M. Sc. Geology – Course structure

Under Choice Based Credit System (CBCS)

Department of Geology

Faculty of Earth Sciences, M.L. Sukhadia University

M. Sc. Second Year (Semester IV) 2020-21

GEOLOGY

Course S. No.	Course Code	Title of Course	L-T-P	No. of Credit	Max. Marks		Total
					Univ. Exam	Inter. Exam	
1	M4GEO01-CT11	Core Course –XI **Metamorphic Petrology**	3-1-0	4	80	20	100
2	M4GEO02-CT12	Core Course – XII **Mineral Exploration & Mining Geology**	3-1-0	4	80	20	100
3	M4GEO03-ET03	Discipline Specific Elective Course – III **Environmental Geology and Disaster Management**	3-1-0	4	80	20	100
4	M4GEO04-ET04	Discipline Specific Elective Course – IV **Geochemistry**	3-1-0	4	80	20	100
5	M4GEO05-CP06	Core Course PR–VI **(Metamorphic & Mineral Exploration and Mining Geology)**	0-0-8	4	80	20	100
6	M4GEO06-EP02	Elective PR– II **(Environmental Geology and Disaster Management & Geochemistry)**	0-0-8	4	80	20	100
7	M4GEO07-SE02	Skill Course Elective **(Survey & Leveling)**	0-0-4	2	80	20	100
	TOTAL			24	560	140	700

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(Dr. Harish Kapasya)

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M. Sc. Second Year (Semester IV) 2020-21
GEOLOGY

M4GEO01-CT11 Core Course – XI : Metamorphic Petrology No. of Credits : 4

UNIT – I

Agents and kinds of metamorphism; metamorphic zones; grades; iso-grades; metamorphic facies; Fabric of metamorphic rocks formed under regional, dynamic and thermal metamorphisms; Classification of regional metamorphism based on P/T ratio.

UNIT – II

Principles of thermodynamics; Mineralogical phase rule; Diagrammatic representation of mineral paragenesis in: ACK, AKF and AFM diagrams; thermodynamics and kynetics of metamorphic reactions.

UNIT – III

Studies of metamorphic facies: zeolite facies; pumpellyite-prehnite facies; glucophane schist facies; greenschist facies; amphibolite facies; granulite facies, eclogite facies; albite-epidote hornfels facies; hornblende-hornfels facies; pyroxene-hornfels facies; sanidinite facies.

UNIT – IV

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 – V

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.

Recommended Books:

Bucher, K. and Frey, M. 1984: Petrogenesis of Metamorphic Rocks, Springer Verlag
Kretz, R., 1994: Metamorphic Crystallization, John Wiley
Philipotts, A., 1992: Igneous and Metamorphic Petrology. Prentice Hall
Turner, F.J., 1980: Metamorphic Petrology, McGraw Hill, New York
Wood, B.J. and Fraser, D.G., 1976: Elementary thermodynamics for Geologist. Oxford University Press
Yardely, B.W., 1989, An Introduction to Metamorphic Petrology. Longman New Yourk

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M4GEO02-CT12 **Core Course – XII** **No. of Credits : 4**
(Mineral Exploration & Mining Geology)

UNIT – I

Guides for locating ore deposits: structural, lithological, stratigraphic and physiographic guides. Surface prospecting methods: pitting and trenching; Sub-surface exploration: drilling, different types of drilling, use of diamond drilling in exploration; core-logging and assaying; sampling: various methods of sampling.

UNIT – II

Ore reserves and resources: definition and outline of United Nations International framework classification of mineral reserves and resources; grades and recovery of ores; methods of ore reserve estimations; surface area and cross sectional area methods; recoverable reserves and anticipated life of the deposits.

UNIT – III

Outline of geophysical and geochemical prospecting; role of remote sensing in mineral exploration; explosives: types, storage and precautions in handling of explosives; blasting: various patterns of blast holes and methods of their charging and blasting.

UNIT – IV

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

UNIT – V

Outlines of the rules governing conservation, development and utilization of mineral resources; National mineral policy; prospecting license and mining lease; procedures of granting prospecting license and mining lease. Environmental aspects of Mining activities.

Recommended Books:

Dobrin, M. B., 1976: *Introduction to Geophysical Prospecting. McGraw Hill*
Arogyaswami, R.P.N., 1996: *Courses in Mining Geology. IV Ed. Oxford IBH*
Boyle, R.W., 1982: *Geochemical Prospecting for Thorium and Uranium Deposits. Elsevier*
Clark, G.B., 1967: *Elements of Mining. III Ed. John Wiley*

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GEOLOGY

M4GEO03-ET03 Discipline Specific Elective Course – III No. of Credits : 4
(Environmental Geology and Disaster Management)

UNIT – I

Environment : definition and types of environment; Environmental Geology: definition and concepts of environmental geology; pollution and geohazards; environmental problems: global warming, green house effect, depletion of ozone layer, acid rain.

