray, G.V and Middleton, R.C. (1980): *Origin of Sedimentary Rocks*, Prentice Hall.
5. Boggs Sam JR. (1995): *Principles of Sedimentology and Stratigraphy*, Prentice Hall.
6. Davis, R.A. (1992): *Depositional Systems*, Prentice Hall.
7. Einesele, G. (1992): *Sedimentary Basin*, Springer-Verlag.
8. Friedman, G.M, and Sanders, J.E. (1979): *Principles of Sedimentology*, Wiley New York.
9. Miall, A.D. (2000): *Principles of Sedimentary Basin Analysis*, Springer-Verlag.
10. Milner, H.B. (1962): *Sedimentary Petrography*, George Allen and Unwin.
11. Nicholas, G. (1999): *Sedimentology and Stratigraphy*, Blackwell.
12. Pettijohn, F.J. (2005): *Sedimentary Rocks*, Harper & Row.
13. Potter, P.E and Pettijohn, F.J. (1977): *Paleocurrents and Basin Analysis*, Springer-Verlag.
14. Prothero, D.R. and Schwab, F. (1996): *Sedimentary Geology*, Freeman.
15. Reineck, H.E and Singh, I.B. (1980): *Depositional Sedimentary Environments*, Springer.
16. Sengupta, S. (1997): *Introduction to Sedimentology*, Oxford-IBH

MODEL QUESTION PAPER

II – SEMESTER, M.Sc. GEOLOGY

PAPER – II, SEDIMENTOLOGY AND SEDIMENTARY PETROLOGY (G-CC-202)

(With effect from the admitted batch of 2025-2026)

Time: 3Hrs

Max. Marks: 60

**Answer FIVE questions, choosing ONE from each Unit.
All questions carry equal marks.**

UNIT-I

1. Write an essay on different sedimentary structures generated by mechanical and chemical process. Illustrate with neat sketches.

OR

2. Write notes on **ANY TWO** of the following:
- Sedimentary rock record.
 - Biogenic sedimentary structures.
 - Processes of transport.

UNIT-II

3. What are grain size parameters? Explain their importance in the interpretation of deposition of sediments.

OR

4. Write notes on **ANY TWO** of the following:
- Sedimentary texture.
 - Wentworth grade scale .
 - Origin of sedimentary rocks

UNIT-III

5. What is delta? Explain the detailed notes of various deposits formed in the deltaic environment.

OR

6. Write notes on **ANY TWO** of the following:
- Glacial environment.
 - Desert environment.
 - Littoral and barrier complex.

UNIT-IV

7. Write an essay on the classification on the carbonate rocks.,

OR

8. Write notes on **ANY TWO** of the following:
- Classification of sandstones.
 - Chemical and volcanogenic sediments.
 - Clastic sediments

UNIT-V

9. Write an essay on Basin Mapping Methods.

OR

10. Write notes on **ANY TWO** of the following:
- Basin Morphology
 - Basin Analysis
 - Provenance

SYLLABUS

II – SEMESTER, M.Sc. GEOLOGY

PAPER - III, GEOCHEMISTRY AND ISOTOPE GEOLOGY (G-CC-203 a)

(With effect from the admitted batch of 2025-2026)

UNIT-I

Concept of Geochemistry: Origin of Elements, Cosmic Abundance of Elements, Geochemical Evolution of the Earth, Types of Nuclides: Isotopes, Isotones, Isobars & Isomers; Composition and classification of Meteorites, Structure and Composition of the Earth, Geochemical Classification of Elements.

UNIT-II

Thermodynamics and Crystal Chemistry; Fundamentals of Thermodynamic Equations Principles of Crystal Structure. Silicate Structures; Isomorphism, Solid Solution, and Polymorphism. Major, Minor and Trace Elements. Minor Elements during Magmatic Crystallization. Rare Earth Geochemistry-Chondrite normalised plots

UNIT-III

Geochemical Cycle Geochemical Mobility under Low and High P-T-t Conditions; Geochemical Dispersion, Primary and Secondary Dispersion Patterns, and their Classification; Geochemistry of Lithosphere, Atmosphere, Biosphere, Hydrosphere.

UNIT-IV

Nernst's Partition Coefficient (Compatible and Incompatible Elements), Nernst-Berthelot Partition Coefficient and Bulk Partition Coefficient; Fick's Laws of Diffusion and Activity Composition Relation (Roult's and Henry's law); Principles of Equilibrium and Rayleigh Fractionation; Eh and pH Diagrams (Natural Environments and Sedimentary Association).

UNIT-V

Radioactivity-N-Z graph; Half-Life and Decay Equation; Uranium Thorium Decay Series, Dating of Minerals and Rocks with Potassium-Argon, Rubidium-Strontium, Uranium-Lead, Samarium-Neodymium & Carbon dating techniques; Types of Isotopes-Stable Isotope Geochemistry of Carbon, Oxygen and Sulphur and their Applications in Geology; Neutron Activation Analysis, Nuclear Reactors.

(P.T.O)

PRACTICALS:

- a) Sampling and Sample Preparation – Methods of Preparation of ‘B’ Solution (Dissolution Procedures).
- b) Determination of Elemental Concentration on Atomic Absorption Photo Spectrometer.
- c) Calculation of Radiometric Dating of Minerals.

TEXT BOOKS:

1. Brian Mason and Moore, C.B. (1982): *Principles of Geochemistry*, John Wiley & Sons.
2. Faure, G. & Mensing, T.M. (2005): *Isotopes: Principles and Applications*, John Wiley & Sons.
3. Faure, G. (1986): *Principles of Isotope Geology*, John Wiley & Sons.
4. Gold Schmidt, V.M. (1954): *Geochemistry*, Oxford University Press.
5. Jochen Hoefs. (2009): *Stable Isotope Geochemistry*, Springer.
6. Krauskopf, K.B. and Bird, D. K. (1995): *Introduction to Geochemistry*, McGraw Hill, New York.
7. Kula C. Misra. (2012): *Introduction to Geochemistry Principles and Applications*, John Wiley & Sons.
8. Siegel, F.R. (1974): *Applied Geochemistry*, John Wiley & Sons.
9. William M. W. (2005): *Geochemistry*, John Wiley & Sons.

MODEL QUESTION PAPER

II – SEMESTER, M.Sc. GEOLOGY

PAPER – III, GEOCHEMISTRY & ISOTOPE GEOLOGY (G-CC-203 a)

(With effect from the admitted batch of 2025-2026)

Time: 3Hrs

Max. Marks: 60

**Answer FIVE questions, choosing ONE from each Unit.
All questions carry equal marks.**

UNIT-I

1. Write an essay on Geochemical Classification of the elements

OR

2. Write notes on **ANY TWO** of the following:
- Cosmic abundance of elements
 - The Composition of the earth crust
 - Composition of the meteorites

UNIT-II

3. Describe Rare earth geochemistry and their abundance and mobility in crust level

OR

4. Write notes on **ANY TWO** of the following:
- Significance of crystal chemistry
 - Distribution coefficient of trace elements
 - Isomorphism

UNIT-III

5. Explain briefly the geochemical mobility under low and high Pressure – Temperature conditions

OR

6. Write notes on **ANY TWO** of the following:
- Primary dispersion patterns.
 - Geochemistry of Lithosphere.
 - Geochemistry of atmosphere.

UNIT-IV

7. Describe the Process of water – rock interaction

OR

8. Write notes on **ANY TWO** of the following:
- Migration of elements in endogenic environment
 - Mineral stability
 - Eh-pH diagram

UNIT-V

9. Write an essay on Radiometric dating of minerals

OR

10. Write notes on **ANY TWO** of the following:
- Radiogenic Isotopes
 - Geochemistry of uranium
 - Nuclear Reactors

SYLLABUS

II – SEMESTER, M.Sc. GEOLOGY

PAPER- III, SEDIMENTARY BASINS OF INDIA (G-CC-203 b)

(With effect from the admitted batch of 2025-2026)

UNIT-I

Classification of Tectonic Basin, Tectonics and Basin Filling, Basin Morphology and Depositional Environments. Basin Evolution and Sediment: Rift Basins, Continental Margin and Slope Basins, Intracontinental Sag Basins. Deep-Sea Trenches, Foreland, Back-arc and Retro-arc Basins, Remnant and Foreland Basins, Collision – Related Basins, Pull-Apart Basins, Basin-type Transitions (Polyphase Basins), Young Rift Zones.

UNIT-II

Basin Mapping Methods: Structure and Isopach Contouring, Lithofacies Maps, Geophysical Techniques, Clastic Petrographic Data, Computer Mapping Methods, Stratigraphic Cross Sections, Paleocurrent Analysis, Types of Remote sensing.

Depositional Systems and Sequence Stratigraphy: Stratigraphic Architecture, Non-marine Depositional Systems, Alluvial Depositional Systems, Aeolian Depositional Systems, Lacustrine Depositional Systems, Coastal Depositional System. Clastic Shelves and Associated Depositional Systems, Carbonate and Evaporate Depositional Systems, Clastic Depositional Systems of the Continental Slope, Rise and Basin Plain, Sequence Stratigraphy.

UNIT-III

Stratigraphy, Structure and Tectonics of Onshore and Offshore Sedimentary Basins of East Coast of India with special reference to – Bengal Basin – Mahanadi - Krishna - Godavari and Cauvery Basins.

