

**University of Rajasthan
Jaipur**

SYLLABUS

M.Sc.

(GEOLOGY)

2014-2015 (I & II SEMESTER)

2015-2016 (III & IV SEMESTER)

1. Course structure

Semester 1

M.Sc. Geology
Semester2014-2015 (I II Sem)
2015-2016 (III IV Sem)

S. No.	Subject Code	Course title	Course category	Credit	Contact hours per week	EoSE duration (Hrs.)
					L-T-P	Thy-P
1.	Gel101	Structural Geology	CCC	4	4-0-0	3-0
2.	Gel102	Mineralogy & Crystallography	CCC	4	4-0-0	3-0
3.	Gel103	Applied Palaeontology & Micropalaeontology	CCC	4	4-0-0	3-0
4.	Gel104	Principles of stratigraphy & Phanerozoic stratigraphy	CCC	4	4-0-0	3-0
5.	Gel111	Practical -I (Structural Geology & Mineralogy)	CCC	8	0-0-12	0-4
6.	Gel112	Practical -II (Palaeontology & Phanerozoic Stratigraphy)	CCC	8	0-0-12	0-4
7.	Gel113	Field Training of 10 days (90 hrs)	CCC	4		Along with Gel111
Total credits in the semester				36		

D.K. Pandey
(Prof. D.K. Pandey)
Coordinator

[Signature]
HEAD
Department of Geology
University of Rajasthan, JAIPUR

①

Use of the meeting of BOS held on 12/11/2014

12 Noon. Geology

1-A

The following members were present


1. Prof. Anil Maheshwari
2. Prof. R. S. Sharma
3. Prof. M. K. Pandit
4. Prof. S. Agrawal
5. Prof. D. K. Pandey


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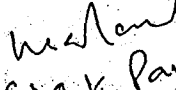
Prof. M. S. Sisodia could not attend the meeting.

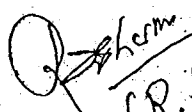
It was resolved that Prof:

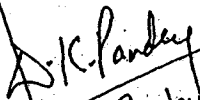
1. Prof. D. K. Pandey is elected as Convener BOS
2. Prof. M. K. Pandit is elected to serve on the Committee for appointment of examiners.
3. (a) No change is proposed in the syllabus of B.Sc. exam. 2015
(b) No change is proposed in the syllabus of M.Sc (Annual scheme) examination 2015
(c) Revised syllabus for M.Sc. (Semester - scheme) was prepared & approved w.e.f Academic Session 2014-15 (I & II Semester); 2015-16 (III & IV Semester) - Appendix I
4. The meeting ended with a vote of thanks to chair


(Anil Maheshwari)


(S. Agrawal)


(M. K. Pandit)


(R. S. SHARMA)


(D. K. Pandey) 12/11/2014

Semester 2

S. No.	Subject Code	Course title	Course category	Credit	Contact hours per week	EoSE duration (Hrs.)
					L-T-P	Thy-P
1.	Gel 201	Tectonics and Geomorphology	CCC	4	4-0-0	3-0
2.	Gel 202	Geochemistry	CCC	4	4-0-0	3-0
3.	Gel 203	Invertebrate & Vertebrate Palaeontology, & palaeobotany	CCC	4	4-0-0	3-0
4.	Gel 204	Precambrian Stratigraphy & crustal evolution	CCC	4	4-0-0	3-0
5.	Gel 211	Practical-I (Geomorphology & Geochemistry)	CCC	8	0-0-12	0-4
6.	Gel212	Practical-II (Palaeontology & Precambrian Stratigraphy)	CCC	8	0-0-12	0-4
7.	Gel213	Field Training of 10 days (90 hrs)	CCC	4		Along with Gel211
Total credits in the semester				36		

Semester 3

S. No.	Subject Code	Course title	Course category	Credit	Contact hours per week	EoSE duration (Hrs.)
					L-T-P	Thy-P
1.	Gel301	Mineral Resources	CCC	4	4-0-0	3-0
2.	Gel302	Igneous Petrology	CCC	4	4-0-0	3-0
3.	Gel303	Sedimentary Petrology	CCC	4	4-0-0	3-0
4.	Gel304	Hydrogeology & Remote Sensing	CCC	4	4-0-0	3-0
5.	Gel311	Practical –I (Mineral Resources, Sedimentary Petrology)	CCC	8	0-0-12	0-4
6.	Gel312	Practical –II (Remote Sensing, Hydrogeology & Igneous Petrology)	CCC	8	0-0-12	0-4
7.	Gel313	Field Training of 10 days (90 hrs)	CCC	4		Along with Gel311
Total credits in the semester				36		

