# DEPARTMENT OF GEOLOGY
# SEMESTER – V
# BSC (H) Geology
# Category - I

**DISCIPLINE SPECIFIC CORE COURSE - DSC – 13:** Economic Geology (L3, P1)

## CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

| Course title & Code | Credits | Credit distribution of the course | | | Eligibility criteria | Pre-requisite of the course (if any) |
|---|---|---|---|---|---|---|
| | | Lecture | Tutorial | Practical/ Practice | | |
| **DSC – 13:** Economic Geology (L3, P1) | **4** | **3** | **0** | **1** | **12th pass with science** | **Studied Earth System Science and Equivalent** |

### Learning Objectives
This course on economic geology is provide basic knowledge and leaning to students to about morphology, structure, mineralogy, petrology and geochemistry of various ore deposits, and to help them to develop a basic idea and comprehension of different ore forming processes.

### Learning outcomes
After going through this course students will develop basic understanding and skill about the characteristics and distribution of mineral resources and the knowledge on different ore-bearing geological systems. They will learn about the different processes that are responsible for producing different types of ores corresponding to different tectonic settings. They will learn about the different major ore bodies that have been identified in different parts of the India.

### SYLLABUS OF DSC-7
**Theory (45 hours)**

**UNIT – I (9 hours)**
Detailed content
**Introduction to ore geology:** Economic and academic definitions/terminologies of ore geological components. Ore minerals and their uses. Morphology and style of ore mineralization. General textures and structures

**UNIT – II (9 hours)**
Detailed contents
**Basic principles of an ore deposit formation:** Geochemical behaviour of elements in ore geological systems. Concept of source-transporting agent-driving mechanism-trap

**UNIT – III (9 hours)**
Detailed contents
**Ore forming processes:** Magmatic ore forming processes. Hydrothermal ore forming processes. Sedimentary ore forming processes. Surficial and supergene ore forming processes

**UNIT – IV (9 hours))**
Detailed contents
**Basic mineral economics and policies:** Introduction to mineral economics related to metal an non-metallic commodities. Application of mineral economics to understand mineral commodity markets. An assessment of the mineral economics for the public and corporate policies.

**UNIT – V (9 hours)**
Detailed contents
Distribution of major metallic and non-metallic ore deposits in India

**Practical Component- (30 Hours)**
Identification of common ore minerals by physical and optical properties

**Essential/recommended readings**
Robb, L., 2020. Introduction to ore-forming processes. John Wiley & Sons.
Evans, A.M., 2009. Ore geology and industrial minerals: an introduction. John Wiley & Sons

**Suggestive readings**
Robb, L., 2020. Introduction to ore-forming processes. John Wiley & Sons.
Evans, A.M., 2009. Ore geology and industrial minerals: an introduction. John Wiley & Sons.
Bateman, A.M. and Jensen, M.L. 1990. Economic Mineral Deposits. John Wiley & Sons.
Misra, K., 2012. Understanding mineral deposits. Springer Science & Business Media.
Ramdohr, P., 2013. The ore minerals and their intergrowths. Elsevier.
Sarkar, S.C. and Gupta, A., 2012. Crustal evolution and metallogeny in India. Cambridge University Press.

**Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.**

## DISCIPLINE SPECIFIC CORE COURSE – DSC – 14: Engineering Geology ((L3, P1)

**Credit distribution, Eligibility and Prerequisites of the Course**

| Course title & Code | Credits | Credit distribution of the course | | | Eligibility criteria | Pre-requisite of the course (if any) |
|---|---|---|---|---|---|---|
| | | Lecture | Tutorial | Practical/ Practice | | |
| **DSC – 14:** Engineering Geology (L3, P1) | **4** | **3** | **0** | **1** | **12th pass with science** | **Studied Stratigraphy, Earth System Science or Equivalent** |

**Learning Objectives**

The main objective of this course is to provide a basic introduction on the role of geology in slope stability and civil engineering projects. It is aimed to provide various insights of topography, lithology and geological structures to ensure the stability and economy of engineering projects.

**Learning outcomes**

After going through this course, students will know the basic geological and geotechnical requirements for the site selection of engineering projects. They will be able to characterize the rock-mass strength of the site for various engineering projects and suggest the necessary support system. They will be able to identify the primary causative factors of the slope failure and suggest the preliminary mitigation measures. They will be able to investigate the various geological factors to assess environmental impacts of any engineering project.

**SYLLABUS OF DSC- 14**
**Theory (45 Hours)**

**UNIT – I (9 hours)**
Detailed contents
**Introduction to engineering geology**: Principles and scope of engineering geology: material, material fabrics and environmental factors. Geological and geotechnical investigations.

**UNIT – II (9 hours)**
Detailed contents
**Engineering properties of geological material:** Rock strength; Rock aggregates; Significance of rock as construction material; Rock mass: discontinuities, Rock mass classification; Soil: strength, standard penetration test and engineering bedrock.

**UNIT – III (9 hours)**
Detailed contents
**Engineering structures: dams, tunnels and roads:** Engineering structures: Dams, tunnels, road, their types, acting forces, ground conditions; tunnelling methods; geological considerations for site selection.

