U.G. 1st Semester

Paper: GLY101C (Core)
General Geology and Geomorphology

Credits: 5 = 4+0+1 (64 Lectures)

Total Number of Theory classes (*Lectures*) : 64 (64 hours)
Total Number of Practical classes (*Practicals*) : 16 (32 hours)

THEORY

General Geology *Number of Lectures: 40*

General Concepts : Introduction to various branches of Earth Science. Scope of Geology and its relation to the different branches of science. Standard stratigraphic time scale and introduction to the concept of time in geological studies. Rock types.

General characteristics and origin of the Universe, Solar System and its planets. The terrestrial and jovian planets. Meteorites and Asteroids. Earth in the solar system. Formation of core, mantle, crust, hydrosphere, atmosphere and biosphere.

Major surface features of the earth – continents and ocean basins and their evolution. Major internal processes of the earth- Volcanism and volcanoes; Types and distribution of volcanoes; Causes of earthquake; Earthquake belts; Earthquake zones of India

Geomorphology *Number of Lectures: 24*

Introduction to Geomorphology, Endogenic and Exogenic processes, Orogenesis (with reference to Himalaya). Surfacial Processes and geomorphology, Weathering and associated landforms, Hill slopes. Glacial, Periglacial processes and landforms, Fluvial processes and landforms, Aeolian Processes and landforms, Coastal Processes and landforms, Landforms associated with igneous activities.

PRACTICAL *Number of Practicals: 16*

General Geology and Geomorphology:

Study of contours: Pattern of contours to indicate various topographical features; Interpretation of topographic maps; Drawing of profile and study of geomorphological features from topographic maps. Model study of different geomorphic features.

Recommended Books:

1. Geomorphology – A.L. Bloom; *Prentice Hall of India Pvt. Ltd.*
2. A Textbook of Geomorphology – P. Dayal; *Shukla Book Depot, Patna.*
3. Essentials of Geology- Frederick K. Lutgens, Edward J. Tarbuck and Dennis Tasa, *Prentice Hall*.
4. Geomorphology – S. Singh; *Prayag Pustak Bhawan, Allahabad*
5. Physical Geology – R. F. Flint and J Skinner, *John Wiley and Sons, Inc*
6. Textbook of Physical Geology- G. B. Mahapatra, *CBS Publishers*.
7. Principles of Geomorphology – W. D. Thornbury; *John Wiley and Sons, Inc*
8. Engineering and General Geology – P. Singh (6th edition); *S. K. Kataria and Sons*

Paper: GLY102C (Core)
Crystallography and Crystal Chemistry

Credits: 5=4+0+1 (64 Lectures)

Total Number of Theory classes (*Lectures*) : 64 (64 hours)
Total Number of Practical classes (*Practicals*) : 16 (32 hours)

THEORY

Crystallography : *Number of Lectures: 44*

Definition of crystalline and amorphous substance; Crystallization and crystal growth.
Crystal morphology – faces, edges and solid angle; Interfacial angle and its measurement; Symmetry operations and elements; Types of external symmetry shown by the crystals; Point Groups; Symmetry notations of Hermann-Mauguin with relation to different crystal systems and conversion to total symmetry.

Crystallographic axis; Axial ratio and its determination; Parameters and indices; Crystal forms and habit; Zone, Zone axis and Zonal equation.

Unit cell; Definition and types of lattices; Significance of the lattice; Bravais (Space) lattices; Skew axis and Glide planes; Space Groups. Study of 32 Point Groups (Crystal classes) including forms, symmetry elements, stereogram and example of minerals.

Crystal intergrowth; Definition of twinning, Twin elements, Composition surface, Types of Twinning, Twin laws, Study of twin laws of minerals in different crystal systems.

Concept of spherical and stereographic projection.

