

CET202	Engineering Geology	Category	L	T	P	Credits	Year of Introduction
		PCC	3	0	1		

**Preamble:** Goal of this course is to introduce to the students the basics of earth processes, materials, groundwater and the geological characteristics of such processes and materials which are relevant to the Civil Engineering applications.

**Prerequisites:** Nil

**Course Outcomes:** After completion of the course the student will be able to:

CO1	Recall the fundamental concepts of surface processes, subsurface process, minerals, rocks, groundwater and geological factors in civil engineering constructions.
CO2	Identify and describe the surface processes, subsurface process, earth materials, groundwater and geological factors in civil engineering constructions.
CO3	Apply the basic concepts of surface and subsurface processes, minerals, rocks, groundwater and geological characteristics in civil engineering constructions.
CO4	Analyze and classify geological processes, earth materials and groundwater.
CO5	Evaluation of geological factors in civil engineering constructions.

**Mapping of course outcomes with program outcomes (Minimum requirement)**

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

**Assessment pattern**

Bloom's Category	Continuous Assessment Tests		End Semester Examination (Marks)
	Test1 (Marks)	Test2 (Marks)	
Remember	9 (3 marks for each question in which one question from third module)	6	15
Understand	6	9 (3 marks for each question in which one question from third module)	15
Apply	14 + 14 + 7 (Question for 7 marks is from third module)	14 + 14 + 7 (Question for 7 marks is from third module)	70
Analyse			
Evaluate			

**Mark distribution**

Total Marks	CIE marks	ESE marks	Test 1&2 Duration	ESE Duration
150	50	100	1.5 hours	3 hours

**Continuous Internal Evaluation Pattern:**

Attendance: 10 marks

Continuous Assessment Test (2 numbers): 25 marks

Assignment/Quiz/Course project: 15 marks

**End Semester Examination Pattern:**

There will be two parts; Part A and Part B. Part A contains 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 14 marks.

**Course Level Assessment Questions:****Part A**

Course Outcome 1 (CO1): (One question from each module to meet the course objective 1: To recall the fundamental concepts of surface processes, subsurface process, minerals, rocks, groundwater and geological factors in civil engineering constructions).

**1. Define weathering of rocks**

Course Outcome 2 (CO2) (One question from each module to meet the course objective 2: To identify and describe the surface processes, subsurface process, earth materials, groundwater and geological factors in civil engineering constructions.)

**1. Explain the classification of soil****Part B**

All the questions under this section shall assess the learning levels corresponding to the course outcomes 3, 4 and 5.

1. a) Classify weathering and discuss the engineering classification of weathered rock masses (7 marks)
- b) Write your comments on the relevance of geology in civil engineering constructions (7 marks)

**Model Question Paper**

QPCODE:

RegNo.: \_\_\_\_\_

Name: \_\_\_\_\_

**PJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY FIRST SEMESTER  
B.TECH DEGREE EXAMINATION, MONTH & YEAR**

CourseCode:CET202

**ENGINEERING GEOLOGY**

Max.Marks:100

Duration:3hours

**Part A**

(Answer all questions; each question carries 3 marks)

1. Define weathering of rocks
2. Explain soil erosion and classification of soils
3. Describe earthquakes and write notes on seismograph and seismogram
4. Illustrate the elastic rebound theory with a diagram
5. Define Ghyben-Herzberg relation in seawater intrusion
6. Explain Darcy's Law with a neat diagram
7. Write down the physical properties and chemical composition of given minerals
  - a. Calcite
  - b. Gypsum
8. Describe the different types of igneous rocks based on their origin
9. Illustrate the major parts of the fold with a neat diagram
10. Distinguish between clinometer compass and Brunton compass

**PART B**

(Answer one full question from each module, each question carries 14 marks)

**Module -1**

11. a) Discuss the relevance of geology in civil engineering constructions (7 marks)  
b) Give an account on classification of weathering with suitable diagrams and examples (7 marks)
12. Describe the geological work of rivers. Discuss different landform features produced by weathering and river action with suitable diagrams. (14 marks)

**Module-2**

13. Comment on the relation of earthquakes with plate tectonics. Give an account on different plates with earthquake prone area (14 marks)

14. Discuss the various types of seismic waves and their relevance in the study of internal structure of earth. (14marks)

Module-3

15. Discuss the vertical distribution of groundwater. Give an account of the water bearing properties of rocks and hydrological cycle with neat diagrams. (14marks)
16. a) Elucidate application of electrical resistivity survey in ground water exploration. (8 marks)
- b) Give a brief account on different groundwater recharge methods (6marks)

Module-4

17. Distinguish between metamorphic and sedimentary rocks with respect to their structure with diagrams (14marks)
18. a) Elucidate various physical properties of minerals for their identification. (9marks)
- b) Give an account on hardness of minerals with Moh's hardness scale (5 marks)

Module -5

19. a) Enumerate the geological factors to be considered for selecting a dam site (9 marks)
- b) Discuss the geological conditions suitable and unsuitable for construction of tunnels (5marks)
20. Distinguish between folds and faults. Give an account on classification of folds with neat diagrams (14 marks)