Semester 4

S. No.	Subject Code	Course title	Course category	Credit	Contact hours per week	EoSE duration (Hrs.)
					L-T-P	Thy-P
1.	Gel401	Metamorphic Petrology	CCC	4	4-0-0	3-0
2.	Gel402	Mining Geology & Engineering geology	CCC	4	4-0-0	3-0
3.	Gel403	Fuel geology & mineral exploration	CCC	4	4-0-0	3-0
4.	Gel404	Environmental geology & disaster management	CCC	4	4-0-0	3-0
5.	Gel411	Practical-I (Metamorphic Petrology & Fuel geology)	CCC	8	0-0-12	0-4
6.	Gel412	Practical -II (Environmental Geology & Engineering geology)	CCC	8	0-0-12	0-4
7.	Gel413	Field Training of 10 days (90 hrs)	CCC	4		Along with Gel411
Total credits in the semester				36		

Note: Field Training Programs are Compulsory. Student not taking part in the field Training shall not be allowed to appear at the EoSE.

M. Sc. GEOLOGY FIRST SEMESTER

Paper I

Structural Geology

Code: Gel 101

Unit-I

Primary sedimentary and igneous structures, Gravity related features and their usefulness in structural analyses. Unconformities and basement cover relationship. Principles of geological mapping, projection diagrams.

Unit-II

Stress, Strain, Stress-strain relationship of elastic, plastic and viscous materials. Mechanical behaviour of rocks. Measurement of strain in deformed rocks. Time relationship between crystallization and deformations.

Unit-III

Folds: Geometry, classification, mechanism of folding. Superimposed folds: occurrence, recognition and geometric analyses. Cleavage: Types, origin, mechanics and relationship with folding.

Unit-IV

Faults: Geometry, classification, mechanism of faulting. Shear zones, Shear sense indicators, shear zone kinematics. Role of fluids. Joints: Relation of joints and fractures to strain field. Lineation: Types, origin and deformation. Basic principles of structural analyses.

M. Sc. GEOLOGY FIRST SEMESTER

Paper II

Mineralogy

Code: Gel 102

Unit- I

Polarized light, Nicol prism and working principle of petrological microscope, Optical properties of minerals, Optical accessories and their use, Uniaxial and biaxial minerals, interference figures

Unit- II

Chemical composition, crystal structure, P-T stability, physical and optical properties and mode of occurrence of olivine, garnet, pyroxene and amphibole group of minerals

Unit- III

Chemical composition, crystal structure, P-T stability, physical and optical properties and mode of occurrence of mica, feldspar, epidote and nepheline group of minerals

Unit- IV

Symmetry in crystals; 32 point groups (Symmetry classes) & introduction to 230 space groups. Stereographic projection, Introduction to X-Ray and its application in study of minerals, Bragg's Law, Rotation Method and Powder Method. Study of precious and semiprecious minerals.

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M. Sc. GEOLOGY FIRST SEMESTER

Paper III Applied Palaeontology & Micropalaeontology

Code: Gel 103

Unit -I

Origin of life, origin of metazoan. Taxonomy: classification and species nomenclature, species concept. Migration, dispersion and extinction of animals and plants.

Unit- II

Theories, mechanism and evidences of evolution. Evidences of life during Precambrian. Major events in the history of Paleozoic, Mesozoic and Cenozoic life. Palaeoecology: a) fundamentals b) palaeoenvironment: physical parameters and various approaches of reconstruction C) taphonomy, taphocoenosis, thanatocoenosis, time-averaging/condensation, shell-beds and biostratigraphy d) palaeoecological interpretation and its application

Unit -III

Paleobiogeographic provinces. Collection, preparation and preservation of fossils. Outline of classification of invertebrates fossils. Application of the following groups of fossils in stratigraphy and stratigraphic correlation/ reconstruction of palaeoenvironment Foraminifers, Radiolarian, Serpulids, Conodonts and Ostracodes

Unit- IV

Ichnology: definition, classification, description of common Ichnogenera, their application in the reconstruction of depositional environment, sequence stratigraphy, stratigraphic correlation.



