CBCS
M. Sc. GEOLOGY
I and II- SEMESTER
SYLLABUS
SEMESTER-I

THEORY

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<tr>
<td>G. 1.1.</td>
<td>Crystallography and Crystal Optics</td>
<td>04</td>
<td>20</td>
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<td>G. 1.2.</td>
<td>Mineralogy and Geochemistry</td>
<td>04</td>
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<td>G. 1.3.</td>
<td>Physical Geology and Geomorphology</td>
<td>04</td>
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<td>G. 1.4.</td>
<td>Igneous and Metamorphic Petrology</td>
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PRACTICAL

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<tr>
<td>G. 1.5.</td>
<td>Crystallography, Crystal Optics &amp; Mineralogy</td>
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<td>G. 1.6.</td>
<td>Igneous and Metamorphic Petrology</td>
<td>09</td>
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Total Credits for Semester -I is 26

SEMESTER-II

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<tr>
<td>G. 2.1.</td>
<td>Principles of Stratigraphy and Palaeontology</td>
<td>04</td>
<td>20</td>
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<td>Indian Geology</td>
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<td>Sedimentology and Fuel Geology</td>
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PRACTICALS

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<td>Palaeontology and Structural Geology</td>
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<td>Sedimentology and Fuel Geology</td>
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Total Credits for Semester -II is 30
SEMESTER-I
PAPER-I
CRYSTALLOGRAPHY AND CRYSTAL OPTICS

UNIT-I

UNIT-II
Classification of crystals into 7 systems and study of their normal class.
1. Cubic system-Galena type
2. Tetragonal system-Zircon type
3. Hexagonal system-Beryl type
4. Trigonal system-Calcite type

UNIT-III
1. Orthorhombic system-Barytes type
2. Monoclinic system-Gypsum type
3. Triclinic system- Axinite type
Twinning in crystal – Definition of twin plane, twin axis and composite plane.

UNIT-IV

References:
1. A text book of Mineralogy- E. S. Dana and W. E. Ford
2. An introduction of crystallography – R. C. Phillips
3. Elements of Mineralogy-Rutleys
SEMESTER-I
PAPER-II
MINERALOGY AND GEOCHEMISTRY

UNIT-I


UNIT-II

Crystal chemistry. Different types of chemical bonds in minerals. Crystal structure, chemistry, optics and paragenesis of the following mineral groups, pyroxene, amphibole, mica, garnet epidote, feldspar, feldspathoid olivine, silica, aluminum silicates, cordierite, Zircon and beryl.

UNIT-III

The periodic table, geochemical classification of elements. Abundance of elements in the earth as a whole, crust and mantle. Cosmic abundance of elements, primary geochemical differentiation of the earth.

UNIT-IV

Distribution of elements during magmatic crystallization. Goldsmith rules, the distribution. Certain classic examples of layered igneous complexes.

References:

1. An introduction to rock forming minerals-deer, Howie and zussman.
2. Elements of Mineralogy- Mason and Berry.
SEMESTER-I
PAPER-III
PHYSICAL GEOLOGY AND GEOMORPHOLOGY

UNIT-I

UNIT-II

UNIT-III

UNIT-IV

References
2. Physical Geology-A. N. Stracher
3. Principles of Geomorphology- Williams D. Thornbury
5. Basic physical Geology- E.S. Robinson.
SEMESTER-I
PAPER-IV
IGNEOUS AND METAMORPHIC PETROLOGY

UNIT-I

UNIT-II
Phase relations-Equilibria and the phase rule. One, two, and three component systems-Diopside – Albite –Anorthite, Diopside-Forstchite-Silica, Petrogeny’s residual system. Partial melting and Zone melting, Bowens reaction principle. Generation and evolution of magma, magmatic differentiation and assimilation. Petrography and petrogenesis of the following rocks; Granites, Basalts, Anorthosites, Alkaline rocks, Lamprophyres, Kimberlites and Carbonatites.

UNIT-III
Definition and types of Metamorphism, Agents of metamorphism, grades and zones of metamorphism, classification of metamorphic rocks, structures and textures of metamorphic rocks.

UNIT-IV

References:
1. The principles of Petrology – G. W. Tyrrell.
5. Igneous and Metamorphic Petrology – Myron G.Best.
SEMMESTER-II
PAPER-I
PRINCIPLES OF STRATIGRAPHY AND PALAEONTOLOGY

UNIT-I

UNIT-II

UNIT-III
Vertebrates: Broad classification of pisces.
  a). Ostrocodermi
  b). Placodermi
  c). Chnodrichthyes
  d). Osteichthyes
  Detail study and evolution of: Horse, Elephant and Man.

