



Geology Department
Osmania University
Proposed Choice Based Credit System (CBCS)
M.Sc. Geology
Scheme of Instruction and Examination (2022-2023)
Semester – I

| S. No | Code No. | Paper | Paper Title | Hours / Week | Internal Assessment | Semester Exam | Total Marks | Credits |
|------------------|----------|-------|--|--------------|---------------------|---------------|-------------|-----------|
| Theory | | | | | | | | |
| 1 | GL 101 T | I | Crystallography, Optical Mineralogy & Mineralogy | 4 | 20 Marks | 80 Marks | 100 Marks | 4 |
| 2 | GL 102 T | II | Structural Geology & Geotectonics | 4 | 20 Marks | 80 Marks | 100 Marks | 4 |
| 3 | GL 103 T | III | Paleontology & Stratigraphy | 4 | 20 Marks | 80 Marks | 100 Marks | 4 |
| 4 | GL 104 T | IV | Geomorphology & Field Geology | 4 | 20 Marks | 80 Marks | 100 Marks | 4 |
| Practical | | | | | | | | |
| 5 | GL 105 P | I | Crystallography, Mineralogy & Optical Mineralogy | 2 | - | 100 Marks | 100 Marks | 1 |
| 6 | GL 106 P | II | Geomorphology & Paleontology | 2 | - | 100 Marks | 100 Marks | 1 |
| 7 | GL 107 P | III | Field Geology & Structural Geology | 2 | - | 100 Marks | 100 Marks | 1 |
| 8 | GL 108 P | IV | Geological report writing | 2 | - | 100 Marks | 100 Marks | 1 |
| | | | Total | 24 | 80 | 720 | 800 | 20 |

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Syllabus of M. Sc. GEOLOGY (CBCS)

I Semester

Paper - I (AGL 101 P): Crystallography, Optical Mineralogy & Mineralogy

Unit - I

External symmetry of crystals: Symmetry Elements, methods of projection, derivation of 32 classes, Hermaun Muguin notation. Internal symmetry of crystals: Derivation of 230 space groups, diffraction of crystals by X-rays, Braggs' law.

Unit -II

Principles of optical mineralogy: Optical mineralogy, polarized light, behaviour of isotropic and anisotropic minerals in polarized light, refractive index, double refraction, birefringence, sign of elongation, interference figures, 2V, dispersion in minerals. optic sign, pleochroic scheme and determination of fast and slow vibrations and accessory plates.

Unit - III

Introduction to mineralogy: Definition and classification of minerals. Structural and chemical principles of crystals / minerals, chemical bonds, ionic radii, coordination number (CN) and polyhedron. Structure, chemistry, physical and optical characters and paragenesis of mineral groups: Olivine, pyroxene, amphibole, mica and spinel groups.

Unit - IV

Structure, chemistry, physical and optical characters and paragenesis of mineral groups: Feldspar, quartz, feldspathoid, aluminum silicate, epidote and garnet groups. Accessory minerals: Apatite, calcite, corundum, scapolite, sphene and zircon. Earth mineralogy: Average mineralogical composition of crust and mantle, mineral transformations in the mantle with depth.

Practicals

Crystallography and Mineralogy

1. Study of important crystal models corresponding to Normal Class of cubic system.
2. Study of important crystal models corresponding to Normal Class of orthorhombic system.
3. Study of important crystal models corresponding to Normal Class of monoclinic system.
4. Study of important crystal models corresponding to Normal Class of triclinic system.
5. Study of important crystal models corresponding to Normal Class of tetragonal system.
6. Study of important crystal models corresponding to Normal Class of hexagonal system.
7. Stereographic projections on the Wulf's Stereonet.
8. Megascopic study of rock forming minerals : Olivines, pyroxenes, amphiboles and micas.

