GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Branch: Geotechnical Engineering

Course / Subject Code: ME01076041

Course / Subject Name : Engineering Rock Mechanics

w.e.f. Academic Year:	2024-25
Semester:	1st Semester
Category of the Course:	PEC

Prerequisite:	Knowledge of Geotechnical Engineering, Mechanics of Solids
Rationale:	The subject is introduced in the first semester as a program elective with a view that student can identify and explore various rock types similar to soil type based on formation, can understand rock classification systems based on rock geology and mechanical properties computed using various field and laboratory tests. Further exploring rock deformation characteristics using various rock failure theories and its application in rock mining (rock openings), rock tunnelling, rock stability and rock foundations.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes
01	Understand rock formation and various rock classification systems and its application
02	Rock exploration based on geophysical methods
03	Determine mechanical and physical properties of rock and rock testing and Application of rock failure theories to determine deformation characteristics
04	Design rock openings and related parameter, rock foundation, rock bolting and rock tunnelling

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+(PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial/ Practical		
L	T	PR	C	ESE (E)	PA/ CA (M)	PA/CA(I)	ESE (V)	
3	0	2	4	70	30	20	30	150

Course Content:

Unit No.	Content	No.of Hours	%of Weightage
1.	Rock formation: Rock formation and its genesis, rock and rock mass classification, physical and mechanical properties, defects in rock mass, Elastic constants of rock; Insitu stresses in rock.	8	18
2.	Rock exploration: Objective of rock exploration, methods of rock exploration; by direct penetration, by geophysical processing, in-situ and laboratory tests.	6	10
3.	Strength Behaviour: Compression, Tension and Shear, Stress-Strain relationships, Rheological behavior.	7	15
4.	Strength and Failure of rocks: Theories of rock failure; Mohr Coulomb, Griffith theory, Hoek and Brown, strength and other strength criteria, discontinuities of rock masses, effect of discontinuities on strength of rock, Absolute stress measurement in Rocks, single opening in massive elastic rock - Design criteria and stress distribution in various shapes of openings.	16	40
5.	Application of rock mechanics: Rock tunneling, rock slope stability, bolting, blasting, grouting and rock foundation design. Modern modelling techniques & analyses in rocks.	8	17
	Total	**45**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
16	14	12	10	10	8

WhereR:Remember;U:Understanding;A:Application,N:AnalyzeandE:EvaluateC:Create(as per Revised Bloom's Taxonomy)

References/SuggestedLearningResources:

(a) Books:

1.Jaeger, J.C & Cook, N.G.W, Fundamentals of Rock Mechanics, Chapman and Hall, 1976
2. Wyllie, D.C; Foundations on Rock, E & FN Spon.2nd Edition, 1992.
3. Goodman, R.E, Introduction to Rock Mechanics, John Wiley & Sons.
4. Hudson J.A & J.P. Harrison, Engineering Rock Mechanics: An Introduction to the

Principles, 1997, Elsevier, Oxford
5. Singh B and Goek R.K., Rock Mass Classification-A Practical Engineering Approach, Elsevier
6. Hoek.E, 'Practical Rock Engineering', Rock Science.

(b)Open source software and website:

1. NPTEL lecture series
2. MIT open source material
3. ISRM open source material

Suggested Course Practical List:

1. List of Experiments:
2. Physical properties of rock
3. UCS with E and μ
4. Brazilian test Slake durability index test
5. Direct Shear test
6. Rock Triaxial compression test
7. Schmidt Hammer test
8. Ring Shear test
9. Ultrasonic pulse velocity test

ListofLaboratory/LearningResourcesRequired:

1. Major Equipment:
2. Rock triaxial machine,
3. Rock compression machine,
4. Large size box shear apparatus,
5. Ultrasonic pulse velocity tester

Suggested Project List:

1) Visit of NABL accredited soil/rock testing laboratory/research station

2) Preparation of Rock Borelog report based on conventional tests and geophysical tests.

Suggested Activities for Students:

1) Visits of hilly areas/mountains and understand rock formation and rock identification based on local regional geology.
2) Referring IS CODES and Practicing Manuals

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