

# **MAHAKAUSHAL UNIVERSITY JABALPUR**

**As per model syllabus of U.G.C. New Delhi, drafted by  
Central Board of Studies and Approved by Higher  
Education and the Governor of M.P.**



**Faculty of Science  
Syllabus & Prescribed Books  
Subject- Geology  
M.Sc. Semester Examination**

**I to IV Semester**

**Department of Higher Education, Govt. of M.P.  
Semester wise Syllabus for Postgraduates  
As recommended by Central Board of Studies and  
Approved by HH the Governor of M.P.**

MGEO0101-T

**CLASS :** M.Sc. PREVIUOS  
**SUBJECT :** GEOLOGY  
**PAPER TITLE:** FIRST : GEODYNAMICS  
**SEMESTER:** FIRST

### **Unit-1**

Earth's surface features. Seismology: seismic waves, intensity and isoseismic lines, earthquake belts, Earthquake zones of India, Seismograph, causes of Earthquake. Internal structure of the Earth

### **Unit-2**

Volcanism: Types and causes of volcanic eruptions. World distribution of volcanoes, Migration of volcanoes, Palaeo-magnetism.

### **Unit-3**

Isostasy: Development of the concept, Isostatic anomalies, Isostatic models, Evidence . Geosynclines: Classification and evolution of Geosyncline, causes of subsidence and upliftment.

### **Unit-4**

Continental drift: Development of the concept, Taylor's and Wegner's theories of continental drift. Evidences of continental drift and polar wandering. Sea floor spreading. Morphological features of ocean floor.

### **Unit-5**

Concept of plate tectonics. Types of plate boundaries, features of convergent and divergent boundaries. Ophiolite suites, Arc-Trench system, volcanic mountain chain. Triple junctions and their stability. Causes of plate motion. Origin of the Himalayas

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### **References:**

Holmes, Doris L and Arthur: **Holmes' Principles of Physical Geology**. Wiley  
Wyllie, Peter J: **The Dynamic Earth**. Wiley  
Wyllie, Peter J: **The Way the Earth Works**. Wiley  
Hodgson, J H: **Earthquake and Earth's Structures**. Prentice Hall  
Martin H P Bott: **The Interior of the Earth**. Edward Arnold  
Condie K C: **Plate Tectonics and Crustal Evolution**.  
Strahler: **Earth Sciences**.  
Gutenberg Beno: **Internal Constitution of the Earth**. Dover

**Department of Higher Education, Govt. of M.P.  
Semester wise Syllabus for Postgraduates  
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MGEO0102-T

**CLASS :** M.Sc. PREVIUOS  
**SUBJECT :** GEOLOGY  
**PAPER TITLE:** SECOND : STRUCTURAL GEOLOGY  
**SEMESTER:** FIRST

### UNIT-1

Rock failure: Mechanical principles of rock deformation, factors controlling behavior of material. Concept of stress and strain analysis in two and three dimensions. Progressive deformation. Mohr circles. Symmetry concept in deformation. Unconformities: types and recognition .

### UNIT-2

Geometry of folds surface: Single and multi-layered. Super-imposed folding . Classification of folds. Types of folds . Recognition of folds . Effects of folds on outcrops .

### UNIT-3

Geometry of faults. Classification and types of faults. Slips, Separation, Recognition of faults. Causes of faulting.

### UNIT-4

Origin, kinds and their relation to other structures: Fractures and joints, Lineation, Foliation, rock cleavages and schistosity.

### UNIT-5

Mechanics of folding and faulting. Tectonic Fabrics. Magma Tectonics : Emplacement of Plutons, Origin of Ring Dykes and Cone Sheets.

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### Reference: -

- Bayly B 1992: **Mechanics in Structural Geology**. Springer-Verlag  
Davis G H 1984: **Structural Geology of Rocks and Region**. John Wiley  
Ghosh S K 1995: **Structural Geology Fundamentals of Modern Developments**.  
Hubert MK 1972: **Structural Geology**. Hafner Publ Co. New York  
Moore E and Twiss RJ 1995: **Tectonics**. Freeman Pergamon Press  
Price NJ and Cosgrove JW 1990: **Analysis of Geological Structure**. Cambridge University Press  
Hobbs, Means and Williams: **An Outline of Structural Geology**.  
Badgeley P C: **Structural Geology for the Exploration Geology**.  
Fairhurst: **Rock Mechanics**. Pergamen Press  
Whitten E H T: **Structural Geology of Folding Rocks**.

