

# **Syllabus for B.Sc. with Geology**

**Six Semester Course  
Under  
Choice Based Credit System  
(Effective from session 2015-16)**

**Details of Courses Under Undergraduate Program (B.Sc.)**

Course	Theory+ Practical	*Credits
<b>I. Core Course</b> <b>(12 Papers)</b> 04 Courses from each of the 03 disciplines of choice	12×4= 48	Theory+Tutorials 12×5=60
<b>Core Course Practical / Tutorial*</b> <b>(12 Practical/ Tutorials*)</b> 04 Courses from each of the 03 Disciplines of choice	12×2=24	12×1=12
<b>II. Elective Course</b> <b>(6 Papers)</b> Two papers from each discipline of choice including paper of interdisciplinary nature.	6×4=24	6×5=30
<b>Elective Course Practical / Tutorials*</b> <b>(6 Practical / Tutorials*)</b> Two Papers from each discipline of choice including paper of interdisciplinary nature	6×2=12	6×1=6
<b>III. Ability Enhancement Courses</b>		
<b>1. Ability Enhancement Compulsory</b> <b>(2 Papers of 2 credits each)</b> Environmental Science English/MIL Communication	2×2=4	2×2=4
<b>2. Skill Enhancement Course</b> <b>(Skill Based)</b> <b>(4 Papers of 2 credits each)</b>	4×2=8	4×2=8
<b>Total credit= 120</b>		<b>Total credit= 120</b>

**Institute should evolve a system/ policy about ECA/ General Interest/Hobby/Sports/NCC/NSS/related courses on its own.**

**\*Wherever there is practical there will be no tutorials and vice-versa**

**Proposed scheme for choice based credit system in B. Sc. Program**

	<b>CORE COURSE (12)</b>	<b>Ability Enhancement Compulsory Course (AECC) (2)</b>	<b>Skill Enhancement Course (SEC) (4)</b>	<b>Discipline Specific Elective DSE (6)</b>
<b>I</b>	DSC- 1 A	(English /MIL Communication)/ Environmental Science		
	Physical and Structural Geology			
	DSC- 3 A			
<b>II</b>	DSC- 1 B	Environmental Science /(English/MIL Communication)		
	Crystallography and Mineralogy			
	DSC- 3 B			
<b>III</b>	DSC- 1 C		SEC-1 Photogeology and Remote Sensing	
	Petrology			
	DSC- 3 C			
<b>IV</b>	DSC- 1 D		SEC-2 Geomorphology and Geotectonics	
	Stratigraphy and Palaeontology			
	DSC- 3 D			
<b>V</b>			SEC-3 Environmental Geology	DSE-1 A
				DSE-2 A Economic Geology & Hydrology
				DSE-3 A
<b>VI</b>			SEC-4 Geochemistry	DSE-1 B
				DSE-2 B Elements of Applied Geology
				DSE-3 B

<b>SEMESTER</b>	<b>COURSE OPTED</b>	<b>COURSE NAME</b>	<b>Credits</b>
I	Ability Enhancement Compulsory Course-I	English/MIL communications/ Environmental Science	2
	Core Course-I	DSC-1A	6
	Core Course-II	Physical and Structural Geology	4
	Core Course-II Practical	Physical and Structural Geology Lab	2
	Core Course-III	DSC-3A	6
II	Ability Enhancement Compulsory Course-II	English/MIL communications/ Environmental Science	2
	Core Course-IV	DSC-1B	6
	Core Course-V	Crystallography and Mineralogy	4
	Core Course-V Practical	Crystallography and Mineralogy Lab	2
	Core Course-VI	DSC-3B	6
III	Core Course-VII	DSC-1C	6
	Core Course-VIII	Petrology	4
	Core Course-VIII Practical	Petrology Lab	2
	Core Course-IX	DSC-3C	6
	Skill Enhancement Course-1	SEC-1 Photogeology & Remote Sensing	2
IV	Core Course-X	DSC-1D	6
	Core Course-XI	Stratigraphy and Palaeontology	4
	Core Course-XI Practical	Stratigraphy and Palaeontology Lab	2
	Core Course-XII	DSC 3D	6
	Skill Enhancement Course-2	SEC-2 Geomorphology & Geotectonics	2
V	Skill Enhancement Course-3	SEC-3 Environmental Geology	2
	Discipline Specific Elective-1	DSE-1A	6
	Discipline Specific Elective-2	DSE-2A Economicgeology &Hydrology	6
	Discipline Specific Elective-3	DSE-3A	6
VI	Skill Enhancement Course-4	SEC-4 Geochemistry	2
	Discipline Specific Elective-4	DSE-1B	6
	Discipline Specific Elective-5	DSE-2B Elements of Applied Geology	6
	Discipline Specific Elective-6	DSE-3B	6
Total credits			120

