


M.Sc Geology

Programme Outcomes: (PO)

- PO₁** To impart Geological knowledge with emphasis on courses relevant to the societal benefits.
- PO₂** To enhance the knowledge of geological science by introducing Remote Sensing and GIS
- PO₃** To prepare the students to learn the subject outside the class room i.e. through geological field work and mapping
- PO₄** To learn the subject by applying the theoretical knowledge in laboratory
- PO₅** To apply the principals of geological knowledge in project dissertation
- PO₆** To apply the classroom knowledge to mitigate the geological hazards and other environmental problems.
- PO₇** To obtain and apply the knowledge for exploring the fuels, minerals and Ground water
- PO₈** To prepare the students to face and resolve the real world problems by applying the learnt geological knowledge

Programme Specific Outcomes (PSO)

- PSO₁** : To impart geological knowledge useful to the development of the society.
- PSO₂** : To enhance scientific skills through field work, mapping, surveying and by introducing new tools like Remote Sensing and GIS.
- PSO₃** : To train the students to get employment by learning exploration techniques for fuels, minerals and Ground water.
- PSO₄** : To carryout field trainings and Project works to mitigate the real world geological hazards and Environmental problems


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**ANDHRA UNIVERSITY
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COLLEGE OF SCIENCE AND TECHNOLOGY**



Scheme of Instruction and Examinations

M. Sc. GEOLOGY (I - SEMESTER)

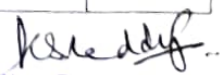
(With effect from the admitted batch 2022-2023)

M.Sc. GEOLOGYScheme of Instruction and Examinations
(With effect from the admitted batch of 2022-2023)**I - SEMESTER**

S. No	Course Code	Course	Teaching/ Lab Hours Per week	Duration of Examination in hours	Allotment of Marks		Total Marks	Subject Credits
					External	Internal (Sessional s)		
01	G -101	Paper-I Mineralogy	4	3	70	30	100	4
02	G -102	Paper-II Igneous and Metamorphic Petrology	4	3	70	30	100	4
03	G -103	Paper-III Structural Geology & Tectonics	4	3	70	30	100	4
04	G -104	Paper-IV Stratigraphy & Micropaleontology	4	3	70	30	100	4
05	G -105	Paper-I Mineralogy (Practical)	3	3	50	-	50	2
06	G -106	Paper-II Igneous and Metamorphic Petrology (Practical)	3	3	50	-	50	2
07	G -107	Paper-III Structural Geology & Tectonics (Practical)	3	3	50	-	50	2
08	G -108	Paper-IV Stratigraphy & Micropaleontology (Practical)	3	3	50	-	50	2
09	G -109	Field Work	-	-	-	-	50	2
10.	G -110	Viva Voice	-	-	-	-	50	2
TOTAL							700	28



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**I-Semester M.Sc Geology
MINERALOGY**

Paper: I

Course outcomes

- CO₁** : To introduce structure, chemistry, physical & optical properties of Olivine, garnet, Epidote groups
- CO₂** : To impart knowledge on Pyroxene, amphiboles, clay and Mica Minerals.
- CO₃** : To introduce concepts on Isomorphism, Polymorphism and Physical, optical properties of Feldspars
- CO₄** : To familiarize the studies on Non silicate Groups like Oxides & Sulphides
- CO₅** : To equip the students on chemistry and paragenesis of carbonates, Phosphates and gemstones etc.

Learning outcomes:

At the end of the course student will be able to

- LO₁** : Explain the properties of Neso silicates
- LO₂** : Identify the inosilicates and phyllosilicates
- LO₃** : Interpret the processes of isomorphism & Polymorphism
- LO₄** : Identify the Non silicates, native elements, oxides and sulphates
- LO₅** : Explain the chemistry and paragenesis of Gemstones and Non silicates

Course Specific Outcomes

- CSO1:** To Identify the minerals through physical and chemical, optical properties
- CSO2:** To distinguish Silicate and Non silicate minerals

Mapping of Course Outcomes with Program Outcomes:

CO/PO	P01	P02	P03	P04	P05	P06	P07	P08
C01	√							
C02	√							
C03	√							
C04	√							
C05	√							

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4
C01	√			
C02	√			
C03	√			
C04	√			
C05	√			

SYLLABUS

M. Sc GEOLOGY

PAPER- I, MINERALOGY

I - SEMESTER

UNIT - I

Introduction to Minerals. 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. Structure, chemistry, physical and optical properties of (a) Feldspathoids Group (b) Feldspars and (c) silica minerals

UNIT - IV

Classification of nonsilicates; chemistry and paragenesis of Native elements, Oxides and Sulphides.

UNIT - V

Chemistry and paragenesis 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 formula
- c) Interpretation of X-ray diffractograms of common minerals and D.T.A curves.
- d) SEM photographs

TEXT BOOKS:

An Introduction to the rock forming minerals by **W.A.Deer, R.A. Howie and J. Zussman**

Dana's Text book of Mineralogy by **W.E. Ford**

Manual of Mineralogy by **Klein, C. and Hurlbut, Jr.C.S**

Descriptive Mineralogy by **L.G. Berry and Mason.**

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Model Question Paper
Mineralogy, I - Semester
M. Sc Geology, Paper - I

(With effect from the admitted batch of 2022-2023)

Time: 3Hrs

Max. Marks: 70

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. Answer any two of the following:

- a) Structure of olivine group of minerals
- b) Chemistry of garnet group of minerals
- c) Optical properties of kyanite and sillimanite

UNIT-II

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

OR

4. Answer any two of the following:

- a) Di-Octahedral micas
- b) Smectite group
- c) Chemistry of amphiboles

UNIT-III

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

OR

6. Answer any two of the following:

- a) Classification of Feldspathoids
- b) Structure of quartz, trydamite and crystobalite.
- c) Isomorphism

UNIT-IV

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

OR

8. Answer any two of the following:

- a) Classification of non-silicates
- b) Physical properties of Native metallic elements
- c) Spinel group of minerals


UNIT-V

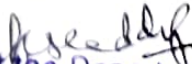
9. Describe the phosphate minerals in terms of its chemistry and paragenesis.

OR

10. Answer any two of the following:

- a) Gemstone varieties of Quartz and their properties.
- b) Halide group of minerals
- c) Chemistry of carbonate minerals


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**I - Semester M.Sc Geology
IGNEOUS AND METAMORPHIC PETROLOGY**

Paper : II

Course outcomes

- CO₁** : To introduce the basic concept of Generation of Magmas and its occurrences
- CO₂** : To impart knowledge on Bowen's reaction series, crystallization and classification of magmas.
- CO₃** : To familiarize the descriptive studies of Petrographic province, Mineralogy, Texture and petrogenesis of igneous rocks.
- CO₄** : To introduce the Textures, Structures, Recrystallization differentiation and facies of metamorphic rocks
- CO₅** : To illustrate the metamorphic reactions, Temperature- pressure conditions.

Learning outcomes:

At the end of the course student will be able to

- LO₁** : Explain the basics of magma generation, mixing. Discuss about plate tectonics in relation to petrology.
- LO₂** : Introduce the Basics reaction series, and their classification of igneous rocks.
- LO₃** : Choose the concept of descriptive studies of rocks.
- LO₄** : Illustrate the metamorphic conditions and student can explain phase diagrams.
- LO₅** : Outline of the various metamorphic reaction, such as regional metamorphism and paired metamorphic belts, P-T t paths.

Course Specific Outcomes

- CSO1** : Candidate to understand nature of Magmas, crystallization of Unicomponent, Bicomponent & Tricomponent.
- CSO2** : To identify various rocks and their textures, structures etc

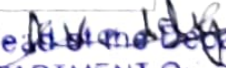
Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1		√						
CO2		√						
CO3		√						
CO4		√						
CO5	√							

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4
CO1	√			
CO2		√		
CO3			√	
CO4		√		
CO5	√			


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SYLLABUS

M. Sc GEOLOGY

PAPER – II; IGNEOUS AND METAMORPHIC PETROLOGY

I - SEMESTER

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 patrogenesis of major igneous rock types such as granites, Basalts, ultramafic rocks, carbonotites. Lamprophyres syenites, & Nepheline syenites.

UNIT – IV

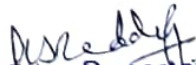
Metamorphic textures and structures. Recrystallisation, metamorphic differentiation, metamorphic condition, mineralogies and protoliths. Metamorphic phase diagrams – ACF, AKF and AFM, metamorphic facies with special reference to Indian Examples.

UNIT – V

Nature of metamorphic reactions. Pressure – temperature conditions of metamorphism. Anatexis and origin of migmatites. Regional metamorphism and paired metamorphic belts. P-T-t paths.

PRACTICALS:

- Megascopic and microscopic study of igneous rocks.
- Calculation of CIPW norms. Preparation of variation diagrams.
- Megascopic and microscopic study of metamorphic rocks.
- Construction of ACF – AKF – AFM diagrams.
- Geothermobarometric calculations.


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TEXT BOOKS:

Philpots A., 1992. Igneous and metamorphic petrology.

Best, M.G., 1986. Igneous and metamorphic petrology.

Yardley, B.W., 1989. An introduction to metamorphic petrology.

Raymond, L.A., 1995. Petrology.

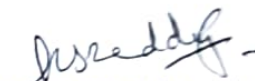
Middlemost – Magmas and Magmatic rocks.

Turner & Verhoogom – Igneous & Metamorphic petrology.