UNIT-IV

Stratigraphy, Structure and Tectonics of Onshore and Offshore Sedimentary Basins of West Coast of India with special reference to Kutch – Saurashtra – Narmada – Cambay, Bombay High, Kerala – Konkan Offshore Basins.

UNIT-V

Stratigraphy, Structure and Tectonics of other Sedimentary basins of India with special reference to Cuddapah - Vindhyan – Rajasthan - Assam Shelf – and Himalayan Foot Hill Basins.

(P.T.O)

PRACTICALS:

Basin Analysis; Structure and Isopach Contouring, Sand/Shale Ratio Map, Lithofacies Maps, Geophysical Techniques, Computer Mapping Methods, Stratigraphic Cross Sections and Paleocurrent Analysis.

TEXT BOOKS:

- 1) Bhandari, L.L. (1983): *Petroliferous Basins of India*, Petroleum Asia Journal, sponsored by the International Union of Geological Sciences--INSA; organised by K.D. Malaviya Institute of Petroleum Exploration, ONGC.
- 2) Einsele, G. (1992): *Sedimentary Basins*, Springer Verlag.
- 3) Miall, A. (2000): *Principles of Sedimentary Basin analysis*, Springer Verlag.
- 4) Sengupta, S. (1997): *Introduction to Sedimentology*, Oxford – IBH.

Model Question Paper
II – SEMESTER, M.Sc. GEOLOGY
PAPER – III, SEDIMENTARY BASINS OF INDIA (G-CC-203 b)
(Effective from the Admitted Batch of 2025-2026)

Time: 3hourse

Max. Marks: 60

Answer FIVE questions, choosing ONE from each Unit.
All questions carry equal marks.

UNIT – I

1) Write in detail the Tectonic classification of Sedimentary Basins.

OR

2) Write short notes on any **TWO** of the following:

- a) Rift basins
- b) Intercontinental Sag Basins
- c) Foreland Basins.

UNIT – II

3) Explain different mapping methods of Sedimentary Basins.

OR

4) Write short notes on any **TWO** of the following:

- a) Sequence stratigraphy.
- b) Carbonate and evaporate depositional systems.
- c) Nonmarine depositional systems.

UNIT – III

5) Write on the Stratigraphy, Structure and Tectonics of Krishna -Godavari Basin.

OR

6) Write short notes on any **TWO** of the following:

- a) Mahanadi Basin.
- b) Bengal Basin.
- c) Cauvery Basin.

UNIT – IV

7) Write on the Stratigraphy, Structure and Tectonics of Bombay highOffshore Basin.

OR

8) Write short notes on any **TWO** of the following:

- a) Cambay Basin.
- b) Narmada Basin.
- c) Konkan Offshore Basin.

UNIT – V

9) Write on the Stratigraphy, Structure and Tectonics of Assam Basin.

OR

10) Write short notes on any **TWO** of the following:

- a) Cuddapah Basin.
- b) Rajasthan Basin.
- c) Himalayan foot hill Basin.

SYLLABUS

II – SEMESTER, M.Sc. GEOLOGY

PAPER - III, GEODYNAMICS (G-CC-203 c)

(With effect from the admitted batch of 2025-2026)

UNIT-I

Planet Earth: Introduction-Scope and Relation of Geodynamics with Other Branches of Geology; Interior of the Earth: Crust, Mantle and Core; Earthquakes: Distribution of Epicentres; Intensities and Isoseismic Lines; Earthquake Zones; Internal zones of the Earth on the Basis of Seismic Data; Seismic Zones and Major Earthquakes of India.

UNIT-II

Mantle & Core: Heat Flow Mechanism, Core-Mantle Convection and Mantle Plumes. Crustal types; Distribution and Characters; Age Province or Structural Province; Plate Reconstructions; Chronological Studies; Composition of Archean Crust.

UNIT-III

Continental Displacement: Concepts of Continental Drift, Geological and Geophysical Evidences of Continental Drift. Phase Transitions and Seismic Discontinuities in the Earth; Seismic Waves and Relation Between V_p , V_s and Density; Seismic and Petrological Moho; Rheology of Rocks and Fluids (Newtonian and Non-Newtonian Liquids); Rock Magnetism and its Origin; Polarity Reversals, Polar Wandering and Supercontinent Cycles; Mantle Plumes and their Origin; Plate Tectonic-Types of Plate Boundaries and their Inter-relationship; Heat Flow and Heat Production of the Crust.

UNIT-IV

Paleomagnetism: Theory and Mechanism of Sea Floor Spreading. Paleomagnetic Evidences; Rock as Fossil Compasses; Normal and Reversed Magnetism; Paleomagnetic Time Scale; Paleo-position of India and Geodynamics of the Indian plate.

UNIT-V

Geosynclines, Orogenic Belts. Evolution of Folded Mountains. Structural Tectonics & Mountain Building. Tectonics of India & Himalayas. Mobile belts of India. Major Tectonic Features of the World.

(P.T.O)

PRACTICALS:

- a) Location of Major and Minor Plates on World map.
- b) Exercise Related to Major Earthquakes and Volcanoes.
- c) Study of Seismic Map of India and Zonation
- d) Study of Tectonic Map of India and Inferences
- e) Basic Study of the Movement of Indian Plate towards North and its Collision with Eurasian plate and reasons thereof.
- f) Phase Assemblages with Changing Zero-Pressure Densities for a Model of the Upper Mantle to Understand the Earth Geodynamics.

TEXT BOOKS:

1. Condi, K. C. (1989): *Plate tectonics and crustal evolution*, Pergamon (3rd Ed.), 504p.
2. Datta, A. K. (2014): *Introduction to Physical Geology*, Kalyani Publishers, New Delhi.
3. Holmes, A. (1978): *Principles of Physical Geology*, Wiley (3rd Ed), 730p.
4. Siddharth, K. (2015): *The Earth's Dynamic Surface*, KisalayaPub (2nd Ed.), 600p.
5. Singh, S. (1999): *Physical Geology*, Prayag Pustak Bhawan, Allahabad, 555p.

MODEL QUESTION PAPER

II – SEMESTER, M.Sc. GEOLOGY

PAPER – III, GEODYNAMICS (G-CC-203 c)

(With effect from the admitted batch of 2025-2026)

Time: 3hours

Max marks 60

**Answer ANY FIVE Questions, choosing one from each Unit
All questions carry equal marks.**

UNIT-I

1. Describe in detail about the different seismic zones in India

OR

2. Write short notes on **ANY TWO** of the following
- Interior of the earth
 - Epicentre
 - Isosismic lines

UNIT-II

3. Describe in detail about the arechean crust composition

OR

4. Write any two of the following
- Mantle plumes
 - Plate reconstructions
 - Heat flow mechanism between Mantle and core

UNIT-III

5. Describe in detail, about plate tectonic theory

OR

6. Write any two of the following
- Continental drift
 - Rock Magnetism
 - Rheology of Rocks

UNIT-IV

7. Describe in detail about paleomagnetic evidence

OR

8. Write any two of the following
- Sea floor spreading
 - Paleo position of India
 - Reversed magnetism

UNIT-V

9. Major Tectonic features of the world

OR

10. Write any two of the following
- Geosynclines
 - Mobile Belts
 - Folded mountains

SYLLABUS

II – SEMESTER, M.Sc. GEOLOGY

PAPER - IV, ECONOMIC GEOLOGY AND INDIAN MINERAL DEPOSITS (G-SOC-204)

(With effect from the admitted batch of 2025-2026)

UNIT – I

Principles of Formation of Mineral Deposits, Process of Formation of Mineral Deposits, Ore Bearing Fluids. Metallogenic epochs and Provinces – Geological Thermometers.

UNIT –II

Magmatic and Pegmatitic Deposits (Chromite, Ti-magnetite, Diamond, Cu-Ni Sulphide, PGE, REE, Muscovite, Rare Metals); Hydrothermal Deposits (Porphyry Cu-Mo, Greisens Sn-W, Skarn, VMS and SEDEX Type Sulphide Deposits, Orogenic Gold).

UNIT – III

Sedimentary Deposits (Fe, Mn, Phosphorite, Placer); Supergene Deposits (Cu, Al, Ni and Fe); Metamorphic and Metamorphosed Deposits (Mn, Graphite); Fluid Inclusions in Ore Mineral Assemblages-Physical and Chemical Properties using Micro Thermometry.

UNIT – IV

Geological Setting, Mode of Occurrence, Genesis, Distribution and Uses of Chromite, Manganese, Iron, Copper- Lead- Zinc, Bauxite, Placers, PGE Minerals.

UNIT – V

Geological Setting, Mode of Occurrence, Genesis, Distribution and Uses of Coal, Barites, Clay, Limestone, Mica, Phosphates, Precious and Semi-Precious Stones.

PRACTICALS:

- a) Megascopic identification of ore minerals.

TEXT BOOKS:

1. Bateman, Jenson A.M, M.L. (1979): *Economic Minerals Deposits*, third edition, John Willey and sons.
2. Deb, S. (1980): *Industrial Minerals and rocks of India*, Allied Publishers Pvt. Ltd.
3. Gokhale, K.V.G.K. and T.C Rao. (1973): *Ore Deposits in India*, Thomson Press.
4. Lindgren, W. (1933): *Ore Deposits*, McGraw-Hill.
5. Park Jr. C.F. and MacDiarmid, R.A. (1978): *Ore Deposits*, Third Edition, W.H. Freeman & Co Ltd.
6. Stanton, R.L. (1972): *Ore Petrology*, McGraw-Hill.