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M. Sc. GEOLOGY FIRST SEMESTER

Paper IV Principles of Stratigraphy & Phanerozoic Stratigraphy Code: Gel 104

Unit- I

Code of stratigraphic nomenclature. Geochronology. Stratigraphic classification: lithostratigraphy, biostratigraphy and chronostratigraphy and their units. Sequence stratigraphy: concept and application. Magnetostratigraphy. Climastratigraphy. Seismic Stratigraphy. Event Stratigraphy. Graphic representation of stratigraphic data.

Unit -II

Palaeozoic & Mesozoic stratigraphy of India: nomenclature, classification, distribution, structures, succession, sedimentary history, fauna, flora, age, igneous intrusion, palaeogeography, palaeoclimate and regional correlation.

Unit -III

Gondwana Supergroup of India: nomenclature, classification, distribution, structures, succession, sedimentary history, fauna, flora, age. Deccan traps; age, duration of volcanism, infra & inter-trappeans sedimentary formations and their fossils. Precambrian- Cambrian, Permian- Triassic and Cretaceous – Tertiary (KT) boundaries.

Unit - IV

Cenozoic Stratigraphy of India: nomenclature, classification, distribution and regional correlation. Siwalik System: distribution, fossils and age.

Phanerozoic stratigraphy of Rajasthan: divisions and rock types.

M. Sc. GEOLOGY FIRST SEMESTER

Paper V

Practical-I

Code: Gel 111

Duration: 4 hours

Max. Marks 100

Structural Geology :-

35 Marks

1. Solving structural problems by stereographic and orthographic projections.
2. Identification of structural elements and their chronology in hand specimen.
3. Structural analysis with stereo net: S-pole and beta-pole diagrams; Fold axis and axial plane; Contour diagrams; Methodology and interpretation of patterns.
4. Interpretation of geological maps and drawing of cross sections.

Mineralogy:-

25 Marks

1. Determination of axial ratio.
2. Identification of minerals in hand specimen.
3. Microscopic properties of minerals, identification of interference figures and optical sign, determination and measurement of 2V.

Viva-Voce

10 Marks

Field work (Gel 113)

15 Marks

Record

15 Marks

M. Sc. GEOLOGY FIRST SEMESTER

Paper VI

Practical-II

Code: Gel 112

Duration: 4 hours

Max. Marks 100

Paleontology:

45 Marks

Labeled sketches, classification, morphological description, and age/horizon and locality of available macro- and micro-fossil specimens. Study of index fossils in their chronological order.

Phanerozoic Stratigraphy:

30 Marks

Identification, description and geochronology of Indian phanerozoic stratigraphic rocks. Phanerozoic Stratigraphic maps of India. Phanerozoic Palaeogeographic maps of India

Viva-Voce

10 Marks

Record

15 Marks

Compulsory Field Training Program : Geological Field Training – 10 days duration

Note: Field Training is Compulsory, Student not taking part in the field training shall not be allowed to appear in the examination.

M. Sc. GEOLOGY SECOND SEMESTER

Paper I

Tectonics and Geomorphology

Code: Gel 201

Unit - I

Earth as a dynamic system. Internal constitution of the Earth; heterogeneity of the Earth; seismic, gravity and magnetic characteristics. Continental drift, sea-floor spreading. Plate tectonics, Paleomagnetism and its application.

Unit - II

Seismicity and seismic belts of the Earth. Continental shield areas and mountain chains. Features associated with oceanic crust, mid-oceanic ridges, gravity and magnetic anomalies at mid oceanic ridges, Deep sea trenches, Island arcs and Volcanic arcs.

Unit - III

Basic principles of Geomorphology, Weathering and erosion pathogenesis; mass movement, erosion, transportation and deposition. Types of landforms: fluvial, glacial, Aeolian, coastal and karst. Tectonics and Landforms. Tectonic subdivision of India.

Unit- IV

Geomorphic mapping- tools and Techniques, slope studies, drainage and basin analysis. Application of geomorphology in mineral prospecting, civil & defense engineering and environmental studies.

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M. Sc. GEOLOGY SECOND SEMESTER

Paper II

Geochemistry

Code: Gel 202

UNIT - I

Atomic structure, periodic table and properties of elements. Silicate structures; Isomorphism, polymorphism, solid solution and exsolution.

