22CEPE25	ROCK MECHANICS AND APPLICATIONS		Semester		VII
PREREQUISITES		Category	PE	Credit	3
Engineering Geology, Mechanics of Soil, Foundation Engineering		Hours/Week	L	T	P	TH
			3	0	0	3

Course Learning Objectives

1	To provide the knowledge about the index properties of Rocks and its classification
2	To gain the knowledge of failure criteria of Rocks
3	To understand the influence of in situ stress in the stability of various structures
4	To provide various technique in improving the in situ strength of rocks
5	To develop a strong knowledge about the various technique to improve the in situ strength of rocks

Unit I	CLASSIFICATION OF ROCKS	9	0	0	9

Types of Rocks – Index properties and classification of rock masses, competent and incompetent rock – value of RMR and ratings in field estimations.

Unit II	STRENGTH CRITERIA OF ROCKS	9	0	0	9

Behaviour of rock under hydrostatic compression and deviatoric loading – Modes of rock failure – planes of weakness and joint characteristics – joint testing, Mohr – Coulomb failure criterion and tension cut-off. Hoek and Brown Strength criteria for rocks with discontinuity sets.

Unit III	IN SITU STRESSES IN ROCKS	9	0	0	9

In Situ stresses and their measurements, Hydraulic fracturing, flat jack, over coring and under coring methods – stress around underground excavations – Design aspects of openings in rocks – case studies.

Unit IV	SLOPE STABILITY AND BEARING CAPACITY OF ROCKS	9	0	0	9

Rock slopes – role of discontinuities in slope failure, slope analysis and factor of safety – remedial measures for critical slopes – Bearing capacity of foundations on rocks – case studies- Tunneling

Unit V	ROCK REINFORCEMENT	9	0	0	9

Reinforcement of fractured and joined rocks – shotcreting, bolting, anchoring, installation methods – case studies-

Total= 45 Periods

Text Books:	
1	Goodman, R.E., Introduction to rock mechanics, John Willey and Sons, 1989.
2	Hudson, A. and Harrison, P., Engineering Rock mechanics – An introduction to the principles, Pergamon publications, 1997.
Reference Books:	
1	Hoek, E and Bray, J., Rock slope Engineering, Institute of Mining and Metallurgy, U.K. 1981.
2	Hoek, E and Brown, E.T., Underground Excavations in Rock, Institute of Mining and Metallurgy, U.K. 1981.
3	Obvert, L. and Duvall, W., Rock Mechanics and the Design of Structures in Rock, John Wiley, 1967.
4	Bazant, Z.P., Mechanics of Geomaterials Rocks, Concrete and Soil, John Wiley and Sons, Chichester, 1985.
5	Wittke, W., Rock Mechanics. Theory and Applications with case Histories, Springer Verlag, Berlin, 1990.
6	Waltham, T, Foundations of Engineering Geology, Second Edition, Spon Press, Taylor & Francis Group, London and New York, 2002.

7	T. Ramamurthy, Editor, Engineering in Rocks for Slopes Foundations and Tunnels, PHI Learning Pvt. Ltd., 2007

Course Outcomes: Upon completion of this course, the students will be able to:	Bloom's Taxonomy Mapped
CO1 Understand the various classification of rocks and its index properties.	Understand
CO2 Assess the various Behaviour of rocks and its Strength Criteria.	Evaluate
CO3 Evaluate the In Situ stresses in Rocks and the Design Aspects.	Evaluate
CO4 Analysis the stability of Rock Slopes and the remedial measures for critical slopes	Analyse
CO5 Evaluate the Bearing capacity of foundations on rocks and illustrate the various techniques to improve the in situ strength of rocks.	Evaluate

COURSE ARTICULATION MATRIX

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	1	-	-	1	-	-	-	-	-	3	-	-
CO2	2	1	2	2	-	-	2	-	-	-	-	-	3	-	-
CO3	3	3	3	3	-	-	2	-	-	-	-	-	3	-	-
CO4	3	3	2	3	-	-	2	-	-	-	-	-	3	-	-
CO5	3	3	3	3	-	-	2	-	-	-	-	-	3	-	-
Avg	2.4	2.4	2.2	2.4	-	-	1.8	-	-	-	-	-	3	-	-
3/2/1 – indicates strength of correlation (3- High, 2- Medium, 1- Low)															