9. Megascopic study of rock forming minerals : Feldspars, feldspathoids, silica minerals and alumino silicates.
10. Megascopy of accessory minerals : Apatite, zircon, magnetite, ilmenite, calcite, epidote, sphene etc

Optical Mineralogy

1. Centering and, orthoscopic and conoscopic arrangement of the petrological microscope.
2. Microscopy of rock forming minerals : Olivines, pyroxenes, amphiboles and micas.
3. Microscopy of rock forming minerals : Feldspars, feldspathoids, silica minerals and alumino silicates.
4. Microscopy of accessory minerals : Apatite, zircon, magnetite, ilmenite, calcite, epidote, sphene etc.
5. Determination of relative relief (RI) of minerals by Becke-line test and .
6. Determination of sign of elongation of minerals.
7. Determination of pleochroic scheme of minerals.
8. Determination of optic sign of uniaxial minerals.
9. Determination of optic sign of biaxial minerals.
10. Determination of anorthite content of plagioclase by Michel Levy Method.

Books Recommended

Crystallography, Mineralogy & Optical Mineralogy

1. Deer, W., Howie, R.A. & Zussman, J., 1996; The Rock forming minerals. Longman.
2. Klein, C and Hurlbut, Jr., C.S. 1993; Manual of Mineralogy. John Wiley.
3. Putnis Andrew, 1992; Introduction to Mineral Science, Cambridge University Press.
4. Spear, F.S. 1993; Mineralogical Phase Equilibria and Pressure - Temperature - Time paths. Mineralogical society of America Publisher.
5. Phillips, Wm, R. & Griffen, D.T 1986. Optical Mineralogy, CBS edition.
6. Hutchison, C.S., 1974 laboratory handbook of Petrographic Techniques. John Wiley.

Paper - II (AGL 102 T) Structural Geology & Geotectonics

Unit - I

Concept of stress and strain: Stress-strain relationships of elastic, plastic and viscous materials, measurement of strain in deformed rocks, behaviour of minerals and rocks under deformation conditions. Folds: classification and causes of folding, diapirs and salt domes.

Unit - II

Shear zones: Recognition of shear zones and faults in field, mechanics of shearing and faulting. Geometry of thrust sheets: Block faulted and rifted regions. Wrench faults and associated structures. Tectonic mélanges, Dome and basin structures, Structural behaviour of igneous rocks. Foliations and Lineations: classification, origin and significance. Petrofabric analysis (microfabrics): Data collection, plotting, symmetry and interpretation, concept of symmetry of fabric of tectonites.

Unit - III

Geotectonics: Introduction, tectonic framework of earth's crust, interior of earth. isostasy, convection currents, Wilson Cycle. Continental Drift: Computer fitting, geological and palaeontological evidences in support of continental drift and insitu theories. Sea-floor spreading: Hess's concept and evidences of sea-floor spreading. Vine-matthew's magnetic tape recorder.

Unit - IV

Plate tectonics: Concept of plate and plate movements, plate model of Morgan, nature of convergent, divergent and conservative plate margins, transpression and transtension. Plate tectonics in relation to igneous, sedimentary and metamorphic processes and mineralization. Triple junctions, aulocogens, plume theory, island arcs. Nature and origin of earth's magnetic field.

Practicals

Structural Geology

1. Reconstruction of folds, determination of the depth at the end of the section.
2. Reconstruction of folds, determination of the height at the end of the section.
3. Vertical fault problems
4. Inclined fault problems; standard geological maps.
5. Maps with uniformly dipping beds / unconformable beds.
6. Maps with beds dipping with different dips.
7. Maps with folded formations.
8. Maps with faulted formations.
9. Maps with intrusives / unconformities.
10. Maps of geotechnical importance.