UNIT- II

Structure and composition of earth and distribution of elements; Geochemical classification of elements. Geochemical cycle. Earth in relation to solar system and universe, cosmic abundance of elements

UNIT-III

Concept and application of binary and ternary variation diagrams – Major, Trace and Rare Earth Elements and their application in provenance studies, tectonic environment and petrogenesis.

UNIT - IV

Isotope geochemistry: Radiogenic and stable isotope. Concept and application of C-, and O- and H isotopes. Geochronologic application of Rb – Sr, U – Pb and Ar – Ar systematics.

M. Sc. GEOLOGY SECOND SEMESTER

Paper III Invertebrate & Vertebrate Palaeontology & palaeobotany Code: Gel 203

Unit-I

Geological history and application of Lamellibranchs (with functional morphology), Gastropods, Nautiloids, Ammonoides, Belemnites, Brachiopods (with functional morphology), corals and Sponges in stratigraphy and stratigraphic correlation/ reconstruction of palaeoenvironment.

Unit-II

Application of the following groups of fossils in stratigraphy and stratigraphic correlation/ reconstruction of palaeoenvironment: Trilobites, Monoplacophora, Graptolites, Hyoliths, Bryozoans, Echinoids (with functional morphology), Crinoides.

Unit -III

Palaeobotany: classification of Kingdom Plantae, Gondwana Flora: systematic study of important Gondwana Plants, Application bearing on palaeoclimate. Application of the following groups of fossils in stratigraphy/stratigraphic correlation/reconstruction of palaeoenvironment: Algae (Calcareous/Siliceous): Coccolithophore, Stromatolites, Dinoflagellates, Halimeda, Diatoms, Pollen grains and spores

Unit -IV

Outline of classification of vertebrates, significance of vertebrate palaeontology, Sequence of vertebrates through geological ages. Evolutionary history of man, elephant and horse. Classification, significance and extinction of Dinosaurs.

M. Sc. GEOLOGY SECOND SEMESTER

Paper IV Precambrian Stratigraphy & Crustal Evolution Code: Gel 204

Unit- I

Early history of the earth, nature of primitive crust and evolution of early crust. Evolution of Granite- Greenstone and Granulite belts. Precambrian Chronostratigraphy and their units. Outline of tectonic subdivision and Precambrian provinces of India

Unit II

Distribution, stratigraphic correlation, succession, geochronology and economic importance of Archean and Paleoproterozoic rocks of India; Dharwar Province, Eastern Ghat Province, Central Indian Province and Singhbhum-Orissa Province

Unit-III

Meso- and Neoproterozoic rocks in India; Cuddapah-Kurnool, Kaladgi, Bhima, Pakhal and Vindhyan basins: Distribution, stratigraphic correlation, succession and economic importance

Unit -IV

Precambrian geology of Rajasthan; Banded Gneissic Complex (Bhilwara Supergroup), Aravalli Supergroup, Delhi Supergroup, Marwar Supergroup, Vindhyan Supergroup and Malani Igneous Suite

(15)

M. Sc. GEOLOGY SECOND SEMESTER

Paper V

Practical-I

Code: Gel 211

Duration: 4 hours

Max. Marks 100

Tectonics and Geomorphology:

40 Marks

1. Identification and description of various landforms.
2. Morphometric analysis of drainage basins.
3. Studies of drainage patterns.
4. Exercises on Slope analysis.

Geochemistry

20 Marks

5. Graphical presentation and interpretation of geochemical data.

Viva-Voce

10 Marks

Field work (Gel 213)

15 Marks

Record

15 Marks

M. Sc. GEOLOGY SECOND SEMESTER

Paper VI

Practical-II

Code: Gel 212

Duration: 4 hours

Max. Marks 100

Palaentology

40 Marks

Labeled sketches, classification, morphological description, and age/horizon and locality of available macro- and micro-fossil specimens. Study index fossils in their chronological order.

Precambrian Stratigraphy:

35 Marks

1. Identification, description and geochronology of Indian Pre-cambrian stratigraphic rocks.
2. Pre-cambrian Stratigraphic maps of India.
3. Pre-cambrian Palaeogeographic maps of India.
4. Graphical representation of stratigraphic sections (Litholog)

Viva-Voce

10 Marks

Record

15 Marks

Compulsory Field Training Program : Geological Mapping Training – 10 days duration.