UNIT-IV

Reference:
1. Historical Geology and principles of India Stratigraphy – Ravindra Kumar.
2. Stratigraphy and Practice- Marvin Weller.
SEMESTER-II
PAPER-II
INDIAN GEOLOGY

UNIT-I

UNIT-II
Stratigraphic succession and Mineral wealth of important Proterozoic Basins- Cuddapah, Pakhals, Vindhyams, Kurnools and Bhima.

UNIT-III
Introduction to Nomenclature and Divisions and Sub-divisions of Gondwana formations and their distribution in India. Gondwana flora and coal deposition. Cretaceous formations and Tirichinapally.

UNIT-IV

References:
2. Geology of India and Burma – M. S. Krishnan.
SEMESTER-II
PAPER-III
STRUCTURAL GEOLOGY AND TECTONICS

UNIT-I

UNIT-II

UNIT-III

UNIT-IV

References:
SEMESTER-II
PAPER-IV
SEDIMENTOLOGY AND FUEL GEOLOGY

UNIT-I
Sources of sediments – Mechanical and Chemical weathering, Modes of transportation, stratification sedimentary textures, Grain size. Grain shape and Grain fabric. Sedimentary structures; Classification and clastic and non-clastic sedimentary rocks. Classification of sandstones, limestones, dolomites and Dolomitization.

UNIT-II

UNIT-III

UNIT-IV

3. Geology of Petroleum – A. I. Laverson
4. Petroleum Geology – F. K. North
SEMESTER-II

PAPER – I: PRACTICALS

PALAEOONTOLOGY AND STRUCTURAL GEOLOGY

1. Identification of Plant and Animal Fossils
2. Study of Geological Maps. Preparation of Cross Sections

PAPER – II: PRACTICALS

SEDIMENTOLOGY AND FUEL GEOLOGY

1. Megascope and Microscopic identification of Sedimentary rocks.
2. Mechanical Analysis of Sands.
3. Fuel Geology problems.
CBCS
GEOLOGY
III and IV- SEMESTER - SYLLABUS
SEMESTER-III
THEORY

<table>
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<tr>
<td>G. 3.1.</td>
<td>Ore Genesis</td>
<td>04</td>
<td>20</td>
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<td>Hydro Geology</td>
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<td>G. 3.3.</td>
<td>Remote Sensing</td>
<td>04</td>
<td>20</td>
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<td>G. 3.4 (a).</td>
<td>Mining and Mineral Beneficiation (Elective-1).</td>
<td>04</td>
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<td>Ore Deposits and Electives</td>
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<td>Hydro Geology and Remote Sensing</td>
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Total Credits for Semester -III is 30

SEMESTER-IV
THEORY

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<td>Ground Water Exploration &amp; Management</td>
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<td>Engineering Geology (Elective-2).</td>
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<td>G. 4.5.</td>
<td>Mineral Deposits and GIS</td>
<td>09</td>
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<td>Ground Water Exploration and Electives</td>
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Total Credits for Semester -IV is 30
Total Credits I Semester + II Semester + III Semester + IV Semester = 116
SEMESTER-III
PAPER-I
G.3.1: ORE GENESIS

UNIT – I

UNIT – II

UNIT – III
Processes of Magmatic and Hydrothermal deposits: Residual and Mechanical concentration deposits; Sedimentary Ore deposits.

UNIT – IV

References:

SEMESTER-III
PAPER-II

G.3.2: HYDROGEOLOGY

UNIT-I


UNIT-II


UNIT-III

Aquifers, types of Aquifers; Geological formations Aquifers; Crystalline rocks, Volcanic rocks, Sedimentary rocks, Unconsolidated Aquifers; Groundwater provinces of India.

UNIT-IV


References:

2. Applied Hydrogeology-Fetter, C.W.
3. Hydrogeology – Karanth. K. R.
4. Groundwater – Raghunath. N. M.
5. Groundwater – Shankar Pitchaiah
7. The Atmosphere –Anthes
8. Hydrogeology – Davis. S.N. & Dewiest .R.J.M.
9. Geohydrology - Dewiest .R.J.M.
SEMESTER-III
PAPER-III
G.3.3: REMOTE SENSING

UNIT-I


UNIT-II

Remote sensing data acquisition systems, Remote Sensing Platforms, Geostationary and synchronous Satellites sensors active sensor, Passive sensor, multi spectral scanner (MSS), image resolution.

UNIT-III


UNIT-IV


References:

1. Remote sensing – Principles and Interpretation –Sabins F.F
4. Image Interpretation in Geology –Drury.
5. Photo Geology – Miller. V. C
8. Principles of applications of Photo Geology –Shiv. N. Pandey
13. Geomorphology and Remote sensing- Jha
SEMESTER-III  
PAPER-IV  
G. 3.4(a): MINING AND MINERAL BENEFICIATION (ELECTIVE-1)

UNIT-I  

UNIT-II  
Underground Mining- Gophering, Breast, Stopping, Open Overhand stopping, Underground Glory Hole Mining. Pillar and Chamber Method, Sub-Level Stopping Method.

