

DETAILS OF UNDERGRADUATE SYLLABUS

There shall be six semesters spread over three years with two papers in each semester at Undergraduate level. Each paper will be of three hours duration and there shall be one practical examination of three hours duration in each of them with session assessment and field work. The session and field work will be assessed on the basis of class-work, practical record and field work performance. Each Theory paper shall be of 80 marks (60 for external exam + 20 marks Internal Assessment). The practical shall be of 40 marks.

Semester	Paper	Course	Max. Marks
I	Paper- I	Physical Geology (6106)	80
	Paper- II	Crystallography (6107)	80
	Practical	Physical + Crystallography (6108)	30
	Field work	Field Training (6109)	10
	Total		
II	Paper-I	Structural Geology (6206)	80
	Paper-II	Mineralogy (6207)	80
	Practical	Structural Geology + Mineralogy (6208)	40
	Total		
III	Paper-I	Igneous and Metamorphic Petrology(6306)	80
	Paper-II	Sedimentary Petrology(6307)	80
	Practical	Igneous and Metamorphic Petrology + Sedimentary Petrology(6308)	30
	Field work	Field Training (6309)	10
	Total		
IV	Paper-I	Stratigraphy (6406)	80
	Paper-II	Palaeontology (6407)	80
	Practical	Stratigraphy + Palaeontology (6408)	40
	Total		
V	Paper-I	Economic Geology and elements of Mineral Exploration (6506)	80
	Paper-II	Engineering Geology (6507)	80
	Practical	Economic Geology and elements of Mineral Exploration+ Engineering Geology(6508)	30
	Field work	Field Training (6509)	10
	Total		
VI	Paper-I	Photogeology (6606)	80
	Paper-II	Environmental Geology (6607)	80
	Practical	Photogeology + Environmental Geology (6608)	40
	Total		

Semester I

Paper – I Physical Geology

Unit-I: Introduction to geology and its scope, Earth and solar system: origin, size, shape, mass, density and its atmosphere. Laws of uniformitarianism

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;.

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.

Paper – II Structural Geology

Unit-I: 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-II: Elementary idea of types of deformation; Folds: nomenclature and types of folds;

Unit-III: Faults: nomenclature, geometrical and genetic classifications, normal, thrust and slip faults;

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

Books Recommended:

1. Billings, M.P., 1972. Structural Geology. Prentice Hall.
2. Davis, G.R., 1984. Structural Geology of Rocks and Region. John Wiley
3. Hills, E.S., 1963. Elements of Structural Geology. Farrold and Sons, London.
4. Singh, R. P., 1995. Structural Geology, A Practical Approach. Ganga Kaveri Publ., Varanasi.

Practical

Physical Geology:

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

Structural Geology:

Study and use 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.

Geological Field Training

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

Semester II

Paper –I Crystallography

Unit-I: Crystals and their characters:

Unit-II: Crystal form, face, edge, solid angle; 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, Orthorhombic, Monoclinic and Triclinic systems.

Books Recommended:

1. Dana, E.S. and Ford, W.E., 2002. A textbook of Mineralogy (Reprints).
2. Flint, Y., 1975. Essential of crystallography, Mir Publishers.
3. Phillips, F.C., 1963. An introduction to crystallography. Wiley, New York.

Paper – II Mineralogy

Unit-I: Definition and characters of mineral;

Unit-II: Common physical properties of minerals; Chemical composition and diagnostic physical properties of Olivine, Garnet, Pyroxene, Amphiboles, Feldspar and Silica family.

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

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

Books Recommended:

1. Berry, L.G., Mason, B. and Dietrich, R.V., 1982. Mineralogy. CBS Publ.
2. Nesse, D.W., 1986. Optical Mineralogy. McGraw Hill.
3. Read, H.H., 1968. Rutley's Element of Mineralogy (Rev. Ed.). Thomas Murby and Co.
4. Berry and Mason, 1961. Mineralogy. W.H. Freeman & Co.

Practical

Crystallography:

Study of symmetry elements of normal class of Isometric (Cube, Octahedron, Trisoctahedron, Tetrahexahedron, rhombdodecahedron, trapezohedron); Teetragonal (Zircon, Visuvianite) Hexagonal (Beryl); Orthorhombic (Barytes); Monoclinic (Zypsum and Orthoclase) Systems.

Mineralogy:

Study of physical properties of minerals such as Olivine, Garnet, Muscovite, Biotite, Beryl, Tourmaline, Hornblende, Gypsum, and its varieties, Quartz and its varieties, Orthoclase, Microcline, Plagioclase, Chalcedony, Barite, Augite, Chalcedony, Agate, Jasper, Flint. Use of polarizing microscope; Study of optical properties of common rock forming minerals such as Olivine, Garnet, Muscovite, Biotite, Hornblende, Tourmaline, Augite, Quartz, orthoclase, Microcline, Plagioclase etc

Semester III

Paper –I Igneous and Metamorphic Petrology

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

Reaction principle; Bowen's reaction series, Differentiation and Assimilation; Crystallization of unicomponent and bicomponent (mixed-crystals);

Unit-II: Mineralogical and chemical classification of igneous rocks.

Detailed petrographic description of Granite, Granodiorite, Syenite, Diorite, Rhyolite and Basalt

Unit-III: Processes of formation of sedimentary rocks; Classification, textures and structures of sedimentary rocks;

Petrographic details of important siliciclastic and carbonate rocks such as - conglomerate, breccia, sandstone, greywacke, shale, limestones.

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

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

Books Recommended:

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

Paper- II Photogeology

Unit-I

Definition and scope of photogeology. EM radiation and EM spectrum. EM energy interactions with atmosphere and earth surface features. Film and digital aerial photography.