**Department of Higher Education, Govt. of M.P.  
Semester wise Syllabus for Postgraduates  
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MGEO0103-T

**CLASS :** M.Sc. PREVIUOS  
**SUBJECT :** GEOLOGY  
**PAPER TITLE:** THIRD : GEOMORPHOLOGY  
**SEMESTER:** FIRST

## **UNIT 1**

Concept of Geomorphology principles and their significance. Cycle of erosion, Davis' and Plank' cycle of erosion. Slope forming processes: Landslides, Soil creep and Solifluction.

## **UNIT 2**

Fluvial Agency: Types of rivers, Valley development – Base level and its varieties, graded streams, Cross profiles of valleys. Classifications of valleys. Drainage Patterns and their significance. Erosion landforms and depositional landforms of streams.

## **UNIT 3**

Glaciers: Types of Glaciers, Regimen of Glaciers, nourishment of glaciers, wastage of glaciers. Major features resulting from glacial erosion and glacial deposition. Glacio-fluvial features. Eolian Agency, Topographic effects of wind erosion. Landforms of aeolian deposition. Piedmonts and piedmont problems. Arid cycle of erosion.

## **UNIT 4**

Karst Topography: Important areas of Karst. Conditions essential for development of Karst, features characteristic of karst region. Origin of Limestone caverns. Karst geomorphic cycle. Marine erosion. Topographic feature resulting from marine erosion and marine depositions. Classification of coasts.

## **UNIT 5**

Morphometric Analysis of Terrain and its significance. Morphometric analysis of drainage basin and its significance. Statistical correlation methods for interpretation. The organization of drainage system.

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### **References:**

Holmes, Doris L and Arthur: **Holmes' Principles of Physical Geology**. Wiley  
Thornbury, W D: **Geomorphology**. Wiley  
Small, R J: **Study of Landforms**. Cambridge  
Von Engelen, O D: **Geomorphology Systematic and Regional**. MacMillan  
Savinder Singh: **Geomorphology**  
Mathew Fontaine Maury: **The Physical Geography of the Sea**. Harvard Univ Press  
David Lang: **The Earth System**. Brown Publishers  
Halis, J R: **Applied Geomorphology**.

**Department of Higher Education, Govt. of M.P.  
Semester wise Syllabus for Postgraduates  
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MGEO0104-T

**CLASS :** M.Sc. PREVIOUS  
**SUBJECT :** GEOLOGY  
**PAPER TITLE:** FOURTH : MINERALOGY AND GEOCHEMICS  
**SEMESTER:** FIRST

### UNIT-1

Atomic structure, mineralogical properties and mode of occurrence of the following : -i. Sulfides: (AX, A<sub>2</sub>X, and AX<sub>2</sub> Types), Oxides (XO, X<sub>2</sub>O, XO<sub>2</sub> X<sub>2</sub>O<sub>3</sub> and XY<sub>2</sub>O<sub>4</sub> types) ii. Sulfates (anhydrous and hydrous) and, iii. Carbonates (calcite, aragonite, and dolomite groups). Classification of silicate structures. Isomorphism, Polymorphism, Exsolution .

### UNIT-2

Atomic structure, chemistry, physical, and optical properties of the following rocks forming mineral groups: Feldspar, Feldspathoid, Pyroxene, Amphibole, Mica and Zeolite.

### UNIT-3

Atomic structure, chemistry, physical and optical properties of the following rock forming mineral groups: Garnets, Olivine, Quartz and its varieties, Epidote, Chlorite, and Aluminosilicates (Kyanite, Sillimanite and Andalusite), Precious and Semi-Precious Stones .

### UNIT-4

Principles of optics, Double refraction, Optical classification of minerals, Birefringence, Determination of Refractive Index, Uniaxial and Biaxial Indicatrix, Determination of interference colours and interference figures, Optic Sign .

### UNIT-5

Geochemical classification of elements, Radioactive decay scheme of U-Pb, Rb-Sr, K-Ar, & Sm-Nb, Laws of Thermodynamics, Concept of geochemical cycle, Principles of ionic substitutions in mineral, Composition of the Earth .