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

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

**SOES/GEOL/UG/Core Course-001:**Physical & Structural Geology(04 credits)+Labs(2 credits)

**SOES/GEOL/UG/Core Course-002:**Crystallography & Mineralogy(04 credits)+Labs(2 credits)

**SOES/GEOL/UG/Core Course-003:** Petrology (04 credits) + Labs (2 credits)

**SOES/GEOL/UG/Core Course-004:** Stratigraphy & Palaeontology(04 credits)+Labs (2 credits)

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

**SOES/GEOL/UG/DSE-001:** Economic Geology and Hydrology (04 credits) + Labs (2 credits)

**SOES/GEOL/UG/DSE-002:** Elements of Applied Geology (04 credits) + Labs (2 credits)

### **Skill Enhancement Course (Credit: 02 each) - SEC 1 to SEC 4**

**SOES/GEOL/UG/SEC-001:** Photo Geology and Remote Sensing

**SOES/GEOL/UG/SEC-002:** Geomorphology and Geotectonics

**SOES/GEOL/UG/SEC-003:** Environmental Geology

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

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## Semester I

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### SOES/GEOL/UG/Core Course-001(THEORY) PHYSICAL AND STRUCTURAL GEOLOGY (04 CREDITS) (70+30)

**Unit-I:** Introduction to geology and its scope, Earth and solar system: origin, size, shape, 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, their intensity and magnitude scale; Origin of earthquake; Volcanoes: types, products and causes of volcanism.

**Unit-V:** Introduction to Structural Geology; contours, topographic and geological maps; Elementary idea of bed, dip and strike; Outcrop, effects of various structures on outcrop. Clinometer/Brunton compass and its use.

**Unit-VI:** Elementary idea of types of deformation; Folds: nomenclature and types of folds.

**Unit-VII:** Faults: nomenclature, geometrical and genetic classifications; Normal, thrust and slip faults.

**Unit-VIII:** Definition, kinds and significance of joints and unconformity.

### SOES/GEOL/UG/Core Course-001(PRACTICALS/LAB) PHYSICAL AND STRUCTURAL GEOLOGY (02 CREDITS) (70+30)

#### É **Physical Geology: (20)**

Study of important geomorphological models; Reading of Survey of India topographical maps; Identification of geomorphic features.

#### É **Structural Geology: (20)**

Study of Clinometers/Brunton compass; Identification of different types of folds/faults from block models; Exercises on structural problems; Preparation of cross section profile from a geological map.

#### É **Practical records: (15)**

#### É **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.

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## Semester II

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### **SOES/GEOL/UG/Core Course-002(THEORY) CRYSTALLOGRAPHY AND MINERALOGY (04 CREDITS) (70+30)**

**Unit-I:** Crystals and their characters. Crystal form, face, edge, solid angle.

**Unit-II:** Interfacial angle and their measurements; Crystallographic axes and angles.

**Unit-III:** Crystal parameters, Weiss and 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, Definition and characters of mineral.

**Unit-VI:** Common physical properties of minerals; Chemical composition and diagnostic physical properties of minerals such as: Quartz, Orthoclase, Microcline, Hypersthene, Hornblende, Garnet, Muscovite, Biotite, Chlorite, Olivine, Epidote, Calcite.

**Unit-VII:** Polarizing microscope, its parts and functioning; Ordinary and polarized lights; Common optical properties observed under ordinary, polarized lights and crossed nicols.

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

### **SOES/GEOL/UG/Core Course-002(PRACTICALS/LAB) CRYSTALLOGRAPHY AND MINERALOGY (02 CREDITS) (70+30)**

#### **É Crystallography: (15)**

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

#### **É Mineralogy: (15)**

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.

#### **É Practical records: (10)**

#### **É Geological Field Training: (20)**

Students will be required to carry out field work in a suitable geological area to study the elementary aspects of field geology and to submit a report thereon.

#### **É 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.

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### Semester III

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#### SOES/GEOL/UG/Core Course-003(THEORY)

#### PETROLOGY

(04 CREDITS) (70+30)

#### Igneous Petrology

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

**Unit-II:** Reaction principle; Differentiation and Assimilation; Crystallization of unicomponent and bicomponent (mix-crystals); Bowen's reaction series.