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Model Question Paper
M. Sc Geology, Paper - II
Igneous and Metamorphic Petrology, I – Semester

(With effect from the admitted batch of 2022-2023)

Time: 3Hrs

Max. Marks: 70

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 THREE of the following:

- | | |
|-----------------------------------|---------------------------------|
| a) Mantle xenoliths. | b) Primary and modified magmas. |
| c) Lithosphere and Asthenosphere. | d) Magma mixing. |

UNIT-II

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

OR

4. Write notes on any THREE of the following:

- Textural classification of igneous rocks.
- Mineralogical classification of igneous rocks.
- Role of volatiles in Crystallisation.
- Norm – CIPW.

UNIT-III

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

OR

6. Answer any THREE of the following:

- | | |
|---|--------------------|
| a) Petrographic provinces and associations. | b) Basalts. |
| c) Granites. | d) Alkaline rocks. |

UNIT-IV

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

OR

8. Answer any THREE of the following:

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

UNIT-V

9. Write about migmatites and their origin.

OR

10. Answer any THREE of the following:

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

**I-Semester M.Sc Geology
STRUCTURAL GEOLOGY & TECTONICS**

Paper : III

Course outcomes

- CO₁** : To introduce Mechanical principles and Rock properties
- CO₂** : To introduce folds and its classification
- CO₃** : To introduce fractures, Joints and classification of faults
- CO₄** : To introduce concept of petrofabrics and symmetry Field and lab techniques.
- CO₅** : To introduce plate tectonics and evolution of continental and oceanic crust and tectonics of organic belts of India

Learning outcomes:

At the end of the course student will be able to

- LO₁** : Explain to mechanical principles, rock properties, concept of stress and strain and composition and resolution of forces.
- LO₂** : Explain structural features particularly folds mechanics and causes and top bed of primary features
- LO₃** : Explain origin and classification of Joints and faults.
- LO₄** : Explain concept of Petrofabrics and Symmetry, types of fabrics and field and lab techniques
- LO₅** : Explain plate tectonics, continental and Oceanic crust evolution theory and orogenic belts of India and Some case studies.

Course Specific Outcomes

- CSO1** : To understand Mechanical principals, rock properties and structure like folds, faults, joints etc
- CSO2** : Field and Laboratory techniques to identify and interpret various structures

Mapping of Course Outcomes with Program Outcomes:

CO/PO	P01	P02	P03	P04	P05	P06	P07	P08
CO1	√							
CO2	√							
CO3		√						
CO4		√						
CO5		√						

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4
CO1	√			
CO2		√		
CO3		√		
CO4		√		
CO5		√		

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SYLLABUS

M. Sc GEOLOGY

PAPER- III, STRUCTURAL GEOLOGY AND TECTONICS

I - SEMESTER

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.

TEXT BOOKS:

- 1) Structural Geology by M.P. Billings.
- 2) Structural Geology and Tectonic Principles by P.C. Badgley.
- 3) Principles of Physical Geology by A. Holmes and D. L. Holmes.
- 4) Aspects of Tectonics focus on South Central India by K.S. Validya.
- 5) An outline of structural Geology by Bruce E. Hobbs.


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Model Question Paper
Structural Geology & Tectonics, I - Semester
M. Sc Geology, Paper - III
(With effect from the admitted batch of 2022-2023)

Time: 3Hrs

Max. Marks: 70

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

a) Slickenside

b) Columnar Joints

c) Nappe

UNIT-IV

7. Discuss the concept of petrofabrics and symmetry.

OR

8. Answer 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. Answer any TWO of the following:

a) Wilson cycle

b) Back-arc margins

c) Continental platforms

**I- Semester M.Sc Geology-
STATIGRAPHY AND MICROPALAEONTOLOGY**

Paper : IV

Course outcomes

- CO₁** : To introduce the principles of Stratigraphy controls and development of Stratigraphic record.
- CO₂** : To impart knowledge of Bio-Stratigraphy, magneto Stratigraphy, cyclo Stratigraphy, event Stratigraphy.
- CO₃** : To illustrate seismic Stratigraphy, sequence Stratigraphy, chemostatrigraphy, completeness and in completeness of Stratigraphic record.
- CO₄** : To introduce advance in micropaleontology, kingdoms of life and morphology, Ecology, distribution and outline classification of foraminifera.
- CO₅** : To impart knowledge on morphological groups of ostracoda, radiolaria, coccolithophores, calcareous, nanno-plankton etc.

Learning outcomes:

At the end of the course student will be able to

- LO₁** : Explain the principles of Stratigraphy, controls and development of Stratigraphic record etc.
- LO₂** : Outline the Biostatigraphy, magnetostatigraphy, cyclostratigraphy and element Stratigraphy etc.
- LO₃** : Illustrate the seismic Stratigraphy, seismic Stratigraphy, chemostatigraphy, completeness and in completeness of Stratigraphic record
- LO₄** : Explain advances in micropaleontology, kingdoms of life, morphology, ecology distribution and outline classification of foraminifera.
- LO₅** : Outline the ideas about major morphological groups of ostrocods, radiolaria, coccolithophores/calcareous nanno plankton, pollen and spores.

Course Specific Outcomes

- CS01** : To know principals of Stratigraphy, Magneto Stratigraphy, cyclo Stratigraphy and event Stratigraphy etc.
- CS02** : To understand morphology and Ecological distribution of Foraminifera, Ostrocods, Radiolarians, Nonno planktons and applications of Microfossils

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	√							
CO2	√							
CO3	√							
CO4	√							
CO5	√							

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4
CO1	√			
CO2		√		
CO3	√			
CO4	√			
CO5	√			

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SYLLABUS

M. Sc GEOLOGY

PAPER- IV; STRATIGRAPHY AND MICROPALAEONTOLOGY

I - SEMESTER

UNIT - I

Importance and principles of stratigraphy, geological time scale, Hutton's uniformitarianism - controls and development of stratigraphic record, Litho stratigraphy, correlation and stratigraphic code.

UNIT - II

Bio stratigraphy: Review of current trends, Zonation and time significance. Magneto stratigraphy, Cyclostratigraphy and Event stratigraphy.

UNIT - III

Seismicstratigraphy and Sequence stratigraphy geochronology and Chrono stratigraphy Chemostratigraphy, Completeness and incompleteness of stratigraphic records.

UNIT - IV

Introduction and advances in Micropalaeontology. Kingdoms of life. Stratigraphic distribution of major microfossil groups. Collection, separation and mounting of microfossils from surface and sub-surface sediments. Morphology, Ecology distribution and outline classification of Foraminifera. Role of Foraminifera in hydrocarbon exploration and Monitoring Coastal pollution.

UNIT - V

Elementary ideas about the major morphological groups of Ostracoda, Radiolaria, Coccolithophores/ Calcareous Nannoplankton, pollen and spores and their stratigraphic and paleoecological significance Stable Isotopes and palaeclimates. Taphonomy and paleobiogeography.

PRACTICALS:

Processing and preparation of samples for Microscopic study. Identification of selected fossils/species of Foraminifera, Ostracoda and Radiolaria under stereo binocular Microscope with CCTV. Study of Important microfossils from stratigraphic formations of India. Study of SEM photographs of microfossils. Construction of Biostratigraphic range charts and paleoenvironmental analysis of well sections. Preparation of different stratigraphic distribution maps of India. Study of paleogeographic Maps.

TEXT BOOKS:

- 1) Doyle, P and Bennet, M.R., 1996; Unlocking the stratigraphic Record. John Wiley.
- 2) Boggs, Sam JR; 1995; Principles of sedimentology and stratigraphy Prentice Hall.
- 3) Brenner, R.E and MC Hargue, T.R; 1988; Integrative Stratigraphy Concepts and applications Prentice Hall.
- 4) Prothero, D.R. 1988; Bringing fossils to life. An Introduction to palaeo-biology. MC grew Hill.
- 5) Stratigraphic principles and practice, 1960. J. Marwin Weller. Harper and Row Publisher.
- 6) Haq, B.U and Boersma, A. 1978; Introduction to Marine Micropaleontology. Elsevier.



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Model Question Paper
Stratigraphy & Micropalaeontology, I - Semester
M. Sc Geology, Paper - IV

(With effect from the admitted batch of 2022-2023)

Time: 3Hrs

Max. Marks: 70

Answer FIVE questions, choosing ONE from each Unit.

All questions carry equal marks.

UNIT-I

1. Write an essay on principle of correlation.

OR

2. Answer any TWO of the following

- a) Uniformitarianism. b) Geologic time scale. c) Lithostratigraphy.

UNIT-II

3. Write an essay on cyclostratigraphy and event stratigraphy.

OR

4. Answer any TWO of the following

- a) Zonation. b) Magnetostratigraphy. c) Biostratigraphy.

UNIT-III

5. Discuss about seismic stratigraphy and sequence stratigraphy.

OR

6. Answer any TWO of the following:

- a) Completeness of stratigraphic records. b) Geochronology.
c) Chemostratigraphic correlation.

UNIT-IV

7. Write about morphology, ecology, distribution and outline classification of Foraminifera.

OR

8. Answer any TWO of the following:

- a) Stratigraphic distribution of major micro fossil groups.
b) Role of Foraminifera in hydrocarbon exploration.
c) Methods of Collection and Separation of Microfossils.

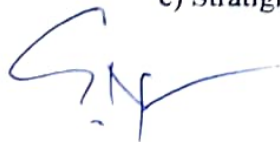
UNIT-V

9. Write about the morphological characters, stratigraphic and paleoecological significance of Ostracoda with neat sketches.


OR

10. Answer any TWO of the following:

- a) Stratigraphic significance of pollen and spores.
b) Taphonomy.
c) Stratigraphic significance of Radiolaria.