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### Reference: -

Gribble, CD.1993: Rutley's **Elements of Mineralogy**.  
Deer, WA; Howie, RA and Zussman, J 1996: **Rock forming minerals**. Longman  
Henderson, P. 1987: **Inorganic Chemistry**, Pergamon press.  
Phillips, WR and Griffin DT; 1986: **Optical mineralogy**.  
CBS  
Klein, C and Hurlbut, CS. 1993 **Manual of mineralogy**. John  
Wiley. Mason, B 1991: **Principles of Geochemistry**.  
Hoefs, j 1980: **Stable Isotope Geochemistry**. Springer Verlag  
Brian Mason: **Principles of Geochemistry**.  
Anderson: **Geochemistry**  
Dana : **Textbook of Mineralogy**

**Department of Higher Education, Govt. of M.P.  
Semester wise Syllabus for Postgraduates  
As recommended by Central Board of Studies and  
Approved by HH the Governor of M.P.**

**CLASS :** M.Sc. PREVIUOS  
**SUBJECT :** GEOLOGY  
**SEMESTER :** Ist  
**PAPER TITLE:** PRACTICAL – 1 : GEODYNAMICS LAB (MGEO0105-P)  
PRACTICAL – 2 : MINERALOGY AND GEOCHEMICS LAB  
(MGEO0106-P)

**Department of Higher Education, Govt. of M.P.  
Semester wise Syllabus for Postgraduates  
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MGEO0201-T

**CLASS :** M.Sc. PREVIOUS  
**SUBJECT :** GEOLOGY  
**PAPER TITLE:** FIRST : IGNEOUS AND METAMORPHIC PETROLOGY  
**SEMESTER:** SECOND

### UNIT-1

Origin of Magma. Factors affecting Magma composition. Evolution of Magma by Differentiation and Assimilation. Phase Equilibria of Monary (Silica), Binary (Mixed and Eutectic) and Ternary (Ab – An – Di), (Fo – Fa – Silica) Silicate Systems.

### UNIT-2

Classification of igneous rocks including IUGS system. Reaction principle. Reaction Series. Textures of igneous rocks and interpretation of crystallisation history. Layered igneous structures. Petrographic provinces.

### UNIT-3

Origin of Granite: Magmatic and granitisation processes. Petrogenesis, Petrography and Indian occurrences of Basalt, Andesite, Carbonatite, Alkaline, and Ultra Mafic Rocks

### UNIT-4

Agents of metamorphism. Kinds of metamorphism, Types of metamorphism. Metamorphic differentiation. Structures and Textures of metamorphic rocks. Concept of metamorphic zones, Metamorphic zones in contact aureoles.

### UNIT-5

Metamorphic grades, facies and facies series. Facies classification. Metasomatism and their types. Origin and types of Migmatites. Metamorphism of carbonates, Pelites, mafic rocks . Charnockites and Khondalites .

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### References: -

- Best, M.G. 1986: **Igneous and Metamorphic Petrology**, CBS Publ.  
Bose, M.K.1997: **Igneous Petrology**, World Press  
Bucher, K & Frey, M. 1994: **Petrogenesis of Metamorphic Rocks**, Springer-Verlag  
Kretz, R. 1994: **Metamorphic crystallization**, John Wiley  
Mc Birney, A.R. 1993: **Igneous Petrology**, Jones and Bartlet Publ  
Phillipots, A. 1992: **Igneous and Metamorphic Petrology**, Prentice Hall.  
Turner, F.J. 1980: **Metamorphic Petrology**, Mc Graw Hills  
Yardley, B W. 1989: **An Introduction to Metamorphic Petrology**, Longman  
Winkler, HGF: **Petrogenesis of Metamorphic Rocks**. Springer Verlag  
Miyashiro, A: **Metamorphism and Metamorphic Rocks**. George Allen and Unwin  
Wyllie, P.J: **Ultramafic Rocks**. P J Heffer  
Baily, B: **Introduction to Petrology**. Prentice Hall  
Huang, V J: **Petrology**.

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MGEO0202-T

**CLASS :** M.Sc. PREVIUOS  
**SUBJECT :** GEOLOGY  
**PAPER TITLE:** SECOND : SEDIMENTALOGY  
**SEMESTER:** SECOND

### UNIT-1

Processes of sedimentation. Fluid flow, origin of sediments. Modes of transport of sediments. Stoke's Law of sediments. Classification and nomenclature of the common sediments (rudites, arenites and argillites). Classification of sedimentary rocks.

### UNIT -2

Origin, classification and significance of primary, secondary and organic sedimentary structures. Palaeocurrent significance in quality assessment. Classification of sandstone and limestone. Dolomite.

### UNIT-3

Textures of sedimentary rocks and their genetic significance. Granulometric analyses of clastic particles, statistical measure and interpretation of nature of sediments. Diagenesis.

### UNIT-4

Elements and types of depositional environments: Continental (Fluvial, lacustrine, aeolian and glacial), Transitional and marine environments, Evaporates, and Volcano-clastic sediments.