Model Question Paper

II – SEMESTER, M.Sc. GEOLOGY

Paper – IV, Economic Geology and Indian Mineral Deposits (G-SOC-204)

(With effect from the admitted batch 2025-2026)

Time: 3Hrs

Max. Marks: 60

**Answer FIVE questions, choosing ONE from each Unit.
All questions carry equal marks.**

UNIT-I

1. Discuss the role of pressures and temperatures in ore-bearing fluids.

OR

2. Write short notes on **ANY TWO** of the following:
- Metalogenic epochs.
 - Metalogenic provinces.
 - Geological thermometers.

UNIT-II

3. Describe the Physical properties of ore minerals under reflecting microscope.

OR

4. Write short notes on **ANY TWO** of the following:
- Supergene Enrichment.
 - Preparation of polished section.
 - Metasomatism.

UNIT-III

5. Describe the structures and textures of ore minerals.

OR

6. Write short notes on **ANY TWO** of the following:
- Characteristics of metamorphic paragenesis.
 - Ore microscopic studies in ore dressing.
 - Zoning.

UNIT-IV

7. Describe the geological setting, mode of occurrence, genesis, distribution and uses of Bauxite deposits.

OR

8. Write short notes on **ANY TWO** of the following: :
- Manganese ore.
 - Chromite deposits.
 - Placer deposits.

UNIT-V

9. Give the geological setting, mode of occurrence, genesis, distribution characteristics and uses of coal with reference to India.

OR

10. Write short notes on **ANY TWO** of the following:
- Diamond.
 - Glass.
 - Phosphates.

SYLLABUS

II – SEMESTER, M.Sc. GEOLOGY

PAPER - IV, INSTRUMENTATION IN GEOLOGY (G-SOC-204 a)

(With effect from the admitted batch of 2025-2026)

UNIT- I

Field Instruments: Clinometer Compass, Brunton Compass, Global Positioning System, pH meter, Electric Conductivity Meter, Dissolved Oxygen Meter, Water Level Indicator (Sounder).

UNIT- II

Geological Instruments: Petrological Microscope, Ore Microscopy, Scanning Electron Microscope.

UNIT- III

Geophysical Instruments: Gravimeter, Magnetometer, Resistivity Meter, Instrument for Electric Resistivity Tomography, Seismometer and Other Seismic Instruments.

UNIT- IV

Geochemical Instruments-1: Turbidity Meter/Nephelometer, Atomic Emission Spectroscopy - Flame Photometer, Atomic Absorption Spectroscopy – AAS.

UNIT - V

Geochemical Instrumentation – 2: X Ray Fluorescence (XRF) Spectrometer, X Ray diffraction (XRD) Spectrometer, Mass Spectroscopy (MS), Laser Ablation (La) Inductively Coupled Plasma Mass Spectroscopy (ICPMS).

PRACTICAL:

- a) Imparting the Working Knowledge of Field Instruments like Clinometer Compass, Brunton Compass, GPS, pH, EC and DO meters and Water level Indicators.
- b) Identification of Rock Sections, Ores Using Various Microscopes
- c) Application of Gravimeter, Magnetometer, Resistivity meter, Instrument for Electric Resistivity Tomography, Seismometers and other Seismic instruments in Exploration.
- d) Application of Various Geochemical Instruments in Determining the Composition of Rocks and /or water.

TEXT BOOKS:

1. Joe Carry. (2016): *Geoscience: Instrumentation and Analytical Techniques*, Syrawood Publishing House.
2. Wolff Edward, A. and Enrico P. Mercanti. (1974): *Geoscience Instrumentation*, John Wiley & Sons.

MODEL QUESTION PAPER
II – SEMESTER, M.Sc. GEOLOGY
PAPER - IV, INSTRUMENTATION IN GEOLOGY (G-SOC-204 a)
(With effect from the admitted batch of 2025-2026)

Time: 3hours

Max marks 60

Answer ANY FIVE Questions, choosing one from each Unit
All questions carry equal marks.

UNIT-I

1. Describe in detail about the Global Positioning system

OR

2. Write short notes on **ANY TWO** of the following
- a) Brunton compass
 - b) Conductivity meter
 - c) pH meter

UNIT-II

3. Describe the functioning of the ore microscope

OR

4. Write short notes on **ANY TWO** of the following
- a) Scanning electron microscope
 - b) petrological microscope
 - c) ore mineral textures

UNIT-III

5. Describe in detail about the different Geophysical instruments and its applications

OR

6. Write short notes on **ANY TWO** of the following
- a) Magnetometer
 - b) Resistivity meter
 - c) Seismometer

UNIT-IV

7. Write the function of the Atomic Absorption Spectroscopy(AAS)

OR

8. Write short notes on **ANY TWO** of the following
- a) Atomic Emission Spectroscopy
 - b) Flame photo meter
 - c) Turbidity meter

UNIT-V

9. Discuss in detail a on ICP (MS) and its advantages in chemical analysis

OR

10. Write short notes on **ANY TWO** of the following
- a) XRF
 - b) XRD
 - c) Mass Spectroscopy.

SYLLABUS

II – SEMESTER, M.Sc. GEOLOGY

PAPER - V, PALEONTOLOGY (G-SOC-205)

(With effect from the admitted batch of 2025-2026)

UNIT-I

Modes of Preservation of Fossils, Concept of Taphonomy. Body & Ichonofossils: Morphology, Evolution and Distribution of Cnidaria and Graptolites.

UNIT-II

Morphology, Evolution and Distribution of Brachiopoda, Lamellibranchia and Gastropoda.

UNIT-III

Morphology, Evolution and Distribution of Cephalopoda, Trilobites, Echinoderma and Plant fossils.

UNIT-IV

Morphology, Evolution and Distribution of Proboscidea, Equidae and Hominidae.

UNIT-V

Morphology, Evolution and Distribution of Foraminifera, Ostracoda, Radiolaria, Coccolithophores, Pollen and Spores.

PRACTICALS:

- a) Megascopic Identification of Fossils: Graptolites, Lamellibranchia, Gastropoda, Cephalopoda, Trilobites, Echinoderma and Plant Fossils.
- b) Processing and Preparation of Samples for Microscopic Study.
- c) Identification of Selected Fossils/Species of Foraminifera, Ostracoda and Radiolaria under Stereo Binocular Microscope with CCTV.
- d) Study of Important Microfossils from Stratigraphic Formations of India.
- e) Study of SEM Photographs of Microfossils.
- f) Construction of Biostratigraphic Range Charts and Paleoenvironmental Analysis of Well Sections.
- g) Preparation of Different Stratigraphic Distribution Maps of India. Study of Paleogeographic Maps.

(P.T.O)

TEXT BOOKS:

1. Arnold, C.A. (1947): *An Introduction to Paleobotany*, Agrobios.
2. Bignot, G. (1985): *Elements of Micropaleontology*, Graham and Trotman.
3. ENK Clarkson. (1998): *Invertebrate Paleontology and Evolution*, John Wiley.
4. Haq, B.U. and Boersma, A. (1998): *Introduction to Marine Micropaleontology*, Elsevier.
5. Haynes, J.R. (1981): *Foraminifera*, John Wiley.
6. Henry woods. (1958): *Paleontology Invertebrate*, Cambridge University Press.
7. Lehmann, U. and Hillmer, G. (1983): *Fossil Invertebrates*, Cambridge University Press.
8. Shimmer, H.W. (1933): *An Introduction to the Study of Fossils*, Macmillan.

MODEL QUESTION PAPER
II – SEMESTER, M.Sc. GEOLOGY
PAPER – V, PALEONTOLOGY (G-SOC-205)
(With effect from the admitted batch of 2025-2026)

Time: 3Hrs

Max. Marks: 60

Answer FIVE questions, choosing ONE from each Unit.
All questions carry equal marks.

UNIT-I

1. Describe advances in palaeontology
- OR**
2. Write short notes on **ANY TWO** of the following:
 - a) Concept of Taphonomy
 - b) Distribution of Cnidaria
 - c) Distribution of Graptolites.

UNIT-II

3. Write about morphology, distribution of Brachiopoda.
- OR**
4. Write short notes on **ANY TWO** of the following:
 - a) Morphology of Lamellibranchia.
 - b) Evolution of Gastropoda.
 - c) Distribution of Mollusca

UNIT-III

5. Write about the major morphological characters of trilobites.
- OR**
6. Write short notes on **ANY TWO** of the following:
 - a) Distribution of Cephalopoda
 - b) Morphology of Echinoderma
 - c) Gondwana Plant fossils

UNIT-IV

7. Write Morphology, Evolution and distribution of Proboscidea.
- OR**
8. Write short notes on **ANY TWO** of the following:
 - a) Morphology of Equidae.
 - b) Distribution of Hominidae.
 - c) Evolution of Hominidae.

UNIT-V

9. Write an essay on Morphology, Evolution and distribution of foraminifera.
- OR**
10. Write short notes on **ANY TWO** of the following:
 - a) Spores and Pollens
 - b) Distribution of Radiolaria
 - c) Morphology of Coccolithophores.

