

B. Tech. Civil Engineering

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

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)
CO1	Identify & classify rock and use this classification for design.
CO2	Collects the sample and tests it to find its different properties.
CO3	Analyse stresses developed due to the opening in the rock mass and the excavations of tunnels .
CO4	Analyse and design the foundation on rock and slope stability.
CO5	Suitability of the construction method for particular conditions.

S. No	Contents	Contact Hours
UNIT 1	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
UNIT 2	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

UNIT 3	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
UNIT 4	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
UNIT 5	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
	Total	42

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