Note: Field Training is Compulsory. Student not taking part in the field training shall not be allowed to appear in the examination

M. Sc. GEOLOGY THIRD SEMESTER

Paper I

Mineral Resources

Code: Gel 301

Unit- I

Magma and its relation with mineral deposits. the development of the modern theories of ore formation. classification for ore deposits. processes of ore formation. magmatic concentration, contact metasomatism, hydrothermal, residual and mechanical concentration, sedimentation, metamorphism. Supergene enrichment, Bacteriogenic and volcanogenic exhalative deposits

Unit -II

Metallogenic provinces and epochs. Metallogenesis in relation to Plate tectonics Wall rock alteration; Structural and stratigraphic control of ore localization. stratabound and stratiform ore deposits. Fluid inclusion in ores : Principles, limitations and applications. Study of Stable and unstable Isotopes studies in relation to ore deposits

Unit - III

Study of the following minerals in India with reference to their geographic and geologic distribution, mode of occurrence origin and uses: fertilizer minerals, refractory minerals, glass and ceramic minerals, abrasives, gemstones, cement and building stones.

Unit - IV

Study of the following metallic deposits in India with reference to geologic distribution, mode of occurrence and origin : Iron, gold, chromium, , aluminum, Manganese. Brief outline of Important world deposits- Bushveld chromite, Sudbury Nickel, and Kuruko deposit.



M. Sc. GEOLOGY THIRD SEMESTER

Paper II

Igneous Petrology

Code: Gel 302

Unit - I

Magma: Origin, composition and constitution. Magma emplacement and its relation to plate tectonics, Reaction Principle, magmatic crystallization, differentiation and assimilation. Igneous Rocks: intrusive and extrusive forms. Texture and Structures of Igneous rocks and their petrogenetic significance

Unit - II

Mineralogical and chemical classification of igneous rocks including IUGS systematics. Concept of tectonic classification of granite and basalt. Phase rule, crystallization process in silicate melts in light of experimental studies for following systems: Diopside – Anorthite, Albite – Anorthite; Albite – Orthoclase, Forsterite – Silica; Crystallization of Ternary system: Diopside-Forsterite-Silica.

Unit - III

Major, trace, REE and Isotopic compositions of igneous rocks and their implication in petrogenesis and tectonic setting. Mode of occurrence, nomenclature, classification and petrogenesis of the following rocks: Alkaline rocks, Ophiolites, Lamprophyres, Ultramafics and Carbonatites.

Unit - IV

Mode of occurrence, nomenclature, classification and petrogenesis of acid, basic and intermediate rock associations and pegmatites.

M. Sc. GEOLOGY THIRD SEMESTER

Paper III

Sedimentary Petrology

Code: Gel 303

Unit - I

Weathering & erosion: modes of sediment transport, fluid flow, transport types, movement of particles, settling velocity of sediments. Sedimentary environment - marine, marginal marine, non-marine; fluvial, lacustrine, palustrine. Walter's Law; vertical and lateral relationship.

Unit - II

Genesis & classification of sedimentary rocks: Siliciclastic rocks - conglomerate, breccia, sandstone, siltstone, claystone and shale. Carbonate rocks - limestone, dolomite, marl, evaporite, phosphorite, chert, iron and manganese rich sediments.

Unit - III

Structures and textures in sedimentary rocks and their significance. Application of trace elements, rare-earth elements and stable isotope geochemistry to sedimentological investigation.

Unit - IV

Tectonics and sedimentation: classification of sedimentary basins, basin analysis; stacking pattern, sediment composition, paleocurrent analysis. Sedimentary basins of India.

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M. Sc. GEOLOGY THIRD SEMESTER

Paper IV

Hydrogeology and Remote Sensing

Code: Gel 304

Unit - I

Ground water: Genetic types, hydrological cycle. Occurrence and distribution of ground water. Aquifer and its hydrological properties. Water table, water table contour maps; hydrological properties of rocks - specific yield, specific retention, porosity, hydraulic conductivity, transmissivity, storage coefficient.

Unit -II

Groundwater flow in porous media – Darcy's Law and its application; determination of Permeability. Physical and chemical properties of ground water; quality criteria for different uses; groundwater contamination. Saline water intrusion in coastal areas. Groundwater development; artificial recharge: need and benefits, methods of artificial recharge. Ground water provinces of India with special reference to Rajasthan.

