

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



**Scheme of Instruction and Examinations**

**M.Sc. APPLIED GEOLOGY (I - SEMESTER)**

(With effect from the admitted batch 2025-2026)

**M.Sc. APPLIED GEOLOGY (I - SEMESTER)**  
**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.	AG-CC – 101(T)	Mineralogy	3	3	60	40	100	3
02.	AG-CC - 102 (T)	Igneous and Metamorphic Petrology.	3	3	60	40	100	3
03.	AG-CC – 103 a (T) AG-CC – 103 b (T) AG-CC – 103 c (T)	<b>(Optional anyone)</b> Structural Geology Crystallography Geomorphology	3	3	60	40	100	3
04.	AG-SOC -104 (T) AG-SOC -104 a (T)	<b>(Optional anyone)</b> Hydrogeology Statistical Geology and Computer applications	3	3	60	40	100	3
05.	AG-SOC -105 (T) AG-SOC -105 a (T)	<b>(Optional anyone)</b> Field Geology and Surveying Geological mapping Techniques	3	3	60	40	100	3
06.	AG-OOTC-106 (T)	Open Online Transdisciplinary course	3	3	50		50	2
07.	AG -107 (T) AG -107a (T)	<b>(Optional anyone)</b> (Online Course) Indian Knowledge Systems 1 Indian Knowledge Systems 1a	3	3	75		75	<b>0 AUDIT SCORE</b>
08.	AG-CC – 101 (P)	Mineralogy	2	3	25		25	1
09.	AG-CC – 102 (P)	Igneous and Metamorphic Petrology	2	3	25		25	1
10.	AG-CC – 103 a (P) AG-CC – 103 b (P) AG-CC – 103 c (P)	<b>(Optional anyone)</b> Structural Geology Crystallography Geomorphology	2	3	25		25	1
11.	AG-SOC -104 (P) AG-SOC -104 a (P)	<b>(Optional anyone)</b> Hydrogeology Statistical Geology and Computer applications	2	3	25		25	1
12.	AG-SOC -105 (P) AG-SOC -105 a (P)	<b>(Optional anyone)</b> Field Geology and Surveying Geological mapping Techniques	2	3	25		25	1
13.	AG – CC–108 (P)	Viva Voce	-	-	25		25	1
<b>TOTAL</b>							<b>775</b>	<b>23</b>

## ***SYLLABUS***

### **I – SEMESTER, M.Sc. APPLIED GEOLOGY PAPER- I, MINERALOGY (AG-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

## **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. APPLIED GEOLOGY**

**PAPER – I, MINERALOGY (AG-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:
- Structure of olivine group of minerals
  - Chemistry of garnet group of minerals
  - 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:
- Di-Octahedral micas
  - Smectite group
  - 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:
- Classification of Feldspathoids
  - Structure of quartz, trydamite and crystobalite.
  - 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:
- Classification of non-silicates
  - Physical properties of Native metallic elements
  - 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:
- Gemstone varieties of Quartz and their properties.
  - Halide group of minerals
  - Chemistry of carbonate minerals

## ***SYLLABUS***

### **I – SEMESTER, M.Sc. APPLIED GEOLOGY**

#### **PAPER – II, IGNEOUS AND METAMORPHIC PETROLOGY (AG-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, Claussius-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. APPLIED GEOLOGY**  
**PAPER – II, IGNEOUS AND METAMORPHIC PETROLOGY (AG-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, M.Sc. APPLIED GEOLOGY PAPER- III, STRUCTURAL GEOLOGY (AG-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. APPLIED GEOLOGY**  
**PAPER – III, STRUCTURAL GEOLOGY (AG-CC-103a)**  
**(With effect from the admitted batch of 2025-2026)**

**Time: 3 Hrs**

**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. APPLIED GEOLOGY PAPER-III, CRYSTALLOGRAPHY (AG-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. APPLIED GEOLOGY**  
**PAPER - III, CRYSTALLOGRAPHY (AG-CC-103 b)**  
**(With effect from the admitted batch of 2025-2026)**

**Time: 3 hours**

**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. APPLIED GEOLOGY** **PAPER - III, GEOMORPHOLOGY (AG-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. APPLIED GEOLOGY**  
**PAPER - III, GEOMORPHOLOGY (AG-CC-103 c)**  
**(With effect from the admitted batch of 2025-2026)**

**Time: 3 hours**

**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. APPLIED GEOLOGY**  
**PAPER – IV, HYDROGEOLOGY (AG-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.

