

M.Sc. Geology-97

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ગુજરાત યુનિવર્સિટી

૧. એકેડેમિકાબી. ૮૦૧૪ ૧૧૯૯૭

ગુજરાત યુનિવર્સિટી કાર્યાલય,
અમદાવાદ-૯. તા. ૧૨-૮-૧૯૯૭

પરિપત્ર: ૨૪

યુનિ.સાયે સેક્રેટારીએલ એમ.એસસી.પા.૯૦૧૪, ૨ ના ઉપલેક્ષિત વિષય ભણાવતા કેન્દ્રના આચાર્યશ્રીને જણાવવાનું કે, એમ.એસસી.પા.૯૦૧૪ ઉપલેક્ષિત વિષયના અભ્યાસક્રમ આ સાથેના પરિશિષ્ટ મુજબ સુધારવામાં આવ્યા છે, જેને અમલમાં લાગુ કરવાની ક્રિયા કરવાનો રહેશે.

વે.રમ
કુલસચિવનમ ૧૨/૮/૯૭

પ્રતિ

૧. અધ્યક્ષશ્રી,
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એમ.જી.સાયે-સ ઈન્સ્ટીટ્યુટ,
નવરંગપુરા, અમદાવાદ-૯.
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બી. ૧૨૮૯૭.

GEOLOGY

M.SC. PART - II

NEW SYLLABUS IN FORCE FROM JUNE 1997.

PAPER- I : Economic geology, Principles of ore genesis,
Mining geology, Exploration methods, Pre-Cambrian
geology of India.

PAPER- II : Igneous petrology, Metamorphic petrology,
Sedimentary petrology, Geochemistry.

PAPER- III : Engineering geology, Hydrogeology, Environmental
geology, Principles of remote sensing techniques,
Clay mineralogy, Surveying methods.

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Economic geology, Principles of ore genesis, Mining geology, Exploratory methods, Pre-Sambrian geology of India.

1.1. ECONOMIC GEOLOGY :

1.1.1. Development of economic geology.

1.1.2. Geological distribution and classification of mineral deposits. Mineral deposits - their form, structure, association, stability and workability. Ore, gangue, grade, tenor, etc.

1.1.3. Characteristics, distribution and diagnostic features of metallic and non-metallic mineral deposits. Mineral fuels, Fertilizers and atomic energy minerals. Precious and semi-precious stones.

1.1.4. Metallogenic provinces and epochs in India.

.2. PRINCIPLES AND PROCESSES OF ORE GENESIS :

1.2.1. Controls of ore localisation. Theories of transportation and deposition of ores. Physico-chemical controls of ore deposition. Modes of concentration.

1.2.2. Wall rock alteration, paragenesis, zonal distribution, geothermometry. Stability of minerals.

1.2.3. Characteristics of syngenetic, epigenetic, sedimentary, residual and supergene enrichment deposits.

1.2.4. Metamorphism of ores. Mineral associations.

1.3. MINING GEOLOGY :

1.3.1. Mines. Methods of samplings, calculation of average grade, estimation of ore reserves, dressing and beneficiation.

1.3.2. Mining methods - alluvium, open cast, underground. Coal mining.

1.3.3. Mine evaluation, Mineral economics and its concepts. Valuation of mines.

1.3.4. National mineral policy, Conservation and substitution. Development of mining and mineral industry in India.

1.4. EXPLORATION METHODS :

1.4.1. Principles of geological, geochemical and geophysical exploration methods.

1.4.2. Geophysical exploration methods - general principles, nature of physical properties, units of measurements, equipments, etc. Geophysical anomalies.

1.4.3. Classification of geophysical methods. Radioactive methods and other important methods of prospecting.

1.5 PRE-CAMBRIAN GEOLOGY OF INDIA :

- 1.5.1. Chief divisions of Indian subcontinent and their Physiography.
- 1.5.2. Pre-Cambrian crustal provinces -- shields, platforms, proterozoic mobile belts etc,
Archaean and proterozoic provinces of India -- structural framework, stratigraphy, geochronology, correlation and world distribution of Archaean rocks.
- 1.5.3. Classification of Pre-Cambrian era -- Archaean system : its distribution and classification in Peninsula and extra-Peninsula, their correlation and economic importance. Igneous activity in the Archaeans.
- 1.5.4. Dharwar supergroup.
Cuddapah-, Delhi - and Vindhyan- supergroups - their distribution, classification, age correlation and economic importance in Peninsula and extra-Peninsula.

PAPER .. II

Igneous petrology, Metamorphic petrology, Sedimentary petrology,
Geochemistry -

2.1 IGNEOUS PETROLOGY :

- 2.1.1. Distribution of elements in the earth's crust. Origin and evolution of magma. Physical properties of magma temperature, density, viscosity, thermal conductivity, heat capacity and liquid compressibility.
- 2.1.2. Differentiation, assimilation and syntexis.
- 2.1.3. Crystallisation of basaltic and granitic magmas and petrographic significance.
- 2.1.4. Representation of chemical analysis of rocks. Calculation of norm, niggli values.
- 2.1.5. Granitisation and granite tectonics.
- 2.1.6. Chemistry, mineralogy and petrogenesis of pegmatites, alkaline rocks, carbonatites, anorthosites, ultra-basic rocks, lamprophyres and related rocks. Spilite-Keratophyre association.

