



# Engineering Geology

SWAYAM Prabha Course Code – C22

<b>PROFESSOR'S NAME</b>	Dr. Debasis Roy
<b>DEPARTMENT</b>	Civil Department
<b>INSTITUTE</b>	Indian Institute of Technology, Kharagpur
<b>Course Outline</b>	<p><b>Introduction</b> (1 lecture) Origin and development</p> <p><b>Geologic Mapping and Remote Sensing</b> Topographic maps, geologic maps, preparation of geologic sections, aerial photographs, LIDAR, SAR, GIS (3 lectures + 1 laboratory)</p> <p><b>Mineralogy</b> (3 lectures) Chemical analysis of rocks and minerals, rock and soil minerals, physical properties of minerals, susceptibility of minerals to alteration, basics of optical mineralogy, SEM, XRD</p> <p><b>Classification of Soil and Rock</b> (2 lectures + 1 laboratory) Types of rock and origin: Igneous (extrusive and intrusive), sedimentary and metamorphic, ternary diagrams, definitions (structure, texture)</p> <p><b>Igneous Rock</b> (1 lecture) Agents, structure, texture, IUGG classification of intrusive and extrusive rocks</p> <p><b>Metamorphic Rock</b> (1 lecture) Causes of metamorphism (stress, temperature, tectonism, pore fluid), recrystallization, phase change, structure and texture</p> <p><b>Sedimentary Rock</b> (1 lecture) Sedimentation environments, structure, textural classification of siliclastic and carbonate rock</p> <p><b>Soil Formation</b> (2 lectures) Weathering processes, transportation and sedimentation processes, structure, texture and classification, surficial deposits and landforms</p> <p><b>Subsurface exploration</b> (3 lectures)</p>

Intrusive and non intrusive sub-surface investigation, drilling and sampling, geophysical methods, geologic investigations for site selection of dams, reservoirs, tunnels, bridges and highways

**Engineering Properties of Soil and Rock** (2 lectures + 1 laboratory)

Engineering properties (density, unit weight, porosity), strength, index measurements for soil and rock (SPT blow count, RQD, RMR, Point Load Index), relationships of index measurements with strength of soil and rock.

**Strength Behavior of Soil and Rock** (5 lectures)

Stress and strain in rock, Mohr’s Circle, concept of effective stress, failure of soil and rock, fracturing of rock, folds, faults and joints in rock, shear failure of soil and rock, consequences of failure (landslides, earthquakes, subsidence)

**Subsurface water** (5 lectures)

Sources, aquifer, aquiclude, water table, Artesian groundwater in soil and rock, springs, hydraulic conductivity and its measurement, Darcy’s law, well hydraulics, well yield, water capacity of rock, lowering of water table and subsidence, salt water intrusion in coastal areas

**Geologic and seismotectonic setting of India** (3 lectures)

Geologic provinces of India and their surficial and subsurface geology, seismotectonics of the Indian plate, seismic zones of India

**Geological Hazards** (5 lectures)

Major geological hazards Geological considerations in design of constructed facilities and infrastructure, causes and classification of landslides, stability assessment for soil and rock slopes, mitigation of landslide hazard, effect of earthquakes on constructed facilities and infrastructure, geotechnical and structural considerations in mitigation of earthquake hazard

**COURSE DETAILS**

S. No	Module ID/ Lecture ID	Lecture Title/Topic
1	L1	Introduction to Engineering Geology
2	L2	Geologic Structures
3	L3	Geologic Maps and Stratigraphic Sections
4	L4	Remote Sensing in Engineering Geology

5	L5	Physical Properties of Minerals
6	L6	Crystallography and Optical Properties
7	L7	Chemical Characteristics of Minerals
8	L8	Origin And Types of Rocks
9	L9	Origin And Types of Soils
10	L10	Igneous Rocks
11	L11	Metamorphic Rocks
12	L12	Weathering
13	L13	Weathering
14	L14	Sediment Transport and Deposition
15	L15	Introduction to Subsurface Exploration
16	L16	Introduction to Subsurface Exploration
17	L17	Sampling and Non - Intrusive Methods
18	L18	Index Properties and Classification of Soils
19	L19	Index Properties of Rock and Rock Mass
20	L20	Stress-Strain Behavior of Soil and Rock
21	L21	Stress-Strain Behavior of Soil and Rock - II
22	L22	In-situ State of Stress
23	L23	Geologic Considerations in Tunneling
24	L24	Geologic Considerations in Dam Construction
25	L25	Groundwater - Preliminaries
26	L26	Groundwater Flow
27	L27	Groundwater Flow - II

28	L28	Groundwater Related Engineering Issues
29	L29	Groundwater Over Utilization
30	L30	Plate Tectonics
31	L31	Plate Tectonics - 2 and Earthquake
32	L32	Earthquake Hazard Assessment
33	L33	Geologic Hazards - Seismicity and Volcanism
34	L34	Geologic Hazards - Shoreline Processes
35	L35	Geologic Hazards - Shoreline Processes
36	L36	Geologic Hazards - Landslide Hazards - Zoning
37	L37	Geologic Hazards Subsidence , Collapsible Soils
38	L38	Preparation of Geologic Sections
39	L39	Index testing of soil & rocks
40	L40	Identification of minerals and rock samples

**References if Any:**