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**ANDHRA UNIVERSITY
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Scheme of Instruction and Examinations

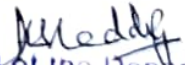
M.Sc. GEOLOGY (II SEMESTER)
(With effect from the admitted batch 2022-2023)

M.Sc. GEOLOGY
Scheme of Instruction and Examinations
(With effect from the admitted batch 2022-2023)

II - SEMESTER

S. No	Course Code	Course	Teaching/Lab Hours Per week	Duration of Examination hours	Allotment of Marks		Total Marks	Subject Credits
					External	Internal (Sessionals)		
01	G -201	Paper-I Sedimentology	4	3	70	30	100	4
02	G -202	Paper-II Geochemistry & Isotope Geology	4	3	70	30	100	4
03	G -203	Paper-III Hydrogeology	4	3	70	30	100	4
04	G -204	Paper-IV Economic Geology & Indian Mineral Deposits	4	3	70	30	100	4
05	G -205	Paper-I Sedimentology (Practical)	3	3	50	-	50	2
06	G -206	Paper-II Geochemistry & Isotope Geology (Practical)	3	3	50	-	50	2
07	G -207	Paper-III Hydrogeology (Practical)	3	3	50	-	50	2
08	G -208	Paper-IV Economic Geology & Indian Mineral Deposits (Practical)	3	3	50	-	50	2
9	G -209	Surveying	-	-	-	-	50	2
10	G -210	Viva Voice	-	-	-	-	50	2
TOTAL							700	28


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**II Semester M.Sc Geology
SEDIMENTOLOGY**

**Paper : I
Course outcomes**

- CO₁** : To study the Sedimentology and various types of Sedimentary structures.
CO₂ : To study origin and texture of Sedimentology rocks.
CO₃ : To introduce the sedimentary environments and facies.
CO₄ : To impart knowledge on Clastic, Biogenic, Chemical and volcanogenic sediments and their classifications.
CO₅ : To study the provenance of sediments and field and laboratory techniques in Sedimentology.

Learning outcomes:

At the end of the course student will be able to

- LO₁** : Understand the history and development of Sedimentology, process of transport and sedimentary structures.
LO₂ : Explain the origin of sedimentary rocks and grain size parameters.
LO₃ : Distinguish the continental and transitional sedimentary environments and their facies.
LO₄ : Differentiate the Clastic, Biogenic, Chemical and volcanogenic sediments and also classify the clastic and carbonate rocks.
LO₅ : Describe the provenance of sediments, Process of diagenesis of the clastic and carbonate rocks. Field and laboratory techniques in Sedimentology.

Course Specific Outcomes:

- CSO1** : To understand sedimentary rock record with sedimentary environments and facies
CSO2 : To know the provenance of clastic, Biogenic, Chemical and Volcanogenic sediments

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1			√					
CO2				√				
CO3			√					
CO4				√				
CO5				√				

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4
CO1		√		
CO2	√			
CO3		√		
CO4		√		
CO5			√	

SYLLABUS

M. Sc GEOLOGY

PAPER- I, SEDIMENTOLOGY

II - SEMESTER

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 -Wentworth scale, sieving and grain size parameters.

UNIT - III

Sedimentary environments and facies. Characteristics of continental: desert, fluvial, glacial, lacustrine, deltaic and transitional- lagoonal, littoral and barrier complex environments.

UNIT- IV

Clastic sediments- gravel, sand and mud. Biogenic, chemical and volcanogenic sediments. Classification of conglomerates, sandstones and mudstones, and carbonate rocks.

UNIT-V

Provenance of sediments. Diagenesis and fluid flow. Diagenesis of mudstone, sand stone, limestone and Dolomites: Changes in mineralogy, fabric and chemistry. Field and laboratory techniques in sedimentology: recording of sedimentary structures, preparation of litho logs, rock and thin section staining.

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PRACTICALS:

- 1) Study of primary, secondary and biogenic sedimentary structures in hand specimens, of photographic atlases, field photographs and wherever possible on the outcrops.
 - 2) Pipette analysis – sand, silt and clay separation and estimation of percentages
 - 3) Size analysis – (sieving), calculation of grain size parameters.
 - 4) Heavy mineral- liquid separation-Bromoform method
 - 5) Graphical representation of data-Preparation of histograms, triangular coordinate diagrams and Shepard classification chart.
 - 6) Microscopic study of heavy minerals and sedimentary rocks.
- ±

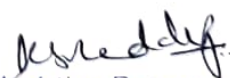
TEXT BOOKS:

- Allen, J.R.L., 1985: Principles of Physical Sedimentation. George Allen & Unwin.
- Allen, P., 1997: Earth surface Processes. Blackwell.
- Nicholas,G.,1999: Sedimentology and Stratigraphy. Blackwell.
- Davis, R.A.Jr., 1992: Depositional Systems. Prentice Hall.
- Einesele.G., 1992:Sedimentary basins. Springer Verlag.
- Friedman G.M.,and J.E Sanders: Principles of Sedimentology
- Prothero, D.R. and Schwab, F., 1996: Sedimentary Geology, Freeman
- Potter P.E & Pettijohn, F.J: Paleocurrents and Basin Analysis by
- Pettijohn F.J : Sedimentary rocks
- Reineck,H.E and Singh,I.B 1980: Depositional Sedimentary Environments.
- Springer-Verlag.
- Miall,A.D.,2000: Principles of sedimentary Basin Analysis. Springer-Verlag
- Milner, H.B: Sedimentary Petrology
- Blatt H, Murray, G,V and Middleton,R.C.,1980: Origin and sedimentaryRocks.
- Bhattacharya,a and Chakraborti,C.,2000: Analyses of sedimentary successions.
- Oxford-IBH
- Boggs Sam Jr.m1995: Principles of Sedimentology and Stratigraphy, Prentice Hall.
- Sengupta S., 1997: Introduction to Sedimentology. Oxford-IBH



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Model Question Paper
Sedimentology, II - Semester
M. Sc Geology, Paper - I

(With effect from the admitted batch 2022-2023)

Time: 3Hrs

Max. Marks: 70

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 THREE of the following.
- | | |
|-----------------------------|------------------------------------|
| a) Sedimentary rock record. | b) Biogenic sedimentary structures |
| c) Processes of transport. | d) Stylolite. |

UNIT-II

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

OR

4. Answer any TWO of the following:
- | | |
|--------------------------------|--------------------------|
| a) Sedimentary texture. | b) Wentworth grade scale |
| c) Origin of sedimentary rocks | |

UNIT-III

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

OR

6. Answer any THREE of the following:
- | | |
|----------------------------------|----------------------------|
| a) Glacial environment. | b) Desert environment. |
| c) Littoral and barrier complex. | d) Lacustrine environment. |

UNIT-IV

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

OR

8. Answer any TWO of the following:
- | | |
|----------------------------------|---|
| a) Classification of sandstones. | b) Chemical and volcanogenic sediments. |
| c) Clastic sediments | |

UNIT-V

9. Write and essay on diagenesis of sandstones

OR

10. Answer any TWO of the following:
- | | |
|--|---------------------------|
| a) Field and laboratory techniques in sedimentology. | b) Diagenesis of mudstone |
| c) Rock and thin section staining. | |

**II- Semester M. Sc Geology
GEOCHEMISTRY AND ISOTOPE GEOLOGY**

**Paper : II
Course outcomes**

- CO₁ :** To introduce concept of Geochemistry, cosmic abundance of elements, geochemical evolution of the earth, meteorites, structure, composition of the earth and geochemical classification of elements.
- CO₂ :** To introduce crystal chemistry, trace elements, laws of thermo dynamics, gibbs free energy, ionic substitution in minerals
- CO₃ :** To introduce Geochemical mobility under low ad high P-T conditions, Geochemical dispersions and geochemistry of lithosphere, atmosphere, biosphere, and Geochemical cycle.
- CO₄ :** To introduce Geochemistry of water, Mineral stability, water rock interaction.
- CO₅ :** To introduce Radiogenic isotopes, radioactive decay shemas of U-Th- Pb, Rb-Sr, K-Ar, Application of stable isotopes in geology.

Learning outcomes:

At the end of the course student will be able to

- LO₁ :** Explain the concept of Geochemistry, evolution of the earth composition of meteorites, internal structure and composition of the earth, and geochemical classification of elements.
- LO₂ :** Explain the crystal chemistry, isomorphism, diadochy camouflage of elements laws of thermo dynamics, Rare earth elements geochemistry.
- LO₃ :** Explain the Geochemical mobility under low and high P-T conditions, Geochemical dispersions, Geochemistry of lithosphere, Atmosphere, Biosphere and Geochemical cycle.
- LO₄ :** Explain the Geochemistry of water, mineral stability, water-rock interaction
- LO₅ :** Explain the Radiogenic isotopes Radioactive decay schemes of U-Th- Pb, Rb-Sr, K-Ar, Geochemistry of uranium and thorium.

Course Specific Outcomes:

- CS01 :** To understand for Geochemical classification with geochemical mobility under low and high P.T conditions.
- CS02 :** To understand Radiogenic Isotopes with decay schemes of U-Th- Ph, Rb-Sr, K-Ar.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1				√				
CO2				√				
CO3				√				
CO4				√				
CO5				√				

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4
CO1	√			
CO2	√			
CO3		√		
CO4			√	
CO5		√		

SYLLABUS

M. Sc. GEOLOGY

PAPER – II; GEOCHEMISTRY AND ISOTOPE GEOLOGY

II - SEMESTER

UNIT-I

Concept of Geochemistry, Cosmic abundance of elements, geochemical evolution of the earth, Composition of meteorites, Structure and composition of the earth, primary differentiation of elements and Geochemical classification of elements.

UNIT-II

Significance of Crystal chemistry in Geochemistry, isomorphism and diadochy camouflage, computing and admission of trace elements, Laws of thermodynamic, Gibbs free energy, Principles of Ionic substitution in minerals, Rare earth geochemistry and their abundance and mobility in crust.