Unit-II

Types of aerial photographs, Aerial photography mission. Tilt in aerial photographs. Scale of aerial photographs. Relief distortions and vertical exaggeration in aerial photographs. Orthophotographs.. Stereoscopic vision in aerial photographs. Stereoscopes and their types.

Unit-III

Phototechnical and geotechnical elements of photo-interpretation. Aerial photo mosaics, their types and utility.

Unit-IV

Application potential of aerial photographs in land cover, landform, rock type and structure recognition,

Books Recommended:

1. Pandey, S.N., 1987. Principles and Application of Photogeology. Wiley Eastern, New Delhi.
2. Rampal K.K. 1999. Hand book of aerial photography and interpretation. Concept publication.

Practical

Study of important metallic and non-metallic ores and minerals in hand specimens

Identifying the phototechnical and geotechnical elements of different landforms, land use/ land cover classes and structures

Identification of rocks: On the basis of their physical properties in hand specimen; and optical properties in thin sections.

Identification of sedimentary and metamorphic rocks both in hand specimen and thin sections.

Geological Field Training

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

Semester IV

Paper-I Straigraphy

Unit I: Definition, Principle and classification of stratigraphy; Geological Time Scale; Physiographic division of India.

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

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

Unit IV: Paleogene-Neogene sequences of northwest Himalaya.

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.

Paper-II Palaeontology

Unit-I: Condition and modes of fossilization and significance; binomial nomenclature.

Unit II: Morphology and geological distribution of brachiopoda, pelecypoda, gastropoda and cephalopoda.

Unit III: Morphology and geological distribution of trilobita.

Unit IV Evolutionary history of horse and man.

Books Recommended:

1. Shrock, R.R. & Twenhoffel, W.H., 1952. Principles of Invertebrate Paleontology. CBS Publ.
2. Swinerton, HH., 1961. Outlines of Paleontology. Edward Arnold Publishers
3. Jain, P.C. & Anantharaman, M.S., 1983. Paleontology: Evolution & Animal Distribution.
4. Lehmann, U., 1983. Fossil Invertebrate. Cambridge Univ. Press.
5. Rastogi, 1988. Organic evolution. Kedrnath and Ramnath Publ.

Practical

Straigraphy

1. Preparation of lithostratigraphic maps of India showing distribution of important geological formations and Gondwana flora.
2. Morphological characters, systematic position and age of fossil genera of gastropoda, brachiopoda, pelecypoda, cephalopoda and trilobita.

Semester V

Paper- I Economic Geology And Elements of Mineral Exploration

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: Processes of formation of ore deposits; Magmatic, contact metasomatic, hydrothermal, sedimentation,

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

Unit-IV: Mineral exploration: Elementary idea of geological, geophysical and geobotanical prospecting and mining methods.

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. Krishnaswamy, 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.

Paper – II Environmental Geology

Unit-I

Scope and aims of environmental geology. Biosphere and man. Natural hazards- Earthquakes, volcanism, floods, avalanches, landslides and slope failures, Strategies and coping up with natural hazards

Unit-II

Climatology and global environment- Coastal, temperate, desertic, tropical, cold and polar. Green house effect and global warming

Unit-III

Elementary idea of soil types. Soil erosion and conservation. Preliminary idea of environmental implications of mining activities and their remedies.

Unit-IV

Elementary concept of watershed management. Land reclamation

Books Recommended:

1. Valdiya, K.S. 1987: Environmental Geology-Indian Context. Tata McGraw Hill
2. Keller, E.A. 1978: Environmental Geology, Bell and Howell, U.S.A.
3. Bryant, E., 1985: Natural Hazards, Cambridge University Press.
4. Patwardhan, A.M., 1999: The Dynamic Earth System. Printice Hall
5. Subramannian, V., 2001: Text book in Environmental Science, Narosa International
6. Bell, F.G., 1999: Geological Hazards. Routledge, London.
7. Smith, K., 1992: Environmental hazards. Routledge, London.

Practical

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.

Identifying the phototechnical and geotechnical elements of different landforms, land use/ land cover classes and structures.

Geological Field Training

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

Semester VI

Paper-I Elementary Engineering Geology

Unit-I: Engineering properties of rocks and Soils. Soil and Soil groups of India.

Unit-II: Dam, Types and their geological and environmental considerations; Geological problem of reservoirs.

Unit-III: Tunnels: geology, structure, seepage problem and role of water table;

Unit-IV: Landslides: classification, causes and preventative measures.

Books Recommended:

1. Valdiya, K.S., 1987. Environmental Geology – 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.

Practicals

Surveying by Plane Table/Theodolite; Preparation of engineering geological maps; Engineering properties and identification of building stones. Identification of various models of landslide, tunnel and dam. Study of soil profiles.

Paper-II Elements of Mineral Exploration

Unit-I

Mineral exploration: Surface and sub surface exploration methods including use of remote sensing techniques

Unit- II

Prospecting for economic minerals: drilling sampling and assaying.

Unit-III

Elementary knowledge of geological and geophysical prospecting. Gravity, electrical, magnetic airborne and seismic methods of exploration. Geobotanical and geochemical methods of exploration.

Unit-IV:

Elementary idea of mining and environmental considerations.

Books Recommended:

1. McKinstry, H.E., 1962: Mining Geology. II Ed. Asia Publishing House.

2. Clark, G.B., 1967: Elements of Mining. III Ed. John Wiley
3. Arogyaswami, R.P.N., 1996: Courses in Mining Geology. IV Ed. Oxford IBH.
4. Umathi, Exploration Geology.

Practical

Exercises in showing distribution of various mineral deposits on map of India. Laboratory exercises in solving exploration related problems.