

**NATIONAL EDUCATION POLICY 2022-26 THREE YEARS**  
**DEGREE/FOUR YEARS (RESEARCH)**  
**Syllabus for B.Sc. Geology**

SEMESTER	Major Subject	COURSE NAME	Credit	Marks
I	Core Subject -1 (CS-1)	Physical and Structural Geology	4	70+30
	Core Subject -1 Practical	Physical and Structural Geology Lab	2	70+30
	Core Subject -2 (CS-2)	Any other subject	4	70+30
	Core Subject -2 Practical	Any other subject	2	70+30
	Additional /Inter Disciplinary	Elementary knowledge of Earth Part I,with practical	2+2	70+30
	Skill course-1	Geomorphology	2	70+30
	Extracurricular courses/CC	1- Understanding and connecting with the environment	2	70+30
	Total		20	700
II	Core Subject -1 (CS-1)	Crystallography and Mineralogy	4	70+30
	Core Subject -1 Practical	Crystallography and Mineralogy	2	70+30
	Core Subject -2 (CS-2)	Any other subject	4	70+30
	Core Subject -2 Practical	Any other subject	2	70+30
	Additional /Inter Disciplinary	Elementary knowledge of Earth Part II,with practical	2+2	70+30
	Skill course-2	Geological Field Training	2	70+30
	Life skills and personality development	Life skills and personality development/cc	2	70+30
	Total		20	700
III	Core Subject -1 (CS-1)	Petrology	4	70+30
	Core Subject -1 Practical	Petrology	2	70+30
	Core Subject -2 (CS-2)	Any other subject	4	70+30
	Core Subject -2 Practical	Any other subject	2	70+30
	Additional /Inter Disciplinary	Elementary knowledge of Earth Part III,with practical	2+2	70+30
	Skill course-1	Geomorphology	2	70+30
	IKS 1	System I	2	70+30
	Total		20	700
IV	Core Subject -1 (CS-1)	Palaeontology and Stratigraphy	4	70+30
	Core Subject -1 Practical	Palaeontology and Stratigraphy	2	70+30
	Core Subject -2 (CS-2)	Any other subject	4	70+30
	Core Subject -2 Practical	Any other subject	2	70+30
	Additional /Inter Disciplinary	Elementary knowledge of Earth Part IV,with practical	2+2	70+30
	Skill course-2	Geological Field Training	2	70+30
	IKS 2	System I	2	70+30
	Total		20	700

V	Core Subject -1 (CS-1)	Economic Geology	4	70+30
	Core Subject -1 Practical	Economic Geology	2	70+30
	Core Subject -2 (CS-2)	Any other subject	4	70+30
	Core Subject -2 Practical	Any other subject	2	70+30
	Vocational course/field visit/Entrepreneurship skills	Geochemistry	2+2	70+30
	Extracurricular courses/Compulsory courses	Culture, traditions and moral values	2	70+30
	Languages-I	Indian, Modern Regional language-1	2	70+30
	Total		20	700
VI	Core Subject -1 (CS-1)	Engineering Geology	4	70+30
	Core Subject -1 Practical	Engineering Geology	2	70+30
	Core Subject -2 (CS-2)	Any other subject	4	70+30
	Core Subject -2 Practical	Any other subject	2	70+30
	Vocational course/field visit/Entrepreneurship skills	Geological Field Training	2+2	70+30
	Communication skills Based on: either CS-1 or CS-2	Communication skills (Based on developing soft skills)	2	70+30
	Languages-II	Indian, Modern Regional language-II	2	70+30
	Total		20	700
VII with Research	Core Subject -1 (CS-1)	Geohydrology	3	70+30
	Core Subject -2 (CS-2)	Structures and Tectonics	3	70+30
	Practical Core-1 and 2	Geohydrology/Structures and Tectonics	2	70+30
	Research Methodology	Research Methodology of Geology	6	70+30
	Elective Paper	Vertebrate & Micropalaeontology with practical	3+1	70+30
	Research writing Ethics	Research writing and research Ethics	2	70+30
	Total		20	600
VIII	Core Subject -1 (CS-1)	Mineral Exploration and Mining	3	70+30
	Core Subject -2 (CS-2)	Igneous and Metamorphic Petrology	3	70+30
	Practical Core-1 and 2	CS-1 and CS-2	2	70+30
	Research Presentation skill	Research Presentation skill (Oral and Paper)	2	70+30
	Elective Paper	Natural Hazards	3+1	70+30
	Dissertation	Project oriented and Field based	6	70+30
	Total		20	600
	Grand Total			5400