UNIT-III

Geochemical mobility under low and high P-T conditions; Geochemical Dispersion. Primary and Secondary dispersion patterns and their classification; Geochemistry of Lithosphere, Atmosphere, Biosphere; Geochemical cycle.

UNIT-IV


Geochemistry of Water – Mineral Stability; Water – rock interaction, Migration of elements in endogenic environment. Eh-pH – diagram and natural water environment.

UNIT-V

Radiogenic isotopes, Radioactive decay and growth; Basic ways of dating, Isochrons, Radiometric dating of single mineral and whole rock; Radioactive Decay schemes of U-Th-Pb, Rb-Sr, K-Ar; Geochemistry of Uranium and Thorium – Nuclear Reactors, Neutron activation analysis. Application of stable isotopes in Geology.



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PRACTICALS:

Sampling and sample preparation – Methods of Preparation 'B' solution (Dissolution procedures) Determination of elemental concentration on Atomic absorption spectrometer. Calculation of radio metric dating of minerals.

TEXT BOOKS:

Principles of Geochemistry – Brian Mason & C.B. Moore Geochemistry – Gold Schmidt.


Introduction to Geochemistry – Krawskop, K.B., M.C. Graw Hill Applied Geochemistry – F.R. Siegel.

Stable Isotope Geochemistry – Springer verlag Principles of Isotope Geology – John Wiley Publication Faure, G; 1986.



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Model Question Paper
Geochemistry and Isotope Geology, II - Semester
M. Sc Geology, Paper - II
(With effect from the admitted batch 2022-2023)

Time: 3Hrs

Max. Marks: 70

Answer FIVE questions, choosing ONE from each Unit.

All questions carry equal marks.

UNIT-I

1. Write an essay on Primary Differentiation of elements in the earth

OR

2. Write short notes on any THREE of the following:
- Cosmic abundance of elements
 - The Composition of the earth crust
 - Geochemical Classification of the elements
 - Composition of the meteorites

UNIT-II

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

OR

4. Write short notes on any THREE of the following:
- Significance of crystal chemistry
 - Distribution coefficient of trace elements
 - Laws of the thermodynamics
 - Ionic substitution in minerals

UNIT-III

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

OR

6. Write short notes on any THREE of the following:
- | | |
|---------------------------------|---------------------------------|
| a) Primary dispersion patterns. | b) Geochemistry of Lithosphere. |
| c) Geochemistry of atmosphere. | d) Geochemical cycle. |

UNIT-IV

7. Describe the Process of water – rock interaction

OR

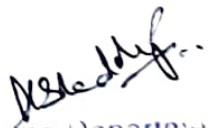
8. Write short notes on any THREE of the following:
- Migration of elements in endogenic environment
 - Mineral stability
 - Eh-pH diagram
 - Natural water environment

UNIT-V

9. Write an essay on Radiometric dating of minerals

OR

10. Write short notes on any THREE of the following:
- | | |
|------------------------|----------------------------|
| a) Radiogenic Isotopes | b) Geochemistry of uranium |
| c) Nuclear Reactors | d) Decay scheme of K- Ar |


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**II Semester M.Sc Geology
HYDROGEOLOGY**

Paper: III

Course outcomes

- CO₁ :** To Introduce concepts on occurrence and distribution of underground water.
- CO₂ :** To familiarize the students with the principles of ground water movement.
- CO₃ :** To impart the techniques of ground water exploration and drilling Methodologies to the students.
- CO₄ :** To Introduce and familiarize the students regarding quality and pollution aspects of Ground water.
- CO₅ :** To explain the concepts Groundwater management.

Learning outcomes:

At the end of the course student will be able to

- LO₁ :** Learn about basic concepts in Ground water occurrence and distribution in different geologic formations.
- LO₂ :** How the ground water moves in different geologic structures and lithologies.
- LO₃ :** Explore and exploit the ground water in different geologic terrains.
- LO₄ :** Independently determine the quality of groundwater and decide upon its uses for domestic, irrigation and irrigation utilities.
- LO₅ :** Learn how to conserve and manage Ground water resources.

Course Specific Outcomes:

- CSO1 :** Occurrence and distribution of ground water with the principals of ground water moment.
- CSO2 :** To understand Ground water chemistry to assess the quality and pollution aspects of ground water

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
C01				√				
C02		√						
C03			√					
C04						√		
C05				√				

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4
C01		√		
C02		√		
C03			√	
C04			√	
C05	√			

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M. H. Reddy
**Head of the Department
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Andhra University
Visakhapatnam - 530 002**

SYLLABUS

M. Sc GEOLOGY

PAPER- III, HYDROGEOLOGY

II - SEMESTER

UNIT-I

Occurrence and distribution of Ground Water: Origin of Water: Hydrologic cycle; Hydrological properties of rocks – Porosity, Specific yield, Specific Retention, Hydraulic Conductivity, Storativity, and Transmissivity; Vertical Distribution of Ground Water; Types of Aquifers- Unconfined, Confined, Semi - Confined & Perched; Springs; Hydrothermal phenomena.

UNIT-II

Ground Water Mechanics: Darcy's law and its Application ; Determination of Permeability in laboratory and in field; Steady State, Unsteady State and Radial Flow equations; Tracer Studies; Pumping Tests- Methods, Estimation of T & S by Theis, Jacob and Theis Recovery Methods, Specific Capacity Method by Slither'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 Development; Well Rehabilitation; Pumping equipment.

UNIT-IV

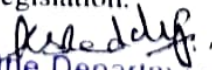
Ground Water Chemistry: Quality of Ground Water, Physical and Chemical properties; Quality criteria for domestic, irrigation and industrial uses; Graphical presentation of Water quality data; Sources of pollution; Sea water intrusion and its controls; Problems of Arsenic, Fluoride and Nitrate; Radioisotopes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

UNIT-V

Ground Water Management: Water Table Contour maps; Water Table fluctuations and causative factors; Overexploitation and Ground Water Mining ; Ground Water Development in Urban areas and Rain water Harvesting; Renewable and Non-renewable Ground Water resources; Concept of Basin Management, Watershed Basin Management; Artificial Recharge methods; Land subsidence; Modelling Techniques; Ground Water Provinces of India; Ground Water Legislation.



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PRACTICALS:

Hydro geological surveys around Visakhapatnam. 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. Well loss estimation from stop drawdown test and graphical presentation of chemical data.

TEXT BOOKS:

Ground water Hydrology by Todd, D.K. John Wiley & Sons. New York.

Hydrogeology by Karanth, K.R. Tata Mc Graw Hill Publ Co New Delhi.


Ground water assessment, Development and Management by Karanth K.R. Tata Mc Graw Hill Publ. Co. New Delhi.

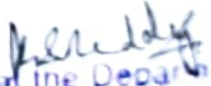
Hydro Geology by Davis S.N. and Dewiest, R.J.M. John wiley & Son New York.

Ground Water by Raghunath, H.M. Wiley Eastern Ltd. New Delhi.

Ground water Resources evaluation by Walton, W.C. Mc Graw Hill Publ. Co. New Delhi.

Ground water Hydrology by Bouwer H. Mc Graw Hill Book Co. New Delhi.


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Model Question Paper
Hydrogeology, II - Semester
M. Sc Geology, Paper - III

(With effect from the admitted batch 2022-2023)

Time: 3Hrs

Max. Marks: 70

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 **THREE** of the following:
- | | |
|---|-----------------------------------|
| a) Precipitation. | b) Evaporation and transpiration. |
| c) Vertical distribution of ground water. | d) Infiltration. |
| e) Coastal aquifer system. | |

UNIT-II

3. Describe the occurrence of groundwater in sedimentary formations,

OR

4. Write short notes on any **THREE** of the following:
- | | |
|---------------------------------------|-------------------------|
| a) Hydraulic conductivity. | b) Storage coefficient. |
| c) Specific yield. | d) Tidal efficiencies. |
| e) Groundwater in Basaltic formation. | |

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 **THREE** of the following:
- | | |
|---------------------------|----------------------------------|
| a) Boundary conditions. | b) This method of pumping tests. |
| c) Flow net analysis. | d) Cone of depression. |
| e) Construction of wells. | |

UNIT-IV

7. Explain in detail the different drilling methods.

OR

8. Write short notes on any **THREE** of the following:
- | | |
|---------------------------|----------------------|
| a) Well maintenance. | b) Well development. |
| c) Tube wells. | d) Design of wells. |
| e) Construction of wells. | |

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UNIT-V

9. Give a brief account of ground water pollution.

OR

10. Write short notes on any **THREE** of the following:
- | | |
|--|---|
| a) Diagrammatic representation of chemical data. | c) Classification of irrigation waters. |
| b) Bacteriological parameters. | e) Fluorosis. |
| d) Hardness of water. | |

**II-Semester M.Sc Geology
(ECONOMIC GEOLOGY & INDIAN MINERAL DEPOSITS)**

Paper : IV

Course outcomes

- CO₁** : To introduce processes of formation of mineral deposits, ore bearing fluids, metallogenic epochs etc.
- CO₂** : To impart knowledge on preparation of polished sections and physical properties of Ore minerals.
- CO₃** : To familiarize student with structures and textures of ore minerals. Applications of ore microscopic studies in ore dressing.
- CO₄** : To impart knowledge on chromite, manganese, copper-lead-zinc deposits etc.
- CO₅** : To familiarize student on coal, barites, clays, limestone etc.

Learning outcomes:

At the end of the course student will be able to

- LO₁** : Explain the processes of formation of mineral deposits, able to understand ore bearing fluids, metallogenic epochs etc.
- LO₂** : Understand the procedure of preparation of polished sections and physical properties of ore minerals.
- LO₃** : Outline various structures and textures of ore minerals and applications of ore microscopic studies in ore dressing.
- LO₄** : Explain occurrence, genesis, distribution and Uses of chromate, manganese, copper-lead-zinc deposits etc.
- LO₅** : Understand the occurrence, genesis, distribution and uses of coal, barites, clays, limestone etc.