Books Recommended

Structural Geology & Geotectonics

1. An outline of Structural Geology By John Wiley:: Hobbs, Means and Williams,
2. Outline of Structural Geology By Mathuen, London:: E S Hills,
3. Structural Geology of rocks and regions By John Wiley:: H. davis,
4. Foundations of structural geology By Blakie:: R.G.Park,
5. Structural Geology By McGraw Hill:: L.U.De Sitter,
6. Structural Geology By P.H.I.: M.P.Billings,
7. Fundamentals of modern structural geology By S.K. Ghosh., Elsevier Publication,
8. T.M.H.: Aspects of tectonics of SE Asia: K.S.valdiya Understanding the earth By Artemis Press:: Gass, Smith and Wilson,
9. Physical Geology By P.H.I.: Judson, Deffeyes & Hargraves,
10. Plate tectonics and crustal evolution By K.C.Condie Pergomon press,
11. Holmes principles of Physical Geology. By D.Duff Chapman & Hall,
12. The evolving continents: By B. F. Windley J.W.,
13. Crustal evolution and orogeny By S.P.h.Sychanthavong. Oxford & IBH.,
14. The evolving earth By Sawkins and others. Mac Millan,
15. The evolving Earth By L A M Cocks. Cambridge University Press,
16. Plate tectonics and magnetic reversals. Allan Cox . Freeman,
17. Basic problems in Geotectonics. V V Beloussov. Mc Graw Hill,
18. Development in Geotectonics. Series from Vol.1 to 6. Elsevier,
19. Continental deformation By Paul Hancock. Oxford Publication House.

Paper - III (AGL 103 T) Palaeontology & Stratigraphy

Unit - I

Micro-palaeontology: Origin and evolution of life. Classification and uses of micro fossils. Detailed study of microfossils such as Foraminifera, Radiolaria, Conodonts, Ostracoda, Bacteria, Diatoms, Dinoflagellata and Charophyta. Plant fossils: Gondwana flora and their significance.

Unit - II

Vertebrate palaeontology: General characters, classification, evolution of Fishes including Agnaths, Placoderms, Chondrichthyes and Osteichthyes. General characters, age of Amphibians, Reptiles and Mammals. General characters, classification, evolution, age and extinction of Dinosaurs. General characters, classification and evolution of Horse, Elephant and Man.

Unit - III

Principles of stratigraphy: Nomenclature and the modern stratigraphic code. Litho-, bio- and chrono-stratigraphic units and their inter-relationships. Geological time scale. Magneto-stratigraphy. Dating of rocks. Modern methods of stratigraphic correlation. Precambrian stratigraphy: Achaean stratigraphy -tectonic frame-work, geological history and evolution of Dharwar, and their equivalents; Easterghats mobile belt; Proterozoic stratigraphy -tectonic framework, geological history and evolution of Cuddapahs and their equivalents.

Unit -IV

Palaeozoic stratigraphy: Palaeozoic formations of India with special reference to type localities, history of sedimentation, fossil content. Mesozoic stratigraphy: Mesozoic formations of India with special reference to type localities, history of sedimentation, fossil content. Palaeogeography and Gondwana system. Cenozoic stratigraphy: Cenozoic formations of India, Rise of the Himalayas and evolution of Siwalik basin. Deccan volcanics. Stratigraphic boundaries: Stratigraphic boundary problems in Indian geology.

Practicals

Palaeontology

1. Morphology, classification, geological age and stratigraphic position of important fossils of Protozoa and corals.
2. Morphology, classification, geological age and stratigraphic position of important fossils of Gastropoda.
3. Morphology, classification, geological age and stratigraphic position of important fossils of Cephalopoda.
4. Morphology, classification, geological age and stratigraphic position of important fossils of Lamellaebranchia.
5. Morphology, classification, geological age and stratigraphic position of important fossils of Brachiopoda.

6. Morphology, classification, geological age and stratigraphic position of important fossils of chinodermanta.
7. Morphology, classification, geological age and stratigraphic position of important fossils of Arthropoda.
8. Morphology, classification, geological age and stratigraphic position of important plant fossils.
9. Morphology, classification, geological age and stratigraphic position of important microfossils
10. Morphology, classification, geological age and stratigraphic position of important vertebrate fossils.

Books Recommended

Palaeontology & Stratigraphy

1. Outline of palaeontology - H.H.Swinnerton
2. Principles of invertebrate palaeontology-Shrock and Twenhofell.
3. Introduction to evolution-Paul Ames Moody
4. Evolution of the invertebrate-Jean chaline
5. Palaeobotany - Arnold
6. Elements of Micropalaeontology by G. Bignot
7. Microfossils by M.D. Brasier
8. Palaeobiology of Plant protests by Helen Tappen
9. Palaeontology - Evolution and Animal distribution by P.C. Jain & M.S. Anantharaman
10. A text book of Stratigraphy and Micropalaeontology and Palaeobotany by S.K. Tiwari
11. Sedimentation and stratigraphy - Krumbein and Sloss L.L.
12. Principles of stratigraphy - Dunbars & Rodgers
13. Principles and practices in Stratigraphy - Marvin Weller
14. Geology of India & Burma- M.S.Krishnan, 15. Geology of India- D.N. Wadia, 16. Fundamentals of Historical geology & stratigraphy of India- Ravindra Kumar.