## **B.Sc. Program with Geology**

### **Core papers Geology (Credit: 06 each)**

SOES/GEOL/UG/C C-001:Physical & Structural Geology(04 credits)+Labs(2 credits)  
SOES/GEOL/UG/C C-002:Crystallography & Mineralogy(04 credits)+Labs(2 credits)  
SOES/GEOL/UG/C C-003: Petrology (04 credits) + Labs (2 credits)  
SOES/GEOL/UG/C C-004: Palaeontology & Stratigraphy (04 credits)+Labs (2credits)  
SOES/GEOL/UG/C C-005: Economic Geology (04 credits)+Labs (2credits)  
SOES/GEOL/UG/C-006: Engineering Geology (04 credits)+Labs (2 credits)  
SOES/GEOL/UG/C C-007: Geohydrology (04 credits)+Labs (2 credits)  
SOES/GEOL/UG/C C-008: Structures & Tectonics (04 credits)+Labs (2credits)  
SOES/GEOL/UG/C C-009: Mineral Exploration and Mining (04 credits)+Labs (2 credits)  
SOES/GEOL/UG/C C-010:Igneous & Metamorphic Petrology (04 credits)+Labs (2 credits)

### **Discipline-Specific Elective papers (Credit: 06 each) (DSE 1, DSE 2):**

SOES/GEOL/UG/DSE-001: Vertebrate & Micropalaeontology with practical (03 credits) + Labs (1 credits)  
SOES/GEOL/UG/DSE-002: Natural Hazards (03 credits) + Labs (1 credit)

### **Skill Enhancement Course (Credit: 02 each) (SEC1-4)**

SOES/GEOL/UG/SEC-001: Geomorphology  
SOES/GEOL/UG/SEC-002: Geological Field training  
SOES/GEOL/UG/SEC-003: Geomorphology  
SOES/GEOL/UG/SEC-004: Geological Field training

### **Additional /Interdisciplinary (2 Theory+2 Lab. credits) (AD)**

SOES/GEOL/UG/AD-001: Elementary knowledge of Earth Sciences Part I, 2 Th+2 Lab. credits  
SOES/GEOL/UG/AD-002: Elementary knowledge of Earth Sciences Part II, 2 Th+2 Lab. credits  
SOES/GEOL/UG/AD-003: Elementary knowledge of Earth Sciences Part III, 2 Th+2 Lab. credits  
SOES/GEOL/UG/AD-004: Elementary knowledge of Earth Sciences Part IV, 2 Th+2 Lab. credits

### **Vocational Course/field visit/Entrepreneurship skills (4 Credit)**

SOES/GEOL/UG/VC-001 Geochemistry  
SOES/GEOL/UG/VC-002 Geological field training

## I<sup>st</sup> year, Semester I

### **SOES/GEOL/UG/CORE COURSE-001 PHYSICAL AND STRUCTURAL GEOLOGY (04 CREDITS) (70+30)**

**Unit-I:** Introduction to Geology and its scope, Earth and solar system: origin, shape, size, mass, density and its atmosphere.

**Unit-II:** A brief account of various theories regarding the origin and age of the earth; brief idea of interior of earth and its composition.

**Unit-III:** Weathering and Erosion: factors, types and their effects.

**Unit-IV:** Earthquakes: nature of seismic waves and their intensity; causes of earthquakes; Volcanoes: types, products, causes and distribution.