Course Specific Outcomes:

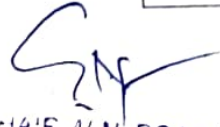
- CSO1** : To understand process of formation of mineral deposits, with special reference to chromites, Manganese, copper-lead, zinc deposits
- CSO2** : To know the applications of ore Microscopic studies in ore dressing with reference to coal, barites, clays, limestone etc.

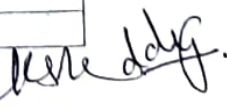
Mapping of Course Outcomes with Program Outcomes:

CO/PO	P01	P02	P03	P04	P05	P06	P07	P08
CO1	√							
CO2				√				
CO3				√				
CO4	√							
CO5							√	

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4
CO1		√		
CO2	√			
CO3		√		
CO4	√			
CO5	√			


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SYLLABUS

M. Sc GEOLOGY

PAPER – IV; ECONOMIC GEOLOGY AND INDIAN MINERAL DEPOSITS

II - SEMESTER

UNIT – I

Nature of ore bearing fluids Principles of formation of mineral deposits – Role of pressure and temperature in ore-bearing fluids – Metallogenic epochs and provinces – geological thermometers. Process of formation of mineral deposits.

UNIT –II

Ore microscope – preparation of polished section – physical properties of ore minerals under reflecting microscope – form, colour, hardness, reflectivity – reflection pleochorism, etch test etc.

UNIT – III

Structures and textures of ore minerals – Application of ore microscopic studies in ore dressing.

UNIT – IV

Geological setting mode of occurrence, genesis, distribution and uses of chromite, manganese, iron, copper- lead- zinc, bauxite and placers.

UNIT – V

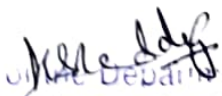
Geological setting mode of occurrence, genesis, distribution and uses of coal, barites, clays, limestones, mica, phosphates, precious and semi-precious stones.

PRACTICALS:

- I. Megascopic identification of ore minerals.
- II. Identification of ore minerals under ore microscope.

TAXT BOOKS:

1. Economic Minerals Deposits – Bateman, A.M. and Jenson, M.L.
2. Ore Deposits – Park Jr. C.F. and MacDiarmid, R.A.
3. Ore Deposits in India – Gokhale, K.V.G.K. and Rao, T.C.
4. Industrial Minerals and rocks in India – Deb, S.
5. Ore Deposits – Lindgren, W.
6. Ore Petrology – Stanton, R.L.
7. Ore Microscopy – Cameron, E.C.
8. Ore texture and their intergrowths – Ramdohr, P.


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COLLEGE OF SCIENCE AND TECHNOLOGY**



Scheme of Instruction and Examinations


III SEMESTER, M.Sc. GEOLOGY

(With effect from the admitted batch 2022-2023)

III – SEMESTER, M.Sc. GEOLOGY
Scheme of Instruction and Examinations
(With effect from the admitted batch 2022-2023)

S. No.	Course Code	Course	Teaching/Lab Hours Per week	Duration of Examination hours	Allotment of Marks		Total Marks	Subject Credits
					External	Internal (Sessionals)		
01.	G-301	Paper-I Mineral Exploration and Mineral Economics	4	3	70	30	100	4
02.	G-302	Paper-II Fuel Geology	4	3	70	30	100	4
03.	G-303	Paper-III Environmental Geology	4	3	70	30	100	4
04.	G-304	Paper-IV Sedimentary Basins of India	4	3	70	30	100	4
05.	G-305	Paper-I Mineral Exploration and Mineral Economics (Practical)	3	3	50		50	2
06.	G-306	Paper-II Fuel Geology (Practical)	3	3	50		50	2
07.	G-307	Paper-III Environmental Geology (Practical)	3	3	50		50	2
08.	G-308	Intellectual Property Rights (IPR)	-	-	-		50	2
09.	G-309	MOOCs	-	-	-		100	4
10.	G-310	Geological Mapping (Two weeks)	-	-	-	-	75	3
11.	G-311	Viva Voice	-	-	-	-	25	1
TOTAL							800	32


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**III-Semester M.Sc Geology
MINERAL EXPLORATION AND MINERAL ECONOMICS**

Paper: I

Course outcomes

- CO₁** : To introduce the basic concepts on Geological Mapping, sampling and prospecting.
- CO₂** : To impart knowledge on prospecting of metallic and non metallic mineral deposits.
- CO₃** : To familiarize students with basics of Geophysical prospecting methods.
- CO₄** : To impart knowledge on the basics of geochemical prospecting.
- CO₅** : To familiarize students with the basics of minerals economics.

Learning outcomes:

At the end of the course student will be able to

- LO₁** : Explain the basics of Geological mapping, sampling and prospecting.
- LO₂** : Understand different prospecting methods for metallic and non metallic mineral deposits.
- LO₃** : Explain the geophysical prospecting methods.
- LO₄** : Outline various basics of geochemical prospecting.
- LO₅** : Understand the basics of mineral economics.

Course Specific Outcomes


- CSO1** : To understand Geological mapping, sampling and Geological, Geophysical and Geochemical prospecting Methods.
- CSO2** : To understand peculiarities of Mineral deposits basics of minerals economics and mineral based industries in A.P

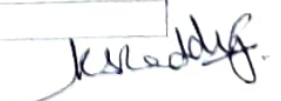
Mapping of Course Outcomes with Program Outcomes:

CO/PO	P01	P02	P03	P04	P05	P06	P07	P08
C01			√					
C02				√				
C03				√				
C04				√				
C05					√			

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4
C01		√		
C02			√	
C03			√	
C04			√	
C05	√			


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SYLLABUS

III – SEMESTER, M. Sc GEOLOGY

PAPER- I, MINERAL EXPLORATION AND MINERAL ECONOMICS

(With effect from the admitted batch 2022-2023)

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.

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

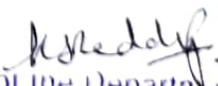
Demand & Supply of minerals and conservation and substitution of minerals Strategic, critical and essential minerals changing pattern on mineral consumption and economy in India. Mineral based industries in Andhra Pradesh.

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. Mining Geology by MC kinstry Geochemical Mineral Bachu Viva.
2. Field Geology by Lahee.
3. Mineral Economics by Sinha & Sharma
4. Practical munch of exploration & Prospect by S.K. Babu.
5. Geo-Chemistry in mineral exploration by Hakess / webb.


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Model Question Paper

III – SEMESTER, M. Sc GEOLOGY

PAPER – I, MINERAL EXPLORATION AND MINERAL ECONOMICS

(With effect from the admitted batch 2022-2023)

Time: 3Hrs

Max. Marks: 70

Answer FIVE questions, choosing ONE from each Unit.

All questions carry equal marks.

UNIT-I

1. Explain in detail reconnaissance survey.

OR

2. Answer any **TWO** of the following:
a) Geological prospecting.
b) Sampling.
c) Geological mapping.

UNIT-II

3. Write about geological prospecting for coal deposit and add a note on Singareni coal deposits of Andhra Pradesh.

OR

4. Answer any **TWO** of the following:
a) Ore reserve estimation.
b) Asbestos deposits of India.
c) Non-metallic mineral deposits.

UNIT-III

5. Describe the various geophysical methods of prospecting for metallic deposits.

OR

6. Answer any **TWO** of the following:
a) Data generation and interpretation.
b) Radioactivity method.
c) Exploration of gas and oil.

UNIT-IV

7. Write an essay on geochemical mobility and its importance in mineral exploration.

OR

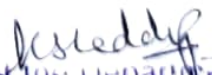
8. Answer any **TWO** of the following:
a) Primary dispersion
b) Geochemical environment.
c) Geobotanical methods in mineral exploration.

UNIT-V

9. Write an essay on strategic, critical and essential minerals and their distribution in India.

OR

10. Answer any **TWO** of the following:
a) Conservation of minerals
b) Demand and supply of minerals.
c) Mineral based industries in A.P.


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**III -Semester M.Sc Geology
FUEL GEOLOGY**

Paper: II
Course outcomes

- CO₁** : To introduce the petroliferous rocks, origin and occurrence of petroleum
- CO₂** : To study the migration and accumulation of petroleum
- CO₃** : To classify the hydrocarbon traps and study the physical and chemical properties of reservoir fluids.
- CO₄** : To study the geological conditions of coal formation origin of coal and development of coal facies, classification, ranking and grading of coal.
- CO₅** : To introduce the principles and applications of coal petrology and origin of coal macerals, classification of Gondwana coals.

Learning outcomes:

At the end of the course student will be able to

- LO₁** : Understand the petroliferous rocks viz, source, reservoir and cap rocks. Discuss the origin and occurrence of petroleum.
- LO₂** : Explain the primary and secondary migration, classification of hydrocarbon traps and reservoir fluid characters.
- LO₃** : Describe the different types of well logs and their uses. Classification of sedimentary basins of India.
- LO₄** : Understand the geological conditions of coal formation describe the origin, classification, ranking and grading of coal.
- LO₅** : Explain the origin of coal macerals and coal petrology Classification of Gondwana coals and coal bed methane.