### UNIT-5

Provenance and mineral stability. Concept and types of sedimentary provenance. Heavy minerals: their separation and utility in the provenance analyses. Tectonic framework of sedimentation (Kay's classification of tectonic elements). Cyclothem .

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### Reference:-

- Allen, P. 1997: **Earth Surface Processes**. Blackwell  
Davis, R A, 1992: **Depositional Systems**. Prentice hall  
Einsels, G 1992: **Sedimentary Basins**. Springer Verlag  
Miall AD, 2000: **Principles of Sedimentary Basin Analysis**. Springer Verlag  
Nichols, G. 1999: **Sedimentology and Stratigraphy**. Black well  
Reading H G. 1996: **Sedimentary Environments**. Black well  
Sengupta, S 1997: **Introductions of Sedimentology**. Oxford IBH  
Pettijohn, F J: **Sedimentary Petrology**.  
Thompson and Collison: **Sedimentary Structures**.  
Pettijohn, Potter and Seiver: **Sand and Sandstones**.

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MGEO0203-T

**CLASS :** M.Sc. PREVIUOS  
**SUBJECT :** GEOLOGY  
**PAPER TITLE:** THIRD: STRATIGRAPHY OF INDIA  
**SEMESTER:** SECOND

## **UNIT-1**

Criteria for the Stratigraphic classification and correlation. Litho-, Bio- and Chrono-stratigraphic units. Magneto-stratigraphy. Sequence Stratigraphy. Geological time-Scale. Orogenic cycles in the Indian Stratigraphy . Tectonic framework of India . Geological Column of the Indian Stratigraphy.

## **UNIT-2**

Ice-ages in the Indian Stratigraphy: Precambrian, Permo-Carboniferous and Pleistocene ice ages, their evidences. Archaean (Azoic) History of India: Distributions and stratigraphy of the Archaeans of South India, Madhya Pradesh, Rajasthan, Jharkhand and Orissa.

## **UNIT-3**

Precambrian (Proterozoic) History of India: Distribution and stratigraphy of the Cuddapah and Vindhyan Super Groups . Palaeozoic history: Distributions and stratigraphy of Salt Range and Spiti. Origin and age of Saline Formation. Precambrian – Cambrian Boundary problem .

## **UNIT-4**

Mesozoic history : Distribution and stratigraphy of Triassic of Spiti, Jurassic of Cutch (Kachhh) and Cretaceous of South India. Bagh Beds. Lameta Beds. Deccan Traps. Permo – Triassic Boundary problem.

## **UNIT-5**

Palaeoclimate, classification, distribution and stratigraphy of the Gondwana Super Group . Cenozoic history : Tertiary of Assam, its economic importance. Siwaliks and its vertebrate fossil record. K-T Boundary .

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## **References :**

Boggs Sam Jr 1995: **Principles of Sedimentary and Stratigraphy**. Prentice Hall  
Krishnan, M S: **Geology of India and Burma**. Higginbothams, Madras  
Ravindra Kumar: **Historical Geology and Stratigraphy of India**. John Wiley  
Wadia, D N : **Geology of India**. MacMillan & Co  
Doyle and Brennet MR 1996: **Unlocking the Stratigraphy: Concepts and Application**.  
Prentice H

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MGEO0204-T

**CLASS :** M.Sc. PREVIOUS  
**SUBJECT:** GEOLOGY  
**PAPER TITLE:** FOURTH : PALAEOBIOLOGY  
**SEMESTER:** SECOND

## UNIT – 1

Modes of fossilization, uses of fossils, Classification, evolution, geological history of : Trilobites, Graptolites, Echinoids and Corals.

## UNIT – 2

Classification, evolution, geological history of the following: Brachiopoda, Gastropoda, Lamellibranchia and Cephalopoda.

## UNIT – 3

Succession of the Vertebrate Life through the geological time. Evolutionary history of Human, Elephant and Horse.

## UNIT – 4

Micropaleontology: Classification, separation of microfossils. Application of microfossils in fossil fuel exploration, Morphology and geological history of foraminifera.

## UNIT – 5

Concept of Palaeobotany and Palynology. Plant life through ages. Characteristic features of Lower Gondwana flora. Characteristic features of Upper Gondwana flora.