**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. APPLIED GEOLOGY**  
**PAPER – III, HYDROGEOLOGY (AG-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. APPLIED GEOLOGY**

#### **PAPER – IV, STATISTICAL GEOLOGY AND COMPUTER APPLICATIONS (AG-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. APPLIED GEOLOGY**

**PAPER – IV, STATISTICAL GEOLOGY AND COMPUTER APPLICATIONS (AG-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. APPLIED GEOLOGY PAPER – V, FIELD GEOLOGY AND SURVEYING (AG-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. APPLIED GEOLOGY**  
**PAPER – V, FIELD GEOLOGY AND SURVEYING (AG-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
- a) Field Equipment
  - b) strike and dip measurements
  - c) 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
- a) Identification of structures
  - b) sequence of structural events
  - c) 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
- a) Identification of topographic features
  - b) Surveying techniques
  - c) coordinate systems – projections

**UNIT-IV**

7. Write a detail note on chain surveying

**OR**

8. Write short notes on **ANY TWO** of the following
- a) Procedure of Compass surveying
  - b) Prismatic surveying
  - c) 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
- a) Theodolite surveying
  - b) Total Station
  - c) Drone Survey.

## ***SYLLABUS***

### **I – SEMESTER, M.Sc. APPLIED GEOLOGY**

#### **PAPER –V, GEOLOGICAL MAPPING TECHNIQUES (AG-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. APPLIED GEOLOGY**  
**PAPER – V, GEOLOGICAL MAPPING TECHNIQUES (AG-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
    - a) Brunton compass
    - b) Geological maps
    - c) Toposheets

**UNIT-II**

3. Describe the stereographic projections of structures.
- OR**
4. Write short notes on **ANY TWO** of the following
    - a) Xenoliths
    - b) Recognition of faults in the field
    - c) unconformities

**UNIT-III**

5. What are the different recording sedimentary structures?
- OR**
6. Write short notes on **ANY TWO** of the following
    - a) Field observations
    - b) Sedimentary lithology
    - c) 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
    - a) Recording features of Metamorphic rocks
    - b) Joints
    - c) Post-kinematic features

**UNIT-V**

9. Describe the mapping techniques and different mapping.
- OR**
10. Write short notes on **ANY TWO** of the following
    - a) Sampling Strategies
    - b) Palaeontology information.
    - c) Thin section

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



Scheme of Instruction and Examinations

**M.Sc. APPLIED GEOLOGY (II - SEMESTER)**

(With effect from the admitted batch 2025-2026)

**II – SEMESTER, M.Sc. APPLIED 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.	AG-CC – 201 (T)	Stratigraphy and Indian Geology	3	3	60	40	100	3
02.	AG-CC – 202 (T)	Sedimentology and Sedimentary Petrology	3	3	60	40	100	3
03.	AG - CC -203 a (T) AG - CC -203 b (T) AG - CC -203 c (T)	<b>(Optional any one)</b> Geochemistry and Isotope Geology. Sedimentary Basins of India. Geodynamics	3	3	60	40	100	3
04.	AG-SOC -204 (T) AG-SOC-204 a (T)	<b>(Optional any one)</b> Economic Geology and Indian Mineral Deposits. Instrumentation in Geology.	3	3	60	40	100	3
05.	AG-SOC-205(T) AG-SOC-205 a (T)	<b>(Optional any one)</b> Paleontology Petroleum Geology	3	3	60	40	100	3
06.	AG-OOTC-206 (T)	Open Online Transdisciplinary course	3	3	50		50	2
07.	AG -207 (T) G -207 a (T)	<b>(Optional any one)</b> (Online Course) Indian knowledge systems 2 Indian knowledge systems 2 a	3	3	75		75	<b>0 AUDIT SCORE</b>
08.	AG-CC – 201 (P)	Stratigraphy and Indian Geology	2	3	25		25	1
09.	AG-CC – 202 (P)	Sedimentology and Sedimentary Petrology	2	3	25		25	1
10.	AG - CC -203 a (P) AG - CC -203 b (P) AG - CC -203 c (P)	<b>(Optional any one)</b> Geochemistry and Isotope Geology. Sedimentary Basins of India. Geodynamics	2	3	25		25	1
11.	AG-SOC -204 (P) AG-SOC-204 a (P)	<b>(Optional any one)</b> Economic Geology and Indian Mineral Deposits. Instrumentation in Geology.	2	3	25		25	1
12.	AG-SOC-205(P) AG-SOC-205 a (P)	<b>(Optional any one)</b> Paleontology Petroleum Geology	2	3	25		25	1
13.	AG-CC-208- (P)	Viva Voce	-	-	25		25	1
<b>TOTAL</b>							<b>775</b>	<b>23</b>