Course Specific Outcomes

- CS01** : To understand Origin, occurrence of Hydrocarbons, physical and Chemical properties of Reservoirs fluids.
- CS02** : To understand coal origin and development of facies, classification, ranking and grading of coal and classification of grades coal.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	P01	P02	P03	P04	P05	P06	P07	P08
CO1				√				
CO2				√				
CO3							√	
CO4				√				
CO5				√				

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4
CO1		√		
CO2		√		
CO3			√	
CO4			√	
CO5			√	

SYLLABUS

III – SEMESTER, M. Sc GEOLOGY

PAPER- II, FUEL GEOLOGY

(Effective from the Admitted Batch of 2022 – 2023)

UNIT-I

Introduction to Petroleum Geology, Sand stone, Sandstone reservoir. Surface and subsurface occurrences of petroleum, pools, fields and provinces. Classification and Nomenclature of Reservoir rocks, fragmental and chemical. Origin and classification of porosity and permeability. Type and nature of source rocks. Origin of petroleum – Organic origin – Nature of organic source. Maturation of Kerogen, Biogenic and thermal effect. Source rocks and petroleum Geochemistry.

UNIT-II

Migration and accumulation of petroleum, primary and secondary migration. Geological factors controlling hydrocarbon migration routes and stratigraphic barriers. Reservoir traps – Classification of hydrocarbon traps, structural, stratigraphic and combination. Reservoir fluids – Water, oil and gas and their physical and chemical characters. Fluid flow various traps: Stratigraphical, lithological and structural.

UNIT-III

Methods of petroleum exploration – Well logging. Petroliferous basins of India – Assam, Bengal, Krishna, Godavari, Cauvery, Cambay and Bombay offshore basins. Occurrence of gas hydrates in the Eastern continental margin of India.

UNIT-IV


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.

UNIT-V

The Origin of Coal Macerals. Principles and applications of coal petrology. Coal petrology and Evaluation, Microscopic constituents of Coal, Vitrinite, Exinite and Intertinite group. Classification of Gondwana coals, their conditions of deposition and distribution in India. Microlithotypes. Applied coal petrology, petrography of Gondwana coals and Coal bed Methane.



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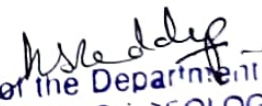
PRACTICALS:

Preparation of Stratigraphic cross sections, Development of stratigraphic panel (Fench) diagrams. Intertounging diagrams. Structure contour map, location of oil and gas. Isopach and Isolith maps. Identification of Megascopic coal samples, different macerals and microlithotypes. Coal rank measurements based on reflectance. Exercises on well-logging - Electrical, Sp. and Sonic etc for petroleum and coal.

TEXT BOOKS:

- 1) Selly, R.C; 1998: Elements of petroleum geology. Academic press.
- 2) Levenson, A.I, 1985, Geology of petroleum, C.B.S. Publishers and Distributors.
- 3) Chandra, D. Singh, R.M and Sing M.P: 2000: Text book of Coal (Indian Context). Tara Book agency, Varanasi.
- 4) Sing, M.P. (Ed), 1998: Coal and organic petrology, Hindustan pub. Corp. New Delhi.
- 5) P.K. Bhowmick, Phanerozoic petroliferous Basins of India. KDMIPE, ONGC, Dehradun.
- 6) Kotur S. Narasimhan and A.K. Mukherjee; Gondwana coals of India; Allied publishers limited.


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Model Question Paper
III - SEMESTER, M.Sc. GEOLOGY
PAPER-II: FUEL GEOLOGY
(Effective from the Admitted Batch of 2022 – 2023)

Time: 3 hours

Max. Marks: 70

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

UNIT-I

- 1) Write an essay on classification of petroleum Reservoir rocks.

OR

- 2) Write short notes on any **TWO** of the following :
- a) Surface occurrence of oil and gas.
 - b) Porosity.
 - c) Nature of Organic source for hydrocarbons.

UNIT-II

- 3) Discuss about the various geological factors controlling the hydrocarbon migration.

OR

- 4) Write short notes on any **TWO** of the following:
- a) Primary migration.
 - b) Stratigraphic traps.
 - c) Reservoir fluids.


UNIT-III

- 5) Write an essay on methods of petroleum Exploration.

OR

- 6) Write short notes on any **TWO** of the following:
- a) Electrical method of well logging.
 - b) Stratigraphy & Tectonics of Cauvery basin.
 - c) Occurrence of Gas hydrates.


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(P.T.O)

UNIT-IV

7) Write an essay on favourable geological conditions of Coal formation.

OR


- 8) Write short notes on any **TWO** of the following :
- a) Development of Coal facies.
 - b) Temperature and redox potential.
 - c) Grade of Coal.

UNIT-V

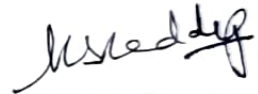
9) Give an account on classification and distribution of Gondwana Coals in India.

OR

- 10) Write short notes on any **TWO** of the following:
- a) Microscopic constituents of Coal.
 - b) Petrography of Gondwana Coals.
 - c) Coal bed Methane.



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**III-Semester M.Sc Geology
ENVIRONMENTAL GEOLOGY**

Paper: III

Course outcomes

- CO₁** : To introduce of Environmental Geology, concept of land uses and desertification, degradation and management of land
- CO₂** : To impart knowledge on soil profile and conservation, degradation, uses of Fertilizers, Feticides, Importance of hydrological consideration.
- CO₃** : To familiarize the impact of mining activities on environment, surface and underground water, Atmosphere
- CO₄** : To introduce the effects the Geo-environmental hazards such as Geological and Natural Hazards and remedial measures against hazards
- CO₅** : To illustrate the causes for pollution and remedies methods and energy resources.

Learning outcomes:

At the end of the course student will be able to

- LO₁** : Explain the basics principles of Environmental Geology
- LO₂** : Interpret the soil and water vulnerability conditions in India.
- LO₃** : Illustrate the impacts of mining activities on various environments.
- LO₄** : Choose the means of preparedness measures against- geological hazards.
- LO₅** : Causes and controlling methods of Global warming, Pollution and students cause's aware alternative energy resources

Course Specific Outcomes

- CSO1** : To understand land use patterns and desertification, degradation and Soil Profile, conservation, degradation
- CSO2** : To understand to impact of mining activities, on environment like surface and underground water, Atmosphere, Geo- environmental hazards and pollution and remedial measures, and energy resources

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1			√					
CO2				√				
CO3						√		
CO4						√		
CO5						√		

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4
CO1	√			
CO2		√		
CO3				√
CO4				√
CO5				√

M.S. GEOLOGY
III SEMESTER SYLLABUS
PAPER – III
ENVIRONMENTAL GEOLOGY
(With effect from the academic year 2022-2023)

UNIT – I

Principles of environmental geology; Land and its use, cause for land desertification and land degradation and land management.

UNIT – II

Soil profile and conservation; Soil degradation irrigation, use of fertilizers and pesticides water resources – hydrological considerations, problems and management; Environmental impact of water impoundment.

UNIT – III

Impacts of mining activities on the environment, soil environment, surface water, underground water, atmosphere management in mining, erosion – causes and control.

UNIT – IV

Geoenvironmental hazards – Volcanoes, earthquakes, Floods, Coastal

Hazards: cyclones, Tsunami and wave surges.

UNIT – V

Pollution and energy – Global warming, water contamination, waste disposal: Solid waste, alternative sources of energy.

PRACTICALS:

- a) Water analysis.
- b) Classification of suitable water for drinking, irrigation and industrial purposes.
- c) Presentation of chemical data and plotting chemical classification diagram.
- d) Evaluation of ground water pollution.

BOOKS:

1. Valdiya, K.S., 1987: Environmental Geology – Indian context, Tata – McGraw Hill, New Delhi.
2. Keller, E.a., 1978. Environmental Geology. Bell and Howell, USA.
3. Patwardhan, A.M., 1999: The Dynamic earth system, Prentice Hall, New Delhi.
4. Submanian, V., 2001. Text book in environmental Science, Narosa Publication, New Delhi.

Aswathy
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Andhra University
Visakhapatnam

M.S. GEOLOGY DEGREE EXAMINATION
III SEMESTER SYLLABUS
MODEL QUESTION PAPER
PAPER – III: ENVIRONMENTAL GEOLOGY
(With effect from the academic year 2022-2023)

Time: 3 hours

Max. Marks: 70

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

UNIT – I

1. Explain the various land use practices in India.

OR

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

- a) Environmental Geology
- c) Land management.

b) Land Desertification.

UNIT – II

3. Write an essay on environmental impact of water impoundment.

OR

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

- a) Effect of fertilizers
- c) Conservation of soil profile.

b) Soil degradation.

UNIT - III

5. Explain the causes for erosion in mining areas and add a note on the controlling measures.

OR

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

- a) Impact of mining activities
- c) Mining and health hazards.

b) Mining management.

UNIT – IV

7. What is a Volcano. Explain the goenvironmental effects due to Volcanoes.

OR

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

- a) Floods
- c) Cyclones and Coastal areas.

b) Earthquakes

UNIT – V

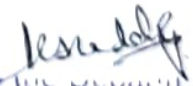
9. Write an essay on alternative sources of energy.

OR

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

- a) Global warming.
- c) Waste disposal.

b) Water contamination.


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**III- Semester M.Sc Geology
SEDIMENTARY BASINS OF INDIA**

Paper: IV

Course outcomes

- CO₁** : To introduce Basin classification and depositional environments Basin evolution and sediments and Remnant and fore land basins and young rift zones.
- CO₂** : To introduce basin mapping methods, depositional systems and sequence Stratigraphy
- CO₃** : To introduce Stratigraphy, structure and tectonics of sedimentary basins of East coast of India K G Basin, Bengal, Mahanadi and Cauvery Basins.
- CO₄** : To introduce Stratigraphy, Structure and tectonics of Sedimentary West Coast of India kutch-Saurashtra-Narmada, Cambay, Bombay high, Kerala-Konkan off shore basins.
- CO₅** : To introduce Stratigraphy, structure and tectonics of some other sedimentary basins of India like Cuddapah, Rajasthan, Assam Shelf and Himalayan Basins.