UNIT-III  
Coal Mining Method – Panel System, Board and Pillar Method, Long wall Mining, Advance and Retreat, Horizon Mining, Strip Mining, Mine Supports, Lighting Ventilation.

UNIT-IV  

Reference:  
1. Courses in Mining Geology- Arogyaswamy  
2. Principles of Mineral Dressing- Gaudin  
3. Mining Policy Initiatives- Dhar, Gautam  
4. Mineral Processing Technology-Wills
SEMESTER-III

PAPER-IV (b)

G. 3.4(b): MINERAL EXPLORATION AND MINERAL (ELECTIVE-2)

UNIT-I


UNIT-II


UNIT-III

Geophysical Exploration – Concept of Geophysics, Gravity, Magnetic, Seismic and Electrical Methods of Prospecting. Well logging Techniques.

UNIT-IV


References:

5. Mineral Economics – Sinha and Sharma
SEMESTER-III

PRACTICAL

G: 3.5: ORE GENESIS AND ELECTIVES

Microscopic study of polished sections – ore textures and structures and identification of minerals. Para genesis. Mining problems / Exploration problems.

SEMESTER-III

PRACTICAL

G: 3.6: HYDROGEOLOGY AND REMOTE SENSING

UNIT-I
Geology Mode of Occurrence, Origin and Distribution in India and Uses of the following Ore deposits.
Precious Metals : Gold
Ferrous Metals : Iron, Manganese and Chromite

UNIT-II
Geology Mode of Occurrence, Origin and Distribution in India and Uses of the following Ore deposits.
Base Metals: Copper, Lead and Zinc.
Light Metals : Aluminum and Magnesium.

UNIT-III
Geology Mode of Occurrence, Origin and Distribution in India and Uses of the following Ore deposits.
Refractory, Ceramics, Glass, Abrasives and Fertilizers.

UNIT-IV
Geology Mode of Occurrence, Origin and Distribution in India and Uses of the following Ore deposits.
Mica, Asbestos, Talc, Gypsum, Barytes and Gemstones.

References:
SEMESTER –IV
PAPER-II

G: 4.2: GROUND WATER EXPLORATION AND MANAGEMENT

UNIT-I


UNIT-II


UNIT-III

Water quality and pollution – Introduction to Groundwater quality, Physical and Chemical properties. - Surface and Groundwater pollution – Factors contributing to pollution of surface and subsurface water. Industrial pollution, Agriculture pollution. Urban pollution and Mining Pollution – Saline water intrusion, its causes and control – Water pollution controlling measures.

UNIT-IV


References:

1. Ground Water Hydrology – Todd
2. Applied Hydrogeology –Fetter
3. Groundwater Assessment and Development- Karanth
4. The Geochemistry of Natural Water - Dreven
5. Groundwater Management- Raman
6. Water Shid Management- Khan
7. Evaluation and Development of Groundwater- Mahajani
9. Groundwater Surveys and Investigations – Mahajani
10. Physical and Chemical Hydrogeology – Domenico
11. groundwater and Tube Wells- Garg
12. Groundwater and Management –Ramesh Ramachandra
SEMESTER –IV

PAPER-III

G: 4.3: GEOGRAPHICAL INFORMATION SYSTEM (GIS)

UNIT-I
Geographical Information System- History and Developments in Geographical Information System. GIS Terminology, Hardware and Software requirements. Overview of Current GIS Packages. Basic commands for drawing and editing lines, Polygon, Labeling and Annotations.

UNIT-II

UNIT-III

UNIT-IV

References:
2. Good Child, Geographical Information System- Principles, Vol.1
5. GIS by ESRI, map projections, geo- referencing spatial data, environmental system research institute inc., New York, USA.
SEMESTER –IV
PAPER-IV (a)

G: 4.4(a): ENVIRONMENTAL GEOLOGY (ELECTIVE -1)

UNIT-I

UNIT-II

UNIT-III
Geotechnical constructions and its effects on environment- Dams, tunnels, Roads, Urbanization and Canals, Pollution- Air, Water (surface and sub-surface), agriculture, industrial and Marine oil pollution.