**Unit-V:** Introduction to Structural Geology; contours, topographic and geological maps. Elementary idea of dip and strike; true and apparent dip, outcrops and effects of different structures on outcrop.

**Unit-VI:** Folds: nomenclature and their classification.

**Unit-VII:** Fault: terminology and classification with emphasis on Normal and Reverse faults.

**Unit-VIII:** Definition, types and importance of joints and unconformities.

### **PRACTICALS/LAB (02 CREDITS) (70+30)**

#### **Physical Geology: (20)**

Study of topographic maps, Identification of geomorphic features/ models.

#### **Structural Geology: (20)**

Learning use of Clinometers/Brunton compass; Exercises on structural problems; Preparation of cross-section profiles.

#### **Practical records: (15)**

#### **Viva Voce: (15)**

#### **Books Recommended:**

1. Arthur Holmes, 1992. Principles of Physical Geology. Chapman and Hall, London.
2. Miller, 1949. An Introduction to Physical Geology. East West Press Ltd.
3. Spencer, E.V., 1962. Basic concepts of Physical Geology. Oxford & IBH.
4. Mahapatra, G.B., 1994. A text book of Physical geology. CBS Publishers.
5. Billings, M.P., 1972. Structural Geology. Prentice Hall.
6. Davis, G.R., 1984. Structural Geology of Rocks and Region. John Wiley
7. Hills, E.S., 1963. Elements of Structural Geology. Farrold and Sons, London.
8. Singh, R. P., 1995. Structural Geology, A Practical Approach. Ganga Kaveri Publ., Varanasi.
9. Structural Geology (Haakon Fossen, 2010).
10. Structural Geology (Twiss and Moores, 2007)
11. Structural Geology of Rocks and Regions (Davis and Reynolds, 1996).
12. Structural Geology (Ghosh, 1993).

## **ADDITIONAL/INTERDISCIPLINARY SUBJECT**

**SOES/GEOL/UG/AD-001**

### **ELEMENTARY KNOWLEDGE OF EARTH SCIENCES PART I (PHYSICAL AND STRUCTURAL GEOLOGY: THEORY)**

**(02 CREDITS) (70+30)**

**Unit-I:** Introduction to Geology and its scope, Earth and Solar System; Big bang theory

**Unit-II:** Brief idea of interior of the earth and its composition.

**Unit-III:** Elementary ideas about weathering and Erosion

**Unit-IV:** Earthquake and volcano their causes and distribution.

**Unit-V:** Contours, topographic maps, elementary idea of dip and strike, outcrops and effects of different structures on outcrop.

**Unit-VI:** Brief idea of folds and their geometrical classification.

**Unit-VII:** Elementary idea of faulting.

**Unit-VIII:** Brief account of joints and unconformities.

## **PRACTICALS/LAB**

### **ELEMENTARY KNOWLEDGE OF EARTH SCIENCES PART I**

**(02 CREDITS) (70+30)**

**Physical Geology: (25)**

Study of topographic maps; Identification of geomorphic features/ models.

**Structural Geology: (25)**

Learning use of Clinometers/Brunton compass; Preparation of cross-section profiles.

**Practical records: (15)**

**Viva Voce: (15)**

## **SKILLCOURSE-1**

**SOES/GEOL/UG/SEC-001**

### **GEOMORPHOLOGY**

**(02 CREDITS) (70+30)**

**Unit-I:** Basic Principles of Geomorphology, Geomorphological Cycles, Weathering and Erosion; Geomorphic mapping: tools and techniques.

**Unit-II:** Epigenic and Exogenic processes: degradation and aggradation. Hypogenic and Endogenic processes; Diastrophism and Volcanism, Extraterrestrial Processes; Geological Work of Wind, Glacier, River, Underground Water and Ocean.

