

**B. Tech. Civil Engineering**

Course code: Course Title	Course Structure			Pre-Requisite
<b>CE313: Rock Engineering</b>	L	T	P	CE: 206 Soil Mechanics
	3	0	2	

**Course objective:**

- To introduce and explain fundamentals of Rock Mechanics, which is used in the applications of Foundation engineering, tunnel engineering, stability of slopes, anchoring and soil nailing, etc.
- To give fundamental knowledge of Rock, its properties and behaviour under various conditions of internal and external load and stresses.
- To develop understanding about Griffith's theory, Coulomb's theory, Deformation characteristics of rock, bearing capacity and stability.
- To imbibe basic laws and equations used for the analysis of rocks.
- To inculcate the importance of rock mechanics and its applications in Industries.
- To Analyse and design different types of tunnels.
- To determine the suitability of the construction method for particular conditions.

S. No	Course Outcomes (CO)
<b>CO1</b>	Identify & classify rock and use this classification for design.
<b>CO2</b>	Collects the sample and tests it to find its different properties.
<b>CO3</b>	Analyse stresses developed due to the opening in the rock mass and the excavations of tunnels .
<b>CO4</b>	Analyse and design the foundation on rock and slope stability.
<b>CO5</b>	Suitability of the construction method for particular conditions.

S. No	Contents	Contact Hours
<b>UNIT 1</b>	Introduction, Classification and index properties of rock, Stress in rock mechanics and rock engineering, stress component and stress matrix, principal stress, in situ stress, method of stress Determination, Strain, strain tensor.	8
<b>UNIT 2</b>	Rock strength and failure criteria, laboratory testing of rocks, Griffith's theory, Coulomb's theory, in-situ tests on rock mass; deformation characteristics, mechanical, thermal and electrical properties of rock mass.	8

<b>UNIT 3</b>	Rock exploration, site investigation, preliminary, detailed and geophysical investigation, exploratory drilling methods and their utility, Exploration planning, Foundation on rocks, bearing capacity of intact and jointed rocks; general consideration for design of foundation, treatment of rock defects.	8
<b>UNIT 4</b>	Openings in rock mass and stresses around openings; pressure tunnels, development of plastic zone; rock support needed to avoid plastic deformation; lined and unlined tunnels; support pressure and slip of the joint; underground excavation and subsidence	8
<b>UNIT 5</b>	Rock slopes; Types of rock slope failure, rock slope analysis-conventional and numerical method, rock slope stabilisation, rock bolt and anchors, methods of construction; problems associated with tunnels, tunnelling in various subsoil conditions and rocks.	10
	<b>Total</b>	<b>42</b>

<b>REFERENCES</b>		
<b>S. No.</b>	<b>Name of Books/Authors/Publishers</b>	<b>Year of Publication / Reprint</b>
<b>1</b>	Design and Construction of Tunnels by Pietro Lunardi, Pub: Springer.	2008
<b>2</b>	Engineering Rock Mechanics: An Introduction to the Principles by Hudson and Harrison, Pub: Pergamon.	2000
<b>3</b>	Rock Mechanics Design in Mining and Tunnelling, by Z.T. Bieniawski, Pub: A.A. Balkema.	1984
<b>4</b>	Engineering in Rocks for Slopes, Foundations and Tunnels by T Ramamurthy (ISBN 0-07-0768249-5).	2014
<b>5</b>	Engineering Rock Mass Classification by Z.T. Bieniawski (ISBN 3-78-070891-8).	1989
<b>6</b>	Introduction to Rock Mechanics by R.E. Goodman (ISBN 0-07-754621-7).	1988