SYLLABUS

II – SEMESTER, M.Sc. GEOLOGY

PAPER V, PETROLEUM GEOLOGY (G-SOC-205 a)

(With effect from the admitted batch of 2025-2026)

UNIT-I

Introduction to Petroleum Geology, Type and Nature of Source Rocks, Reservoir Rocks like Sandstones and Limestones, Subsurface Occurrence of Petroleum with Seeps if any, Petroleum Provinces, Pools and Fields.

UNIT-II

Origin of Petroleum – Organic Origin – Nature of Organic Source. Maturation of Kerogen: Biogenic and Thermal Effect. Geological Factors Controlling Hydrocarbon Migration Duration and Stratigraphic Barriers, with Caprocks.

UNIT-III

Reservoir Traps – Classification of Hydrocarbon Traps, Structural, Stratigraphic and Combination. Reservoir Fluids – Water, Oil and Gas and their Physical and Chemical Characters. Fluid Flow: Stratigraphical, Lithological and Structural; Reservoir Characteristics.

UNIT-IV

Petroleum Geochemistry Composition and Characteristics of Liquid and Gaseous Hydrocarbons – Normal, Branched and Cycloalkanes, Aromatics, Asphaltenes, Resins and Compounds Containing Hetero (S,N,O) Atoms. Physical and Chemical Properties of Oils – Carbon Preference Index (CPI). API Gravity, Viscosity, Pour Point, Cloud Point and Flash Point. Classification of Oils. Oil Field Waters and their Classification. Definitions and Characteristics of Some Oil Field Waters – Meteoric Water, Interstitial Water, Connate Water.

Hydrocarbon Generation in Sedimentary Rocks – Burial of Organic Matter and its Preservation Effects of Diagenesis, Catagenesis and Metagenesis Processes and Their Significance. Kerogen – Composition and Conversion to Bitumen, Petroleum and Natural Gas. Time-Temperature Index (TTI) – Its calculation and Correlation to Important Stages of Oil and Gas Generation. Applications of TTI to Petroleum Exploration.

(P.T.O)

UNIT-V

Unconventional Resources: Oil shale, Tar sands, Tight gas sands, Shale gas, Coal Bed Methane (CBM) and Gas (methane) Hydrates. Distinction Between Conventional (Oil and Natural Gas) and Unconventional Resources. Need for Their Exploration and Exploitation in India. Coal Bed Methane (CBM) – Generation, Retention and Liberation of Methane from Coal beds. Methods of Estimation and Production of Methane. Global CBM Resources. Typical Indian Coal Fields Containing Methane – Ranigunj, Bokaro, North and South Karanpura, Eastern and Western Sohapur, Satpura and North Barmer. Gas (methane) Hydrates – Occurrence, Physical Properties, Structure and Composition of Gas Hydrates. Methods of Detection and Production Technologies. Environmental Impacts. Worldwide Distribution of Gas Hydrates with Emphasis on Indian Offshore Regions of the Bay of Bengal Area.

PRACTICALS:

Preparation of Structure Contour map, Location of Oil and Gas based on Stratigraphic Isopach, Sand shale Ratio map and Isolith Maps. Determination of Flash Point, Four point, Cloud Point.

TEXT BOOKS:

1. Bhowmick, P.K. (1993): *Phanerozoic Petroliferous Basins of India*, KDMIPE, ONGC, Dehradun.
2. Levenson, A.I. (1985): *Geology of Petroleum*, C.B.S. Publishers and Distributors, Pvt., Ltd.
3. Rao, G.N. (2022): *Petroleum Geology of India*, Astral International Pvt. Ltd, New Delhi.
4. Selly, R.C. (1998): *Elements of Petroleum geology*, Academic press.
5. Sing, M.P. (1998): *Coal and Organic Petrology*, Hindustan pub. Corp. New Delhi.

MODEL QUESTION PAPER
II – SEMESTER, M.Sc. GEOLOGY
PAPER-V, PETROLEUM GEOLOGY (G-SOC-205 a)
(With effect from the admitted batch of 2025-2026)

Time: 3Hrs

Max. Marks: 60

Answer FIVE questions, choosing ONE from each Unit.
All questions carry equal marks.

UNIT-I

1. Describe the various surface occurrences of petroleum drawing neat sketches wherever necessary.

OR

2. Write short notes on any **TWO** of the following:
 - a) Reservoir rocks.
 - b) Porosity and permeability.
 - c) Kerogen shale.

UNIT-II

3. Write an essay on the origin of Petroleum.

OR

4. Write short notes on any **TWO** of the following:
 - a) Migration of Hydrocarbons
 - b) Cap rock.
 - c) Maturation of Kerogen

UNIT-III

5. Describe the various types of structural traps with neat sketches.

OR

6. Write short notes on any **TWO** of the following:
 - a) Physical properties of crude oil.
 - b) Hydrodynamic traps
 - c) Salt domes.

UNIT-IV

7. Explain the process of thermal maturation of organic matter.

OR

8. Write short notes on any **TWO** of the following:
 - a) Time -Temperature Index (TTI).
 - b) Chemical properties of Oil
 - c) Oil field waters

UNIT-V

9. Discuss in detail the unconventional resources.

OR

10. Write short notes on any **TWO** of the following:
 - a) Coal Bed Methane
 - b) Distribution of Gas Hydrates.
 - c) Raniganj coal fields.

**ANDHRAUNIVERSITY
DEPARTMENT OF GEOLOGY
COLLEGE OF SCIENCE AND TECHNOLOGY**



**Scheme of Instruction and Examinations
M.Sc. GEOLOGY (III - SEMESTER)**
(With effect from the admitted batch 2025-2026)

III – SEMESTER, M.Sc. GEOLOGY

Scheme of Instruction and Examinations

(With effect from the admitted batch 2025-2026)

S. No	Course Code	Course	Teaching/ Lab Hours Per week	Duration of Examination hours	Allotment of Marks		Total Marks	Subject Credits
					Final	Mid- Exam		
01.	G-CC -301 (T)	Marine Geology	3	3	60	40	100	3
02.	G-CC -302 (T)	Remote sensing and GIS	3	3	60	40	100	3
03.	G-CC -303 a(T) G-CC -303 b (T) G-CC -303 c (T)	(Optional any one) Coal & Nuclear Geology. Mining Quaternary Geology.	3	3	60	40	100	3
04.	G-SOC -304 (T) G-SOC -304 a(T)	(Optional any one) Environmental Geology and Engineering Geology. Ore Geology	3	3	60	40	100	3
05.	G-SOC -305 (T) G-SOC -305 a(T)	(Optional any one) Mineral Exploration and Mineral Economics. Water Resource Management.	3	3	60	40	100	3
06.	G-CC -301 (P)	Marine Geology	2	3	25		25	1
07.	G-CC -302 (P)	Remote sensing and GIS	2	3	25		25	1
08.	G-CC -303 a (P) G-CC -303 b (P) G-CC -303 c (P)	(Optional any one) Coal & Nuclear Geology. Mining Quaternary Geology	2	3	25		25	1
09.	G-SOC -304 (P) G-SOC -304 a (P)	(Optional any one) Engineering Geology and Environmental Geology. Ore Geology	2	3	25		25	1
10.	G-SOC -305 (P) G-SOC -305 a (P)	(Optional any one) Mineral Exploration and Mineral Economics. Water Resource Management.	2	3	25		25	1
11.	G – CC–108 (P)	Viva Voce	-	-	25		25	1
TOTAL							650	21

SYLLABUS

III – SEMESTER, M.Sc. GEOLOGY

PAPER- I, MARINE GEOLOGY (G-CC-301)

(With effect from the admitted batch of 2025-2026)

UNIT-I

Introduction and Historical Development of Marine Geology. Hypothesis on the Formation of Oceans. Movements of Ocean Waters. Physical and Chemical Characteristics of Different Ocean Waters. Morphology of the Ocean; Oceanic Crust Structure, Petrology and Sources of Oceanic Crust and Evolution of Oceanic Crust.

UNIT-II

Continental Drift; Sea Floor Spreading; Plate Tectonics – Concept and Geometry of Plate Tectonics; Divergent, Convergent & Transform Movements Driving Mechanism of Plates, Island arcs & Back arc Basins; Continental Margin Types: Active Margins & Passive; Processes on Margins. Nearshore Geological Processes.

UNIT-III

Sea-Coast-Classification; -Physiographic Features along the Coast: Dune, Backshore, Berm, Foreshore & Offshore Sea-Level Changes, Marine Pollution. Law of the Sea. Coastal Regulatory Zone (CRZ), Calcium Carbonate Compensation Depth (CCD), Marine Mineral Resources - Polymetallic Nodules, Mineralogy & Genetic and Economic Aspects.

UNIT-IV

Deep Sea Sediments and Classification; Terrigenous; Biogenic and Authigenic Sediments. Surface and Bottom Currents. Types of Currents: Cold Currents, Warm Currents, Turbidity Currents, Rip Currents & Longshore Currents and their Significance. Geologic Record of Bottom Currents – Method of Study; Erosion, Transportation and Deposition by Bottom Currents.

UNIT-V

Definition of Paleoceanography- Approach to Paleoceanographic Mapping -Late Phanerozoic Paleoceanographic Changes ; Sediment History of the Ocean Basins of Pacific, North & South Atlantic and Indian ocean.