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## References:

- Moore, Lalicher and Fischer: **Invertebrate Palaeontology**.  
Woods, Henry: **Invertebrate Palaeontology**.  
Clarkeson ENK 1998: **Invertebrate Palaeontology and Evolution**. Blackwell  
Stearn CW and Carrol RL 1989: **Palaeontology -the Record of Life**. John Wiley  
Smith AB 1994: Systematics and the Fossils Record-Documenting Evolutionary Patterns. Blackwell  
Prothero DR 1998: **Bringing Fossils to Life: An Introduction to Palaeobiology**. McGraw  
Ananthraman and Jain: **Textbook of Palaeontology**.  
Banner FT and Lord A R: **Aspects of Micropalaeontology**.  
Roger A S: **Vertebrate Palaeontology**.  
Jones D J: **Microfossils**.  
Glassner M P: **Principles of Micropalaeontology**.  
Haq B U and Boersma A: **Introduction to Marine Micropalaeontology**.  
Andrew: **Palaeontology**.



# MAHAKAUSHAL UNIVERSITY JABALPUR

**Department of Higher Education, Govt. of M.P.  
Semester wise Syllabus for Postgraduates  
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**CLASS :** M.Sc. PREVIUOS  
**SUBJECT :** GEOLOGY  
**SEMESTER :** IIND  
**PAPER TITLE:** PRACTICAL – 1 : PETROLOGY LAB (MGEO0205-P)  
PRACTICAL – 2 : PALAEONTOLOGY AND STRATIGRAPHY LAB  
(MGEO0206-P)

**CLASS : M.SC.**  
**SEMESTER : THIRD**  
**SUBJECT : GEOLOGY**  
**PAPER NO. : FIRST (MGEO-0301-T)**  
**TITLE : PHOTO GEOLOGY AND REMOTE SENSING**

**UNIT - I** Introduction to aerial photography. Types of aerial photos. Geometric principles of photographs- relief and tilt displacement, Vertical Exaggeration and distortions. Measurements from Aerial Photographs : Scales, Distance, Area and Height.

**UNIT - II** Preparation of Photo-geologic Maps. Mosaic controlling factors of aerial photograph. Flight plan, area, purpose, time and season of photography. Introduction to overlap, sidelap, drift, crab, fiducial marks. Elements of interpretation of aerial photographs.

**UNIT - III** Electro-Magnetic Spectrum. Space platforms. Reflectance of Minerals, vegetation, rocks and water. Elementary idea about active and passive sensors Introduction to IRS mission.

**UNIT - IV** Multispectral Scanners (MSS); Thematic Mappers (TM); Linear Imaging self scanning (LISS). Elementary idea about image processing. Concept and application of Geographic information system (GIS).

**UNIT - V** Application of Photo Geology and Remote Sensing in the study of Geomorphology, Lithology and Structural Features and Hydrogeologic studies.

### **SUGGESTED READINGS :**

- Curra, P.J., 1985 : Principles of Remote Sensing, ELBS/Longman
- Drury, S.A., 1987 : Image Interpretation in Geology, Allen and Unwin.
- Lend, D.R. : Principles and Interpretation of Aerial Photographs.
- Miller, V.C., 1961 : Photo Geology, McGraw
- Pandey, S.N., 2001 : Principles and Applications of Photo Geology, New Age.
- Parry S. Seigal and Alan R : Remote Sensing in Geology.
- Patel, A.N. and Surendra Singh : Principle of Remote Sensing, Scientific Publishers
- Pratt, V.K. : Digital Image Processing.
- Tripathi and Bajpai ed. 2000 : Remote Sensing in Geosciences.
- Wolf : Introduction to Photogrammetry.
- Jenson : Environmental Remote Sensing

**CLASS : M.SC.**  
**SEMESTER : THIRD**  
**SUBJECT : GEOLOGY**  
**PAPER : SECOND ( MGEO0302-T )**  
**TITLE : ENGINEERING GEOLOGY**

**UNIT - I** Importance of geology in civil engineering projects. Merits and Demerits of civil engineering in folds, faults and joints affected area. Engineering properties of rocks.

**UNIT - II** Tunnel : Terminology and Types, Geological Considerations for Tunneling in different Grounds. Lining of Tunnels. Highways Geological considerations for construction of highways.

**UNIT - III** Dam and its Parts. Types of dam. Geological consideration for the selection of a dam site and Reservoir. Problems related to failure of Dams. Grouting.

**UNIT - IV** Bridge : Types and Geological considerations. Canals : Geological considerations and lining.

**UNIT - V** Landslide : Causes, Effects and Prevention. Consideration of civil engineering in seismic areas. Geo-hazards : Mitigation and Management.

