

## ENGINEERING GEOLOGY

<b>IV Semester: CE</b>								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACEB05	Core	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
<b>Contact Classes: 45</b>		<b>Tutorial Classes: 15</b>		<b>Practical Classes: Nil</b>			<b>Total Classes: 60</b>	
<p><b>COURSE OBJECTIVES:</b>  <b>Students will try to learn:</b></p> <p>I. Engineering properties of rock and unconsolidated materials in the characterization of geologic sites for construction projects.</p> <p>II. The collection of geological data and information required for the safe development of civil construction.</p> <p>III. The rock engineering concepts and approaches in the design and construction of underground openings.</p> <p><b>COURSE OUTCOMES:</b>            After successful completion of the course, students will be able to:</p> <p>CO 1 <b>Classify</b> rocks using basic geological systems <b>for selective construction material.</b></p> <p>CO 2 <b>Relate</b> the geologic concepts and approaches of rock <b>for engineering projects.</b></p> <p>CO 3 <b>Recall</b> the role of geology in the design and construction process <b>for underground openings in rock.</b></p> <p>CO 4 <b>Classify</b> the relationship between plate tectonics and production of rock terrains <b>for characterization of rocks.</b></p> <p>CO 5 <b>Interpret</b> the geologic literature to establish the geotechnical framework <b>for proper design of constructing civil engineering projects.</b></p> <p>CO 6 <b>Interpret</b> graphs and models used in structural geology <b>for demonstrating stress, strain and tectonics.</b></p> <p>CO 7 <b>Relate</b> the concepts of how minerals form and their uses <b>for identifying the rock forming.</b></p> <p>CO 8 <b>Compare</b> past tectonic settings of an area <b>for evaluation of current structures.</b></p> <p>CO 9 <b>List out</b> the design and construction procedures required <b>for controlling safety of rock behaviour in underground openings.</b></p>								
<b>MODULE-I</b>	<b>INTRODUCTION</b>						<b>Classes: 09</b>	
Branches of geology useful to civil engineering, scope of geological studies in various civil engineering projects. Department dealing with this subject in India and their scope of work- GSI, Granite Dimension Stone Cell, NIRM. Mineralogy-Mineral, Origin and composition. Physical properties of minerals, susceptibility of minerals to alteration, basic of optical mineralogy, SEM, XRD., Rock forming minerals, megascopic identification of common primary & secondary minerals.								

<b>MODULE -II</b>	<b>PETROLOGY</b>	<b>Classes: 09</b>
<p>Rock forming processes. Specific gravity of rocks. Ternary diagram. Igneous petrology- Volcanic Phenomenon and different materials ejected by volcanoes. Types of volcanic eruption. Concept of Hot spring and Geysers. Characteristics of different types of magma. Division of rock on the basis of depth of formation, and their characteristics. Chemical and Mineralogical Composition. Texture and its types. Various forms of rocks. IUGS Classification of phaneritic and volcanic rock. Field Classification chart. Structures. Classification of Igneous rocks on the basis of Chemical composition. Detailed study of Acidic Igneous rocks like Granite, Rhyolite or Tuff, Felsite, Pegmatite, Hornfels. Metamorphic Aureole, Kaolinization. Landform as Tors.</p> <p>Engineering aspect to granite. Basic Igneous rocks Like Gabbro, Dolerite and Basalt. Engineering aspect to Basalt. Sedimentary petrology- mode of formation, Mineralogical Composition. Texture and its types, Structures, Gradation of Clastic rocks. Classification of sedimentary rocks and their characteristics. Detailed study of Conglomerate, Breccia, Sandstone, Mudstone and Shale, Limestone Metamorphic petrology Agents and types of metamorphism, metamorphic grades, Mineralogical composition, structures &amp; textures in metamorphic rocks. Important Distinguishing features of rocks as Rock cleavage, Schistosity, Foliation. Classification. Detailed study of Gneiss, Schist, Slate with engineering consideration.</p>		
<b>MODULE -III</b>	<b>PHYSICAL GEOLOGY AND ROCK MECHANICS</b>	<b>Classes: 09</b>
<p>Weathering. Erosion and Denudation. Factors affecting weathering and product of weathering. Engineering consideration. Superficial deposits and its geotechnical importance: Water fall and Gorges, River meandering, Alluvium, Glacial deposits, Laterite (engineering aspects), Desert Landform, Loess, Residual deposits of Clay with flints.</p> <p>Solifluction deposits, mudflows, Coastal deposits. Sub surface investigations in rocks and engineering characteristics or rocks masses; Structural geology of rocks. Classification of rocks, Field &amp; laboratory tests on rocks, Stress deformation of rocks, Failure theories and shear strength of rocks, Bearing capacity of rocks.</p>		
<b>MODULE -IV</b>	<b>GEOLOGICAL HAZARDS</b>	<b>Classes: 09</b>
<p>Rock Instability and Slope movement: Concept of sliding blocks. Different controlling factors. Instability in vertical rock structures and measures to prevent collapse. Types of landslide. Prevention by surface drainage, slope reinforcement by Rock bolting and Rock anchoring, retaining wall, Slope treatment. Case study on black clay. Ground water: Factors controlling water bearing capacity of rock. Pervious &amp; impervious rocks and ground water. Lowering of water table and Subsidence. Earthquake: Magnitude and intensity of earthquake. Seismic sea waves. Revelation from Seismic Records of structure of earth. Case Study on Elevation and Subsidence in Himalayan region in India. Seismic Zone in India.</p>		
<b>MODULE -V</b>	<b>GEOLOGY OF DAM AND RESERVOIR SITE</b>	<b>Classes: 09</b>
<p>Required geological consideration for selecting dam and reservoir site. Failure of Reservoir. favorable &amp; unfavorable conditions in different types of rocks in presence of various structural features, precautions to be taken to counteract unsuitable conditions, significance of discontinuities on the dam site and treatment giving to such structures</p>		
<b>Text Books:</b>		
<ol style="list-style-type: none"> <li>1. Parbin Singh, "Engineering and General Geology, 8th Edition, 2010, S K Kataria &amp; Sons.</li> <li>2. Text Book of Engineering Geology, N. ChennaKesavulu, 2nd Edition 2009, Macmillan Publishers India</li> </ol>		
<b>Reference Books:</b>		
<ol style="list-style-type: none"> <li>1. J. C. Harvey, "Geology for Geotechnical Engineers", Cambridge University Press 1982.</li> </ol>		

**Web References:**

1. <http://ocw.mit.edu/courses/earth-atmospheric-and-planetary-sciences/12-001-introduction-to-geology-fall-2013/>
2. <http://nptel.ac.in/courses/105105106/>
3. <http://www.journals.elsevier.com/engineering-geology>
4. <http://www.springer.com/earth+sciences+and+geography/engineering+geology/journal/10706>
5. <http://www.springer.com/earth+sciences+and+geography/engineering+geology/journal/10064>
6. <http://www.sciencedirect.com/science/journal/00137952>

**E-Text Books:**

1. <http://cepdf.blogspot.in/2012/07/geology-for-civil-engineers-pdf-book.html>
2. <http://nptel.ac.in/courses/105105106/>
3. <https://www.studynama.com/community/threads/187-Engineering-Geology-Ebook-Lecture-Notes-PDF-download-for-Civil-Engineers>.
4. <http://www.civilenggforall.com/p/engineering-geology-list-of-books.html>