PRACTICALS:

Beach Profile Studies: Estimation of Deposition and Erosion. Interpretation of Echo-Profiles – Continental Shelf, Slope, Rise and Abyssal Plains. Coarse Fraction Studies: Oolites, Glauconite and Phosphorite etc. Clay Mineral Analysis – X-ray Diffraction Charts. Estimation of Calcium carbonate and Magnesium carbonate; Organic Carbon and Organic Matter Percentage in the Sediments.

TEXT BOOKS:

1. James P. Kennett. (1982): *Marine Geology*, Prentice Hall.
2. Pipkin, B.N., Gorsline, D.S., Cassey, R.E. & Hammond, D.E. (1972): *Laboratory Exercises in Oceanography*, Freeman.
3. Seibold, E and Berger, W.H. (1982): *The Sea Floor*, Springer – Verlag.
4. Shepard, F.P. (1948): *Sub Marine Geology*, Harper and Row.
5. William W.A. Anikouchine and R.W. Strenburg. (1981): *The World Ocean*, Prentice Hall.

MODEL QUESTION PAPER

III – SEMESTER, M.Sc GEOLOGY,

PAPER- I, MARINE GEOLOGY (G-CC-301)

(With effect from the admitted batch of 2025-2026)

Time: 3hours

Max marks 60

**Answer ANY FIVE Questions, choosing one from each Unit
All questions carry equal marks.**

UNIT – I

1. Discuss the history and development of marine Geology in the world.
- OR**
2. Write short notes on **ANY TWO** of the following.
 - a) Sources of oceanic crust.
 - b) Physical and chemical characteristics of ocean waters.
 - c) Morphology of the oceans.

UNIT – II

3. What is continental drift? Explain the mechanism of plate tectonics.
- OR**
4. Write short notes on **ANY TWO** of the following.
 - a) Island Arcs.
 - b) Sea floor spreading.
 - c) Nearshore geological processes.

UNIT – III

5. Write detailed notes on classification of sea coasts.
- OR**
6. Write short notes on **ANY TWO** of the following.
 - a) Calcium carbonate compensation Depth. (CCD)
 - b) Marine pollution.
 - c) Law of the sea bed.

UNIT – IV

7. Write detail notes on classification of Deep sea sediments.
- OR**
8. Write short notes on **ANY TWO** of the following.
 - a) Types of currents
 - b) Carbonate sediments.
 - c) Geologic records of Bottom current

UNIT-V

9. Write an essay on the palaeo-oceanography and sediment history of Indian Ocean.
- OR**
10. Write short notes on **ANY TWO** of the following.
 - a) Sediment History of Indian Ocean
 - b) Critical events in ocean history.
 - c) Sediment history of Pacific Ocean

SYLLABUS

III– SEMESTER, M.Sc. GEOLOGY

PAPER II, REMOTE SENSING & GIS (G-CC-302)

(With effect from the admitted batch of 2025-2026)

UNIT - I

Introduction to Photogeology: Aerial Photo Acquisition, Classification and Types of Aerial Photographs, Geometry, Scale, Factors Affecting Scale and Aerial photography, Filters, and Filter Combinations. Stereoscopy: Lens, Mirror Stereoscope, Stereovision, Pseudo Stereovision, Vertical Exaggeration, Image Displacement. Aerial Mosaics: Aerial Mosaics v_s Toposheets. Principles and Fundamentals of Aerial Photo Interpretation and Basic Recognition Elements in Aerial Photographs.

UNIT - II

Remote Sensing Process: Sources of Energy, Energy Interactions in the Atmosphere, Energy Interactions with Earth Surface Features, Spectral Characteristics of Vegetation, Water, and Soil. Electromagnetic spectrum, Atmospheric windows. Orbital Characteristics of Remote sensing Satellites. Platforms and Sensors: Concept of Platforms and Sensors, Remote sensing Systems, Types of Sensors, Resolutions– Spatial, Spectral, Radiometric, and Temporal.

UNIT – III

Satellite and its Classification: Sun-synchronous and Geostationary Orbits. Active and Passive Remote sensing. Remote sensing Satellites in Operation: LANDSAT, SPOT, IRS-series, INSAT, GEOSAT, IKONOS, QUICKBIRD, NOAA, TERRA. Hyperspectral Datasets - HYPERION, HYSI, MODIS, their Sensor Characteristics, and Applications.

UNIT – IV

Image Interpretation: Introduction to Digital Image Processing – Pre-processing of Images, Image enhancement, Image transformations, and Image classification. Application of Remote sensing in Land use and Land cover, Geosciences, Water Resources Management, including Groundwater, Disaster Management - Floods, Landslides, Earthquakes, and Active faults.

UNIT – V

Fundamentals of GIS: Introduction to Geographical Information Systems. Concept of GIS: Definition of GIS, Key Components of GIS, Coordinate system and Map Projections. Spatial and Attribute Information, Integration of Spatial and Non spatial Information. Raster and Vector Datasets, Advantages and Disadvantages of Raster and Vector Data Models. True color composite, - False color composite. GPS: Concept of Global Positioning System (GPS), Working Procedure of GPS, Different Types of Errors in GPS, Applications of GPS in Various Fields.

(P.T.O)

PRACTICAL:

Study of Aerial Photographs, and Identification of Landforms on Oblique/ Vertical Aerial Photographs using Stereoscopes. Application of Tools of ERDAS and Arc GIS, Quantum GIS. Image loading, Display and Image registration, Layer stacking, True colour and False colour images, Satellite image interpretation (Land use Land cover, Forest, Soil, Geomorphology, Surface water, Geology), Image classification. GIS: Digitizing Different Features, Entry of Non-spatial data, linking Spatial and Non-spatial data, Coordinates Transformation and Projections, DEM and DTM Images. Numerical Problems in Remote sensing.

TEXTBOOKS:

1. Ahmed El-Rabbany. (2002): *Introduction to Global Positioning System*, Artech House.
2. Burrough, P.A. and Rachel A.M. (2015): *Principles of GIS*, Oxford University Press.
3. Demers, M. (2008): *Fundamentals of GIS*, John Wiley.
4. George Joseph. (2005): *Fundamentals of Remote sensing*, Universities Press.
5. J.R. Jensen. (2005): *Introductory Digital Image Processing -A Remote Sensing Perspective*, Prentice Hall.
6. Jensen, J.R. (2007): *Remote Sensing of the Environment*, Pearson Prentice Hall.
7. Lillesand, T.M. and Kieffer, R.W. (1987): *Remote Sensing and Image Interpretation*, John Wiley.
8. Millor, V.C. (1961): *Photogeology*, Mc Graw Hill.
9. Moffitt, F.H. and Mikhail, E.M. (1980): *Photogrammetry*, Harper and Row.
10. Pandey, S.N. (1987): *Principles and Applications of Photogeology*, Wiley Eastern.
11. Sabbins, F.F. (1985): *Remote Sensing-Principles and Applications*, Freeman.
12. www.isro.org, www.nrsc.gov.in

MODEL QUESTION PAPER

**III – SEMESTER, M.Sc GEOLOGY,
PAPER II, REMOTE SENSING & GIS (G-CC-302)
(With effect from the admitted batch of 2025-2026)**

Time: 3hours

Max marks 60

**Answer ANY FIVE Questions, choosing one from each Unit
All questions carry equal marks.**

UNIT-I

1. What are different types of aerial photographs? Add a note on their geometry
- OR**
2. Write short notes on **ANY TWO** of the following:
 - a) Controlled mosaic.
 - b) Nadir point.
 - c) Vertical and inclined photograph.

UNIT-II

3. What is electromagnetic spectrum? Discuss it's interaction with earth surface features.
- OR**
4. Write short notes on **ANY TWO** of the following:
 - a) Remote sensing Platforms.
 - b) Types of Sensors
 - c) Atmospheric Windows

UNIT-III

5. Describe in detail about Hyperspectral Remote Sensing
- OR**
6. Write short notes on **ANY TWO** of the following:
 - a) NOAA
 - b) Geostationary Orbits
 - c) Passive Remote sensing

UNIT-IV

7. Write the application of Remote Sensing in land use and land cover.
- OR**
8. Write short notes on **ANY TWO** of the following:
 - a) Digital image processing
 - b) Water Resources Management
 - c) Mitigation Measures of Landslides

UNIT-V

9. Explain the concept and components of GIS
- OR**
10. Write short notes on **ANY TWO** of the following:
 - a) Explain the Advantages and Disadvantages of Raster and Vector Data Models.
 - b) Concept of GPS
 - c) Explain in coordinate system and map projections

SYLLABUS

III– SEMESTER, M. Sc. GEOLOGY

Paper III, COAL AND NUCLEAR GEOLOGY (G-CC-303 a)

(With effect from the admitted batch of 2025-2026)

UNIT-I

Geological Conditions of Coal Formation. Origin of Peat, Bitumen, Lignite and Anthracite. Development of Coal Facies. Types of Deposition, Peat Forming Plants, Nutrient Supply, Bacterial Activity, Temperature, Redox Potential and Diagenesis. Classification, Ranking and Grading of Coal. Lithotypes, Microlithotypes and Maceral Groups of Coal

UNIT-II

The Origin of Coal Macerals. Principles and Applications of Coal Petrology. Evaluation of Coal; Microscopic constituents of Coal - Vitrinite, Exinite and Intertinite Group.

UNIT-III

Classification of Gondwana coals, their Conditions of Deposition and Distribution in India. Applied Coal Petrology, Petrography of Gondwana coals and Coal Bed Methane. Proximate and Ultimate Analysis of Coal.

