

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

Scheme of Instruction and Examinations

III SEMESTER, M.Sc. (TECH) APPLIED GEOLOGY
(With effect from the admitted batch 2016-2017)

III – SEMESTER, M.Sc. (TECH) APPLIED GEOLOGY

Scheme of Instruction and Examinations

(With effect from the admitted batch of 2016-2017)

S. No	Course	Teaching/Lab Hours Per week	Duration of Examination hours	Allotment of Marks		Total Marks	Subject Credits
				Final	Mid-Exam		
01.	Paper - I Geomorphology, Remote Sensing & GIS	4	3	80	20	100	4
02.	Paper – II Engineering Geology & Environmental Geology	4	3	80	20	100	4
03.	Paper – III Hydrogeology	4	3	80	20	100	4
04.	Paper – IV Sedimentary Basin of India	4	3	80	20	100	4
05.	Paper - I Geomorphology, Remote Sensing & GIS <i>(Practical)</i>	4	3	50		50	2
06.	Paper – II Engineering Geology & Environmental Geology <i>(Practical)</i>	4	3	50		50	2
07.	Paper – III Hydrogeology <i>(Practical)</i>	4	3	50		50	2
08.	Geological Mapping (Two Weeks)	-	-	75		75	3
09.	Viva-Voice	-	-	25		25	1
TOTAL						650	26

SYLLABUS

III – SEMESTER, M. Sc. (TECH) APPLIED GEOLOGY

PAPER- I, GEOMORPHOLOGY REMOTE SENSING & GIS

(Effective from the Admitted Batch of 2016 - 2017)

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 & IRS Series of satellites.

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.

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.

ASSIGNMENTS

Topographical maps. Geomorphology of India. Morphology and it's relation to structure and lithology. Application of geomorphology in mineral prospecting, civil engineering studies, hydrogeological studies.

(P.T.O)

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: Photogeolgy, 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

III – SEMESTER, M. Sc. (TECH) APPLIED GEOLOGY

PAPER- I, GEOMORPHOLOGY REMOTE SENSING & GIS

(Effective from the Admitted Batch of 2016 -2017)

Time: 3Hrs

Max. Marks: 80

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:

- | | |
|--------------------------------------|-----------------------|
| a) Controlled mosaic. | b) Nadir point. |
| c) Vertical and inclined photograph. | d) Stereoscope usage. |

UNIT-II

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

OR

- 4) Briefly write about the 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:

- | | |
|-------------------------------------|------------------------------|
| a) Global resource satellites. | b) Remote sensing Platforms. |
| c) Aerial photo Vs Satellite image. | d) Elements of GIS. |

UNIT-IV

- 7) Write essay on Fundamental concepts in Geomorphology.

OR

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

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

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SYLLABUS

III – SEMESTER, M. Sc. (TECH) APPLIED GEOLOGY

PAPER- II, ENGINEERING GEOLOGY & ENVIRONMENTAL GEOLOGY

(Effective from the Admitted Batch of 2016 - 2017)

UNIT-I

Introduction: Scope and role of geologist in engineering construction. Dams and reservoirs – Classification and parts of dams; systematic dam site investigations – Geological, Geo-morphological and geophysical investigations for foundations and material studies; Water tightness of reservoirs, leakage and sedimentation problems of reservoirs. Failure of dams with design of underground structures in rocks using engineering guides and principles, case histories of important river valley projects of India. Soils types, classification and mechanics of soils.

UNIT-II

Landslides – definition, types, causes; stability analysis and remedies of landslides; Building materials and road construct materials, Distribution nature and properties of building stones; Tunnels – types, systematic site investigations and problems for the construction of tunnels.

UNIT-III

Principles of Environmental geology; Land and its use and management; Desertification and degradation of land; Water resources – Hydrogeological considerations and management; Soil profile, degradation, conservation; Erosion – causes and control.

UNIT-IV

Geo-environmental hazards – Volcanoes, Earthquakes, Dams and reservoirs Landslides, Tunnels, Floods, Cyclones and Tsunamis, Subsidence, Avalanches.

ASSIGNMENTS

Pollution and Energy – Impacts of mining activities on the environment and management; Water Pollution; Air pollution; Noise pollution; Waste Contamination; Global Warming; Alternative Sources of Energy.