### **Books Recommended:**

1. Allen, P., 1997. Earth Surface Processes. Blackwell.

2. Bloom, A.L., 1998. Geomorphology: A systematic analysis of Landforms (3rd Edition). Pearson Edu. Inc.
3. Keary, P. and Vine, F.J., 1997. Global Tectonics. Blackwell and crustal evolution. Butterworth-Heinemann.
4. Kale, V.S. and Gupta, A., 2001. Introduction to Geomorphology. Orient Longman Ltd.
5. Moores, E and Twiss. R.J., 1995. Tectonics. Freeman.
6. Patwardhan, A. M., 1999. The Dynamic Earth System. Prentice Hall.
7. Summerfield, M.A., 2000. Geomorphology and Global tectonic. Springer Verlag.
8. Valdia, K.S., 1988. Dynamic Himalaya. Universities Press, Hyderabad.
9. WD Thornbury, 2002. Principles of Geomorphology. CBS Publ. New Delhi.

## Semester II

### **SOES/GEOL/UG/CORE COURSE-002 CRYSTALLOGRAPHY AND MINERALOGY (04 CREDITS) (70+30)**

**Unit-I:** Crystal: Definition and external morphology.

**Unit-II:** Interfacial angles and their measurements, Parameters in crystals, Weiss and Miller system of notations. .

**Unit-III:** Symmetry elements and forms of normal class of Isometric, Tetragonal, Hexagonal, Trigonal, Orthorhombic, Monoclinic and Triclinic systems.

**Unit-IV:** Introduction to Mineralogy, Definition and characters of mineral.

**Unit-V:** Physical properties and Chemical composition of minerals, diagnostic properties of the following minerals: Quartz, Orthoclase, Microcline, Hornblende, Garnet, Muscovite, Biotite, Chlorite, Olivine and Calcite.

**Unit-VI:** Ordinary and polarized lights; Polarizing microscope and its parts with functioning. Important optical properties observed under polarized lights and crossed nicols.

**Unit-VII:** Optical properties of following rock forming minerals: Quartz, Orthoclase, Microcline, Olivine, Garnet, Augite, Hypersthene, Hornblende, Biotite, Calcite and Zircon.

### **PRACTICALS/LAB**

**(02 CREDITS) (70+30)**

**Crystallography: (25)**

Study of symmetry elements of a normal class of Isometric, Tetragonal, Hexagonal, Trigonal, Orthorhombic, Monoclinic and Triclinic systems.

**Mineralogy: (25)**

Study of physical properties of minerals mentioned in theory course. Use of polarizing microscope; Study of optical properties of common rock-forming minerals mentioned in theory course.

**Practical records: (10)**

**Viva Voce: (10)**

### **Books Recommended:**

1. Dana, E.S. and Ford, W.E., 2002. A textbook of Mineralogy.
2. Flint, Y., 1975. Essential of crystallography, Mir Publishers.

3. Phillips, F.C., 1963. An introduction to crystallography. Wiley, New York.
4. Berry, L.G., Mason, B. and Dietrich, R.V., 1982. Mineralogy. CBS Publ.
5. Nesse, D.W., 1986. Optical Mineralogy. McGraw Hill.
6. Read, H.H., 1968. Rutley's Element of Mineralogy (Rev. Ed.). Thomas Murby and Co.
7. Berry and Mason, 1961. Mineralogy. W.H. Freeman & Co.
8. Kerr, B.F., 1995. Optical Mineralogy 5th Ed. Mc Graw Hill, New York.
9. Crystallography and Crystal Chemistry by F.D. Bloss (Crystallography)
10. Introduction to Mineralogy by William D Nesse (Crystallography, Optical Mineralogy & Mineralogy)
11. Optical Crystallography by E. E. Wahlstrom (Optical Mineralogy)
12. Minerals: Their Constitution and Origin by H-R Wenk & A. Bulakh (Mineralogy)
13. An Introduction to Mineral Sciences by A. Putnis (Mineralogy mainly, but excellent concepts in Optical mineralogy & crystallography)
14. Earth Materials: Introduction to Mineralogy and Petrology by C. Klein & A. Philpotts (Crystallography & Mineralogy)

## **ADDITIONAL/INTERDISCIPLINARY SUBJECT**

### **SOES/GEOL/UG/AD-002**

#### **ELEMENTARY KNOWLEDGE OF EARTH SCIENCES PART II**

#### **(CRYSTALLOGRAPHY AND MINERALOGY: THEORY)**

**(02 CREDITS) (70+30)**

Unit-I: Crystal form, face, edge, solid angle.

