

**SEMESTER-V
GEOLOGY (CORE)
HYDROGEOLOGY & ENGINEERING GEOLOGY
PAPER: CC-11.1 FULL MARKS-75**

UNIT-I : HYDROGEOLOGY (A)

Introduction, Hydrological Cycle, Vertical Zonation of Sub-surface water, Properties of water bearing formation: Porosity, permeability, specific yield, specific retention, storage coefficient, Aquifer : Definition and types of Aquifer; Aquitard, Aquiclude & Aquifuse , Darcy's Law.

UNIT-II : HYDROGEOLOGY (B)

Groundwater Exploration, Quality of Groundwater & Its uses in domestic, irrigation & industry, Groundwater Pollution, Sea Water Intrusion.

UNIT-III : HYDROGEOLOGY (C)

Rain water Harvesting, Artificial Recharge of groundwater, Watershed Management, Groundwater Provinces of India & Odisha.

UNIT-IV : ENGINEERING GEOLOGY (A)

Introduction, Engineering properties of Rocks & Soils, Dams & Reservoir: Geological considerations

UNIT-V : ENGINEERING GEOLOGY (B)

Tunnel: Geological considerations, Bridge: Geological considerations, Grouting, Back filling, Soil stabilization, Rock bolting, Building Stones, Alkali-aggregate reactions.

N.B. MID SEM EXAM: 15 MARKS

END SEM EXAM: 60 MARKS

**GEOLOGY (CORE)
HYDROGEOLOGY & ENGINEERING GEOLOGY (Practical)
PAPER: CC-11.2 FULL MARK - 25**

1. Simple numerical Problems related to Groundwater.
2. Groundwater Maps.
3. Problem related to Groundwater Quality.
4. Problem related to Dam site, Tunnel site.
5. Building stones & Road materials.
6. Lab. Record and Viva.

**SEMESTER-V
GEOLOGY (CORE)
ECONOMIC GEOLOGY
PAPER: CC-12.1 FULL MARKS-75**

UNIT-I : ORE GENESIS (A)

Magmatic Concentration, Hydrothermal Process, Metamorphism, Evaporation.

UNIT-II : ORE GENESIS (B)

Oxidation & Supergene Enrichment, Residual & Mechanical Concentration, Sedimentation, Geothermometry, Paragenesis, Wall rock alteration.

UNIT-III : ORE GENESIS (C)

Classification of Mineral deposits, Metallogenic Epochs & Provinces, Controls of Ore localisation.

UNIT-IV : EXPLORATION GEOLOGY (A)

Methods of Mineral Exploration: Geological, Geophysical, Geochemical Methods

UNIT-V : ORE MICROSCOPY

Introduction, Components of Ore Microscope, Preparation of Polished sections, Physical & Optical characters of Ore minerals studied under microscope, Ore textures & structures. Ore minerals studied under microscope: Chalcopyrite, Galena, Pyrite, Pyrolusite, silomelane, Magnetite, Hematite, Chromite, Sphalerite.

N.B. MID SEM EXAM: 15 MARKS

END SEM EXAM: 60 MARKS

**GEOLOGY (CORE)
ECONOMIC GEOLOGY (Practical)
PAPER: CC-12.2 FULL MARKS -25**

1. Problems related to Exploration.
2. Identification of Ores under microscope.
3. Study of Ore texture under microscope.
4. Lab. Record and Viva.

**SEMESTER-V
GEOLOGY (CORE)
FUEL GEOLOGY
DSE- 1.1 FULL MARKS-75**

UNIT 1 : COAL GEOLOGY (A)

Introduction, Ranks of Coal, Classification, Chemical Properties, Mode of Occurrence and Origin of Coal, Geological Formation of Coal Deposit.