## **SYLLABUS**

### **II – SEMESTER, M.Sc. APPLIED GEOLOGY**

#### **PAPER – I, STRATIGRAPHY & INDIAN GEOLOGY (AG-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 Intertouring 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. APPLIED GEOLOGY**

### **PAPER – I, STRATIGRAPHY & INDIAN GEOLOGY (AG-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. Write notes on **ANY TWO** of the following
    - a) Uniformitarianism.
    - b) Geologic time scale.
    - c) Lithostratigraphy.

#### **UNIT-II**

3. Write an essay on cyclostratigraphy and event Stratigraphy.
- OR**
4. Write notes on **ANY TWO** of the following:
    - a) Zonation.
    - b) Magnetostratigraphy.
    - c) Biostratigraphy.

#### **UNIT-III**

5. Discuss about seismic Stratigraphy and sequence Stratigraphy.
- OR**
6. Write notes on **ANY TWO** of the following:
    - a) Completeness of stratigraphic records.
    - b) Geochronology.
    - c) Chronostratigraphy

#### **UNIT-IV**

7. Describe the stratigraphy of Dharwars.
- OR**
8. Write notes on **ANY TWO** of the following:
    - a) Easter Ghats Mobile Belt
    - b) Stratigraphy of Cuddapah System
    - c) Vindhyan system

#### **UNIT-V**

9. Describe the Triassic success of Spiti.
- OR**
10. Write notes on **ANY TWO** of the following:
    - a) Bengal Basin
    - b) Siwalik
    - c) K-T Boundary

**SYLLABUS**

**II – SEMESTER, M.Sc. APPLIED GEOLOGY**

**PAPER – II, SEDIMENTOLOGY AND SEDIMENTARY PETROLOGY (AG-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. APPLIED GEOLOGY**

**PAPER – II, SEDIMENTOLOGY AND SEDIMENTARY PETROLOGY (AG-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. APPLIED GEOLOGY**

#### **PAPER - III, GEOCHEMISTRY AND ISOTOPE GEOLOGY (AG-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. APPLIED GEOLOGY**

**PAPER – III, GEOCHEMISTRY & ISOTOPE GEOLOGY (AG-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. APPLIED GEOLOGY**

#### **PAPER - III, SEDIMENTARY BASINS OF INDIA (AG-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. APPLIED GEOLOGY**  
**PAPER – III, SEDIMENTARY BASINS OF INDIA (AG-CC-203b)**  
**(Effective from the Admitted Batch of 2025-2026)**

**Time: 3hourse**

**Max. Marks: 60**

**Answer one question 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 high Offshore 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. APPLIED GEOLOGY**

### **PAPER - III, GEODYNAMICS (AG-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.

**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. APPLIED GEOLOGY**  
**PAPER - III, GEODYNAMICS (AG-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
    - a) Interior of the earth
    - b) Epicentre
    - c) Isosesmic lines

