Marwadi University

Syllabus for Master of Technology

Civil Engineering (Geotechnical)

Rock Mechanics

01GT0106(PEC)

Objective of the Course:

The main objectives of offering this course in first semester of master of geotechnical engineering are as following:

1. Critically review rock mechanics principles and methods and their applications to engineering practices.
2. Measure the physical characteristics of rock masses, including the engineering description of rocks, discontinuities and rock mass; the strength of rock substance, defects and rock mass; laboratory testing of rock, data presentation.
3. Analyze stresses under gravitational and imposed loads for rock engineering applications.
4. Predict the response of rock masses to loading (and unloading).
5. Classify rock masses for engineering applications, such as tunnel design and construction.
6. Analyze rock slope stability and foundations on rock.

Credits Earned: 5

Students learning outcomes:

After successful completion of the course it is expected that student will be able to..

1. Classify the rock based on different parameters.
2. Understand the strength behavior and find the different strength of rock mass
3. Interpret the stress in rock and understand the design aspects
4. Analyze the stability of slopes and design the stable slope
5. Improve the strength of rock by different methods.

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	CSE (M)	Internal (I)	Viva (V)	Term Work (TW)	
4	0	2	5	50	20	30	25	25	150

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Detailed Syllabus

Sr No.	Title of the unit	Number of hours
1	**CLASSIFICATION OF ROCKS**	**8**
	Revision of physical and structural geology, faults and shear zones	3
	Index properties and classification of rock masses,	2
	Competent and incompetent rock - value of RMR and ratings in field estimations.	2
	Rocks of peninsular India and the Himalayas	1
2	**STRENGTH CRITERIA OF ROCKS**	**9**
	Behaviour of rock under hydrostatic compression and deviatric loading	2
	Models of rock failure, planes of weakness and joint characteristics, joint testing	3
	Mohr - Coulomb failure criterion and tension cut-off	2
	Hook and Brown Strength criteria for rocks with discontinuity sets.	2
3	**DESIGN ASPECTS IN ROCKS**	**9**
	Insitu stresses and their measurements	2
	Flat jack-over-under coring methods	2
	Stress around underground excavations	2
	Design aspects of openings in rocks - case studies.	3
4	**SLOPE STABILITY OF ROCKS**	**9**
	Rock slopes	2
	Role of discontinuities in slop failure,	2
	Slope analysis and factor of safety	2
	Remedial measures for critical slopes - case studies.	3
5	**REINFORCEMENT OF ROCKS**	**9**
	Reinforcement of fractured and joined rocks.	2
	Shotcreting, bolting,	2
	installation methods	2
	case studies	3

Suggested list of experiments:

1. Extraction of core for sample
2. RQD of the rock samples
3. Compressive strength of Rocks
4. Demonstration of slake durability test
5. Demonstration of filed Rock tests

Suggested Theory Distribution

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

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
5%	15%	15%	35%	20%	10%

Instructional Method and Pedagogy:

1. Use of Learning Management system like canvas
2. Demonstration through ppt and videos and lectures
3. Brainstorming and group discussion sessions
4. Collaborative learning

Recommended Study Material:

Reference Book:

1. Goodman, R.E., Introduction to rock mechanics, John Willey and Sons, 1989
2. Hook, E and Bray, J., Rock slope Engineering, Institute of Mining and Metallurgy, U.K. 1981.
3. Hook, E and Brown, E.T., Underground Excavations in Rock, Institute of Mining and Metallurgy, U.K. 1981.
4. Obvert, L. and Duvall, W., Rock Mechanics and the Design of structures in Rock, John Wiley, 1967.
5. Bazant, Z.P., Mechanics of Geomaterials Rocks, Concrete and Soil, John Wiley and Sons, Chichester, 1985.
6. Wittke, W., Rock Mechanics. Theory and Applications with case Histories, Springerverlag, Berlin, 1990.

Web Resources

- Rock Engineering (NPTEL Course)
- http://www.edumine.com/courses/topics/rock-mechanics/

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