UNIT 2 : COAL GEOLOGY (B)

Fundamentals of Coal Petrography, Macroscopic and Microscopic Constituents of Coal, Coal and Environment, Coal and Lignite Resources of India

UNIT 3 : PETROLEUM GEOLOGY (A)

Introduction, Uses of Petroleum, Reservoir Rocks, Origin of Petroleum, Oil Traps

UNIT 4 : PETROLEUM GEOLOGY (B)

Petroleum Exploration, Petroleum and Environment, Composition of Crude Oil, Natural Gas, Distribution of Oil and Gas in India, Sources of Mineral Oil: Oil Shales, Black Shale, CBM, Oil from Plants

UNIT 5 : RADIOACTIVE MINERALS

Introduction, Utilization of Radioactive Elements, Mineralogy of Uranium and Thorium, Genetic Classification of Radium and Thorium Deposits, Uranium and Thorium Deposits in India

N.B. MID SEM EXAM: 15 MARKS

END SEM EXAM: 60 MARKS

**GEOLOGY (CORE)
SUB- FUEL GEOLOGY (Practical)
DSE-1.2 FULL MARKS -25**

1. Plotting of availability of coal, petroleum and radioactive minerals in map of India and Odisha
2. Identification of microscopic and macroscopic component of coal
3. Identification of different ranks in coal
4. Identification of radioactive elements
5. Lab. Record and Viva.

**SEMESTER-V
GEOLOGY (CORE)
MINING GEOLOGY & MINERAL ECONOMICS
DSE-2.1 FULLMARKS-75**

UNIT-I : MINING GEOLOGY (A)

Mining Terminology, Classification of Mining Methods, Alluvial Mining, Opencast Mining, Underground Mining Methods: Cut & Fill Method, Shrinkage Stopping Method, Caving Methods.

UNIT-II : MINING GEOLOGY(B)

Coal Mining Methods, Drilling Methods: Percussion Drills, Rotary Drill, Bore Hole Logging, Types of Explosives used in Blasting.

UNIT-III : MINERAL ECONOMICS (A)

Importance of Minerals in National Economy, Strategic, Essential and Critical Minerals, National Mineral Policy, Mineral Legislation in India.

UNIT-IV : MINERAL ECONOMICS (B)

Conservation and Substitution of Mineral Resources, Concept of Co-product and Bi-product, Mineral Benefication Techniques, Mineral Inventory.

UNIT-V : MINERAL ECONOMICS (C)

Sampling and Sampling Method, Assaying, Type of Reserves, Ore Reserve Estimation.

N.B. MID SEM EXAM: 15 MARKS

END SEM EXAM: 60 MARKS

**GEOLOGY (CORE)
MINING GEOLOGY & MINERAL ECONOMICS
(Practical)
DSE-2.1 FULL MARKS -25**

1. Problem related to mining and drilling
2. Problem related to ore reserve estimation
3. Problem related to assaying and bore hole logging.
4. Lab. Record and Viva.

**SIXTH SEMESTER
GEOLOGY (CORE)
ECONOMIC MINERAL DEPOSITS
(PAPER: CC-13.1, FULL MARK-75)**

UNIT-I : METALLIC MINERALS (A)

Mineralogy, Mode of Occurrence, Distribution and uses of Ores of Iron, Manganese and Copper

UNIT-II : METALLIC MINERALS (B)

Mineralogy, Mode of Occurrence, Distribution and uses of Pb and Zn, Bauxite, Chromite, Gold

UNIT-III : NON-METALLIC MINERALS

Mineralogy, Mode of Occurrence, Distribution and uses of Gypsum, Limestone, Kyanite, Graphite, Mica, Asbestos, Magnesite

UNIT-IV : COAL AND PETROLEUM

Mode of Occurrence, Origin and Indian distribution of Coal and Petroleum

UNIT-V : MINERAL RESOURCES OF ODISHA

East Coast Bauxite, Sukinda Chromite Belt, Heavy Mineral of Ganjam Coast, Mn deposits of Jamba-Koira valley, Gem stone resources of Odisha, Mineral based industries of Odisha

N.B. MID SEM EXAM: 15 MARKS

END SEM EXAM: 60 MARKS

**GEOLOGY (CORE)
SUB- ECONOMIC MINERAL DEPOSITS (Practical)
(PAPER: CC-13.2, FULLMARK-25)**

1. Megascopic identification of metallic and non-metallic minerals
2. Location of mineral bearing areas on the outline map of India and Odisha
3. Lab. record and viva-voce

**SEMESTER-VI
GEOLOGY (CORE)
APPLIED GEOLOGY
PAPER: CC-14.1 FULL MARKS-75**

UNIT-I : PHOTOGEOLOGY

Application of Aerial photo Interpretation in Mineral exploration, Groundwater Studies, Lithology & Geologic Structures, Engineering Projects and Petroleum Exploration.