Unit-II: Interfacial angle and their measurements.

Unit-III: Miller system of notations.

Unit-IV: Symmetry elements and description of normal class of Isometric, Tetragonal, Hexagonal, Trigonal, Orthorhombic, Monoclinic and Triclinic systems.

Unit-V: Introduction to Mineralogy and its importance

Unit-VI: Common physical properties of minerals such as: Quartz, Orthoclase, Hornblende, Garnet, Muscovite, Biotite, Olivine and Calcite.

Unit-VII: Polarizing microscope, its parts and functioning

Unit-VIII: Optical properties of some common rock forming minerals (Quartz, Orthoclase, Olivine, Augite, Hornblende, Biotite and Calcite).

### **PRACTICALS/LAB**

#### **ELEMENTARY KNOWLEDGE OF EARTH SCIENCES PART II**

**(02 CREDITS) (70+30)**

#### **Crystallography: (25)**

Study of symmetry elements of a normal class of Isometric, Tetragonal, Hexagonal, Trigonal, Orthorhombic, Monoclinic and Triclinic systems.

#### **Mineralogy: (25)**

Study of physical properties of minerals mentioned in theory course. Use of polarizing microscope;

**Practical records: (10)**

**Viva Voce: (10)**

**Books Recommended:**

15. Dana, E.S. and Ford, W.E., 2002. A textbook of Mineralogy.
16. Flint, Y., 1975. Essential of crystallography, Mir Publishers.
17. Phillips, F.C., 1963. An introduction to crystallography. Wiley, New York.
18. Berry, L.G., Mason, B. and Dietrich, R.V., 1982. Mineralogy. CBS Publ.
19. Nesse, D.W., 1986. Optical Mineralogy. McGraw Hill.
20. Read, H.H., 1968. Rutley's Element of Mineralogy (Rev. Ed.). Thomas Murby and Co.
21. Berry and Mason, 1961. Mineralogy. W.H. Freeman & Co.
22. Kerr, B.F., 1995. Optical Mineralogy 5th Ed. Mc Graw Hill, New York.

**SKILL COURSE-2**

**SOES/GEOL/UG/SEC-002**

**GEOLOGICAL FIELD TRAINING**

**(02 CREDITS) (70+30)**

Students will be required to carry out Geological field training in an important geological terrain to study the elementary aspects of field geology for one week and to submit a report thereon.



## II<sup>nd</sup> Year, Semester III

### SOES/GEOL/UG/ CORE COURSE -003

#### PETROLOGY

(04 CREDITS) (70+30)

#### Igneous Petrology

**Unit-I:** Magma: definition, composition, types and origin; Forms and textures of Igneous Rocks.

**Unit-II:** Reaction principle; Differentiation and Assimilation.

Crystallization of unicomponent and bicomponent magma, mixed crystals.

**Unit-III:** Mineralogical classification of Igneous Rocks.

**Unit-IV:** Detailed petrographic description of Granite, Granodiorite, Rhyolite, Syenite, Phonolite, Diorite, Gabbro.

#### Sedimentary Petrology

**Unit-V:** Fundamentals of Sedimentary processes and their products; Sedimentary Rocks; Formation, Classification, textures and structures.

**Unit-VI:** Petrographic details of Sedimentary Rocks given below:

Conglomerate, Breccia, Sandstone, Greywacke, Shale, Limestone and Dolomite.

#### Metamorphic Petrology

**Unit- VII:** Process and products of metamorphism; Metamorphism: Factors and types, metamorphic zones and metamorphic facies; Textures and structures, metamorphic facies.

**Unit-VIII:** Petrographic details of following Metamorphic Rocks:- Slate, Phyllite, Schists, Gneisses, Quartzite, Marble.

