DEPARTMENT OF CIVIL ENGINEERING
COURSE SYLLABUS

Course Details				
Code	**Academic Year**			**Semester**
BAU466	2-3-4			Fall-Spring
Title	**T**	**A**	**L**	**ECTS**
Rock Mechanics: Engineering works in/on rock masses	3	2	0	6

Language	English					
Level	**Undergraduate**	✓	**Graduate**		**Postgraduate**	
Department / Program	Civil Engineering					
Forms of Teaching and Learning	Formal					
Course Type	**Compulsory**		**Elective**	✓		
Objectives	. Understanding; the rock mass types that make up a large part of the earth's crust, expected mechanical properties of rocks according to their origins (formation conditions). . Differences in mechanical behavior between rock and soil "materials & masses". (Rocks have higher strength values than soils in general, but rock masses' discontinuities and weakness zones can have potentials to form unrequired bearing capacity circumstances for any civil structures. Learning about these facts are vital important for civil engineers). . Learning the types of engineering structures that can be built "in" and "on" rock masses. . Understanding rock mechanics theories and rock behavior characteristics. . Learning; the behaviors of rock masses according to their discontinuity content, the load bearing properties of rocks related to engineered civil structures to be built in & on rocks, mechanical behavior of rocks, and the approaches developed for rock supports. . Understanding rock stability analysis, and learning related to hazard types & related risks. . Slopes, foundations, tunnels, and urban underground spaces in/on rock masses; Rock stability parameters for their excavation, construction, and operation phases.					
Content	• *First half of the semester:* Introduction, rock types, stress & deformation within the rocks, types of mechanical behavior, rock physical properties, rock material & rock mass testing methods, rock classification systems, examples of important civil structures built in&on the rock & relevant stress environments. *Second half of the semester:* Discontinuities in rocks, streonet drawings, rock fracture initiations, rock columns (pillars) stabilities, rock foundations, stresses around; rock voids, tunnels, urban underground spaces, rock slopes, rock stability analyses.					
Prerequisites	--					
Coordinator	Prof. Dr. Mehmet Kemal Gökay					
Lecturer(s)	Prof. Dr. Mehmet Kemal Gökay					
Assistant(s)	--					
Work Placement	--					

Recommended or Required Reading	
Books / Lecture Notes	Lecture documents and exercises are available ın PDF file format.
Other Sources	- Goodman,R.E.(1988) Introduction to rock mechanics. - Harrison, J.P. & Hudson,J.A.(2000) Engineering rock mechanics (part 1 and 2). - Bieniawski,Z.T.(1989) Engineering rock mass classifications. - Jaeger,J.C., Cook,N.G.W & Zimmerman,R.(2007) Fundamentals of rock mechanics,

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	- Harrison,J.P.&Cosgrove,J.W.(2021) Integrating rock mechanics and structural geo. in rock engineering. - Zhao,J., Labiouse,V.,Dudt,J.P.,Mathier,J.F.(2010) Rock mechanics in civil and environmental engineering. - http://www.rocscience.com/hoek/PracticalRockEngineering.asp
Additional Course Material	
Documents	--
Assignments	--
Exams	--

Course Composition		
Mathematics und Basic Sciences	30	%
Engineering	30	%
Engineering Design	30	%
Social Sciences		%
Educational Sciences		%
Natural Sciences		%
Health Sciences		%
Expert Knowledge	10	%

Assessment

Activity	Count	Percentage (%)
Midterm Exam	1	40
Quiz		
Assignments	2	20
Attendance		
Recitations		
Projects		
Final Exam	1	40
	Total	**100**

ECTS Points and Work Load

Activity	Count	Duration	Work Load (Hours)
Lectures	14	3	42
Self-Study	14	4	56
Assignments	2	19	38
Presentation / Seminar Preparation			
Midterm Exam	1	2	2
Recitations	14	2	28

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Laboratory			
Projects			
Final Exam	1	2	2
		Total Work Load	**168**
		ECTS Points(Total Work Load / Hour)	**6**

Learning Outcomes	
1	Understanding rock types and their formations. Taking their physical differences into account.
2	To be able to evaluate lab.&field tests according to the difference between rock materials & masses.
3	To be able to classify rocks, taking into account the properties affecting the strength of rock masses that concern underground and surface civil structures. Designing the excavation & construction accordingly.
4	To be able to interpret discontinuities within rocks by drawing streonet graphs.
5	To be able to examine the instability that may occur in rock slopes and underground rock spaces at the plan (design) stages and then evaluate them according to the recommended stability analysis.

Weekly Content	
1	Introduction, basic differences of rocks according to their types & formation conditions.
2	Stress and deformation relations in solids, application in rocks.
3	Physical properties of rocks, laboratory and field test methods.
4	Mechanical behavior properties of rocks, rock failure criteria.
5	Purpose of rock classification methods, proposed approaches at the earlier periods.
6	Rock classification methods (complete) and their usage examples.
7	Differences in mechanical behavior of rock and soil materials & masses.
8	Midterm Exam - Stresses and deformations around the underground rock spaces (tunnels, shelters, depots, etc.) and engineered surface rock locations (rock slopes, rock foundations of buildings-dams-bridges).
9	Massive & discontinuous rocks, discontinuity determination, uncertainties in discontinuities.
10	Analysis of discontinuities with Streonet drawings, streonet analysis in underground and surface rock projects.
11	Rock fracture (discontinuity) propagation, basic information of fracture mechanics of rocks. Rock foundation stability, their settlements, rock foundation rehabilitations, reinforcement efforts to have safe rock foundations.
12	Rock stability analyses for urban underground spaces, tunnels, and rock slopes. Reinforcement efforts to have safe underground spaces & rock tunnels (rock steel supports, grouting, rock bolts, anchorage etc.).
13	Rock mechanics considerations in civil engineering application.
14	Brief repetition of course content and exam preparation.
15	Final Exam

Contribution of Learning Outcomes to Program Objectives(1-5)

	P1	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**
1	3	4	4	3	3	4	3
2	4	4	4	3	3	5	4

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3	3	3	5	4	5	4	4
4	3	4	4	4	4	4	5
5	3	3	4	5	5	5	4

Contribution Level	1: Low 2: Low-intermediate 3: Intermediate 4: High 5: Very High
https://obs.tau.edu.tr/oibs/bologna/progLearnOutcomes.aspx?lang=en&curSunit=5728	
Compiled by:	Prof.Dr. Mehmet Kemal Gökay
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