UNIT-II : REMOTE SENSING

Application of Remote Sensing in Geological Mapping, Groundwater Studies, Mineral Exploration & Disaster Management, Different Types of Satellites.

UNIT-III : GIS & GPS

Basics of GPS (Global Positioning System), Application of GPS, Basic Principle of GIS (Geographic Information System), Application of GIS in different Fields.

UNIT-IV : FIELD GEOLOGY (A)

Introduction, Role of Field Studies, Component of Field Studies, Component of Geological map, Methods of Geological Mapping, Symbol used in Geological mapping, Some field indicators of Minerals, rock, structures.

UNIT-V : FIELD GEOLOGY (B)

Petro graphical field features of rocks, Structural field features of rock, Data collected during mapping exercise, Geological reports.

N.B. MID SEM EXAM: 15 MARKS

END SEM EXAM: 60 MARKS

**GEOLOGY (CORE)
APPLIED GEOLOGY (Practical)
PAPER: CC-14.2 FULL MARKS -25**

1. Interpretation of Aerial Photograph
2. Simple numerical problem related to Aerial Photograph
3. Interpretation of Satellite imagery
4. Problems related to Remote Sensing ,GIS & GPS
5. Preparation of maps
6. Lab. Record and Viva.

**SEMESTER-VI
GEOLOGY (CORE)
ENVIRONMENTAL GEOLOGY & DISASTER MANAGEMENT
DSE-3.1 FULLMARKS-75**

UNIT-I : ENVIRONMENTAL GEOLOGY (A)

Spectrum of Environmental Geology, Soil Types and Conservation, Land- Its Use and Management, Water Resources-Its Use, Problem and Management.

UNIT-II : ENVIRONMENTAL GEOLOGY (B)

Erosion: Causes and Control, Desertification and Degradation, Impact of Mining Activities on Environment, Environmental Impact of River Valley Project, Impact of Excess Withdrawal of Groundwater, Role of Geologist in Environmental Planning and Management

UNIT-III : ENVIRONMENTAL GEOLOGY (C)

Environmental Pollution, Waste Disposal: Municipal Waste Disposal, Radioactive Waste Disposal Alternative Sources of Energy, Climate: Past, Present, Future, Environmental Protection and Legislative Measures.

UNIT-IV : DISASTER MANAGEMENT (A)

Natural Disasters, Their Zoning and Risk Assessment, Earthquake and Seismic Hazards, Volcanic Hazards.

UNIT-V : DISASTER MANAGEMENT (B)

Landslides and its Management, Coastal Hazards: Cyclone and Tsunami, Floods and Flood Management.

N.B. MID SEM EXAM: 15 MARKS

END SEM EXAM: 60 MARKS

**GEOLOGY (CORE)
ENVIRONMENTAL GEOLOGY & DISASTER MANAGEMENT
(Practical)
DSE-3.2 FULL MARKS -25**

1. Soil Type in Map of India and Odisha.
2. Earthquake Zones of World and India, Landslide zones of India
3. Volcanic Zones of the World.
4. Problems Related Pollution and Erosion Control Measures.
5. Lab. Record and Viva.

**SEMESTER-VI
GEOLOGY (CORE)
PROJECT**

DSE-4.1 FULLMARKS-75

Projects Related to:

1. Geological Mapping
2. Remote Sensing & GIS
3. Ground Water Studies
4. Engineering Geology
5. Economic Geology
6. Fossil Studies
7. Environmental Geology
8. Applied Geology
9. Geological Resource Management
10. Mining Geology

N.B. Dissertation: 75 marks

**GEOLOGY (CORE)
PROJECT SEMINAR AND VIVA
DSE-4.2 FULLMARKS-25**

Seminar Presentation and Viva –voce.