Paper - IV (AGL 104 T) Geomorphology & Field Geology

Unit - I

Geomorphology: Definition and fundamental concepts of geomorphology, Geomorphic processes: Exogenic processes -gradation, degradation and aggradation; Endogenetic process -diastrophism, and volcanism. Extraterrestrial process -fall of meteorites. Weathering: physical weathering, chemical weathering and differential weathering, formation of soil, soil profile and mass wasting and its types. Fluvial cycle: Streams and valleys, drainage patterns and their significance, stream deposition, Peneplain concept, topography on domal, folded and faulted structures. Groundwater cycle: Origin of limestone caverns. Landforms of karst regions and karst topography.

Unit - II

Glacial cycle: Features resulting from glaciers, development of landforms, effects of glaciation beyond ice caps and interglacial deposits. Arid cycle: Origin of deserts and its landforms, topographic effects of wind erosion. Volcanism: Landforms resulting from eruption and deposition of volcanism. Geomorphology of coasts: Topographic features resulting from marine deposition. Topography of ocean floors: Landforms related to shelves, slopes and deep sea. Applied geomorphology: Application of geomorphology to various fields of earth sciences.

Unit - III

Field Geology: Introduction, Toposheets: Definition, Scale -definition, small scale and large scale, reading various components of a toposheet. Geological map -definition, various components of a geological map including scale, legend, structures etc. Field work and sampling: Field work, geological items to be carried to the field, Use of clinometer compass, Brunton compass, strike and dip measurements; Sampling and oriented sample and its significance, and sampling for isotopic and geochronological studies and its significance; Geological mapping procedures: Geological mapping of igneous terrains, geological mapping of sedimentary terrains, geological mapping of metamorphic terrains.

Unit - IV

Geographic positioning system (GPS): Introduction, definition and scope of GPS, advantages and uses of GPS in different fields. Surveying: Principles and methods surveying, chain survey, prismatic survey, plane table survey and theodolite survey. Dumpy's level and Abny's level. Methods of representation of survey-data.

Practicals

Geomorphology

1. Intra-conversion of scales of toposheets.
2. Study of contour-variations and elevations on toposheets.
3. Identification and classification of various types of fluvial, aeolin, glacial and volcanic landforms on toposheets, geological maps, aerial photos and Lansat imageries.
4. Identification, demarcation and classification of folds and faults from the toposheet.
5. Identification, demarcation and classification of lineaments from toposheet.

6. Identification, classification and preparation of drainage basin map on toposheet.
7. Morphometry analysis of the drainage basin on toposheet.
8. Identification and interpretation of gully patterns on toposheet.
9. Preparation of landuse- and landcover-maps from toposheet.
10. Identification and classification of geomorphological units on toposheet, aerial photos, Landsat imageries.

Field Geology

1. Reading of toposheets, geological maps and mine plans.
2. Representation factor of scale, representation of scale on the maps.
3. Chain survey of an object taking offsets.
4. Prismatic compass survey of an object by taking forward and backward bearing
5. Plane-table survey -radiation method
6. Plane-table survey -intersection method
7. Plane-table survey -traversing method
8. Profiling using Abny's level and Levelling using Dumpy's level
9. Theodolite survey -countouring and height measurements.
10. Operation of GPS.

Books Recommended

Geomorphology & Field Geology

1. Principles of Geomorphology by Thornbury, W.D..
2. Photogeology by Miller and Miller
3. Geomorphology by Arthur Bloome
4. Principles of Physical geology by Arthur Holms
5. Analysis of landforms by Twidale, C.R
6. Geomorphology by Lobeck by Lobeck, A.K.
7. Field Geology by Lahee
8. Field Geology by Compton