Learning outcomes:

At the end of the course student will be able to

- LO₁** : Explain Basin classification and depositional environments and evolution and sediments and some examples of rift zones.
- LO₂** : Explain Basin mapping methods, depositional systems and sequence Stratigraphy.
- LO₃** : Explain Stratigraphy, structure and tectonics of Bengal, Mahanadi, Krishna Godavari and Cauvery sedimentary basins.
- LO₄** : Explain Stratigraphy, structure and tectonics of Kutuch, Saurashtra, Narmada, Combay, Bombay High, Kerala and Kankan offshore basins of India.
- LO₅** : Explain Stratigraphy, structure and tectonics of Sedimentary Basins of India like cuddapah, Vindhyan, Rajasthan, Assam shelf and Himalayan basins

Course Specific Outcomes

- CSO1** : To understand basin classification and depositional environments, basin mapping, sequence Stratigraphy
- CSO2** : The students able to understand Stratigraphy of sedimentary basins of East and west Coast of India

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1				√				
CO2				√				
CO3			√					
CO4			√					
CO5			√					

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4
CO1		√		
CO2		√		
CO3		√		
CO4		√		
CO5		√		

SYLLABUS

III – SEMESTER, M. Sc GEOLOGY

PAPER- IV, SEDIMENTARY BASINS OF INDIA

(Effective from the Admitted Batch of 2022-2023)

UNIT-I

Basins Classification and Depositional Environments: Tectonic Basin Classification, Tectonics and Basin Filling, Basin Morphology and Depositional Environments.

Basin Evolution and Sediments: 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) Examples of 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, Nonmarine depositional systems, alluvial depositional systems, Eolian 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.

TEXT BOOKS:

- 1) Einsele G 1992 Sedimentary Basins. Springer Verlag.
- 2) Miall A 2000 Principles of Sedimentary Basin analysis.
- 3) Sengupta S 1997. Introduction to Sedimentology oxford – IBH.
- 4) Petrol ferrous Basins of India, ONGC, Petroleum Asia Journal.

M. Reddy
DEPARTMENT OF GEOLOGY
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Visakhapatnam - 530003

Model Question Paper
III SEMESTER, M. Sc GEOLOGY,
PAPER – IV, SEDIMENTARY BASINS OF INDIA
(Effective from the Admitted Batch of 2022-2023)

Time: 3hourse

Max. Marks: 70

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:
- Rift basins
 - Intercontinental Sag Basins
 - Foreland Basins.

UNIT – II

- 3) Explain different mapping methods of Sedimentary Basins.

OR

- 4) Write short notes on any **TWO** of the following:
- Sequence stratigraphy.
 - Carbonate and evaporate depositional systems.
 - 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:
- Mahanadi Basin.
 - Bengal Basin.
 - 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:
- Cambay Basin.
 - Narmada Basin.
 - Konkan Offshore Basin.

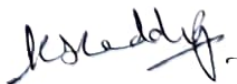
UNIT – V

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

OR

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

- Cuddapah Basin.
- Rajasthan Basin.
- Himalayan foot hill Basin.


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**ANDHRA UNIVERSITY
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COLLEGE OF SCIENCE AND TECHNOLOGY**



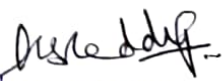
Scheme of Instruction and Examinations
IV SEMESTER, M.Sc. GEOLOGY
(With effect from the admitted batch 2022-2023)

IV – SEMESTER, M.Sc. GEOLOGY
Scheme of Instruction and Examinations
(With effect from the admitted batch 2022-2023)

S. No	Course Code	Course	Teaching/ Lab Hours Per week	Duration of Examination hours	Allotment of Marks		Total Marks	Subject Credits
					External	Internal (Sessional s)		
01.	G -401	Paper-I Marine Geology	4	3	70	30	100	4
02.	G -402	Paper-II Mining & Engineering Geology	4	3	70	30	100	4
03.	G -403	Paper-III Geomorphology Remote Sensing	4	3	70	30	100	4
04.	G -404	Paper I Marine Geology (Practical)	3	3	50		50	2
05.	G -405	Paper III Geomorphology Remote sensing (Practical)	3	3	50		50	2
06	G -406	Research Methodology	2		-		50	2
07	G -407	MOOCs	-		-		100	4
08.	G -408	Paper-IV Project work	8	-	100		100	4
09	G -409	Viva- Voce	-	-	50		50	2
TOTAL							700	28



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**IV- Semester M.Sc Geology
MARINE GEOLGOY**

Paper: I

Course outcomes

- CO₁** : Introduce historical development of marine Geology. Sediment sampling methods, Petrology and source of oceanic crust.
- CO₂** : Illustrate the continental drift, sea floor spreading, plate tectonics divergent - convergent and active margins etc.
- CO₃** : Introduce sea coast classification, sea level changes, law of sea bed causes of sea level changes etc.
- CO₄** : Outline the deep sea sediments and classification, Terrigenous deep sea sediments, Biogenic, authigenic sediments. Marine mineral resources etc.
- CO₅** : Introduce the paleo- oceanography and sediments history of the ocean basins. Oceanic history of CC D. etc.

Learning outcomes:

At the end of the course student will be able to

- LO₁** : Explain historical development of marine geology, sediments sampling methods, Petrology and sources of oceanic crust of changes after formation.
- LO₂** : Illustrate the continental drift, sea floor spreading, Island arcs and back are basins, continental margins types Nearshore geological processes on the continental drifts.
- LO₃** : Illustrate sea-coast classification, sea level changes rate of sedimentation, marine pollution. Causes of sea level changes.
- LO₄** : Explain deep sea sediments and classification, Terrigenous deep sediments. Biogenic and authigenic sediments etc.
- LO₅** : Illustrate the Palaeo-oceanography and sediment history of ocean basins. History of calcium compensation. Depth (CCD)- critical events in ocean history.

Course Specific Outcomes:

- CSO1** : To understand Marine Geology with respect to palaeography and Paleo oceanography
- CSO2** : To know the Deep sea sediments Characteristics

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	√							
CO2	√							
CO3								√
CO4	√							
CO5	√							

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4
CO1	√			
CO2	√			
CO3				√
CO4	√			
CO5	√			

SYLLABUS

IV – SEMESTER, M. Sc. GEOLOGY

PAPER- I, MARINE GEOLOGY

(With effect from the admitted batch 2022-2023)

UNIT-I

Introduction and Historical development of Marine Geology. Sediment sampling methods: morphology of the ocean: oceanic crust structure, petrology and sources of oceanic crust: and changes after formation. New oceanic crust, and trenches.

UNIT-II

Continental drift; sea floor spreading ; Plate tectonics – concept and geometry of plate tectonics: convergent, divergent, transcurrent boundaries driving mechanism of plates, Island Arcs and back arc basins; Continental margin types: Divergent – convergent and active margins; collision processes on convergent margins. Nearshore geological processes on the continental shelf.

UNIT-III

Sea-Coast-Classification, Sea-level changes, Rate of sedimentation. Marine pollution. Law of the Sea. Causes of sea level changes.

UNIT-IV

Deep sea sediments and classification: Terrigenous deep sea sediments; Biogenic and Authigenic sediments. The geologic record of bottom currents – Method of study: erosion, transportation and deposition of bottom currents. Marine Mineral Resources. Turbidity currents cold and warm oceanic currents.

UNIT-V

Palaeo-oceanography and sediment history of the ocean basins – Pacific, Atlantic and Indian. Oceanic history of Calcium Carbonate Compensation Depth (CCD), Global palaeo-oceanography and evolution – Critical events in ocean history.

PRACTICALS:

Beach Profile studies: Estimation of deposition and erosion. **Interpretation of Echo-profiles** – Continental Shelf, Slope, rise and Abyssal Plains. **Coarse fraction studies:** Oolites, Glauconite and Phosphorite etc. **Clay mineral analysis** – X- ray diffraction charts. Estimation of calcium carbonate and Organic matter percentage in the sediments.

TEXT BOOKS:

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

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Model Question Paper

IV – SEMESTER, M. Sc. GEOLOGY

PAPER – I, MARINE GEOLOGY

(With effect from the admitted batch 2022-2023)

Time: 3Hrs

Max. Marks: 70

Answer FIVE questions, choosing ONE from each Unit.

All questions carry equal marks.

UNIT – I

1. Discuss the history and development of marine Geology in the world.

OR

2. Write short notes on any **TWO** of the following.
- Sources of oceanic crust.
 - Core samplers.
 - Morphology of the oceans.

UNIT – II

3. What is continental drift? Explain the mechanism of plate tectonics.

OR

4. Write short notes on any **TWO** of the following.
- Island Arcs.
 - Sea floor spreading.
 - Nearshore geological processes.

UNIT – III

5. Write detailed notes on classification of sea coasts.

OR

6. Write short notes on any **TWO** of the following.
- Rate of Sedimentation.
 - Marine pollution.
 - Law of the sea bed.

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UNIT – IV

7. Write detail notes on classification of Deep sea sediments.

OR

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

- a) Beach placers.
- b) Carbonate sediments.
- c) Occurrence of hydrocarbons in the sea.

UNIT-V

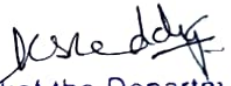
9. Write an essay on the palaeo-oceanography and sediment history of Indian Ocean.

OR

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

- a) Calcium Carbonate Compensation Depth (CCD).
- b) Critical events in ocean history.
- c) Sediment history of Pacific Ocean.