**Unit-III:** Mineralogical and chemical classification of igneous rocks.

**Unit-IV:** Detailed petrographic description of granite, granodiorite, rhyolite, syenite, phonolite, diorite, gabbro.

#### Sedimentary Petrology

**Unit-V:** Processes of formation of sedimentary rocks; Classification, textures and structures of sedimentary rocks.

**Unit-VI:** Petrographic details of important siliciclastic and carbonate rocks such as - conglomerate, breccia, sandstone, greywacke, shale, limestone.

#### Metamorphic Petrology

**Unit-VII:** Process and products of metamorphism; Type of metamorphism. Factors, zones and grade of metamorphism; Textures, structures and classification of metamorphic rocks.

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

#### SOES/GEOL/UG/Core Course-003(PRACTICALS/LAB)

#### PETROLOGY

(02 CREDITS) (70+30)

É **Igneous Petrology: (20)**

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

É **Sedimentary and metamorphic Petrology:(20)**

Identification of sedimentary and metamorphic rocks (listed in theory paper) both in hand specimen and thin sections.

É **Practical records: (15)**

É **Viva Voce: (15)**

#### 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.



**SOES/GEOL/UG/SEC-001**  
**PHOTOGEOLOGY AND REMOTE SENSING**  
**(02 CREDITS) (70+30)**

**Unit-I:** Elementary idea about photogeology: electro-magnetic spectrum, types & geometry of aerial photographs; factors affecting aerial photography; types of camera, film and filters; factors affecting scale.

**Unit-II:** Fundamentals of remote sensing; remote sensing systems; remote sensing sensors; signatures of rocks, minerals and soils; Application of remote sensing in geoscience and geomorphological studies.

**Unit-III:** Types of Indian and Foreign Remote Sensing Satellites, Digital image processing; fundamental steps in image processing; elements of pattern recognition and image classification.

**Unit-IV:** Introduction to Geographic Information System (GIS); components of GIS; product generation in GIS; tools for map analysis; integration of GIS with remote sensing.

**Books Recommended:**

1. Bhatta, B., 2008. Remote Sensing and GIS. Oxford, New Delhi.
2. Gupta, R.P., 1990. Remote Sensing Geology. Springer Verlag.
3. Lillesand, T.M. and Kifer, R.W., 1987. Remote Sensing and Image Interpretation. John Wiley.
4. Pandey, S.N., 1987. Principles and Application of Photogeology. Wiley Eastern, New Delhi.
5. Sabbins, F.F., 1985. Remote Sensing ó Principles and Applications. Freeman.
6. Siegal, B.S. and Gillespie, A.R., 1980. Remote Sensing in Geology. John Wiley.
7. Rampal K.K. 1999. Hand book of aerial photography and interpretation. Concept publication.

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## Semester IV

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### SOES/GEOL/UG/Core Course-004 (THEORY) STRATIGRAPHY AND PALAEOONTOLOGY (04 CREDITS) (70+30)

**Unit I:** Principle of Stratigraphy; Geological Time Scale and stratigraphic classification; Physiographic division of India.

**Unit II:** Study of following Precambrian succession: Dharwar, Cuddapha, Vindhyan and Delhi Supergroups; Brief idea of Palaeozoic succession of northwestern Himalaya; Triassic of Spiti; Mesozoic type secession of Kutch and Rajasthan; Cretaceous of Tiruchirapalli.

**Unit III:** Study of following type localities: Gondwana and Deccan Traps.

**Unit IV:** Palaeogene-Neogene sequences of northwest Himalaya and Assam.

**Unit-V:** Palaeontology: Fossils- definition, characters, binomial nomenclature in taxonomy, mode of preservation, condition of fossilization and significance of fossils.

**Unit VI:** Morphology and geological distribution of brachiopods, pelecypods, cephalopods.

**Unit VII:** Morphology and geological distribution of trilobite, echinoidea.

**Unit VIII:** Evolutionary history of horse; Morphology, distribution and significance of Gondwana flora.

### SOES/GEOL/UG/Core Course-004 (PRACTICALS/LAB) STRATIGRAPHY AND PALAEOONTOLOGY (02 CREDITS) (70+30)

#### É **Stratigraphy: (15)**

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

#### É **Paleontology: (15)**

Morphological characters, systematic position and age of fossil genera pertaining to brachiopods, pelecypods, cephalopods, trilobite and Echinacea.