UNIT-IV

Natural Radioactivity, Nuclear devices and Techniques for Measurement of Radioactivity- Geiger counter and Scintillation counters, Mass spectrometry. Nuclear Materials: Uranium, Thorium, Zirconium & Rare metals (Niobium & Tantalum)

UNIT-V

World Uranium Deposits Classification: Geological Characteristics and Genesis of Major U- deposits and Thorium Resource and their Distribution in India.

(P.T.O)

PRACTICALS:

Identification of Megascopic Coal Samples, Different Macerals and Micro Lithotypes. Proximate Analysis (Moisture, Fixed Carbon, Volatile Matter, Ash Content) and Ultimate Analysis. Coal Rank Measurements based on Reflectance.

TEXT BOOKS:

- 1) Aswathanarayana, U. (1985): *Principles of Nuclear Geology*, Oxford Press.
- 2) Atomic Minerals Directorate Web site for Indian uranium Deposits
- 3) Chandra, D. Singh, R.M and Sing, M.P. (2000): *Text book of Coal (Indian Context)*, Tara Book Agency, Varanasi.
- 4) Dahlkamp Franz, J. (1993): *Uranium Deposits of the World*, Springer.
- 5) Kotur S. Narasimhan and Mukherjee, A.K. *Gondwana coals of India*, Allied publishers limited.
- 6) Red book by IAEA publications
- 7) Scientific technical publications in the nuclear fuel IAEA publications
- 8) Sing, M.P. (1998): *Coal and Organic Petrology*, Hindustan pub. Corp. New Delhi.

SYLLABUS

III– SEMESTER, M.Sc. GEOLOGY

Paper - III, MINING (G-CC-303 b)

(With effect from the admitted batch of 2025-2026)

UNIT – I

Introduction – Terminology – Basic Concepts, Factors Influencing for Selection of Surface/Underground Mining. Alluvial and Placer Mining, Mine Development– Choice of Site for Shaft Development. Method of Working for Opencast and Underground Mining Mine –Waste Disposal Methods.

UNIT –II

Alluvial Mining Methods, Development of Tunnels, Adits, Levels, Cross-cuts, Drives etc. Stopping Methods for Ore Production, Mine Supports.

UNIT – III

Coal mining methods. Mine Transportation, Mine-ventilation, Mine drainage, Mine Supports.

UNIT- IV

Explosives - Classification, Methods of Charging Explosives Effects of Blasting – Mine Rescue Operations.

UNIT-V

Mining Legislation, Mining Plans, - Mining Organisation, Mine Management Principles – Report Preparation, Mine Valuation, Mine safety.

PRACTICALS:

1. Mine Development plans
2. Shaft design- Production & Ventilation shafts etc
3. Mine Drainage plans
4. Mine Ventilation circuit diagram
5. Mine Production
6. Blasting Methods
7. Mine Valuation

TEXT BOOKS

1. Arogyaswamy, R.N.P. (1973): *Courses in Mining Geology*, Oxford & IBH, Delhi.
2. Deshmukh, D. J. (2008): *Elements of Mining Technology*, Vol-1, Publications Central Techno publications.
3. George Joseph, Y. (1923): *Elements of Mining*, Legare Street Press.
4. Guidelines for preparing mining places India Bureau of Mines.
5. Herbert, C. H. (2009): *Principles of Mining*, BiblioBazaar.
6. Mc Kinstry, H.E. (1948): *Mining Geology*, Prentic Hall.
7. Robert Peele.(1927): *Mining Engineers Handbook*, Wiley.

MODEL QUESTION PAPER

III – SEMESTER, M.Sc GEOLOGY,

PAPER-III, MINING (G-CC-303 b)

(With effect from the admitted batch of 2025-2026)

Time: 3hours

Max marks 60

Answer ANY FIVE Questions, choosing one from each Unit

All questions carry equal marks.

UNIT-I

1. What are different advantages and disadvantages of open cast Mining.

OR

2. Write short notes on **ANY TWO** of the following:

- a) Dumping of Mine waste.
- b) Shaft sinking Methods.
- c) Factors influencing for bench development.

UNIT-II

3. Write an essay on alluvial Mining methods.

OR

4. Write short notes on **ANY TWO** of the following:

- a) Tunnel Alignment
- b) Dragline.
- c) Direct haulage

UNIT-III

5. Write an essay on Mine supports.

OR

6. Write short notes on **ANY TWO** of the following:

- a) Mine Ventilation
- b) Board and Pillar method.
- c) Mine transportation.

UNIT-IV

7. Write an essay on various types of explosives.

OR

8. Write short notes on **ANY TWO** of the following:

- a) Efficiency of blasting.
- b) Problems in blasting.
- c) Mine Rescue Operations.

UNIT-V

9. Write an essay on Mine legislation in India.

OR

10. Write short notes on **ANY TWO** of the following:

- a) Flow Chart for Mine organisation.
- b) Mine Safety.
- c) Importance of Mine valuation

SYLLABUS

III –SEMESTER, M.Sc. GEOLOGY

PAPER-III, QUATERNARY GEOLOGY (G-CC-303 c)

(With effect from the admitted batch of 2025-2026)

UNIT-I

Quaternary Period - Chronostratigraphic Status, Divisions and Climatic Significance, Global Boundary Standard Stratotype Sections and Point (GSSP), Neogene- Quaternary Boundary Problem. Tools of Quaternary Stratigraphy. Stefan-Boltzmann Equation and Planetary Temperature; Cause and Effects of Global Climate Change; Earth's Radiation Budget; Greenhouse Gases and Effects; Examples of Positive and Negative Feedback Mechanisms.

UNIT - II

Quaternary Dating Techniques-Thermoluminescence (TL)/ Optically Stimulated Luminescence (OSL), Electron Spin Resonance (ESR), Carbon Dating, Accelerator-Mass Spectrometer (AMS); Amino Acid Dating. Application of Pollen, Spores and Phytoliths in Quaternary Stratigraphy.

UNIT-III

Heinrich Events, Sedimentation Patterns / Records during Pleistocene and Holocene. Tsunami / Paleo tsunami Deposits – Identification and Significance Eustatic Changes during Quaternary (Long / Short Term).

UNIT - IV

Climatic Transect across Cenozoic to Pleistocene: Climate Change. Milankovitch Cycles. Pleistocene Glacial-Interglacial Cycles. Life in Quaternary Period during Glacial– interglacial Periods. Quaternary Record of India.

Quaternary deposits of Jammu & Kashmir and Karewa Sequence, of Flora and Fauna, The Quaternary Deposits of Himachal Pradesh, Indo Gangetic plain, West Bengal, Andhra Pradesh, Tamil Nadu, Kerala, Assam and Arunachal Pradesh. etc.

UNIT- V

Quaternary Deposits Saurashtra, Kutch, Central India, Rajasthan Chronological Sequence of Fossils and Litho, biostratigraphy of Narmada Valley. Central Quaternary Litho Stratigraphy of the Thar deserts with special emphasis on Calcretes.

PRACTICAL:

Quaternary Sediments Dating Problems; Textural Analysis of River, Beach and Aeolian Deposits Including Estimation of Organic Carbon Content and the Inferences. Plotting of Different Quaternary Deposits on the Physiographic Map of India. Calcrete Analysis.

TEXT BOOKS:

1. Alastair G. Dawson. (1992): *Ice Age Earth: Late Quaternary Geology and Climate*, Taylor & Francis.
2. Armstrong, H. and Brasier, M.D.(2005): *Microfossils*, Blackwell Publishing.
3. Dullers, G.A.T.(2008):*Luminescence Dating: Guidelines on using Luminescence Dating in Archaeology*, Swinder; English Heritage.
4. Haq, B.U. and Boersma, A. (1998):*Introduction to Marine Micropaleontology*, Elsevier.
5. Mathur, U.B. (2005):*Quaternary Geology: Indian Perspective*, Geological society of India.
6. Pomerol, C. (1982): *The Cenozoic Era: Tertiary and Quaternary*, Prentice Hall.
7. Publications approved by International Commission on Stratigraphy (ICS) and International Union of Geological Sciences (IUGS) in the journal "Episodes".
8. Rutter, N.W. and Catto, N.R. (1995):*Dating Methods for Quaternary Deposits*, (GEO. TEXT 2) Geological Association of Canada.
9. Vaidyanathan, R. and Ramakrishnan, M. (2008): *Geology of India* , Geological Society of India Special Publication.
10. William F. Ruddiman. (2008): *Earth's Climate, Past and Future*, W. H. Freeman.