UNIT - III

Fundamentals of remote sensing; Physical Basis of Remote Sensing, remote sensing systems; space platforms and orbit patterns; remote sensing sensors; thermal, radar and hyperspectral images; signatures of rocks, minerals and soils. Elements of Remote Sensing Interpretation.

Fundamental principles and technology of aerial photography and its applications in geosciences. Photogrammetry, types & geometry of aerial photographs; factors affecting aerial photography; scale of aerial photography and factors affecting scale; relief displacement; vertical exaggeration; Stereoscopy; Elements of Photo interpretation.

Unit-IV

Types of Indian and Foreign Remote sensing Satellites and their Applicability. Visual and Digital method of Interpretation; Digital image processing; digital data formats; fundamental steps in image processing; image rectification and restoration; elements of pattern recognition and image classification. Application of Remote sensing in Groundwater and Mineral Resource investigation

Introduction to Geographic Information System (GIS); components of GIS; product generation in GIS; tools for map analysis; integration of GIS with remote sensing.

M. Sc. GEOLOGY THIRD SEMESTER

Paper V

Practical-I

Code: Gel 311

Duration: 4 hours

Max. Marks 100

Mineral Resources:

35 Marks

Study of economic minerals in hand specimen. Distribution of important Indian deposits. Microscopic study of important ore minerals.

Sedimentary Petrology:

25 Marks

Identification and description of important sedimentary rocks in hand specimen. Petrographic studies of important sedimentary rocks. Graphic representation of data and its interpretation.

Viva-Voce

10 Marks

Field work (Gel 313)

15 Marks

Record

15 Marks

M. Sc. GEOLOGY THIRD SEMESTER

Paper VI

Practical-II

Code: Gel 312

Duration: 4 hours

Max. Marks 100

Igneous Petrology:

Identification and description of important igneous rocks in hand specimen. Petrographic studies of important igneous rocks. Preparation and interpretation of variation diagrams in relation to petrogenesis. Calculation of CIPW norms.

30 Marks

Hydrogeology :

15 Marks

Calculation and exercises on groundwater quality, exploration, yield, recharge, water table fluctuation etc.

Remote Sensing:

30 Marks

Scale and height of aerial photographs. Interpretation of aerial photographs. Visual interpretation of satellite imageries. Image analysis exercises. Applications using GIS software.

Viva-Voce

10 Marks

Record

15 Marks

Compulsory Field Training Program : Geological Study Tour – 10 days duration.

Note: Field Training is Compulsory, Student not taking part in the field training shall not be allowed to appear in the examination

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M. Sc. GEOLOGY FOURTH SEMESTER

Paper I

Metamorphic Petrology

Code: Gel 401

UNIT - I

Agents and kinds of metamorphism; metamorphic zones; grades; metamorphic facies; Fabric of metamorphic rocks formed under regional, dynamic and thermal metamorphisms; Classification of regional metamorphism based on P/T ratio. Thermodynamics: principle and application in kinetics of metamorphic reactions

UNIT - II

Mineralogical phase rule. Diagrammatic representation of mineral paragenesis in ACK, AKF and AFM diagrams. Study of metamorphic facies: zeolite facies; pumpellyite-prehnite facies; glaucophane schist facies; green schist facies; amphibolite facies; granulite facies, eclogite facies; albite-epidote hornfels facies; hornblende-hornfels facies; pyroxene-hornfels facies; sanidinite facies.

UNIT - III

Principles of metasomatism and metamorphic differentiation; petrogenetic grids; pressure, temperature, time paths; mineralogical and textural changes accompanying progressive regional metamorphism of mafic, ultramafic, pelitic and carbonate rocks.

UNIT - IV

Anatexis and formation of migmatites and origin of granitic magma; petrographic and petrogenetic studies of charnockite, migmatite and amphibolite; metamorphism in relation to magma and orogeny; metamorphism in relation to plate tectonics.

M. Sc. GEOLOGY FOURTH SEMESTER

Paper II

Mining Geology & Engineering Geology

Code: Gel 402

UNIT - I

Drilling, different types of drilling, use of diamond drilling in exploration; core-logging and assaying; sampling: various methods of sampling.; explosives: types, storage and precautions in handling of explosives; blasting: various patterns of blast holes and methods of their charging and blasting.

UNIT - II

Elements of mining: mining methods; various types of surface and underground mining methods; factors involved in selection of open cast and underground mining methods; salient features of bench-mining, sub-level stopping; shrinkage stopping, Cut & fill method, coal mining methods: room and pillar method, long wall method.