#### PRACTICALS/LAB

(02 CREDITS) (70+30)

#### Igneous Petrology: (20)

Identification of igneous rocks both in hand specimen and thin sections listed in theory paper.

#### Sedimentary and Metamorphic Petrology: (30)

Identification of sedimentary and metamorphic both in hand specimen and thin sections-listed in theory paper

#### Practical records: (10)

#### Viva Voce: (10)

#### Books Recommended:

1. Turner, F.J. & Verhoogen, J., 1960, Igneous & Metamorphic petrology. McGraw Hill Co.
2. Tyrell, G. W., 1989. Principles of Petrology. Methuren and Co (Students ed.).
3. Ehlers, WG, and Blatt, H., 1987. Petrology, Igneous, Sedimentary and Metamorphic rocks, CBS Publishers
4. Moorhouse, WW., 1969. The study of rocks in thin sections. Harper and sons.
5. Friedman & Sanders, 1978. Principles of Sedimentology. John Wiley and sons.
6. Pettijohn, F.J., 1975. Sedimentary rocks, Harper & Bros. 3rd Ed.
7. Prasad, C., 1980. A text book of sedimentology.
8. Sengupta. S., 1997. Introduction to sedimentology. Oxford-IBH.
9. Mason, R., 1978. Petrology of Metamorphic Rocks. CBS Publ.
10. Winkler, H.G.C., 1967. Petrogenesis of Metamorphic Rocks. Narosa Publ.
11. Introduction to Igneous and Metamorphic Petrology (Philpotts and Ague)

12. Basalts and their phase diagrams (S. A. Morse)
13. Evolution of the Igneous Rocks (Cox, Bell and Pankhurst)
14. Igneous Petrogenesis - A global Tectonic approach - M. Wilson
15. Metamorphic phase equilibria and pressure-temperature-time paths by Spear, F. S.; 1995; Monograph Mineralogical Society of America, pp. 799.
16. An Introduction to Metamorphic Petrology by Bruce Yardley & Clare Warren; 2021; 2nd Edition, Cambridge University Press.
17. Petrogenesis of Metamorphic Rocks by Kurt Bucher & Martin Frey; 2002; 7th Edition; Springer-Verlag Berlin Heidelberg.
18. Principles of Metamorphic Petrology by R.H. Vernon & G.L. Clarke; 2008; Cambridge University Press.

## **ADDITIONAL/INTERDISCIPLINARY SUBJECT**

### **SOES/GEOL/UG/AD-003**

### **ELEMENTARY KNOWLEDGE OF EARTH SCIENCES PART III**

#### **(PETROLOGY: THEORY)**

**(02 CREDITS) (70+30)**

#### **Igneous Petrology**

Unit-I: Magma: composition, types, and origin;

Unit-II: Reaction principle; Differentiation and Assimilation; Bowen's reaction series.

Unit-III: Tabular classification of igneous rocks.

Unit-IV: Detailed petrographic description of granite, rhyolite, aplite, gabbro, basalt, dolerite.

#### **Sedimentary Petrology**

Unit-V: Classification, textures and structures of sedimentary rocks.

Unit-VI: Petrographic details of conglomerate, breccia, sandstone, shale, limestone.

#### **Metamorphic Petrology**

Unit- VII: Process and types of metamorphism; Textures and structures of metamorphic rocks.

Unit-VIII: Petrographic details of some important metamorphic rocks such as - slate, schists, gneiss, quartzite, marble.

### **ELEMENTARY KNOWLEDGE OF EARTHS-3 (PRACTICALS/LAB)**

#### **PRACTICALS/LAB**

#### **PETROLOGY**

**(02 CREDITS) (70+30)**

•Igneous Petrology: (20)

Identification of igneous rocks (listed in theory paper) in hand specimen

•Sedimentary and Metamorphic Petrology: (30)

Identification of sedimentary and metamorphic rocks (listed in theory paper) in hand specimen

Practical records: (10)

•Viva Voce: (10)

**SKILLCOURSE-1**  
**SOES/GEOL/UG/SEC-001**  
**GEOMORPHOLOGY**  
**(02 CREDITS) (70+30)**

**Unit-I:** Basic Principles of Geomorphology, Geomorphological Cycles, Weathering and Erosion; Geomorphic mapping: tools and techniques.