**UNIT-II**

3. Describe in detail about the arechean crust composition
- OR**
4. Write any two of the following
    - a) Mantle plumes
    - b) Plate reconstructions
    - c) 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
    - a) Continental drift
    - b) Rock Magnetism
    - c) Rheology of Rocks

**UNIT-IV**

7. Describe in detail about paleomagnetic evidence
- OR**
8. Write any two of the following
    - a) Sea floor spreading
    - b) Paleo position of India
    - c) Reversed magnetism

**UNIT-V**

9. Major Tectonic features of the world
- OR**
10. Write any two of the following
    - a) Geosynclines
    - b) Mobile Belts
    - c) Folded mountains

## SYLLABUS

### II – SEMESTER, M.Sc. APPLIED GEOLOGY

#### PAPER - IV, ECONOMIC GEOLOGY AND INDIAN MINERAL DEPOSITS

##### (AG-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. APPLIED GEOLOGY**  
**PAPER – IV, ECONOMIC GEOLOGY AND INDIAN MINERAL DEPOSITS**  
**AG-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:
    - a) Metallogenic epochs.
    - b) Metallogenic provinces.
    - c) 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:
    - a) Supergene Enrichment.
    - b) Preparation of polished section.
    - c) Metasomatism.

**UNIT-III**

5. Describe the structures and textures of ore minerals.
- OR**
6. Write short notes on **ANY TWO** of the following:
    - a) Characteristics of metamorphic paragenesis.
    - b) Ore microscopic studies in ore dressing.
    - c) 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: :
    - a) Manganese ore.
    - b) Chromite deposits.
    - c) 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:
    - a) Diamond.
    - b) Glass.
    - c) Phosphates.

## SYLLABUS

### II – SEMESTER, M.Sc. APPLIED GEOLOGY

#### PAPER - IV, INSTRUMENTATION IN GEOLOGY (AG-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. APPLIED GEOLOGY**  
**PAPER - IV, INSTRUMENTAION IN GEOLOGY (AG-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 it's 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 it's 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. APPLIED GEOLOGY**

**PAPER - V, PALEONTOLOGY (AG-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. APPLIED GEOLOGY**  
**PAPER – V, PALEONTOLOGY (AG-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. APPLIED GEOLOGY

#### PAPER - V, PETROLEUM GEOLOGY (AG-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. APPLIED GEOLOGY**  
**PAPER - V, PETROLEUM GEOLOGY (AG-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.

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



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

**III – SEMESTER, M.Sc. APPLIED 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.	AG-CC-301(T)	Remote Sensing & GIS	3	3	60	40	100	3
02.	AG-CC -302 (T)	Mineral Exploration and Mineral Economics	3	3	60	40	100	3
03.	AG-CC -303 a(T) AG-CC -303 b (T) AG-CC -303 c (T)	<b>(Optional any one)</b> Surface and Underground Mining. Coal & Nuclear Geology. Quaternary Geology	3	3	60	40	100	3
04.	AG-SOC -304 (T) AG-SOC -304 a (T)	<b>(Optional any one)</b> Mineral Processing Engineering. Mine Legislation and Mine Planning.	3	3	60	40	100	3
05.	AG-SOC -305 (T) AG-SOC -305 a (T)	<b>(Optional any one)</b> Engineering Geology & Environmental Geology. Ore Geology	3	3	60	40	100	3
06.	AG-CC -301 (P)	Remote sensing & GIS	2	3	25		25	1
07.	AG-CC -302 (P)	Mineral Exploration and Mineral Economics	2	3	25		25	1
08.	AG-CC -303 a (P) AG-CC -303 b (P) AG-CC -303 c (P)	<b>(Optional any one)</b> Surface and Underground Mining. Coal & Nuclear Geology Quaternary Geology	2	3	25		25	1
09.	AG-SOC -304 (P) AG-SOC -304 a (P)	<b>(Optional any one)</b> Mineral Processing Engineering. Mine Legislation and Mine Planning	2	3	25		25	1
10.	AG-SOC -305 (P) AG-SOC -305 a (P)	<b>(Optional any one)</b> Environmental Geology & Engineering Geology Ore Geology	2	3	25		25	1
11.	G – CC–108 (P)	Viva Voce	-	-	25		25	1
<b>TOTAL</b>							<b>650</b>	<b>21</b>