#### É **Practical records: (10)**

#### É **Geological Field Training: (20)**

Students will be required to carry out field work in a sedimentary terrain or petrologically important terrain of Himalaya and to submit a report thereon.

#### É **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.

**SOES/GEOL/UG/SEC-002**  
**GEOMORPHOLOGY AND GEOTECTONICS**  
**(02 CREDITS) (70+30)**

**Unit-I:** Basic principles of Geomorphology, geomorphological cycles, weathering and erosion; Geomorphic mapping- tools and techniques.

**Unit-II:** Epigene/exogenic processes: degradation and aggradation. Hypogene/endogenic processes; Diastrophism and volcanism, Extraterrestrial processes; Geological work of wind, glacier, river, underground water and ocean.

**Unit-III:** Earth as a dynamic system. Elementary idea of continental drift, sea-floor spreading and mid-oceanic ridges. Paleomagnetism and its application.

**Unit-IV:** Plate Tectonics: the concept, plate margins, orogeny, deep sea trenches, island arcs and volcanic arcs.

**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.

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## Semester V

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### SOES/GEOL/UG/SEC-003 ENVIRONMENTAL GEOLOGY (02 CREDITS) (70+30)

**Unit-I:** Earth and its spheres: atmosphere, hydrosphere, lithosphere, biosphere and Man; Earth Material.

**Unit-II:** Energy budget: Solar radiation; Global environments: coastal, riverine, desertic, tropical, cold, polar; Concept of global warming and climate change.

**Unit-III:** Geological hazards: Earthquakes, volcanism, landslides, avalanches, floods, droughts; Hazard mitigation.

**Unit IV:** Resource Management: Energy resources (Conventional and non-conventional), watershed management, landuse planning, management of water resources, land reclamation.

#### Books Recommended:

1. Verma, V.K., 1986. Geomorphology Earth surface processes and form. McGraw Hill.
2. Chorley, R. J., 1984. Geomorphology. Methuen.
3. Selby, M.J., 1996. Earths Changing Surface. Oxford University Press UK.
4. Thornbury W. D., 1997. Principles of Geomorphology Wiley Eastern Ltd., New Delhi.
5. Valdiya, K. S., 1987. Environmental Geology - Indian Context. Tata McGraw Hill New Delhi.
6. Keller, E. A., 2000. Environmental Geology. Shales E. Merrill Publishing Co., Columbus, Ohio.
7. Montgomery, C., 1984. Environmental Geology. John Wiley and Sons, London.
8. Bird, Eric, 2000. Coastal Geomorphology: An Introduction. John Wiley & Sons, Ltd. Singapore.
9. Liu, B.C., 1981. Earthquake Risk and Damage, Westview.

### SOES/GEOL/UG/DSE-001 (THEORY) ECONOMIC GEOLOGY AND HYDROLOGY (04 CREDITS) (70+30)

**Unit-I:** Concept of ore and ore deposits, ore minerals and gangue minerals; Tenor of ores; Metallic and non-metallic ore minerals; Strategic, Critical and essential minerals.

**Unit-II:** Magmatic, contact metasomatic, hydrothermal, sedimentation, residual and mechanical concentration, oxidation and secondary sulphide enrichment, metamorphism processes.

**Unit-III:** Study of important metallic (Cu, Pb, Zn Mn, Fe, Au, Al) and non-metallic (industrial) minerals (gypsum, magnesite, mica).

**Unit-IV:** Distribution of coal and petroleum in India.

**Unit-V:** Definition of hydrogeology, Hydrological cycle and its components.

**Unit-VI:** Origin of groundwater; Vertical distribution of groundwater.

**Unit-VII:** Types of aquifers; Water bearing properties of rocks ó porosity, permeability, specific yield, specific retention.

**Unit-VIII:** Groundwater provinces of India.

**SOES/GEOL/UG/DSE-001 (PRACTICALS/LAB)  
ECONOMIC GEOLOGY AND HYDROLOGY  
(02 CREDITS) (70+30)**

• **Economic Geology: (20)**

Study of ore and economic minerals in hand specimen; Preparation of maps showing distribution of important metallic and non-metallic deposits and important coal and oil fields of India.

• **Hydrology: (20)**

Study of hydro-geological models, Estimation of porosity and permeability from the given data; Preparation and interpretation of water table maps.

