

ENGINEERING GEOLOGY

IV Semester: CE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACEB05	Core	L	T	P	C	CIA	SEE	Total
		3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil			Total Classes: 60			

COURSE OBJECTIVES:
The course should enable the students to:

- I. Discuss the process of formation of rocks, their classifications and properties of minerals.
- II. Identify different geological structures encountered in nature.
- III. Recognize different hazards such as earthquakes, landslides etc causes and their effects
- IV. Explain the importance of geophysical and geological studies of sites for tunnels, dams and Reservoirs.

COURSE OUTCOMES (COs):

CO 1: Understand the role of geology in the design and construction process of underground openings in rock.

CO 2: Be able to apply geologic concepts and approaches on rock engineering projects.

CO 3: Be able to identify and classify rock using basic geologic classification systems.

CO 4: Be able to use the geologic literature to establish the geotechnical framework needed to properly design and construct heavy civil works rock projects.

CO 5: Have knowledge of design and construction procedures required to safely control rock behavior in underground openings.

COURSE LEARNING OUTCOMES (CLOs):

1. Know the importance of geology in civil engineering.
2. Distinguish weathered rocks from fresh rocks.
3. Understand the effects of weathering on dams, reservoirs and tunnels.
4. Understand the case histories of failure of some Civil Engineering constructions due to geological draw backs. Identify the minerals based on their physical properties.
5. Identify and classify common minerals, rocks and soils, and understand their significance to different types of engineering projects.
6. Identify and classify rock using basic geologic classification systems.
7. Study the minerals by their physical properties, chemical composition, optical properties and X-ray properties.
8. Study the rocks by their physical properties, chemical composition, optical properties and X-ray properties.
9. Understand the geological classification of rocks into Igneous, Sedimentary and Metamorphic rocks, their identification based on structure and texture.
10. Identify the major types of rock-forming minerals and rock under both field and laboratory conditions.
11. Understand the importance of various associated geological structures like folds, faults, joints and unconformities present at site for foundations.
12. Identify subsurface information and groundwater potential sites through geophysical investigations.
13. Remember prediction of hazards and disasters.
14. Posses the Knowledge and Skills for employability and to succeed in national and international level competitive examinations.

15. Understand to select a suitable site for dams and reservoirs to avoid seepage, silting and Tilting.
16. Understand internal geological processes (e.g. faults, earthquakes, volcanoes) and how they affect Engineering studies.
17. Locate various subsurface mines and rock bodies by applying geophysical investigations.
18. Gravity methods, magnetic methods, Electrical methods, seismic methods, radio metric methods and geothermal methods
19. Understanding of impact of engineering solutions on the society and also will be aware of Contemporary issues.
20. Apply geological principles for mitigation of natural hazards and select sites for dams and tunnels.
21. Posses the Knowledge and Skills for employability and to succeed in national and international level competitive examinations.
22. Determination of shear strength of soil using direct shear test and tri-axial test in various drainage conditions.
23. Recognize the behavior of soil in normal, over and under consolidated soil. Understand the concept of dilatancy in sandy soil.

MODULE-I	WEATHERING OF ROCKS	Classes: 09
Introduction: Importance of geology from civil engineering point of view. Brief study of case histories of failures of some civil engineering constructions due to geological draw backs. Importance of physical geology, petrology and structural geology. Weathering of rocks: Its effect over the properties of rocks importance of weathering with reference to dams, reservoirs and tunnels weathering of common rock like granite.		
MODULE-II	MINERALOGY AND PETROLOGY	Classes: 09
Mineralogy: Definition of mineral, importance of study of minerals, different methods of study of minerals. Advantages of study of minerals by physical properties. Role of study of physical properties of minerals in the identification of minerals. Study of physical properties of following common rock forming minerals: Feldsper, Quartz, Flint, Jasper, Olivine, Augite, Hornblende, Muscovite, Biotite, Asbestos, Chlorite, Kyanite, Garnet, Talc, Calcite. Study of other common economics minerals such as Pyrite, Hematite, Magnetite, Chlorite, Galena, Pyrolusite, Graphite, Magnesite, and Bauxite. Petrology: Definition of rock, geological classification of rocks into igneous, sedimentary and metamorphic. Dykes and Sills, common structures and textures of igneous, sedimentary and metamorphic rocks. Megascopic study of Granite, Dolerite, Basalt, Pegmatite, Laterite, Conglomerate, Sand Stone, Shale, Limestone, Gneiss, Schist, Quartzite, Marble and Slate. Rock excavation, stone aggregates.		
MODULE-III	STRUCTURAL GEOLOGY	Classes: 09
Indian stratigraphy, palaeontology and geological time scale, out crop, strike and dip study of common geological structures associating with the rocks such as fold, faults unconformities, and joint types. Ground water: Water table, common types of ground water movement, ground water exploration. Earth quakes, their causes and effects, shield hazards, water in landslides their causes and effects, measures to be taken to prevent their occurrence. Importance of study of ground water, earthquake and landslides.		
MODULE-IV	GEOLOGY OF DAMS AND RESERVOIRS	Classes: 09
Types of dams and bearing of geology of site in their selection, geological considerations in the selection of a dam site. Factors contributing to the success of a reservoir, geological factors influencing water tightness and life of reservoirs, geo hazards, ground subsidence. Geophysical studies: Importance of geophysical studies principles of geophysical study by gravity methods, magnetic methods, electrical methods, seismic methods, radio metric methods and geothermal method. Special importance of electrical resistivity methods and seismic refraction Methods. Improvement of competence of sites by grouting etc. Fundamental aspects of rock mechanics and environmental geology.		
MODULE-V	TUNNELS	Classes: 09
Purpose of tunnelling, effects of tunnelling on the ground, role of geological considerations in tunneling over break and lining in tunnels, tunnels in rock, subsidence over old mines, mining substances.		

Text Books:

1. N. Chennakesavulu, "Engineering Geology", Mc Milan India Private Limited, New Delhi, India,
2. Venkat Reddy, "Engineering Geology", Vikas Publications, New Delhi, India, 2nd Edition, 2011.
3. Vasudev Kanithi, "Engineering Geology", University Press, 1st Edition, 2013.
4. Gokhale, "Principles of Engineering Geology", BS Publications, 2009.

Reference Books:

1. F.G. Bell, "Fundamentals of Engineering Geology", Butterworth's Publications, 3rd Edition, New Delhi, 1992.
2. K. V. G. K. Gokhale, "Principles of Engineering Geology", BS Publications, New Delhi, India, 5th Edition, 5th Edition, 2008.

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-NotesPDF-download-for-Civil-Engineers>
4. <http://www.civilenggforall.com/p/engineering-geology-list-of-books.html>