UNIT – II

Air pollution : causes, impact and remedial strategies; Noise pollution : causes, impact and remedial strategies; Water pollution : causes, impact and remedial strategies; groundwater pollution and health issues.

UNIT – III

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

UNIT – IV

Disaster, concept and types of disaster, factors, causes and effect of disasters; human behaviour and response during disaster; natural disasters (earthquakes, volcanic activities, floods, droughts land slides).

UNIT – V

Man made disaster, environmental changes, mining, industrial, epidemic, mechanism, distribution and impact of cyclones, hurricanes, tsunamis, lightning etc. management and mitigation of disasters.

Recommended Books:

Bryant, E., 1985: Natural Hazards, Cambridge University Press
Bell, F. G., 1999: Geological Hazards. Routledge, London
Keller, E. A., 1978: Environmental Geology, Bell and Howell, USA
Patwardhan, A. M., 1999: The Dynamic Earth System. Prentice Hall
Smith, K. 1992: Environmental Hazards. Routledge, London
Subramaniam, V., 2001: Text Book in Environmental Science, Narosa International.
Valdiya, K.S., 1987: Environmental Geology – Indian Context. Tata McGraw Hill

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M4GEO04-ET04 Discipline Specific Elective Course – IV (Geochemistry) No. of Credits : 4

UNIT – I

Introduction to atomic structures, periodic table and properties of elements including trace and REE. Basic principles of crystal chemistry, radius ratio, co-ordination number and co-ordination polyhedron; Silicate structures; Isomorphism, polymorphism, solid solution and exsolution.

UNIT – II

Earth in relation to solar system and universe; Introduction to meteorites and planets; Cosmic abundance of elements; Structure and composition of earth and distribution of elements; Geochemical classification of elements.

UNIT – III

Partition coefficient and elemental variation during crystal-liquid fractionation; Geochemistry of atmosphere, hydrosphere and biosphere; Geochemical cycle.

UNIT – IV

Fundamentals of isotope geochemistry; Radiogenic and stable isotopes and their geological applications.

UNIT – V

Introduction to thermodynamics; Gibbs energy and equilibrium; Gx and Tx diagrams; Fundamentals of mole fraction and activity co-efficient; Ideal and non-ideal solutions.

Recommended Books:

Faure, G., 1986: Principal of Isotope Geology. John Wiley
Govett, G.J.S.(Ed), 11983: Handbook of Exploration Geochemistry Elsevier.
Henderson, P., 1987: Inorganic Geochemistry, Pergamon Press.
Hoefs, J., 1980: Stable Isotope Geochemistry. Springer Verlag
Krauskopf, K.B., 1967: Introduction to Geochemistry. McGraw hill
Marshal, C.P. and Fairbridge, R.W., 1999: Encyclopedia of Geochemistry. Kluwer Academic
Mason, B. and Moore, C.B., 1991: Introduction to Geochemistry, Wiley Eastern
Nordstrorm, D.K. and Munoz, J.L., 1986: Geochemical Thermodynamics, Blackwell

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M4GEO05-CP06 Core Course PRACTICAL – VI No. of Credits : 4
(Metamorphic Petrology & Mineral Exploration and Mining Geology)

Metamorphic Petrology:

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

Mineral Exploration and Mining Geology :

1. Survey by prismatic compass and theodolite.
2. Leveling
3. Use of GPS
4. Bore hole plotting, core logging and correlation.
5. Ore reserves estimation.

Viva-Voce
Field work
Record

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M4GEO06-EP02 Elective PRACTICAL– II No. of Credits : 4
(Environmental Geology and Disaster Management & Geochemistry)

Environmental Geology and Disaster Management:

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

Geochemistry :

1. Presentation of analytical data and graphical representation in various diagrams.
2. Calculation of important mineral formula from chemical analysis.

Viva-Voce
Record

Compulsory Field Training Program : Geological Field Training Mining & Exploration aspects.
– 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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M4GEO07-SE02 Skill Course Elective - Survey & Leveling No. of Credits : 2

Introduction to Surveying: Objective of surveying and its importance.

Classification, principles of surveying

Linear measurements: Distance Measurement Chains, tapes, electronic distance measurement,

Plane Table Surveying Methods

Theodolite : Definition and terms, temporary adjustments, measurement from theodolite

Leveling instruments: Definition, different type of leveling instruments

Contouring : General, Contour Interval, Characteristics, Methods of contouring

Global Positioning System (GPS) : Theory, principles and applications.

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