## ENGINEERING GEOLOGY

## Syllabus

Module	Contents	Hours
Module 1 External Earth Processes	Relevance of Geology in Civil Engineering, <b>Surface Processes of the earth-</b> a) Weathering of rocks-Types of weathering, Processes of Origin of Products of weathering like sand, clay, laterite and soil, soil profile, Soil erosion and soil conservation measures. Engineering significance of weathering. b) Geological processes by rivers. c) Landslides-types, causes and controlling measures, Coastal Processes-Geological work by waves and currents and coastal protection measures	9
Module 2 Internal Earth Processes	<b>Internal Processes of the earth-</b> a) Earthquakes- Plate Tectonics, Origin of earthquakes, Seismic waves, Rating of earthquakes, types of earthquakes, Seismic zones of India. <b>Basics of seismic safety factor, Interior of the earth as revealed by propagation of seismic waves.</b>	9
Module 3 Groundwater	<b>Hydrogeology-</b> Occurrence of groundwater, aquifers and types of aquifers, confining beds, porosity and vertical distribution of groundwater. Darcy's Law. Permeability/hydraulic conductivity. Problems created by groundwater to civil engineering structures, <b>Methods to control groundwater problems, Electrical resistivity survey for groundwater exploration. Seawater intrusion in Coastal area. Ghyben Herzberg relation.</b>	9
Module 4 Earth Materials	<b>Mineralogy-</b> Physical properties of minerals, physical properties and chemical composition of minerals like quartz, orthoclase, plagioclase, biotite, muscovite, hornblende, augite, hypersthene, calcite, gypsum. <b>Petrology-</b> Igneous, sedimentary and metamorphic rocks, Igneous rocks-Chemical and mineralogical classification and structure. Sedimentary rocks-types based on mode of formation and structures. Metamorphic rocks-structures only. Megascopic study of granite, dolerite, basalt, sandstone, limestone, shale, gneiss, marble and charnockite. Rock types of Kerala. Rock cycle	9
Module 5 Secondary Structures of Rocks	<b>Structural Geology-</b> Attitude of rocks – Dip and Strike. Terminology, brief classification and engineering significance of folds, faults and joints. Geological part of site investigation for the construction of dams, reservoirs and tunnels. Toposheet. Structural mapping. Clinometer compass and Brunton compass.	9

## Textbooks

1. Duggal S.K, Pandey H.K and Rawat N (2014) Engineering Geology, Mcgraw Hill Education New Delhi
2. Gokhale KVGK (2015) Principles of Engineering Geology, BS Publications, Hyderabad

3. Singh P (2014) Engineering and General Geology, SK Kataria and sons, New Delhi
4. Subinoy Gangopadhyay (2017) Engineering Geology, Oxford University

**References**

1. David K Todd & Larry W Mays (2011) Groundwater Hydrogeology, Wiley India Pvt Ltd.
2. Gokhale N.W. (2015) Manual of Geological Maps, CBS Publishers, New Delhi
3. Gribble CD (2005) Rutleys Elements of Mineralogy, Springer
4. Marland P Billings (2016), Structural Geology, Pearson Education

**Course Contents and Lecture Schedule:**

Module	Topic	No. of hours
<b>Module 1</b>	Weathering of rocks - Types of weathering, Processes of Origin of Products of weathering like sand, clay, laterite and soil	3
	Soil profile, Soil erosion and soil conservation measures. Engineering significance of weathering.	2
	Geological processes by rivers. Landslides - types, causes and controlling measures	2
	Coastal Processes - Geological work by waves and currents and coastal protection measures	2
<b>Module 2</b>	Earthquakes - Plate Tectonics, Origin of earthquakes, Seismic waves, Rating of earthquakes, types of earthquakes	4
	Seismic zones of India. Basics of seismic safety factor	2
	Interior of the earth as revealed by propagation of seismic waves.	3
<b>Module 3</b>	Occurrence of groundwater, aquifers and types of aquifers, confining beds, porosity and vertical distribution of groundwater.	2
	Darcy's Law. Permeability/hydraulic conductivity. Problems created by groundwater to civil engineering structures	3
	Methods to control groundwater problems	1
	Electrical resistivity survey for groundwater exploration.	2
	Seawater intrusion in Coastal area. Ghyben-Herzberg relation.	1
<b>Module 4</b>	Physical properties of minerals, physical properties and chemical composition of minerals like quartz, orthoclase, plagioclase, biotite, muscovite, hornblende, augite, hypersthene, calcite, gypsum	4

	Igneous, sedimentary and metamorphic rocks, Igneous rocks-Chemical and mineralogical classification and structure. Sedimentary rocks-types based on mode of formation and structures Metamorphic rocks-structures only. Megascopic study of granite, dolerite, basalt, sandstone, limestone, shale, gneiss, marble and charnockite. Rock types of Kerala. Rock cycle	5
<b>Module5</b>	Attitude of rocks–Dip and Strike. Terminology	1
	Brief classification and engineering significance of folds, faults and joints	3
	Geological part of site investigation for the construction of dams, reservoirs and tunnels	3
	Toposheet, Structural mapping. Clinometer compass and Brunton compass	2

