**20CE2104 - ENGINEERING GEOLOGY**

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| **Course Category** | Professional Core | **Credits** | 3 |
| **Course Type** | Theory | **Lecture - Tutorial - Practical** | 3-0-0 |
| **Prerequisite** | None  | **Sessional Evaluation**  | 40 |
| **Semester End Exam. Evaluation** | 60 |
| **Total Marks** | 100 |

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| **Course Objectives** | 1. To describe the basic concepts of geology and mineralogy.
2. To identify and describe physical properties of various rock types through basic concepts of petrology.
3. To classify various landforms of the earth through the concepts of geomorphology.
4. To contrast the basic concepts of structural geology, different geological structures and core logging to estimate rock quality.
5. To understand the general geological hazards and their mitigation.
6. To apply the geological concepts for suitable site selection of major civil engineering structures.
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| **Course Outcomes** | CO1 | Relate the importance of geology in civil engineering and identify various minerals. |
| CO2 | Recognize various types of rocks and their properties. |
| CO3 | Classify surface geological process and landforms of earth surface. |
| CO4 | Identify various geological structures to rate the quality of rock mass. |
| CO5 | Summarize the different geological hazards. |
| CO6 | Apply the geological concepts for suitable site selection of major civil engineering structures. |
| **Course Content** | **UNIT - I****INTRODUCTION**: Branches of geology useful to Civil Engineering, Scope of geological studies in GSI and NIRM, Role of engineering geologist in planning, design and construction of civil engineering structural features.**MINERALOGY**: Definition, origin and physical properties of minerals and megascopic identification of common rock forming, economic and clay minerals.**UNIT - II****PETROLOGY AND PROPERTIES of roCks:** Definition, origin (Rock cycle), textures, structures and classification of igneous, sedimentary and metamorphic rocks; Physical identification of acidic igneous rocks –Granite, Rhyolite; Basic igneous rocks – Gabbro, Dolerite and Basalt; Physical identification of sedimentary rocks –Conglomerate, Breccia, Sandstone, Mudstone or Shale and Limestone; Physical identification of metamorphic rocks –Gneiss, Schist, Slate, Marble and Quartzite.**Properties of rocks**–Density, unit weight and porosity.**UNIT - III****PHYSICAL GEOLOGY:** Factors causing weathering, erosion and denudation; Soil as product of weathering and engineering consideration, its profile and types in India; Geomorphologic (landforms) features of various geological agents such as water falls, Gorges, River meanderings, Superficial deposits, alluvium, glacial deposits, laterite (engineering aspects), desert landforms, loess, residual deposits of clay with flints, solifluction deposits, mudflows, coastal deposits.**UNIT - IV****BASICS OF STRUCTURAL GEOLOGY:** Concept of rock deformation and plate tectonics; Geological Structural elements such as Dip and Strike; Fold- classification and nomenclature, Criteria for their recognition in the field. Faults - Classification, nomenclature and their recognition in the field; Types of joints and unconformities.**Strength index measurements of rocks**: Rock Mass Rating (RMR) and Rock Quality Designation (RQD), Core logging, Calculation of true thickness and vertical thickness of bed rock.**UNIT - V****GEOLOGICAL HAZARDS**:Rock instability and slope movement, Concept of sliding blocks, Different controlling factors, Instability in vertical rock structures and measures to prevent collapse, Types of landslides and their prevention.**Ground water:** Factors controlling water bearing capacity of rock – Pervious and impervious rocks and lowering of water table. **Earthquake:** Magnitude and intensity of an earthquake, Seismic zones in India and its Importance in civil engineering. **UNIT - VI****GEOLOGICAL INVESTIGATION FOR DAMS, RESERVOIRS AND TUNNELS:** Required geological consideration for selecting dam (geological profile from catchment area to dam site, topography, slope, drainage system.), reservoir and tunnel site; Failure of Reservoir; Favorable & unfavorable conditions in different types of rocks in presence of various structural features, precautions to be taken to counteract unsuitable conditions for dams, reservoirs and tunnels. Two case studies on failure of dams due to ignorance of geological aspects. |
| **Textbooks and Reference books** | **TEXTBOOKS:**1. ParbinSingh, *Engineering and General Geology*, S K Kataria& Sons, 2013.
2. P.C.Varghese, *Engineering Geology for Civil Engineers*, PHI Learning Private Ltd., 2012.
3. SubinoyGangopadhyay, Engineering *Geology*, Oxford University Press, 2013.

**REFERENCE BOOKS:**1. K.M.Bangar, *Principles of Engineering Geology*, Standard Publishers, 2020.
2. N. W. Gokhale, *A Manual of problems in structural geology*, CBS Publishers, 2018.
3. Dimitri P. Krynine and William R. Judd, *Principles of Engineering Geology and Geotechnics*, CBS Publishers and Distributers Private Ltd., 2018.
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**CO-PO Mapping:** 3-High Mapping, 2-Moderate Mapping, 1-Low Mapping, - -Not Mapping

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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 2 | 1 | - | - | - | - | 1 | - | - | - | - | 1 |
| **CO2** | 2 | - | - | - | - | - | 1 | - | - | - | - | 1 |
| **CO3** | 2 | - | - | - | - | 1 | - | - | - | - | - | - |
| **CO4** | 1 | 2 | - | - | - | - | 1 | - | - | - | - | 1 |
| **CO5** | 1 | - | - | 1 | - | 1 | 3 | - | - | - | - | 2 |
| **CO6** | 2 | - | - | 2 | - | - | - | 1 | 1 | - | - | 1 |