**UNIT – IV (9 hours)**
Detailed contents
**Slope failure and mitigation measures:** Concept of slope failure mechanism; Landslide types and causes, landslide mapping; Engineering treatment of slope and foundations: grouting, retaining walls, rock bolting and other support mechanisms.

**UNIT – V (9 hours)**
Detailed contents
**Site investigation and assessment for engineering structures:** Site investigation and characterization; Reconnaissance survey; Environment impact assessment (EIA); Detailed project report (DPR)

**Practical Component- (30 Hours)**
Merits, demerits & remedial measures based upon geological cross sections of project sites. Computation of Index properties of rocks and soil. Concept, significance and computation of Rock Mass Classification schemes like Rock Structure Rating (RSR), Rock Mass Rating (RMR)/ Tunnelling Quality Index (Q)/Rock Quality Designation (RQD).

**Essential/recommended readings**
Krynin, D.P. and Judd, W.R. (1957). Principles of Engineering Geology and Geotechnique, McGraw Hill (CBS Publ).
Gangopadhyay, S. (2013). Engineering geology. Oxford University Press.

**Suggestive readings** (if any)
Krynin, D.P. and Judd, W.R. (1957). Principles of Engineering Geology and Geotechnique, McGraw Hill (CBS Publ).
Gangopadhyay, S. (2013). Engineering geology. Oxford University Press.
Goodman, R.E. (1993). Engineering Geology: Rock in engineering constructions. Wiley& Sons, N.Y.
Waltham, T. (2009). Foundations of Engineering Geology (3rd Edn.) Taylor & Francis.
Bell, F.G. (2007). Engineering Geology, Butterworth-Heinema.
Anbalagan, R. Singh, B, Chakraborthy, D. and Kohli, A. (2007) "A filed Manual for Landslide investigations". DST, Government of India, New Delhi.
Duncan C. Wyllie and Christopher W. Mah. (2004). Rock Slope Engineering. CRC Press. London.
David George Price (2009). Engineering Geology: Principles and Practice. Springer-Verlag Berlin Heidelberg

## DISCIPLINE SPECIFIC CORE COURSE– DSC – 15: Geological Mapping (L2, P2)

### Credit distribution, Eligibility and Pre-requisites of the Course

| Course title & Code | Credits | Credit distribution of the course | | | Eligibility criteria | Pre-requisite of the course (if any) |
|---|---|---|---|---|---|---|
| | | Lecture | Tutorial | Practical/ Practice | | |
| **DSC – 15:** Geological Mapping (L2, P2) | **4** | **2** | **0** | **2** | **12th Pass with science** | **Studied Earth System Science, Structural Geology, and Mineralogy or Equivalent** |

**Learning Objectives**
This course on geological mapping to provide basic skills to carry out geological fieldwork in different terrains and prepare a geological map with all aspects related to lithology, structures, deformation patterns. Which is essential for basic understanding of geoscience and any detailed exploration activity.

**Learning Outcomes**
After going through this course, students will develop the following skills and knowledge about: How to identify a rock and broadly define its composition? How to identify and measure lithological and/or structural details of rocks at the outcrop/hand-specimen scale? How to plot the data on a base map/toposheet to create a lithological and/or structural map of the terrain? How to appreciate the possible origin of the rock and their genetic process. How to reconstruct the geological history of the terrain?

**SYLLABUS OF DSC-15**
**Theory (30 hours)**

**UNIT – I (6 hours)**
**Introduction to toposheets and maps:** Concepts of scale, contour density, numbering system. Global Positioning Systems, their types and uses. Choosing a suitable geological traverse.

**UNIT – II (6 hours)**
**Outcrop geology:** Pattern of beds in a undulating topography – rule of V. Identification of rock types, and their classification based on field criteria. Textural features of different rocks through field study and microscopy. Preparation of lithologs.

**UNIT – III (6 hours)**
**Basic concept of structural measurements:** Measurement of Strike, dip, trend, plunge, pitch etc. at the outcrop in the field. Distinguishing characters of planar and linear structures in the outcrop scale. Overprinting nature of folds/ metamorphic foliations etc.

**UNIT – IV (6 hours)**
**Folds:** Identification and structural measurement of a fold in the field. Geometric classification of a fold based on field data. Understanding the outcrop pattern of a fold in non-ideal sections

**UNIT – V (6 Hours)**
**Faults:** Distinguishing criteria of a fault in the field. Understanding the slip pattern of faults in an outcrop. Measuring the orientation of different planar and linear structures associated with a fault.

**Practical Component- (60 Hours)**

In the practical class, all the aforesaid techniques of measurement and identification will be demonstrated and practised in the field. The practical classes of this course will be conducted at a go through field visit (10 days) in a suitable geological terrain

**Essential/recommended readings**

Lahee F. H. (1962): Field Geology. McGraw Hill
Billings, M. P. (1987). Structural Geology, 4th edition, Prentice-Hall.
Lisle, R.J., Brabham, P., Branes, J. 2011. Basic Geological mapping, Wiley

**Suggestive readings**

Davis, G. R. (1984) Structural Geology of Rocks and Region. John Wiley
Park, R. G. (2004) Foundations of Structural Geology. Chapman & Hall.