UNIT-IV

References:
1. Environmental Geology – Valdiya
2. Environmental Geology- Coates
3. Environmental Geology, Geo Ecosystems Protection in Mining Areas- Ghosh.
4. Geology, environment Society – Valdiya
5. Global Warming and Climate Change
6. A Text Book of Environmental Geology- Purohit
7. Environmental Geology- Lundgren
8. Mining environment- Bharath B. Dhar
10. Environmental Geology- Montaganery
11. Environmental Geology- Keller
12. Principles of Environmental Sciences- Cunningham.
13. Basic Environmental Technology –Nathanson
14. Environmental Sciences – Wright Nebel
15. Environmental Geography-Saxena
16. Environmental Impact Assessment –Bartiwal
17. A Text Book of Environmental Sciences- Subramanyan
SEMESTER –IV
PAPER-IV (b)
G: 4.4(a): ENGINEERING GEOLOGY (ELECTIVE -2)

UNIT-I

UNIT-II
Dams – Types and geological considerations for the selection of Dam sites. Case Histories of some major Dams – Nagarjuna Sagar, Srisailam and Bhakranangal. Reservoirs- Geological Considerations for Reservoirs and Measures to control Silting. Seismic activity in Reservoir areas.

UNIT-III
Tunnels –Types of Tunnels, Geological consideration in the selection of the Tunnel alignement, Lining of Tunnels and alignment. Consideration for Bridge and Building site selection.

UNIT-IV

References:
1. Principles of Engineering Geology and Geotechniques – Krynine Judd
3. Fundamental of Engineering Geology - Khurmi
6. Modern Geotechnical Engineering – Alam Singh
SEMESTER – IV

PRACTICALS

G: 4.5: MINERAL DEPOSITS AND GIS

Study of Physical properties of metallic Ferrous –Base- light metallic minerals and Industrial Minerals.
Drawing, editing and labeling of point, line and polygon features. Overlay operations. Buffer analysis

SEMESTER – IV

PRACTICALS

G: 4.6: GROUNDWATER EXPLORATION AND ELECTIVES

Department of Geology
Kakatiya University

Open elective- Economic Geology - Paper-I

Unit-I
Scope of Economic geology- introduction to processes of formation of mineral deposits, ore, tenor. Metalliferous deposits- ores, mode of occurrence, distribution and uses of ferrous metals-Iron, Chromite, Manganese, base metals-Copper, Lead and Zinc - Gold and Bauxite.

Unit-II
Non- Metalliferous Industrial minerals- The study of minerals which have an application in the following industries with special reference to their mode of occurrence, uses and distribution in India. Ceramic, Fertilizers, Cement, Chemical, Insulation and Electrical.

Unit-III
Fuels- types, origin, distribution of Coal - origin and distribution of Oil and Gas. Radioactive minerals - occurrence, distribution and uses of Uranium and Thorium. Gem stones- Occurrence and uses of precious and semi precious Gemstones,

Unit-IV
Importance of minerals in national economy, National mineral policy, expendable – non expendable minerals- critical, essential minerals – substitution and conservation of minerals.

Reference books:
1. Indian mineral resources – Krishna Swamy.S
2. Industrial minerals and rocks in India- Deb, S.
3. A treatise on Industrial minerals of India-Sinha R.K.
4. Economic minerals deposits- Bateman, A.M. and Jenson, M.L.
6. An Introduction to Mineral Economics Chatterjee, K. K.
Department of Geology  
Kakatiya University

Open elective- Environmental Geology - Paper-II

Unit-I

Unit-II
Man as agent of mass wasting and land scarification- Environmental impact of mining and mineral processing- waste disposal practices.

Unit-III
Pollution- Water (surface and subsurface) Air and Marine oil, Green house effect- Global warming- Geotechnical constructions and their effects on environment.

Unit-IV
Environmental Monitoring- conservation and management.
Non conventional energy sources- Solar, Wind, Geothermal, Tidal.
Environmental legislation.

Reference books:
2. Environmental Geology- Keller, E.a (1978), Bell and Howell, USA.
4. The dynamic earth system, Patwardham, A.M (1999), prentice hall.
8. Environmental Geology, Strahler and Strahler (1970), Willey and Sons, NY.
9. A textbook of Environmental sciences-Purohit S.S.
Foundation course - Groundwater and its Management - III Semester

Unit-I

Unit-II
Vertical distribution of groundwater- Zone of aeration, soil water zone, vadose water, capillary fringe, Zone of saturation, Water table, Perched water table. Drainage basins and their physical characteristics.

Unit-III

Unit-IV
Water Resource Management- Artificial recharge methods - Rural areas - Gully plug, contour bund, Gabion structure, Percolation tanks, Check dams, Dug well recharge, Sub surface dykes, Spreading techniques, Abandoned wells, Urban areas - Roof top rain water, Runoff harvesting, Recharge pit, Recharge trench, Bore well, Dug well, Defunct well, Concept of watershed management.

Reference books:
4. Applied Hydrogeology by Fetter.
8. Water shed Management - Khan