É **Practical records: (15)**

É **Viva Voce: (15)**

**Books Recommended:**

1. Brown, C. and Dey, A.K.1955. Indian Mineral Wealth. Oxford Univ.
2. Gokhale, K.V.G.K. and Rao, T.C., 1983. Ore Deposits of India. East West Press Pvt. Ltd.
3. Jense, M.L. and Bateman A.M., 1981. Economic Mineral Deposits. John Wiley and Sons.
4. Krishnnaswamy, S., 1979. India's Minerals Resources. Oxford and IBH Publ.
5. Deb, S., 1980. Industrial minerals and Rocks of India. Allied Publishers Pvt. Ltd.
6. Umeshwar Prasad, 2003. Economic Geology. CBS Publishers and distributors.
7. Sharma, N.L. and Ram, K.V.S., 1972. Introduction to India's Economic Minerals, Dhanbad.
8. Karanth, K. R., 1989. Hydrogeology. Tata McGraw Hill Publ.
9. Raghunath, H. M., 1990. Groundwater. Wiley Eastern Ltd.
10. Subramaniam, V., 2000. Water-Kingston Publ. London.

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## Semester VI

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

**GEOCHEMISTRY**

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

**Unit-I:** Introduction to geochemistry: basic knowledge about crystal chemistry. Types of chemical bonds, coordination number; Colloids in geological systems, ion exchanges and geological evidence for earlier colloids; Elementary idea of Periodic Table.

**Unit-II:** Cosmic abundance of elements; Composition of the planets and meteorites; Geochemical evolution of the earth and geochemical cycles.

**Unit-III:** Gold Schmidt's geochemical classification of elements; Distribution of major, minor and trace elements in igneous, metamorphic and sedimentary rocks.

**Unit-IV:** Elements of geochemical thermodynamics; Isomorphism and polymorphism; Isotope geochemistry.

**Books Recommended:**

1. Hoefs, J., 1980. Stable Isotope Geochemistry. Springer-Verlag.
2. Klein, C. and Hurlbut, C.S., 1993. Manual of Mineralogy. John Wiley and Sons, New York.
3. Krauskopf, K.B., 1967. Introduction to Geochemistry. McGraw Hill.
4. Mason, B. and Moore, C.B., 1991. Introduction to Geochemistry. Wiley Eastern.
5. Rollinson, H.R., 1993. Using geochemical data: Evaluation, Presentation, and Interpretation. Longman.

**SOES/GEOL/UG/DSE-002 (THEORY)**

**ELEMENTS OF APPLIED GEOLOGY**

**(04 CREDITS) (70+30)**

**Unit-I:** Engineering properties of rocks and Soils.

**Unit-II:** Soil and Soil groups of India.

**Unit-III:** Dam, types and their geological and environmental considerations; Geological problem of reservoirs.

**Unit-IV:** Tunnels: geology, structure, seepage problems and role of water table.

**Unit-V:** Landslides: classification, causes and preventative measures.

**Unit-VI:** Mineral exploration: Elementary idea of geological and geophysical prospecting.

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

**Unit-VIII:** Environmental considerations for mining.

**SOES/GEOL/UG/DSE-002 (PRACTICALS/LAB)**  
**ELEMENTS OF APPLIED GEOLOGY**  
**(02 CREDITS) (70+30)**

- É Engineering properties and identification of building stones. Study of soil profiles. **(15)**
- É Surveying by Plane Table/Theodolite; Preparation of engineering geological maps/cross sections of project sites. **(15)**
- É **Practical records: (10)**
- É **Geological Field Training: (20)**
- Students will be required to carry out field work in a Himalayan terrain preferably near an engineering project or mining area and to submit a report thereon.
- É **Viva Voce: (10)**

**Books Recommended:**

1. Valdiya, K.S., 1987. Environmental Geology ó Indian Context. Tata McGraw Hill.
2. Rajendran S., 2007. Mineral Exploration: Recent Strategies.
3. Dobrin, M.B. & Savit, CH., 1988. Introduction to Geophysical Prospecting, McGraw-Hill.
4. Arogyaswamy, R.N.P., 1973. Courses in Mining Geology. Oxford and IBH Publ.
5. Parasins, D.S., 1997. Principles of applied geophysics. Chapman Hall.
6. Krynine D.P. and Judd W.R., 1957. Principles of Engineering Geology & Geotechnics. McGraw-Hill Book
7. Kesavulu, N.C., 2009. A text book of engineering geology. Macmillan P publishing India Ltd.
8. Crozier. M.J., 1989. Landslides: causes, consequences and environment. Academic Press.
9. Readman, J.H., 1979. Techniques in Mineral exploration. Applied Science Publishres.
10. Bell, F.G., 1983. Fundamentals of Engineering Geology. Butterworth and Co.