Crystal Chemistry : *Number of Lectures: 20*

Ionic properties- chemical bond, size, ionic charge; Electronegativity; Ionization potential; Compositional classification of minerals into groups; Elementary concepts of isomorphism; Atomic substitution; Polymorphism; Solid solution; Exsolution; Defect lattice; Packing and density; Radius ratio and co-ordination number; Pauling's rule.

PRACTICAL *Number of Practicals: 16*

Crystallography :

Study of the forms and symmetry elements of crystals belonging to the holohedral (Normal) classes of Isometric, Tetragonal, Hexagonal, Orthorhombic, Monoclinic & Triclinic systems and Hextetrahedral, Diploidal, Gyroidal, Tetragonal-scalenohedral, Hexagonal-Trapizohedral, Hexagonal–scalenohedral & Trigonal–trapezohedral classes with the help of either natural crystals or wooden and glass models; Drawing of crystals in clinographic projections.

Study of twinning with the help of crystal models with reference to composition plane, twin plane and twin axis.
Stereographic projection and determination of axial ratios of crystal models of the holohedral classes of Isometric, Tetragonal, Orthorhombic and Monoclinic systems.

Recommended Books:

1. Manual of Mineralogy (After J.D. Dana) – C. Klein and C.S. Hurlbut, Jr.; *John Wiley and Sons, Inc*.

2. Mineralogy – Dexter Perkins; *PHI Learning Pvt. Ltd*.

3. Mineralogy – L.G. Berry and B. Mason (Revised by R.V. Dietrich); *CBS Publishers and Distributors*.

4. A Textbook of Mineralogy – E.S. Dana (Revised by W.E. Ford); *New Age International Publishers*.

5. Mineral Science – K. Conelis; *John Wiley & Sons, Inc*.

6. An Introduction to Crystal Chemistry – R.C. Evans; *Cambridge Univ. Press*.

7. Introduction to Mineral Sciences – A. Putins; *Cambridge Univ. Press*.

Paper: GLY103M (Modular General Elective)
Basic Concepts in Geology

Credits: 4 = 3+1+0 (48 Lectures)

Total Number of Theory classes (*Lectures*) : 48 (48 hours)
Total Number of Tutorial classes (*Tutorials*) : 16 (16 hours)

THEORY *Number of Lectures: 48*

Introduction to the different branches of geology
General geology: Origin and interior of the earth; Weathering, Plate tectonics, Volcanoes, Earthquakes
Mineralogy: Crystallography, Optical mineralogy – important optical properties of mineral, polarizing microscope; Descriptive mineralogy – definition of minerals, physical properties, mineral classification
Petrology: Introduction, Basic concepts on the origin, major types and mode of occurrence of igneous, sedimentary and metamorphic rocks.

Structural Geology – Introduction; Causes for development of structures in rocks; attitude of structural features, Concept of diastrophic and non-diastrophic structures.

Stratigraphy – Introduction; Principles of stratigraphy; Stratigraphic correlation; Geological time scale; Overview of Indian stratigraphy

Palaeontology – Introduction; Preservation of organic remains; Importance of palaeontology
Economic Geology – Definition of ore, ore mineral, and gangue; Primary and secondary mineral deposits; Overview of mineral resources of India

Hydrogeology – Sources of groundwater, zones of groundwater, water table, aquifers.

Geo-exploration – Principles of geological, geochemical & geophysical methods of exploration.

Recommended Books:

1. Textbook of Geology – P. K. Mukherjee; *World Press Pvt. Ltd*.

2. A Textbook of Geology – G. B. Mahapatra; *CBS publishers*

3. Rutley's Elements of Mineralogy – H.H. Read; *CBS publishers*

4. Structural Geology – M. P. Billings; *Prentice Hall*

5. Palaeontology Invertebrate – H. Woods; *CBS Publishers*

6. Economic Geology – U. Prasad; *CBS Publishers*

7. Fundamentals of Historical Geology and Stratigraphy of India – R. Kumar; *New Age International Publishers*

8. Geomorphology and Hydrogeology – S. M. Hamid Rizvi; *CBS Publishers*