MODEL QUESTION PAPER

III –SEMESTER, M.Sc. GEOLOGY

PAPER-III, QUATERNARY GEOLOGY (G-CC-303 e)

(With effect from the admitted batch of 2025-2026)

Time: 3hours

Max marks 60

**Answer ANY FIVE Questions, choosing one from each Unit
All questions carry equal marks.**

UNIT-I

1. Give a detailed note on various causes and effects of Global climate change
- OR**
2. Write short notes on **ANY TWO** of the following:
 - a) Chronostratigraphy.
 - b) Earths radiation budget
 - c) Green house gasses

UNIT-II

3. Describe in detailed about the pollen, spores and phytolithus in quaternary stratigraphy.
- OR**
4. Write short notes on **ANY TWO** of the following:
 - a) Optically stimulated luminescence.
 - b) carbon dating
 - c) Amino Acid dating

UNIT-III

5. Write a a descriptive note on the Eustatic changes during Quaternary
- OR**
6. Write short notes on **ANY TWO** of the following:
 - a) Holocene sedimentation
 - b) Tsunami deposits
 - c) Heinrich events

UNIT-IV

7. Write an essay Pleistocene glacial interglacial cycles.
- OR**
8. Write short notes on **ANY TWO** of the following:
 - a) Milankovitch cycles
 - b) Quaternary deposits of Andhra Pradesh
 - c) Quaternary deposits of Indogangetic plains

UNIT-V

9. Discuss in detailed on the litho and Bio stratigraphy of Narmada Valley
- OR**
10. Write short notes on **ANY TWO** of the following:
 - a) Quaternary deposits of Saurashtra
 - b) Quaternary deposits of central India
 - c) Quaternary deposits of Rajasthan

SYLLABUS

III –SEMESTER, M.Sc. GEOLOGY

PAPER- IV, ENGINEERING GEOLOGY & ENVIRONMENTAL GEOLOGY (G-SOC-304)

(With effect from the admitted batch of 2025-2026)

UNIT-I

Engineering Properties of Rocks & Soil, Role of Geologist in Engineering Construction. Dams and Reservoirs – Classification and Parts of Dams; Systematic Dam Site Investigations – Geological, Geo-morphological and Geophysical Investigations for Foundations and Material Studies; Water Tightness of Reservoirs, Leakage and Sedimentation Problems of Reservoirs. Failure of Dams, Case histories of Important Dams & Reservoirs of India.

UNIT-II

Tunnels - Types, Methods of Construction, Systematic Site Investigations and Problems in the Construction of Tunnels.

UNIT-III

Landslides – Definition, Types, Causes; Stability Analysis and Remedies of Landslides; Building Materials and Road Construction Materials, Distribution, Nature and Properties of Building stones; Soils types, Classification and Mechanics of Soils.

UNIT-IV

Principles of Environmental Geology; Land and its Use and Management; Desertification and Degradation of Land; Water resources. Geo-environmental Hazards – Volcanoes, Earthquakes, Landslides, Floods, Cyclones, Land Subsidence and Avalanches.

UNIT-V

Pollution and Energy – Impact of Mining Activities on the Environment and Management; Water Pollution; Air Pollution; Noise Pollution; Solid waste Management Global Climate Changes-Global warming, Sea level changes.

PRACTICALS:

Identification and Delineation of Geology and Hydrogeological Conditions from Toposheets, Aerial photos and Satellite imageries. Determination of Engineering Properties of Rocks and Soils water Analysis. Evaluation of Soil and Water Pollution.

TEXT BOOKS:

1. Chenne Kesavulu, N. (1996):*Engineering Geology*, Mc-Millan India Ltd., New Delhi.
2. Khurmi, R.S. (1974): *Fundamentals of Engineering Geology*, Dhanpat Rai & Sons.
3. Krynine, D.P. and Judd, W.R. (1957): *Principles of Engineering Geology and Geotechnics*, McGraw-Hill.
4. Parbin Singh. (2008): *Engineering and General Geology*, KatsonPubl House, Ludiana.
5. Smith, K. (1992): *Environmental Hazards*, Routledge.
6. Subramanian V. (2002): *Environmental Science*, .Alpha Science International Ltd
7. Tripathi, R.P. and Singh, H.P. (1993); *Soil Erosion and Conservation*, New Age International .Publishers
8. Valdiya, K.S. (1987):*Environmental Geology – Indian Context*,Tata McGraw-Hill Pub. Co., New Delhi,
9. Venkata Reddy, D. (2010): *Engineering Geology for Civil Engineering*,Vikas Publishing House Pvt. Ltd., New Delhi.

MODEL QUESTION PAPER

III – SEMESTER, M.Sc GEOLOGY,

PAPER- IV, ENGINEERING GEOLOGY & ENVIRONMENTAL GEOLOGY (G-SOC-304)

(With effect from the admitted batch of 2025-2026)

Time: 3hours

Max marks 60

Answer ANY FIVE Questions, choosing one from each Unit

All questions carry equal marks.

UNIT-I

1. Write an essay on engineering properties of rocks.

OR

2. Answer any **TWO** of the following:

- a) Uplift pressure.
- b) Arch dam.
- c) Grouting.

UNIT-II

3. Describe briefly the Systematic Site Investigations for Construction of Tunnels.

OR

4. Answer any **TWO** of the following:

- a) Types of Tunnels.
- b) TBM
- c) Problems in construction of Tunnels

UNIT-III

5. Give an account of Building stones and road construction Materials

6. Answer any **TWO** of the following:

- a) Causes of land slides
- b) Slope stability analysis
- c) Soil Types and Classification

UNIT-IV

7. Explain the principles of environmental geology.

OR

8. Answer any **TWO** of the following:

- a) cyclones
- b) Land subsidence.
- c) Avalanches.

UNIT-V

9. Discuss the impacts of mining activities on the environment.

OR

10. Answer any **TWO** of the following:

- a) Global Warming.
- b) Waste disposal
- c) Water pollution

SYLLABUS

III – SEMESTER, M.Sc. GEOLOGY

PAPER- IV, ORE GEOLOGY (G-SOC-304 a)

(With effect from the admitted batch 2025-2026)

UNIT-I

Source and Nature of the Ore Bearing Fluids. Magmatic Processes of Formation of Mineral Deposits. Early Magmatic Deposits and Late Magmatic Deposits.

UNIT-II

Hydrothermal Deposit (Hypothermal, Mesothermal, Epithermal, Telethermal and Xenothermal), Metasomatism, Skarn, Wall rock Alteration and Gangue.

UNIT-III

Process of Formation of Residual Deposits, Mechanical Process of Formation of Mineral Deposits. Oxidation and Supergene Enrichment. Ores in Relation to Metamorphism.

UNIT-IV

Ore Microscope – Preparation of Polished Sections – Physical Properties of Ore Minerals under Reflected Microscope – Form, Colour, Hardness, Reflectivity – Reflection Pleochroism, Etch test etc.

UNIT-V

Structures and Textures of Ore Minerals – Application of Ore Microscopic Studies in Ore Dressing.

PRACTICALS:

- a) Megascopic Identification of Ores
- b) Identification of Ores under Ore Microscope.

TEXT BOOKS:

1. Cameron, E.N. (1961): *Ore Microscopy*, John Wiley & Sons.
2. Charles, F. P. and Macdiarmid, R. A. (1964): *Ore Deposits*, W.H.Freeman & Co Ltd.
3. Craig, J. R. and Vaughan, D. J. (1994): *Ore Microscopy and Ore Petrography*, John Wiley & Sons.
4. Deb, S. (1980): *Industrial Minerals and rocks in India- A Handbook of Economic Geology*, Allied Publishers Pvt. Ltd.
5. Evans, A. M. (1992): *Ore Geology and Industrial Minerals*, Blackwell Science.
6. Gokhale, K. V. G. K. and Rao, T.C. (1973): *Ore Deposits in India*, Thomson Press (India), Publication Division.
7. Jensen, M. L. & Bateman, A. M. (1981): *Economic Mineral Deposits*, John Wiley & Sons.
8. Krishnaswamy, S. (1972): *Indian Mineral Resources*, Oxford & IBH,
9. Lindgren, W. (2013): *Ore Deposits of New Mexico*, Sylvanite, Inc.
10. Misra, K. C. (1999): *Understanding Mineral Deposits*, Kluwer Academic Publishers.
11. Mookherjee, A. (1998): *Ore Genesis - A Holistic Approach*, Allied Publishers.
12. Ramdohr, P. (1970): *Ore Texture and Their Intergrowths*, Pergamon Press.
13. Stanton, R. L. (1981): *Ore Petrology*, McGraw Hill.
14. Stanton, R.L. (1972): *Ore Petrology*, McGraw Hill Higher Education.
15. Umeshwer Prasad. (2006): *Economic Geology*, CBS Publishersand Distributors PVT LTD.

MODEL QUESTION PAPER

III – SEMESTER, M.Sc GEOLOGY,

PAPER- IV, ORE GEOLOGY (G-SOC-304 a)

(With effect from the admitted batch of 2025-2026)

Time: 3hours

Max marks 60

**Answer ANY FIVE Questions, choosing one from each Unit
All questions carry equal marks.**

UNIT-I

1. Write an essay on source and Nature of the Ore Bearing Fluids
- OR**
2. Write short notes on **ANY TWO** of the following:
 - a) Formation of Mineral Deposits
 - b) Early Magmatic Deposits
 - c) Later Magmatic Deposits

UNIT-II

3. Write an essay on classification of hydrothermal deposits
- OR**
4. Write short notes on **ANY TWO** of the following:
 - a) Metasomatism
 - b) Skarn
 - c) Wall rock alternation.

UNIT-III

5. Write an essay on the oxidation and supergene enrichment.
- OR**
6. Write short notes on **ANY TWO** of the following:
 - a) Mechanical concentration
 - b) Ore in relation to Metamorphism
 - c) Formation of residual deposits.