LIST OF BOOKS (TEXT BOOKS/REFERENCE BOOK)

Sl. No.	Name of the Book	Name of the Author
SEMESTER-I		
1	Text Book of Geology	G.B. Mahapatra
2	Text Book of Geology	P.K. Mukherjee
3	Principles of Engineering Geology	K.M. Bangar
4	Text Book of Physical Geology	G.B. Mahapatra
5	Geomorphology	S. Singh
6	General Geology	V. Radhakrishnan
7	Fundamental of Historical Geology and Stratigraphy of India	Ravindra Kumar
8	Principles & Application of Photogeology	S.N. Pandey
9	Oceanography	K. Siddhartha
10	Global Tectonics	P. Kearey & F. J. Vine
11	The Unstable Earth	J. A. Steers
SEMESTER-II		
1	Mineralogy	Dexter Perkins
2	Mineral Optics	W. R. Phillips
3	Mineralogy	William D. Nesse
4	Mineral Optics	S. Roy
5	Petrology	J. P. Tiwary
6	Principles of Geochemistry	Moore & Mason
7	Rutley's Elements of Mineralogy	H. H. Read
SEMESTER-III		
1	Igneous Petrology	M. K. Bose
2	Principle of Petrology	G. W. Tyrrel
3	Principles of Igneous and Metamorphic Petrology	J. D. Winter
4	Igneous & Metamorphic Petrology	E. Blatt
5	Introduction to Sedimentology	S. M. Sengupta
6	Sedimentology and Stratigraphy	Sam Bogs
7	Textbook of Sedimentary Petrology	V. K. Verma & C. Prasad
8	Sedimentology	Tucker
9	Sedimentary Rocks	F. J. Pettijohn
10	Metamorphic Geology	B. Bhaskar Rao
11	Petrology & Mineralogy	J. P. Tiwary
SEMESTER-IV		
1	Structural Geology	S. K. Ghosh
2	Structural Geology	M. P. Billings
3	Structural Geology	B. S. S. Narayanswami
4	Structural Geology	Twiss and Moore
5	Theory of Structural Geology	N. W. Gokhale
6	Palaeontology	P. C. Jain & M. S. Anantharaman
7	Introduction to Palaeontology	Amal Das Gupta
8	Principles of Invertebrate Palaeontology	Shrock & Twenhofel
9	Palaeontology of Invertebrates	Henry Woods
10	Palaeontology	Moore, Lalicker & Fischer
11	Fundamental of Historical Geology and Stratigraphy of India	Ravindra Kumar

12	Geology of India & Burma	M. S. Krishnan
13	Stratigraphy	D. N. Wadia
SEMESTER-V		
1	Hydrology	D. K. Todd
2	Hydrology	H. M. Raghunath
3	Hydrogeology	K. R. Karanth
4	Evaluation & Development of Ground Water	G. Mahajan
5	Engineering Geology	P. Singh
6	Textbook of Engineering Geology	N. C. Kesavulu
7	Principles of Engineering Geology	K. M. Bangar
8	Principles of Engineering Geology and Geotechnics	D. P. Krynine & W. R. Judd
9	A Handbook of Economic Geology	A. K. Sen & P. K. Guha
10	Economic Mineral Deposit	M. L. Jensen & A. M. Bateman
11	Industrial Mineral	S. Dev
12	Ore Deposit	Mac Diarm
13	Laboratory Manual	A. K. Sen
14	Mineral Economics	Sinha & Sharma
15	Mining Geology	R. N. P. Arogyaswamy
SEMESTER-VI		
1	Economic Geology	U. Prasad
2	A Handbook of Economic Geology	A. K. Sen & P. K. Guha
3	Economic Mineral Deposit	M. L. Jensen & A. M. Bateman
4	Ore Geology, Economic Mineral & Mineral Economics	S. K. Tiwari
5	Principles & Application of Photogeology	S. N. Pandey
6	Environmental Geography	S. Singh
7	Environmental Geology	K. S. Valdiya
8	Field Geology	N. W. Gokhale
9	Economic Mineral Deposits	D. K. Banerjee
10	Field Geology	Lahee
11	Fundamentals of GIS	Debasis Chakravorty & R. N. Sahoo