### **SUGGESTED READINGS :**

- Bell, F.G., 1999 : Geological Hazards, Rout ledge.
- Blyth, F.C.H. : Geology for Engineers, Arnold Ltd.
- Kesavulu, N.C. : Text Book of Engineering Geology, McMillan.
- Khurmi, R.S. : Fundamental of Engineering Geology, Dhanpat Rai & Sons.
- Krynine and Judd, W.R. : Principles of Engineering Geology and Geotechnics, McGraw
- Parbin Singh : Engineering and General Geology, Katson Publ House.
- Ramnathan, R.M. : Engineering Geology, Anuradha Agency, T.N.
- Richey, J.E. : Elements of Engineering Geology, Sir Issac Pitman & Sons.
- Sumit, K. 1992 : Environmental Hazards, Rout ledge.
- Trefethen, N.C. : T.B. of Geology and Engineering Geology, McMillan.

**CLASS** : **M.SC.**  
**SEMESTER** : **THIRD**  
**SUBJECT** : **GEOLOGY**  
**PAPER** : **THIRD ( MGEO0303-T )**  
**TITLE** : **ORE GEOLOGY**

**UNIT - I** Relation of magma to mineral deposits. Geological thermometers. Ore genesis. Control of ore deposits. Paragenesis and zoning in mineral deposits.

**UNIT - II** Processes of Mineral Deposits : Magmatic concentration, Hydrothermal and Volcano-genetic deposits.

**UNIT - III** Processes of Mineral Deposits : Sedimentary, Placer and Residual. Oxidation and Supergene Enrichment. Ore Microscopy : Textures and Structures of Ore.

**UNIT - IV** Origin, mode of occurrence, association, uses and Indian occurrences of the ores of Iron, Manganese, Chromium, Copper, Lead, Zinc, Aluminium and Gold.

**UNIT - V** Origin, Mode of Occurrence, Association, Specification and Grade and distribution for non metallic minerals uses in Industries. Minerals used in Fertilizers and Cement Industries.

#### **SUGGESTED READINGS :**

- Bateman, 1981 : Economic Mineral Deposits, Wiley.
- Deb, S. Industrial Minerals.
- Evans, J.M., 1993 : Ore Geology and Industrial Minerals, Blackwell.
- Krishnaswamy : Mineral Resource of India.
- Lamey, Carl, A : Metallic and Industrial Minerals.
- Mookherjee, Ashok, 2000 : Ore Genesis - a holistic approach, Allied
- Mukerjee, 1999 : Non Fuel Mineral Deposits of India, Allied P.
- Stanton, R.L., 1972 : Ore Petrology, McGraw Hills
- Umeshwar Prasad, 2000 : Economic Geology, CBS

**CLASS** : **M.SC.**  
**SEMESTER** : **THIRD**  
**SUBJECT** : **GEOLOGY**  
**PAPER NO.** : **FOURTH ( MGEO0304-T )**  
**TITLE** : **MINERAL EXPLORATION**

**UNIT - I** Ore-guides for mineral prospecting. Methods of geological exploration : exploratory grids, pits, trenches. Well logging in evaluation of deposits.

**UNIT - II** Sampling types and methods and Assaying by sampling methods. Calculation and classification of ore reserves. Classification of reserves.

**UNIT - III** Classification and principles of geophysical methods : Electrical methods and Magnetic methods.

**UNIT - IV** Gravity methods : Earth's gravity fields, gravity anomalies, Interpretation of gravity anomalies for mineral deposits. Seismic methods : Elastic properties of rocks, types of elastic waves (P, S, L, waves), Refraction and reflection methods, Time-distance relation for horizontal interface,

**UNIT - V** Geochemical Exploration : Geochemical cycle, mobility of elements. Path finder elements. Primary dispersion patterns. Syngenetic and Epigenetic diffusion. Sampling technique for geochemical exploration.

#### **SUGGESTED READINGS :**

- Arogyaswamy, R.N.P., 1996 : Courses in Mining Geology. IV ed, Oxford/IBH.
- Dobrin, M.B. 1976 : Introduction to Geophysical Prospecting, McGraw Hill.
- Ginzburg, I.I. : Principles of Geochemical Prospecting, Pergamon London.
- Hawkes, H. and Wobb, J.S. : Geochemistry in Mineral Exploration, Harper NY
- Holson, G.D. and Tiratsoo, E.N., 1985 : Introduction to Petroleum Geology, Gulf Publ.
- Howel C.H. : Introduction to Geophysics.
- Milton and Dobrin : Introduction to Geophysical Prospecting, McGraw Hill
- Paransia, D.S. : Principles of Applied Geophysics.
- Rao, M.B.R. : Outline of Geophysical Prospecting.
- Sharma, P.V., 1986 : Geophysical Methods in Geology, Elsevier.