**Unit-II:** Epigenic and Exogenic processes: degradation and aggradation. Hypogenic and Endogenic processes; Diastrophism and Volcanism, Extraterrestrial Processes; Geological Work of Wind, Glacier, River, Underground Water and Ocean.

**Books Recommended:**

1. Allen, P., 1997. Earth Surface Processes. Blackwell.
2. Bloom, A.L., 1998. Geomorphology: A systematic analysis of Landforms (3rd Edition). Pearson Edu. Inc.
3. Keary, P. and Vine, F.J., 1997. Global Tectonics. Blackwell and crustal evolution. Butterworth-Heinemann.
4. Kale, V.S. and Gupta, A., 2001. Introduction to Geomorphology. Orient Longman Ltd.
5. Moores, E and Twiss. R.J., 1995. Tectonics. Freeman.
6. Patwardhan, A. M., 1999. The Dynamic Earth System. Prentice Hall.
7. Summerfield, M.A., 2000. Geomorphology and Global tectonic. Springer Verlag.
8. Valdia, K.S., 1988. Dynamic Himalaya. Universities Press, Hyderabad.
9. WD Thornbury, 2002. Principles of Geomorphology. CBS Publ. New Delhi.

## Semester IV

### **SOES/GEOL/UG/CORE COURSE-004: PALAEOLOGY AND STRATIGRAPHY (04 CREDITS) (70+30)**

**Unit I:** Palaeontology, definition, subdivision and scope, its relationship with other subdisciplines of geology.

**Unit II:** Origin of life and a brief idea of organic evolution; Fossils: definition, conditions for fossilization, mode of preservation and significance of fossils; binomial nomenclature in taxonomy.

**Unit III:** Morphology and geological distribution of Brachiopods, Pelecypods, Cephalopods, Gastropods, Trilobite, Echinoidea.

**Unit IV:** Evolution of Horse and its intercontinental migration, Human evolution; morphology, distribution and significance of Gondwana flora in India.

**Unit V:** Stratigraphy: definition, Principles, subdivision, scope and its relationship with other subdisciplines of geology.

**Unit VI:** Geological Time Scale; Stratigraphic classifications; Physical and structural subdivisions of India and their characteristics.

**Unit VII:** Precambrian and its subdivisions: Dharwar, Delhi, Cuddapha and Vindhyan supergroups; Brief idea of Palaeozoic successions of Salt range, Spiti and Kashmir; Triassic of Spiti, Kutch and Rajasthan; Cretaceous of Tiruchirapalli.

**Unit VIII:** Study of Gondwana supergroup and Deccan Traps; Palaeogene-Neogene sequences of Northwest Himalaya, Assam and Rajasthan.

### **PRACTICALS/LAB (02 CREDITS) (70+30)**

#### **Paleontology: (25)**

Morphological characters, systematic position and age of fossil genera pertaining to Brachiopods, Pelecypods, Cephalopods, Trilobite and Echinoidea.

#### **Stratigraphy: (25)**

Preparation of lithostratigraphic maps of India showing distribution of important geological formations.

#### **Practical records: (10)**

#### **Viva Voce: (10)**

### **Books Recommended:**

1. Wadia, D., 1973. Geology of India. Mc Graw Hill Book co.
2. Krishnan, M.S., 1982. Geology of India and Burma, 6th Edition. CBS Publ.
3. Ravindra Kumar, 1985. Fundamentals of Historical Geology & Stratigraphy of India. Wiley Eastern.
4. Shrock, R.R. & Twenhoffel, W.H., 1952. Principles of Invertebrate Paleontology. CBS Publ.
5. Swinerton, HH., 1961. Outlines of Paleontology. Edward Arnold Publishers
6. Jain, P.C. & Anantharaman, M.S., 1983. Paleontology: Evolution & Animal Distribution. Vishal Publ.
7. Lehmann, U., 1983. Fossil Invertebrate. Cambridge Univ. Press.

