INSTITUTE	**FACULTY OF TECHNOLOGY**
PROGRAM	**BACHELOR OF TECHNOLOGY (CIVIL ENGINEERING)**
SEMESTER	**4**
COURSE TITLE	**BASICS OF GEOLOGY & GEOTECHNICAL ENGINEERING**
COURSE CODE	**01CI2403**
COURSE CREDITS	**4**

Objective:

1. Understand the branches, scope, and applications of geology in civil engineering, including landforms, Earth's structure, and seismic events.
2. Learn mineralogy, petrology, and structural geology, focusing on rock properties, classification, and geological structures like faults and folds.
3. Introduce geotechnical engineering concepts, soil formation, classification, and properties, including the three-phase diagram, for construction-related decisions.

Course Outcomes: After completion of this course, student will be able to:

1. Apply geological principles to civil engineering problems by analyzing surface processes, Earth's internal structure, and plate tectonic activity to assess their impacts on construction, site stability, and material selection
2. Analyze the relationships between mineralogy, petrology, and structural geology by examining rock properties, classification systems, and geological structures to assess their influence on geological formations and engineering applications.
3. Analyze geotechnical engineering concepts, soil formation, and index properties, using the three-phase diagram to evaluate soil behavior.
4. Analyze soil classification, structure, and water relationships, applying the Indian Standard Soil Classification System to assess soil behavior

Pre-requisite of course: None

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	2	50	30	20	25	25

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Contents : Unit	Topics	Contact Hours
1	**Physical Geology** Branches & Scope of Geology – Introduction and applications in civil engineering., Surface Processes & Landforms – Weathering, erosion, geological cycle, and actions of agents (river, wind, ocean, glacier, groundwater)., Interior of the Earth – Structure and composition of crust, mantle, and core., Plate Tectonics – Plate movement, types of boundaries, continental drift, seafloor spreading, and associated landforms., Earthquake – Causes, types of seismic waves, measurement of waves and magnitudes, and effects on structures	7
2	**Mineralogy and Petrology** Physical properties of minerals, major rock-forming minerals, occurrence and use of minerals, Introduction to major rock types (igneous, sedimentary and metamorphic rocks) Their genesis, classification and structures, Engineering properties of rocks, advantages, and disadvantages of different rock types at constructions sites	7
3	**Structural Geology** Introduction to primary and secondary geological structures. , Study of geological faults, folds, joints and active faulting. Their origin, types and engineering consideration., Geological mapping: study of Strike and dip using models.	6
4	**Introduction to Geotechnical Engineering & It's Properties** Definition, brief history, the scope of geotechnical engineering, Soil formation and its agencies, soil types based on its formation , Three Phase diagram of soil, Basic terms and definitions, Functional relationships, Determination of index properties	11
5	**Soil Classification** Objectives, Basis of soil classification:1) by size Particle Size Distribution in soil by sieve analysis (Particle size distribution curve and its uses.) and sedimentation. 2) by Plasticity characteristics: consistency limits (liquid, plastic and shrinkage limits and various indices) Activity, Sensitivity & Thixotropy of soil., Brief of Textural Soil Classification, Indian Standard Soil Classification System, Field identification and General characteristics of the soil.	8
6	**Soil Structure & Soil Water** Shape of the particles, Texture and structure of the soil, Types of the structure, properties, conditions for the formation of different structures., Free water and held water, Structural water and absorbed water, Capillary	3
Total Hours		**42**

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Experiment-1** Classification of the Soil based on visual observation	2

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Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
2	**Experiment-2** Specific Gravity of soil	2
3	**Experiment-3** Dry Sieve Analysis	2
4	**Experiment-4** Liquid and Plastic Limit	2
5	**Experiment-5** Shrinkage Limit of soil test	4
6	**Experiment-6** In-situ Density-Core Cutter	2
7	**Experiment-7** In-situ Density of soil - Sand replacement	2
8	**Experiment-8** Hydrometer test for fine grain soil classification	4
9	**Experiment-9** Classification of the rocks based on visual observation	2
10	**Experiment-10** Locating strike and dip of the rock	2
11	**Experiment-11** Compressive strength of rock specimen	2
12	**Experiment-12** Study of physical properties of major rock forming minerals.	2
Total Hours		**28**

Textbook :

1 Engineering and General Geology , Parbin Singh, S. K. Kataria& Sons , 2010

References:

1 Structural Geology of Rocks and Regions , Structural Geology of Rocks and Regions , G. H. Davis, Stephen J. Reynolds and Charles F. Kluth, Wiley, 2012

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking / Creative**
5.00	5.00	40.00	40.00	10.00	0.00

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Instructional Method:

1. Prerequisite of the course and its pattern shall be discussed on the commencement of the course
2. Lectures shall be conducted in class room using various teaching aids.
3. Presence in all academic sessions is mandatory which shall carry 5% marks of the total internal evaluation.
4. At the end of each unit/topic an assignment based on the course content shall be given to the students which shall carry 5% weightage for timely completion and submission of the assigned work.
5. The laboratory experiments are planned in such a way that it covers the practical aspects of the course contents. The performance of these experiments shall bring the clarity of the theoretical concepts which the students have studied during the academic sessions.

Supplementary Resources:

1. https://onlinecourses.nptel.ac.in/noc20_ce25/preview

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