**CLASS : M.Sc.**  
**SEMESTER : THIRD**  
**SUBJECT : GEOLOGY**  
**PAPER : PRACTICAL – 1 ( MGEO0305-P )**  
**TITLE : GEOLOGY LAB**

**PAPER : PRACTICAL– 2 ( MGEO0306-P )**  
**TITLE : PHOTOGEOLOGY & REMOTE SENSING LAB**

**CLASS** : **M.SC.**  
**SEMESTER** : **FOURTH**  
**SUBJECT** : **GEOLOGY**  
**PAPER NO.** : **FIRST ( MGEO0401-T )**  
**TITLE** : **FUEL GEOLOGY**

**UNIT - I** Origin of Coal. Physico-Chemical Characterization : Proximate and Ultimate Analysis. Rank and Varieties of Coal. Macroscopic Ingredients and Microscopic Constituents (Lithotypes, Maceral and Microlithotypes).

**UNIT - II** Indian and International Classification of Coal. Preparation of Coal for Washing, Carbonization, Gasification and Hydrogenation, Briquette of Coal.

**UNIT - III** Geological features of the productive coal fields of India. Methods of Coal Prospecting. Estimation of Coal Reserve. Elementary idea about Coal Mining Methods. Coal Bed Methane.

**UNIT - IV** Origin, Migration and Accumulation (oil-traps) of Petroleum and Natural Gas. Kerozene. Geology of the Productive Oil Fields of India. Status of Oil and Natural Gas in India.

**UNIT - V** Atomic minerals : mode of occurrence, association and distribution in India. Methods of Prospecting, Productive Horizons in India, Nuclear Power Stations of the Country and Future Prospects.

### **SUGGESTED READINGS :**

- Dahlkamp, F.J., 1993 : Uranium Ore Deposits. Springer Verlag
- Durance, E.M., 1986 : Radioactivity in Geology : Principles and Applications.
- Ellis H. Holson GD and Tiratsoo, E.N. , 1985 : Introduction of petroleum Geology. Gulf Pub
- Nettleton L.L. :Geophysical Prospecting for Oil
- North F.K., 1985 : Petroleum Geology. Allen and Unwin
- Selley, R.C., 1998 : Elements of Petroleum Geology. Academic Press
- Singh, M.P.1998 : Coal and Organic Petrology. Hindustan Publications ND
- Tissot, B.P. and Welt, D.H., 1984 : Petroleum Formation and Occurrence. Springer Verlag

**CLASS : M.SC.**  
**SEMESTER : FOURTH**  
**SUBJECT : GEOLOGY**  
**PAPER NO. : SECOND ( MGEO0402-T )**  
**TITLE : MINING AND MINERAL DRESSING**

**UNIT - I** Mining terminology, mine supports, subsidence, shaft and shaft sinking. Breaking of rocks. Percussion and Rotary drilling methods. Classification of mining methods.

**UNIT - II** Alluvial mining. Open-cast mining & Underground mining (other than coal mining) : Stopping methods-open stopes, timbered stopes, shrinkage stopes, slicing system and caving. Mine atmosphere : mine ventilation, pumping of mine water.

**UNIT - III** Coal mining methods : Board and Pillar methods, Long Wall methods, Strip mining. Haulage and winding.

**UNIT - IV** Mineral Dressing : Physical properties of minerals utilized in mineral dressing. Crushers : Primary and Secondary crushers. Grinding mills. Rod mills, ball mills, autogenous mills.

**UNIT - V** Industrial screening : Types of screens. Gravity separation. Heavy - medium separation. Magnetic separation. Froth Floatation technique of separation of sulphide ores.

### **SUGGESTED READINGS :**

- Arogyaswamy RNP : Courses of Mining Geology, Oxford & IBH
- Gaudin : Principles of Mineral Dressing, Mc Graw Hill
- Lewis : Elements of Mining
- Mc Kinstry HE : Mining Geology, Prentice Hall.
- Richards and Looke : Text Book of Ore Dressing, Mc Graw Hill
- Roberts : Elements of Ore Dressing.
- Taggart : Mineral Dressing.
- Young : Elements of Mining Geology.