2.2 Metamorphic petrology :

- 2.2.1. General characters and scope of metamorphism.
- 2.2.2. Mineralogy of metamorphic rocks. Textures and structures of metamorphic rocks.
- 2.2.3. Chemical equilibrium in metamorphic rocks (equilibrium reactions). Phase rules. Retrograde metamorphism.
- 2.2.4. Metamorphic facies (of regional and contact metamorphism), Zones, and grades of metamorphism. Classification of metamorphic rocks.
- 2.2.5. Metamorphic diffusion and differentiation.
- 2.2.6. Migmatites, pygmatic folding, metasomatism, metamorphism and ultrametamorphism.
- 2.2.7. Thermodynamic principles of metamorphic reactions.
Preferred orientation and methods to study orientation.
- 2.2.8. Field relation of metamorphic rocks and processes involved in their formation.
- 2.2.9. Relation between plate tectonics and metamorphism.

2.3. SEDIMENTARY PETROLOGY :

- 2.3.1. Textures of sedimentary rocks -- particle size, sphericity, roundness, porosity and permeability.
- 2.3.2. Sedimentary structures and palaeocurrent analysis.
- 2.3.3. Composition of sedimentary rocks (mineralogy).
Classification of sedimentary rocks.
- 2.3.4. Sedimentary facies, sedimentation and tectonics, sedimentary differentiation. Diagenesis (Diagenetic

2.3.5. Mechanical analysis of sedimentary rocks.

2.3.6. Sedimentary environments and provinces - types.

Significance of climate on sedimentation.

2.4. GEOCHEMISTRY :

2.4.1. Development and scope of geochemistry-

2.4.2. Cosmic abundance of elements, composition of meteorites.

2.4.3. Geochemical structure of the earth. Principles of chemical thermodynamics.

2.4.4. Geochemistry of magmatic crystallisation process.

2.4.5. Sedimentation as a geochemical process (oxidation-reduction).

2.4.6. Geochemical aspects of metamorphism and metasomatism.

2.4.7. Principles of instrumental analytical techniques - UV spectrophotometer, AAS, flame photometer.

PAPER-III

Engineering geology, Hydrogeology, Environmental geology, Principles of remote sensing techniques, Clay mineralogy, Surveying methods

3.1 ENGINEERING GEOLOGY:

- 3.1.1. Engineering properties of rocks and their applications.
- 3.1.2. Geology applied to engineering problems such as foundations, Damsites, Reservoirs, Highways, Building structures, Tunnels, Landslides, Excavations.
- 3.1.3. Geology of construction material.
- 3.1.4. Case histories of engineering problems.
- 3.1.5. Elements of soil mechanics.
- 3.1.6. Principles of terrain evaluation and environmental monitoring of engineering projects.

3.2 HYDROGEOLOGY :

- 3.2.1. Hydrological cycle, ground water in hydrological cycle. Runoff cycle.
- 3.2.2. Origin, types and composition of groundwater. Sub-surface classification of ground water.
- 3.2.3. Classification and hydraulic characteristics of aquifers.
- 3.2.4. Quality of ground water. Exploration methods for ground water and ground water development studies.
- 3.2.5. Detailed studies of ground water occurrences in igneous, metamorphic and sedimentary rocks.
- 3.2.6. Elementary theory of ground water flow. Darcy's law.
- 3.2.7. Artificial recharge of ground water. Water resources management. Sea water encroachment on aquifers-its preventions and examples.

3.3. ENVIRONMENTAL GEOLOGY :

3.3.1. Nature and scope of environmental geology.

Influence of geological characteristics on human life.

3.3.2. Earth resources -- renewable and non-renewable.

3.3.3. Environmental impact of mining, construction and land use.

3.3.4. Waste disposal problems.

3.3.5. Environmental planning and management.

3.3.6. Geology as applied to urban planning.

3.4. PRINCIPLES OF REMOTE SENSING TECHNIQUES:

3.4.1. Aerial photogeology. Characteristics and stereoscopic study of aerial photos.

3.4.2. Various features of aerial photographs. Aerial mosaics.

3.4.3. Interpretation of aerial photos -- lithological, structural and geomorphological.

3.4.4. Introduction to the use of aerial photographs in geological mapping, mineral exploration, engineering geology and ground water exploration.

3.4.5. Principles of remote sensing.

3.4.6. Applications of satellite imageries in geology and geomorphology.

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3.5. CLAY MINERALOGY:

- 3.5.1. Types and structures of clay minerals.
- 3.5.2. Methods of identification- optical, X-ray, thermal and differential thermal analysis.
- 3.5.3. Properties, source and environment of clays.
- 3.5.4. Applications of clay minerals in engineering fields.

3.6. SURVEYING METHODS:

- 3.6.1. Principles of surveying methods.
- 3.6.2. Chain, compass, plain table, theodolite, alidade and abney level surveying methods.
- 3.6.3. Levelling and contouring.
- 3.6.4. Observation and collection of data and samples in the field. Sampling and labelling.
- 3.6.5. Detailed geological mapping using Clinometer compass and Brunton compass.
- 3.6.6. Compulsory field work in suitable areas.

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M. SC. - II

PRACTICALS

PRACTICALS I

Megascopic and microscopic study of igneous, sedimentary and metamorphic rocks with characteristic textures, structures and their petrogenesis.

PRACTICAL - II

Norm calculations, identification of ores, Niggli values, calculation of ore reserves, variation diagrams (petrology). Construction of panel diagrams, stratigraphic column. Palaeocurrent analysis. Determination of particle size by sieving. Solution of selected problems of engineering geology, groundwater geology and environmental geology. Piper diagram. Determination of sphericity and roundness by different methods.

PRACTICAL - III

Geologic and geomorphic interpretation of topographical maps, aerial photographs and satellite imageries. Interpretation of electrical logging data, calculation of resistivity from electrical resistivity data.

1. Keeping of Systematic Journals is Compulsory.
2. Geological field work in suitable areas is compulsory.
3. Geological field training under different Government or Semigovernment Organisations would form a part of the Syllabus.