## **SYLLABUS**

### **III- SEMESTER, M.Sc. APPLIED GEOLOGY**

#### **PAPER – I, REMOTE SENSING & GIS (AG-CC -301)**

(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<sub>s</sub> 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)**

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



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

### **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](http://www.isro.org), [www.nrsc.gov.in](http://www.nrsc.gov.in)

**III – SEMESTER, M. Sc. APPLIED GEOLOGY**  
**PAPER – I, REMOTE SENSING & GIS (AG-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. 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. APPLIED GEOLOGY

#### PAPER - II, MINERAL EXPLORATION AND MINERAL ECONOMICS(AG-CC -302)

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

**MODEL QUESTION PAPER**

**III – SEMESTER, M.Sc. APPLIED GEOLOGY**

**PAPER - II, MINERAL EXPLORATION AND MINERAL ECONOMICS (AG-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. 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. APPLIED GEOLOGY

#### Paper - III, SURFACE AND UNDER GROUND MINING (AG –CC-303 a)

(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**, Central Techno Publications.
3. George, J. Y. (1923): **Elements of Mining**, McGraw-Hill Book.
4. Guidelines for preparing Mining Places India Bureau of Mines.
5. Herbert.C. H. (1909): **Principles of Mining**,Creative Media Partners LLC.
6. Kinstry, M. C. H.E.(1948):**Mining Geology**, Prentice Hall.
7. Robert Peele. (1927): **Mining Engineers Hand book**, Wiley Engineering Hand book services.

**MODEL QUESTION PAPER**

**III– SEMESTER, M.Sc. APPLIED GEOLOGY**

**Paper – III, SURFACE AND UNDER GROUND MINING (AG –CC-303 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. 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) Foot & Hanging wall drives
    - b) Mines Support
    - c) Stopping

**UNIT-III**

5. Write an essay on Mine Transportation Methods.
- OR**
6. Write short notes on **ANY TWO** of the following:
    - a) Mine Ventilation
    - b) Board and Pillar method.
    - c) Mine Ventilation

**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. APPLIED GEOLOGY**

#### **Paper - III, COAL AND NUCLEAR GEOLOGY (AG-CC -303 b)**

(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. APPLIED GEOLOGY**

#### **PAPER - III, QUATERNARY GEOLOGY (AG-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 Strato type 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-Thermo Luminescence (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 of 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.

**(P.T.O)**

**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. Pomeroy, 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. APPLIED GEOLOGY**

**PAPER - III QUATERNARY GEOLOGY (AG-CC -303 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. 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. APPLIED GEOLOGY**

#### **PAPER - IV, MINERAL PROCESSING ENGINEERING (AG –SOC-304)**

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

#### **UNIT – I**

Introduction, Fundamentals of Mineral Processing. Importance of Mineral Processing, Economics of Mineral Processing, Occurrence of Ores, Role of Geologist in Mineral Processing Operations.

#### **UNIT –II**

Crushing, Type of Crushers, Cone crushers, Hammer mill, Stamp mill, Recent Advances in Crushing, Principles of Grinding, Dry and Wet Grinding, Trembling mills – Ball mill, Types of Ball mills, Rod mill, Types of Rod mills and Pulverisers

#### **UNIT – III**

Classification in Mineral Processing. Types of Classifiers, Thickeners screening, Types of screening, Stationary screens, Vibrating screens, Laboratory screens, Wet and Dry Screening.

#### **UNIT- IV**

Hydrocyclones, Types of Hydrocyclones, Heavy and Dense Media Separation, Flocculation and Dispersion Application, Flotation and Agglomeration Application, Jigging; Types of Jigging, Tabling, Types of Tables and Application, Magnetic separation, Types of Magnetic Separators.

#### **UNIT-V**

Flow sheet Design, Miscellaneous Processes – Hydro metallurgy, Heap leaching, Hot water drying of Coals, Radiometric Methods of Coal Separation. Flow sheets of Beach sand Separation, Copper, Lead, Zinc Separation of Khetri and Zawar Mines, Coal Washery Design.