8. Rastogi, 1988. Organic evolution. Kedrnath and Ramnath Publ.
9. Principles of Paleontology, 3rd ed., Michael Foote and Arnold I. Miller, W. H. Freeman
10. Principles of Paleontology, 2nd ed., David M. Raup and Steven M. Stanley, CBS Publishers & Distributors
11. Invertebrate Palaeontology And Evolution, E.N.K. Clarkson, Wiley India Pvt Ltd
12. Paleobiology II, edited by Derek E.G. Briggs & Peter R. Crowther, Blackwell Science
13. Bringing fossils to life, by Donald R. Prothero, 3rd edition, Columbia University Press New York
14. Vertebrate Palaeontology, 4th Edition, Michael J. Benton, Wiley-Blackwell
15. Introduction to Marine Micropaleontology by B.U. Haq and A. Boersma
16. Microfossils by Howard A. Armstrong and Martin D. Brasier
17. Introduction to Microfossils by Daniel J. Jones
18. Principles of Sedimentology and Stratigraphy By Sam Boggs Jr.; Pearson; Latest edition
19. Cycles and events in stratigraphy", by Einsele G., Ricken W., and Seilacher A., Springer
20. Sedimentology and Stratigraphy 2009, by Gary Nichols. – 2nd ed, Wiley-Blackwell
21. Geological Time Scale 2012. ED. Gradstein, F, Ogg, JG, Schmitz, MD, Ogg, GM.
22. of India (Vol. 1 & 2) Editors/Authors: Ramakrishnan M & Vaidyanadhan R, Geol. Soc. Ind.
23. "Principles of sequence stratigraphy", by Catuneanu, Octavian, Elsevier

## **ADDITIONAL/INTERDISCIPLINARY SUBJECT**

### **SOES/GEOL/UG/AD-004**

#### **ELEMENTARY KNOWLEDGE OF EARTH SCIENCES PART IV**

#### **(PALAEOLOGY AND STRATIGRAPHY: THEORY)**

**(02 CREDITS) (70+30)**

**Unit I:** Palaeontology, definition, subdivision and scope.

**Unit II:** Origin of life; Fossils: definition, conditions for fossilization, mode of preservation and significance of fossils.

**Unit III:** Morphology and geological distribution of Brachiopods, Pelecypods, Cephalopods, Gastropods, Trilobite.

**Unit IV:** Evolution of Horse and Human; morphology, distribution and significance of Gondwana flora in India.

**Unit V:** Stratigraphy: definition, Principles, subdivision, scope

**Unit VI:** Geological Time Scale; Physical and structural subdivisions of India

**Unit VII:** Important stratigraphic sequences of Dharwar, Delhi, Cuddapha and Vindhyan supergroups; Brief idea of Palaeozoic successions of Spiti; Triassic of Spiti, Jurassic of Kutch; Cretaceous of Tiruchirapalli.

**Unit VIII:** Study of Gondwana supergroup and Deccan Traps; Breif idea of Himalayan geology.

### **PRACTICALS/LAB**

#### **ELEMENTARY KNOWLEDGE OF EARTH SCIENCES PART IV**

**(02 CREDITS) (70+30)**

**Paleontology: (25)**

Morphological characters, systematic position and age of fossil genera pertaining to Brachiopods, Pelecypods, Cephalopods and Trilobite.

**Stratigraphy: (25)**

Preparation of lithostratigraphic maps of India showing distribution of important geological formations.

**Practical records: (10)**

**Viva Voce: (10)**

**SKILL COURSE-2**

**SOES/GEOL/UG/SEC-004**

**GEOLOGICAL FIELD TRAINING**

**(02 CREDITS) (70+30)**

Students will be required to carry out Geological field training in an important geological terrain to study the different aspects of field geology for a week and submit a report thereon.