UNIT-IV

7. Write an essay on Physical properties of Ore mineral under reflected light
- OR**
8. Write short notes on **ANY TWO** of the following:
 - a) Preparation of polished sections
 - b) Reflection pleochroism
 - c) Etch test

UNIT-V

9. Write an essay on structures of Ore minerals.
- OR**
10. Write short notes on **ANY TWO** of the following:
 - a) Ore microscope
 - b) Replacement textures
 - c) Crystalline granular texture.

.....

SYLLABUS

III – SEMESTER, M.Sc. GEOLOGY

PAPER - V, MINERAL EXPLORATION AND MINERAL ECONOMICS(G-SOC-305)

(With effect from the admitted batch 2025-2026)

UNIT – I

Reconnaissance Survey Geological Mapping, Traverse, Controls of Mapping etc. Guides to Ore Search: Physiographic Guides, Mineralogical Guides, Lithological Guides, Stratigraphic Guides, Structural Guides. Types of Sampling: Grab Sample, Channel Sample, Core Sample and Sampling Errors. Average Assays. Reserves: United Nations Frame Work Classification (UNFC)

UNIT –II

Geological Prospecting for Metallic and Non-metallic Mineral Deposits – Bauxite Chromite, Coal, Copper, Lead and Zinc, Manganese phosphorites

UNIT – III

Geophysical Methods of Prospecting of Metallic and Non-metallic Mineral Deposits Gravity – Electrical – Magnetic, Seismic and Radioactivity Methods. Data Generation and Interpretation. Exploration of Natural Gas and Oil.

UNIT- IV

Geo-chemical Environment: Primary Environment and Secondary Environment, Geo-chemical Dispersion, Geo-chemical Mobility: Supergene Mobility and Hypogene Mobility, Associations of Elements, Pathfinder Elements. The Pattern of Geo-chemical Distribution. Principles of Interpretation. Primary Dispersion, Secondary Dispersion of Elements. Vegetation and the Geo-chemical Methods in Mineral Exploration.

UNIT-V

Demand & Supply of Minerals and Conservation and Substitution of Minerals. Strategic, Critical and Essential Minerals; Changing Pattern on Mineral Consumption and Economy in India. National Mineral Policy; Mineral based Industries in Andhra Pradesh.

PRACTICALS:

Problems on Average Assay Values, Problems on Ore Reserve Estimation. Grade maps and Lithofacies maps and their Interpretation. Plotting of the Assay Values. Anomaly maps and their Interpretation. Use and Interpretation of Geophysical Data.

TEXT BOOKS:

1. Babu, S. K. and Sinha, D. K. (1988): *Practical Manual of Exploration and Prospecting*, CBS Publishers & Distributors.
2. Frederic, H. L. (1941): *Field Geology*, McGraw-Hill.
3. Halder, S. K. (2013): *Mineral Exploration*, Elsevier Science Publishing Co Inc.
4. Hawkes, E. D. & Webb, J. S. (1962): *Geo-chemistry in Mineral Exploration*, Harper and Row.
5. Kinstry, M.C. (1949): *Mining Geology*, Prentice-Hall.
6. Sinha, R. K. and Sharma, N.L. (1980): *Mineral Economics*, Oxford and IBH Publishing Co.

MODEL QUESTION PAPER

III – SEMESTER, M.Sc GEOLOGY,

PAPER – V, MINERAL EXPLORATION AND MINERAL ECONOMICS (G-SOC-305)

(With effect from the admitted batch of 2025-2026)

Time: 3hours

Max marks 60

**Answer ANY FIVE Questions, choosing one from each Unit
All questions carry equal marks.**

UNIT-I

1. Write an essay on lithological guides for mineral exploration.

OR

2. Write short notes on **ANY TWO** of the following:

- | | |
|---------------------------|-------------------------|
| a) Sampling Methods | b) Physiographic Guides |
| c) Average Assays Values. | |

UNIT-II

3. Give a detail account on Bauxite prospecting.

OR

4. Write short notes on **ANY TWO** of the following:

- | | |
|--------------------------|----------------------------|
| a) Coal prospecting | b) Base Metals Prospecting |
| c) Limestone prospecting | |

UNIT-III

5. Explain in detail about gravity Method of prospecting.

OR

6. Write short notes on **ANY TWO** of the following:

- | |
|--------------------------------------|
| a) Seismic and Radioactivity Methods |
| b) Interpretation of Magnetic Data |
| c) Generation of Radiometric data |

UNIT-IV

7. Discuss in detail along primary dispersion patterns.

OR

8. Write short notes on **ANY TWO** of the following:

- | | |
|--------------------------|--------------------------|
| a) Pathfinder Elements. | b) Geo-chemical Methods. |
| c) Secondary Dispersion. | |

UNIT-V

9. Write an essay on mineral Based industries in Andhra Pradesh.

OR

10. Write short notes on **ANY TWO** of the following:

- | | |
|------------------------------|----------------------------|
| a) Substitution of Minerals. | b) National Mineral Policy |
| c) National Mineral Policy. | |

.....

SYLLABUS

III – SEMESTER, M.Sc. GEOLOGY

PAPER - V, WATER RESOURCE MANAGEMENT (G-SOC-305 a)

(With effect from the admitted batch of 2025-2026)

UNIT – I

Water as Single Resource – Distribution of Water on Globe Surface water Resources of India – Groundwater Resources of India.

UNIT –II

Water Resource Management - Supply and Demand Estimation for any Area – Estimation Methods.

UNIT – III

Supply-side Management – Available Surface water Resources - Environmental Flows Estimation of Losses in Surface water – Excess Outflow to Sea, Excess Evaporation from Reservoir and Methods for Reducing and Canal Seepage Losses. Available Groundwater Resources – Artificial recharge. RRR(Recharge, Reuse, Recycle)

UNIT – IV

Demand-side Management – Cropping Pattern Recommendation for Command Area Micro irrigation - Sprinkler, Drip irrigation - Crop rotation.

UNIT – V

Problems and Solutions in Water Management: Droughts, Water logging and Soil Salinity Solutions - Conjunctive Use of Groundwater & Surface water.

PRACTICAL:

1. Estimation of Demand and Availability of Groundwater and Surface water.
2. Estimation of Losses from a Reservoir.
3. Estimation of Artificial recharge from Various Situation.
4. Estimation of Per capita Availability of Water.

TEXT BOOKS:

1. Jakeman, A.J. and Barreteau, Olivier & Hunt, Randall & Rainaudo, Jean – Daniel & Ross, Andrew. (2016): *Integrated Groundwater Management – Concepts, Approaches and Challenges*, Springer.
2. Karanth, K. (2017): *Groundwater Assessment, Development and Management*, McGraw Hill Education.
3. Maitra, M. K. and Ghose, N. C. (1992): *Groundwater Management: An Application*, APH Publishing.

4. Pradip, K. S. (2018): *Groundwater Development and Management: Issues and challenges in South Asia*, Springer.
5. Todd, D. K. and Larry, W. M. (2011): *Groundwater Hydrology*, Wiley India Pvt Ltd.

MODEL QUESTION PAPER

III – SEMESTER, M.Sc. GEOLOGY

PAPER – V, WATER RESOURCE MANAGEMENT (G-SOC-305 a)

(With effect from the admitted batch of 2025-2026)

Time: 3hours

Max marks 60

**Answer ANY FIVE Questions, choosing one from each Unit
All questions carry equal marks.**

UNIT-I

1. Describe the Ground & Surface water Resources of India
- OR**
2. Write short notes on **ANY TWO** of the following:
 - a) Distribution of Water on Globe
 - b) Explain the concept of water as a Single Resource
 - c) Base flow

UNIT-II

3. Explain briefly the water Resources management of any area.
- OR**
4. Write short notes on **ANY TWO** of the following:
 - a) Estimation of Demand of water
 - b) Estimation of Available Surface water
 - c) Estimation of Available Ground water

UNIT-III

5. Explain various Artificial recharge Methods
- OR**
6. Write short notes on **ANY TWO** of the following:
 - a) Environmental flow
 - b) Estimation of Evaporation from Reservoir
 - c) Canal Seepage losses

UNIT-IV

7. Explain briefly the demand side management
- OR**
8. Write short notes on **ANY TWO** of the following:
 - a) Micro Irrigation
 - b) Crop Rotation
 - c) Cropping pattern Recommendation for a command area.

UNIT-V

9. Describe briefly the Conjunctive use of Ground water & Surface water.
- OR**
10. Write short notes on **ANY TWO** of the following:
 - a) Droughts.
 - b) Water logging
 - c) Soil Salinity.

.....

**ANDHRA UNIVERSITY
DEPARTMENT OF GEOLOGY
COLLEGE OF SCIENCE AND TECHNOLOGY**



**Scheme of Instruction and Examinations
M.Sc. GEOLOGY (IV SEMESTER)**
(With effect from the admitted batch 2025-2026)

IV – SEMESTER, M.Sc. GEOLOGY
Scheme of Instruction and Examinations
(With effect from the admitted batch 2025-2026)

S. No	Course Code	Course	Teaching/ Lab Hours Per week	Duration of Examination in hours	Allotment of Marks	Total Marks	Subject Credits
01.	Open Online Trans disciplinary course		3	-	100	100	4
	G-CC -401 (T)	A. Research Methodology					
	G-CC -402 (P)	B. Geological Mapping Training		-	100	100	4
02.	GPW-403 (P)	Project Work Report	-	-	200	200	8
03.	G-CC-404 (P)	Viva Voce	-	-	100	100	4
TOTAL						500	20