**PRACTICALS:**

1. Horse Power (HP) Calculation.
2. Mass balance of a Flow sheet.
3. Flow sheet Design.
4. Performance of a Jaw crusher.
5. Performance of a Hand jig.
6. Assignment on a Topic of Mineral Processing Design and Presentation.
7. Visit to a Mineral Processing Industry.

**TEXT BOOKS:**

1. Taggart, A. F. (1945): **Elements of Ore Dressing**, John Wiley and Sons.
2. Gaudin, A. M. (1939): **Principles of Mineral Dressing**, McGraw-Hill.
3. Pryor, E. J. (1965): **Mineral Processing**, Elsevier Publishing Company.
4. Gokhale K.V.G.K. and Rao, T.C.(1978): **Ore Deposits of India**, Thomson Press.
5. Araogyaswamy, R. N. P. (1973): **Course in Mining Geology**, Oxford & IBH Publishing Company.
6. Jain, S. K.(1987): **Ore Processing**, Oxford & IBH Publishing Company.

**MODEL QUESTION PAPER**

**III – SEMESTER, M. Sc. APPLIED GEOLOGY**

**PAPER - IV, MINERAL PROCESSING ENGINEERING (AG –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 about operations involved in mining and mineral processing.

**OR**

2. Write short notes on **ANY TWO** of the following:
- a) Occurrence of ores.
  - b) Role of geologist in mineral processing.
  - c) Economics of mineral processing.

**UNIT-II**

3. Write about different types of crushers and their operation.

**OR**

4. Write short notes on **ANY TWO** of the following:
- a) Ball mill.
  - b) Rod mill.
  - c) Hammer mill

**UNIT-III**

5. Write in detail about different types of classifiers.

**OR**

6. Write short notes on **ANY TWO** of the following:
- a) Wet screening
  - b) Stationary screening
  - c) Vibrating screening

**UNIT-IV**

7. Describe the method of Flotation.

**OR**

8. Write short notes on **ANY TWO** of the following:
- a) Jigging.
  - b) Tabling.
  - c) Flocculation and agglomerates.

**UNIT-V**

9. Write about the Flow sheets of Beach sand.

**OR**

10. Write short notes on **ANY TWO** of the following:
- a) Hydro metallurgy
  - b) Heap leaching.
  - c) Coal Washery Design

**SYLLABUS**

**III- SEMESTER, M.Sc. APPLIED GEOLOGY**

**PAPER - IV, MINE LEGISLATION & MINE PLANNING**

**(AG –SOC-304 a)**

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

**UNIT – I**

Mines and Minerals Regulation and Development) Act, 1957 – Introduction – Scope – Application – Mining Lease – Major and Minor Minerals – Prospecting License – Renewal – Royalty and Dead rent – Preferential rights – Powers of Government. The Mineral Concession Rules (1960) – Introduction – Preliminary – Certification of Approval – Grant of Prospecting / Mining License for Scheduled Minerals – Prospecting License – Mining License– Statutory time Limits.

**UNIT –II**

The Andhra Pradesh Minor Minerals Concession Rules, 1966 – Introduction – Powers – Seizure of Mineral – Leases – Quarrying – Grant of Quarry Lease – Period of Lease – Renewal – Auction System – Sand Policy and Granite Mining Rules.

**UNIT- III**

The Forest Conservation Act (1980) and Rules (1981). Environmental Impact Assessment and Environmental Management Plan– Experimentation – Report Preparation – National Standards.

