

ENGINEERING GEOLOGY I

ENCE 102

Lecture : 2
Tutorial : 0
Practical : 1

Year : I
Part : I

Course Objectives:

The course will provide the basic knowledge of engineering geology to the civil engineering students. Students will be able to understand the fundamental of engineering geology and various natural process and their influence on the surface as well as sub-surface features, identification of rocks and their significance, enhance the knowledge of mountain building process and importance in the field of civil engineering.

- 1 Introduction to Engineering Geology (2 hours)**
 - 1.1 Introduction to geology, its branches, and their interrelationships
 - 1.2 Definition of engineering geology and its importance in civil engineering
 - 1.3 Importance of engineering geology in the context of Nepal

- 2 Structure of the Earth (3 hours)**
 - 2.1 Origin, and internal structure of earth
 - 2.2 Plate tectonics and mountain building process
 - 2.3 Geological time scale and evolution of life

- 3 Mineralogy and Petrology (7 hours)**
 - 3.1 Formation of minerals, crystal morphology, physical and chemical properties of minerals
 - 3.2 Rock forming minerals and their engineering significance
 - 3.3 Formation of rocks and their classifications
 - 3.4 Introduction, classification, structure, texture, uses, engineering significance and field identification criteria of igneous rock, sedimentary rock, and metamorphic rock

- 4 Structural Geology (8 hours)**
 - 4.1 Introduction of geological plane and its orientation (Dip, Strike, Plunge, and Trend)
 - 4.2 Study of different geological structures: Primary sedimentary structures (Bedding, lamination, cross-bedding, ripple marks, etc.) and secondary structures (Lineation, foliation, folds, joints, faults, and thrusts)
 - 4.3 Field identification criteria of the different geological structure with their importance in civil engineering

5 Physical Geology (6 hours)

- 5.1 Introduction, definition, different geological agents (River, groundwater, glacier, wind, and sea water)
- 5.2 Weathering and erosion, different geomorphological features produced by geological agents
- 5.3 Volcanism

6 Geology of the Himalaya (4 hours)

- 6.1 Evolution of the Himalayas
- 6.2 Tectonic sub-division of the Himalaya (Indo-Gangetic Plain, Siwalik, Lesser Himalaya, Higher Himalaya, Tibetan-Tethys Himalayan zone) and physiographic sub-division of the Himalaya
- 6.3 Major discontinuities systems and their engineering significance and engineering geological problems in the different tectonic sub-division of the Himalaya

Practical (15 hours)

1. Identification of common rock forming minerals (Quartz, Feldspar, Muscovite, Biotite, Chlorite, Calcite, Dolomite, Tourmaline, Pyrite, Talc, Fluorite, Apatite, Corundum, Diamond, Kyanite, Sillimanite, Garnet and clay minerals)
2. Identification of rocks: Shale, Limestone, Sandstone, Siltstone, Conglomerate, Slate, Phyllite, Schist, Gneiss, Quartzite, Marble, Granite, Rhyolite, Gabbro, Basalt, Amphibolite, Syenite)
3. Study of different geological structures in the block diagram
4. Study of maps: Topographic and geological maps, construction of geological cross-section and their interpretation

Field works (2 days)

A two-day fieldwork to provide practical on-site knowledge on preparation and interpretation of engineering geological mapping (Measurement of geological plane using geological compass, identification of minerals and rocks, geomorphology, and geological structures, etc.). Students submit report after the fieldwork (**Attendance in Fieldwork is Compulsory**).

Reference

1. Holmes, A. (1978). Principles of Physical Geology, ELBS English Language Society
2. Bell, F. G. (2006). Engineering Geology. 2nd Edition, Elsevier.
3. Krynine, D., Judd, W. R. (2005). Principles of Engineering Geology and Geotechnics. CBS Publishers.
4. Deoja, B., Dhital, M., Wagner, A., Thapa, K. B. (1991). Mountain Risk Engineering Handbooks I and II. ICIMOD.
5. Dhital, M.R. (2015), Geology of the Nepal Himalaya, Springer International Published, Switzerland

6. Price, D. (2009). Engineering Geology- Principles and Practice. (M. H. de Freitas, Ed.) Springer.
7. Hoek, E., and Brown, E.T. (2019). The Hoek-Brown failure criterion and GSI-2018 edition, *Journal of Rock Mechanics and Geotechnical Engineering*, 11, 445-463.
8. Vallejo, L.G.de., Ferrer, M. (2011). *Geological Engineering*. Routledge, Taylor and Francis Group.