UNIT - III

Engineering Geology: Concept, engineering properties of rocks and soils. Geological investigations for civil engineering projects. Dams and reservoirs: classification, spillways, foundation and reservoir problems and their mitigation.

UNIT - IV

Tunnels: tunnel terminology and classification, tunnel support and tunnel alignment. Bridges – types; foundation problems and remedies. Landslides – classification, causes and prevention. Aseismic design of buildings in seismic areas.

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M. Sc. GEOLOGY FOURTH SEMESTER

Paper III

Fuel geology and Mineral Exploration

Code: Gel 403

Unit-I

Coal: definition and origin of Coal, Rank grade and type of Coal. Indian and International Classification, Geological and geographical distribution of Coal deposits in India, Detailed geology of Important Coalfields of India (Jharia & Raniganj). Nuclear Energy and Radioactive Minerals: Distribution and occurrence.

Unit-II

Petroleum: Its nature and composition. Origin and migration (Primary and Secondary) of Oil and gas. Characteristics of Reservoir rocks and traps (structural & stratigraphic) geology of oil bearing basins of India, Position of oil and natural gas in India, future prospects and the economic scenario.

Unit-III

Guides for locating ore deposits: structural, lithological, stratigraphic and physiographic guides. Surface prospecting methods: pitting and trenching sampling: various methods of sampling.

UNIT - IV

Outline of geophysical prospecting; gravity, seismic, electrical and magnetic prospecting for mineral deposits (oil and ground water). Brief outline of geochemical prospecting.

Ore reserves and resources: definition, classification of mineral reserves and resources; grades and recovery of ores; methods of ore reserve estimations; surface area and cross sectional area methods

M. Sc. GEOLOGY FOURTH SEMESTER

Paper IV Environmental Geology & Disaster Management

GEL 404

Unit - I

Environmental Geology: definition and concept; green house effect, depletion of ozone layer, acid rain; global warming and climate change, mitigation and adaptation. Environmental impact of urbanization; air and noise pollution: causes, impact and remedial strategies.

Unit - II

Environmental impact of mining activities; concept of eco-friendly mining; laws governing protection of environment and control of pollution; environmental impact assessment (EIA); Environmental Management Plan (EMP)

Unit -III

Concept of geological hazards and disaster; types of disaster, factors, causes and effect of disasters: floods, mass wasting, costal hazards, earthquakes and volcanic activity.

Unit -IV

Man made hazards: forest fires, nuclear and chemical hazards; oil well fire and hazards in mining. Human behaviour and response during disaster. Disaster management: Concept, prevention, preparedness and mitigation. Disaster warning system; disaster response and post disaster rehabilitation strategies.

M. Sc. GEOLOGY FORTH SEMESTER

Paper V

Practical - I

Code: Gel 411

Duration: 4 hours

Max. Marks 100

Metamorphic Petrology:

35 Marks

Identification and description of important metamorphic rocks in hand specimen. Petrographic studies of important metamorphic rocks. Graphic construction of ACF, AKF and AFM diagrams.

Fuel Geology :

25 Marks

Identification and description of important fuel minerals in hand specimen. Distribution of fuel deposits (oil, coal & radioactive minerals) in India.

Viva-Voce

10 Marks

Field work (Gel 413)

15 Marks

Record

15 Marks

M. Sc. GEOLOGY FORTH SEMESTER

Paper VI

Practical-II

Code: Gel 412

Duration: 4 hours

Max. Marks 100

Environmental Geology & Disaster Management:

40 Marks

Analysis of different parameters of air, water and noise. Interpretation of air, water and noise data. Preparation of iso-concentration maps of water quality parameters. Seismic maps of World, India and Rajasthan. Exercises on slope failure and landslides.

Engineering Geology

35 Marks

Survey by plane table & prismatic compass. Basic understanding of theodolite, Leveling and GPS

Viva-Voce

15 Marks

Record

10 Marks

Compulsory Field Training Program: Geological Study Tour (Min. Expl.& Mining) – 10 days duration

Note: Field Training is Compulsory, Student not taking part in the field training shall not be allowed to appear in the examination

Rishm
Zeeshan
(Convenor)

[Signature]
 Department of Geology
 University of Rajasthan, JAIPUR

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