**UNIT – IV**

Outline of Mining Plan – General – Geology and Resources – Mining – Blasting – Mine Drainage – Disposal of waste – Use of Mineral – Mineral Beneficiation – Surface Transport – Site Services – Employment Potential

**UNIT-V**

Conceptual Mine Planning / Pre-feasibility, Various Steps in Design of Opencast and Underground Mine Plans. Geotechnical, Groundwater and Surface Hydrogeological Data Utilization for Mine plan Development. Mine Development Sequence. Design of Access Ramp and Haul Roads. Pit design

**(P.T.O)**

### **PRACTICALS:**

1. Preparation of Mining Plan with Case study.
2. Preparation of Mine Ventilation Plan with Case study.
3. Preparation of Mine Production Plan with Case study.
4. Preparation of Mine Environment Plan with Case study.
5. Preparation of Mine Closure Plan with Case study.
6. Preparation of Mine Bench plan with Case study.
7. Preparation of Ultimate Pit plan with Case study.

### **TEXT BOOKS:**

1. Comprehensive Guidelines on Prospecting Requirements. Published by Indian Bureau of Mines, Nagpur 1994.
2. Granite Conservation and Development Rules, 1999. Published by Indian Bureau of Mines, Nagpur, 1999.
3. Indian Bureau of Mines, Nagpur, and Guidelines for Preparation of Mine plan.
4. Indian Minerals Year Books, Published by the Indian Bureau Mines, Nagpur.
5. Seshagiri Rao, P. (1994): **Law of Mines and Minerals**, Asia Law House, Hyderabad.

**MODEL QUESTION PAPER**

**III – SEMESTER, M. Sc. APPLIED GEOLOGY**

**PAPER - IV, MINE LEGISLATION & MINE PLANNING (AG –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 essay on Mining Lease, Mineral prospecting and royalty.

**OR**

2. Write short notes on **ANY TWO** of the following:
- a) Preferential rights.
  - b) The mineral concession rules.
  - c) Statutory time limits.

**UNIT-II**

3. Briefly explain the Andhra Pradesh Minor Minerals Concession Rules, 1966

**OR**

4. Write short notes on **ANY TWO** of the following:
- a) Quarrying
  - b) Granite Mining Rules.
  - c) Auction systems.

**UNIT-III**

5. Briefly explain the Forest conservation rules (1981).

**OR**

6. Write short notes on **ANY TWO** of the following:
- a) Environmental impact assessment
  - b) Environmental management planning.
  - c) Report preparation – National standards.

**UNIT-IV**

7. Briefly explain the Outlines of mine planning.

**OR**

8. Write short notes on **ANY TWO** of the following:
- a) Mineral Beneficiation.
  - b) Site services.
  - c) Mine Drainage.

**UNIT-V**

9. Briefly explain the Conceptual mine planning..

**OR**

10. Write short notes on **ANY TWO** of the following:
- a) Opencast mine plan.
  - b) Pit Design
  - c) Haul Road design

**SYLLABUS**

**III –SEMESTER, M.Sc. APPILED GEOLOGY**

**PAPER- V, ENGINEERING GEOLOGY & ENVIRONMENTAL GEOLOGY (AG-SOC -305)**

(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.

**(P.T.O)**

**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*, Katson Publ 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. APPLIED GEOLOGY**

**PAPER - V, ENGINEERING GEOLOGY & ENVIRONMENTAL GEOLOGY (AG-SOC -305)**

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

**Time: 3 hours**

**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) Write short notes on **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) Write short notes on **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
- OR**
- 6) Write short notes on **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) Write short notes on **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) Write short notes on **ANY TWO** of the following:
    - a) Global Warming.
    - b) Waste disposal.
    - c) Water pollution

**SYLLABUS**

**III – SEMESTER, M.Sc. GEOLOGY**

**PAPER - V, ORE GEOLOGY (AG-SOC -305 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.

**(P.T.O)**

## **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. APPLIED GEOLOGY**

**PAPER- V, ORE GEOLOGY (AG-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. 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.

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



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

**IV – SEMESTER, M.Sc. APPLIED 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
01.	Open Online Trans disciplinary course		3	-	100	100	4
	AG-CC -401 (T)	A. Research Methodology					
	AG-CC -402 (P)	B. Geological Mapping Training	-	-	100	100	4
02.	GPW-403 (P)	Project Work Report	-	-	200	200	8
03.	AG-CC-404 (P)	Viva Voce	-	-	100	100	4
<b>TOTAL</b>						<b>500</b>	<b>20</b>