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**IV –Semester, M.Sc Geology
MINING AND ENGINEERING GEOLOGY**

**Paper : II
Course outcomes**

- CO1 :** To introduce surface mining concepts and methods
- CO2 :** To impart knowledge on underground mining methods, Mine transportation and ventilation
- CO3 :** To Familiarize the students with site investigations for Dams and Reservoirs
- CO4 :** To illustrate methods of tunnelling and problems.
- CO5 :** To introduce soil classification and Engineering properties of rocks

Learning outcomes:

At the end of the course student will be able to

- LO1 :** Explain various methods of surface mining & development of Mines
- LO2 :** Illustrate underground metallic & non metallic mining methods
- LO3 :** Understand Geological parameters to be considered for Dams and Reservoirs
- LO4 :** Explain causes and remedial methods of land slides and tunnelling methods
- LO5 :** Understand Mechanics of Soils & strengths of various rocks

Course Specific Outcomes:

- CSO1 :** To know the surface mining and Underground Mining methods of Metallic and Non Metallic Mineral mine waste disposal methods.
- CSO2 :** To know the Engineering properties of Geological, Geomorphological considerations for construction of civil Engineering structures like dams, Reservoirs, Tunnels etc.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	P01	P02	P03	P04	P05	P06	P07	P08
CO1	√							
CO2	√							
CO3				√				
CO4	√							
CO5	√							

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4
CO1	√			
CO2	√			
CO3	√			
CO4	√			
CO5				√

SYLLABUS

IV – SEMESTER, M. Sc. GEOLOGY

PAPER- II, MINING & ENGINEERING GEOLOGY

(With effect from the admitted batch 2022-2023)

UNIT-I

Surface Mining: Factors Influencing Surface Mining Method. Quarrying. Open cast Mining. Clearing & Development of Benches. Disposal of waste. Manual & Mechanical mining. Methods: Alluvial mining methods, clay mining methods, coal mining methods.

UNIT-II

Underground mining: Mining Methods for metallic & non Metallic Minerals. Levels. Drivers, inclines, shafts, Stopping, stowing, Explosives, drainage, transporatin. Health and safety, mine legislations and planning.

UNIT-III

Role of geologist in Engineering. Types of dams, Dams and reservoirs geological consideration for site investigation Foundation studies. Field tests, Water tightening of reservoirs. Failure of dams, case studies of dams in India.

UNIT-IV

Tunnels, Tunneling in various types of rocks and soils, their problems. Landslides – Causes, types and remedial methods.

UNIT-V

Soils, soil Characteristics, soil classification. Mechanics of soils. Building stones, Engineering properties, strength of materials. Distribution of Various types of building stones in India.

TEXT BOOKS:

1. R. N.P. Arogyaswamy: Courses in Mining Geology
2. McKinstry: Mining Geology.
3. Hooven: Principles of Mining.
4. Krynine: Principles of Engineering Geology.
5. N. Chenna Kesavulu: A Test book of Engineering Geology.
6. Parbin Singh: Engineering & General Geology.

Model Question Paper

IV – SEMESTER, M. Sc. GEOLOGY

PAPER- II, MINING & ENGINEERING GEOLOGY

(With effect from the admitted batch 2022-2023)

Time: 3Hrs

Max. Marks: 70

Answer FIVE questions, choosing ONE from each Unit.

All questions carry equal marks.

UNIT – I

1. What are different factors controls for selection of surface Mining.

OR

2. Answer any **TWO** of the following:
 - a) Disposal of Mine Waste.
 - b) Development of Benches.
 - c) Quarrying.

UNIT – II

3. Explain in detail about underground coal Mining Methods.

OR

4. Answer any **TWO** of the following:
 - a) Stowing.
 - b) Haulage.
 - c) Mine Legislations.

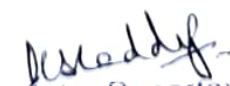
UNIT – III

5. What is various factors influence for the Dam site selection?

OR

6. Answer any **TWO** of the following:
 - a) Geology of Nagarjuna sargar Dam site.
 - b) Water tight___ of reservoirs
 - c) Causes for Dams failure.


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UNIT - IV

7. What are landslides and add remedial methods for landslides.

OR

8. Answer any **TWO** of the following:
- Water problem in Tunnel.
 - Influencing factors for tunnel alignment.
 - Types of Tunnels.

UNIT-V

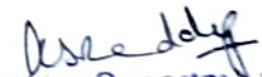
9. Write an essay on soil classifications.

OR

10. Answer any **TWO** of the following:
- Building stones.
 - Physical characteristics of soils.
 - Building stones of A.P



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**IV-Semester, M.Sc Geology
GEOMORPHOLOGY & REMOTE SENSING**

Paper: III

Course outcomes

- CO₁** : To introduce the primitive stages of Remote Sensing
- CO₂** : To introduce the Principles and Physics of Remote Sensing
- CO₃** : To familiarise the students with various applications of Remote Sensing, GIS and GPS
- CO₄** : To introduce the concepts of Drainage basin and Morphometry
- CO₅** : To introduce the importance of topographical maps and Geomorphology in mineral prospecting, Hydrological studies and Engineering Geological studies

Learning outcomes:

At the end of the course student will be able to

- LO₁** : learn about primitive stages of remote sensing i.e. various Photogeological studies and interpretation of aerial photographs
- LO₂** : understand the Principles and physics of Remote Sensing
- LO₃** : know the importance of Remote Sensing, GIS and GPS in mineral, Hydrogeological and various prospecting studies
- LO₄** : learn the advanced geomorphology and its importance in various applications
- LO₅** : Know the importance of Topographical maps and Geomorphology in various geological and terrain evaluation studies.

Course Specific Outcomes:

- CSO1** : To know the principals of Remote Sensing
- CSO2** : To know basic concepts of Geomorphology

Mapping of Course Outcomes with Program Outcomes:

CO/PO	P01	P02	P03	P04	P05	P06	P07	P08
CO1	√							
CO2	√							
CO3				√				
CO4	√							
CO5							√	

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4
CO1	√			
CO2		√		
CO3			√	
CO4	√			
CO5		√		



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SYLLABUS

IV - SEMESTER, M. Sc. GEOLOGY

PAPER – III, GEOMORPHOLOGY & REMOTE SENSING

(With effect from the admitted batch 2022-2023)

UNIT-I

Photo geology: Introduction. Aerial Photographs: types of Aerial Photographs, classification and geometry. Photogrammetry. Stereo grams, stereo scopes. Stereo scopy and scale in aerial photographs. Aerial mosaics. Aerial mosaics vs toposheet. Principles and fundamentals of aerial photo interpretation and Basic recognition elements in aerial photographs.

UNIT-II

Principles of Remote Sensing: Electromagnetic spectrum. Interaction of EMR with atmosphere and earth surface features. Spectral characteristics of vegetation, water and soil. Remote sensing observation flat forms, resolutions and orbits. Global and Indian space missions i.e. LANDSAT, METEOSAT, SEASAT, SPOT, RADARSAT. Indian space programme and its advancements.

UNIT-III

Image interpretation: Introduction to Digital Image Processing. Fundamentals of image interpretation. Basic recognition elements in satellite image interpretation. False colour composite (FCC), Aerial photo vs satellite image. Application of remote sensing in geology, geomorphology, mineral exploration and hydro geological studies.


Fundamentals of Geographic information system (GIS), Global positioning system (GPS) and their applications. Application of GIS in Geological studies.

UNIT-IV

Basic concepts of geomorphology, weathering, mass wasting and soils. Geomorphic cycle. Geomorphic process and resulting land forms. Concept of drainage basin, drainage patterns and slopes and Morphometric studies

UNIT-V

Introduction of Topographical maps, Indian topographical maps. Geomorphology of India. Morphology and it's relation to structure and lithology. Interpretation of Geology and Geomorphology from toposheets. Application of geomorphology in mineral prospecting, civil engineering studies, hydrogeological studies.


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PRACTICALS:

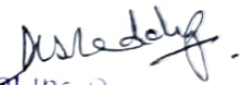
Study of Topographical maps. Stereo tests and study of different types of aerial photographs. Identification of land forms on oblique/ vertical aerial photographs using stereo scopes. Interpretation of satellite images for lithology, geomorphology and structural features.

TEXT BOOKS:

1. Miller, V.C., 1961: Photogeology, Mc Graw H, 11.
2. Sabins F.F., 1985: Remote Sensing – Principles and applications, Freeman.
3. Ray R.G., 1969: Aerial photographs in Geologic interpretations. USGS Prof. Paper 373.
4. Thornbury, W.S.: Principles of Geomorphology, Wiley Eastern New Delhi.
5. Garner H.F., 1974: Origin of Landscapes, oxford University Press.
6. Leopold L.B., 1964: Fluvial processes in geomorphology, Euresia Publishing House.



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Model Question Paper
IV – SEMESTER, M. Sc GEOLOGY,
PAPER – III, GEOMORPHOLOGY & REMOTE SENSING
(With effect from the admitted batch 2022-2023)

Time: 3Hrs

Max. Marks: 70

Answer 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 THREE of the following:
- Controlled mosaic.
 - Nadir point.
 - Vertical and inclined photograph.
 - Stereoscope usage.

UNIT-II

- 3) What is electromagnetic spectrum? Discuss it's interaction with earth surface features.

OR

- 4) Briefly write about the Advancements of Indian space programmes.

UNIT-III

- 5) Describe in detail the elements of visual image interpretation for geology.

OR

- 6) Write short notes on any THREE of the following:
- Global resource satellites.
 - Remote sensing Platforms.
 - Aerial photo Vs Satellite image.
 - Elements of GIS/ Geological Applications of GIS.

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UNIT-IV

7) Write essay on Fundamental concepts in Geomorphology.

OR

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

- a) Morphometry.
- b) Explain the drainage patterns.
- c) Types of soils.
- d) Geomorphic cycle.

UNIT-V

9) Discuss about the relation between the morphology and Structure and lithology.


OR

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

- a) Relief & slope.
- b) Topographical maps
- c) Karst topography
- d) Pediment and residual hill – explain.



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