**CLASS : M.SC.**  
**SEMESTER : FOURTH**  
**SUBJECT : GEOLOGY**  
**PAPER NO. : THIRD ( MGEO0403-T )**  
**TITLE : HYDROGEOLOGY**

**UNIT - I** Distribution of water: surface and subsurface. Introductory idea to type & age of water. Hydrological cycle, Precipitation and its types. Ground water: Origin, importance, occurrences and subsurface reservoirs. Hydrostratigraphic UNITS. Water table contour maps.

**UNIT - II** Geological factors governing the occurrence of ground water. Porosity, permeability, specific yield, Specific retention, hydraulic conductivity, storage coefficient, aquifers and their classification.

**UNIT - III** Groundwater flow: confined, unconfined, steady, unsteady, and radial flow. Forces causing flow. Darcy's Law. Water level fluctuations: causative factors and their measurements. Methods of pumping test and analysis of test data.

**UNIT - IV** Ground water quality: Physical characteristics: Turbidity, colour, taste, odour, temperature and specific conductivity. Chemical characters: TDS and suspended solids, pH value, hardness, heavy metals. and dissolved gases. Biological characteristics. Water contaminants and pollutants.

**UNIT - V** Salt water intrusion in coastal aquifers, remedial measures. Radio isotopes in hydrogeological studies. Water harvesting. Wetland management. Consumptive and conjunctive use of surface and ground water. Concept of watershed management.  
Natural and artificial recharge of ground water.

### **SUGGESTED READINGS :**

- Davis S.N. and De Wiest R.J.M., 1966 : Hydrogeology, John Wiley
- Felter, C.W., 1990 : Applied Hydrogeology, Merrill.
- Freeze, R.A. and Cherry, J.A., 1979 : Ground Water, Prentice Hall.
- Gautam Mahajan : Groundwater survey and Investigation.
- Gulman : Hydrogeology and Wetland Conservation.
- Karanth, K.R. 1987 : Ground Water Assessment - Development and Management,
- Raghunath, N.M., 1982 : Ground Water, Wiley Eastern.
- Subramaniam, V. 2000 : Water. Kingston Publ. London, Tata McGraw Hill
- Todd, D.K. 1980 : Ground Water Hydrology, John Wiley.
- Tollman : Ground Water.

**CLASS : M.SC.**  
**SEMESTER : FOURTH**  
**SUBJECT : GEOLOGY**  
**PAPER NO. : FOURTH ( MGEO0404-T )**  
**TITLE : ENVIRONMENTAL GEOLOGY**

**UNIT - I** Concept of Environmental geology. Ecological perspective of the environment. Global warming and its impact. Impact of mining activity on environment.

**UNIT - II** Impact assessment of degradation and contamination of surface water and ground water quality due to industrialization and urbanization. Soil profiles, types and soil quality degradation due to irrigation, use of fertilizer and pesticides. Environmental problems related to dam and reservoirs.

**UNIT - III** Wetlands: Classification, natural and artificial wetlands, problems of reclamation of wetlands, use of wetlands. Water logging problems. Desertification and Degradation of land. Anti-desertification measures.

**UNIT - IV** Causes of floods, flood hazards and management. Impacts of mining activities on the environment. Environmental management in mining. Effects of earthquakes, Seismic hazards and management. Environmental pollution due to industries, energy resources, urbanization.

**UNIT - V** Earth's natural hazardous processes and its impact on environment: volcanic activity, landslides and coastal hazards. Environmental problems related to dams and reservoirs.

### **SUGGESTED READINGS :**

- Bell, F.G., 1999 : Geological hazards. Rout Ledge, London.  
Hsai - Yang Fang, 1997 : Introduction to Environmental Geotechnology, CRC Press.  
Patwardhan, A.M., 1999 : The Dynamic Earth System, Prentice Hall  
Smith, K., 1992 : Geological Hazards, Rout Ledge, London.  
Subramaniam, V. 2001: Textbook in Environmental Science, Narosa International  
Narosa International T.E. Graedal & P.J. Crutzen, 1993.  
Atmospheric change, Freeman and Co Valdiya, K.S., 1987.  
Environmental Geology- Indian Context. Tata Mc Graw.  
People and Environmental – ISS 310, Michigan State University.

**CLASS** : **M.SC.**  
**SEMESTER** : **FOURTH**  
**SUBJECT** : **GEOLOGY**  
**PAPER** : **PRACTICAL – 1 ( MGEO0405-P )**  
**TITLE** : **MINING AND MINERAL  
DRESSING LAB**

**PAPER** : **PRACTICAL– 2 : ( MGEO0406-P )**  
**TITLE** : **HYDROGEOLOGY LAB**

**Project Work** : **( MGEO0407-P )**