(P.T.O)

PRACTICALS:

Identification and delineation of geology and Hydrogeological conditions from topographic sheets, aerial photos and satellite imageries. Geophysical investigation in civil Engineering constructions. Determination of Engineering properties of rocks. Preparation of Engineering geology report. Evaluation of soil and water pollution.

TEXT BOOKS:

1. Fundamentals of Engineering Geology by Khumi (R.S. Dhanapat Rai & Sons, New Delhi).
2. Principles of Engineering Geology and Geotectonics by Krynine, D.P. and Judd, W.R. (Mc-Graw- Hill, New York)
3. Text book of Engineering Geology by Chennu Kesavulu, N (Mc-Millan India Ltd., New Delhi).
4. Engineering Geology for Civil Engineering, By Venkata Reddy, D (Oxford & IBH Publ. Co. Pvt., Lt., New Delhi).
5. India's Environmental problems and perspective by RADhakrishna, K.K. Geological Society of India, Bangalore.
6. Environmental Geology – Indian context by Valdiya, K.S. (Tata-Mc-Graw Hill Publ. Co., New Delhi).
7. The Dynamic Earth System by Patwardhan, A M (Prentice Hall of India Pvt. Ltd., New Delhi).
8. Engineering and General Geology, by Parbin Singh (Katson Publ House, Ludiana).
9. Soil erosion and conservation by Tripathi, R.P. and Singh, H.P (Wiley Eaastron Limited, New Delhi).
10. Environmental Hazards, Smith, K. 1992, Routledge, London.

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MODEL QUESTION PAPER

III – SEMESTER, M. Sc. (TECH) APPLIED GEOLOGY

PAPER- II, ENGINEERING GEOLOGY & ENVIRONMENTAL GEOLOGY

(Effective from the Admitted Batch of 2016 -2017)

Time: 3Hrs

Max. Marks: 80

Answer FIVE questions, choosing ONE from each Unit.

All questions carry equal marks.

UNIT-I

- 1) Write an essay on engineering properties of rocks.

OR

- 2) Answer any **TWO** of the following:

- | | |
|---------------------|------------------|
| a) Uplift pressure. | b) Arch dam. |
| c) Grouting. | d) Dead storage. |

UNIT-II

- 3) Give an account of building stones and road materials.

OR

- 4) Answer any **TWO** of the following:

- | | |
|----------------------|------------------------|
| a) Dental treatment. | b) Tunnels. |
| c) Landslides. | d) Soil stabilization. |

UNIT-III

- 5) Explain the principles of environmental geology.

OR

- 6) Answer any **TWO** of the following:

- | | |
|---------------------|-----------------------|
| a) Land use. | b) Soil conservation. |
| c) Erosion control. | d) Water management. |

UNIT-IV

- 7) Explain the impacts of floods and how they can be controlled?

OR

- 8) Answer any **TWO** of the following:

- | | |
|-----------------------|---------------------|
| a) Floods management. | b) Land subsidence. |
| c) Avalanches. | d) Tsunamis. |

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SYLLABUS

III – SEMESTER, M.Sc. (TECH) APPLIED GEOLOGY

PAPER- III, HYDROGEOLOGY

(Effective from the Admitted Batch of 2016-2017)

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.

ASSIGNMENTS

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.

(P.T.O)

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

III - SEMESTER M.Sc. (TECH) APPLIED GEOLOGY

PAPER – III, HYDROGEOLOGY

(Effective from the Admitted Batch of 2016-2017)

Time: 3Hrs

Max. Marks: 80

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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III – SEMESTER, M. Sc. (TECH) APPLIED GEOLOGY

PAPER- IV, SEDIMENTARY BASINS OF INDIA

(Effective from the Admitted Batch of 2016-2017)

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)

UNIT-II

Basin mapping methods: Structure and isopach contouring, Lithofacies maps, Geophysical techniques, Clastic petrographic data, Computer mapping methods, Stratigraphic cross sections, Paleocurrent analysis, Remote sensing.

Depositional systems and sequence stratigraphy: Stratigraphic architecture, Nonmarine 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.

ASSIGNMENTS

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.

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