Sveučilište u Zagrebu
RUDARSKO-GEOLOŠKO-NAFTNI FAKULTET

1. GENERAL INFORMATION					
Study programme title	University graduate study programme in geological engineering Subprogramme Hydrogeology and engineering geology				
Course title	Rock Mechanics		**Semester**	I.	
Teacher	Assoc. Prof. Petar Hrženjak, PhD		**Course code**		
Course type	☒ obligatory ☐ elective		**ECTS**	5	
Location	Faculty of Mining, Geology and Petroleum Engineering, Pierottijeva 6, 10000 Zagreb				
Language	☐ Croatian ☒ English				
Class type	**Weekly hours**	**Teaching staff**	**Office hours**	**Room**	**E-mail**
Class	2	Assoc. Prof. Petar Hrženjak, PhD	Tuesday, 10-12 a.m.	229	petar.hrzenjak@rgn.hr
Practice	2	Assist. Prof. Zlatko Briševac, PhD	Monday, 10-12 a.m.	226	zlatko.brisevac@rgn.hr
Field lecture					
E-learning level		1	**Percentage of on-line class (max. 20%)**		5%

2. COURSE DESCRIPTION	
Course aims	Getting to know the basic characteristics of rocks, procedures of laboratory and field test methods, rock mass classifications, estimation of rock mass strength and deformability, understanding of rock mass state and behaviour at different conditions in rock engineering.
Requirements for applicants	
Programme level learning outcomes with course contribution	
Expected course level learning outcomes (4-10 outcomes)	1. Define and explain the basic physical and mechanical properties of intact rock material. 2. Apply the most common methods of laboratory testing to determine the basic physical and mechanical properties of intact rock material. 3. Analyse the data of discontinuity features of the basic structural domain.

	4. Apply the classifications of rock masses. 5. Define and explain the geomechanical characteristics of rock masses. 6. Explain the basic principles of research and in situ testing methods in the rocks. 7. Assess the basic types of instability and rock mass failure forms on surface and underground structures.

Course contents by individual lessons	
Class	Practice
L1 – Introduction to the course	E1 – Introduction to the laboratory and exercises
L2 – Historical development, basic concepts and definitions in rock mechanics	E2 – Determination of water content, porosity and density of rock materials
L3 – Physical and mechanical properties of rocks and methods of determination: density, porosity, humidity, hardness, abrasion	E3 – Uniaxial compressive strength test
L4 – Physical and mechanical properties of rocks and methods of determination: strength and deformability	E4 – Tensile strength test
L5 – Physical and mechanical properties of rocks and methods of determination: index features, rheological properties, homogeneity and isotropy	E5 – Determination of deformability of rock materials in uniaxial compression
L6 – Structural features; types and elements of structure	E6 – Interpretation of structural element data
L7 – Structural features; quantitative description of discontinuity in rock masses	E7 – Triaxial compressive strength test
L8 – Rock mass classifications	E8 – Direct shear test
L9 – Strength and deformability of rock mass	E9 – Classification and strength of rock masses
L10 – Stress in rock masses	E10 – Determination of sound velocity of rock materials
L11 – Methods of research and in situ rock testing	E11 – Point load strength index test
L12 – Mathematical modelling	E12 – Estimation of stresses in rocks
L13 – Rock engineering	E13 – Determination of rock core features
L14 – The principles of slope stability analysis	E14 – Slope stability analysis exercise

L15 – The principles of stability analysis of underground spaces	E15 – Correction of exercises

Students' obligations	Regular presence at the class and laboratory exercises.			
Students' work track *(indicate share in ECTS points for each activity so that overall ECTS number corresponds to class credits score):*	Class attendance	0,75	Research	
	Project	-	Report	
	Colloquium	-	Seminar paper	
	Practical work	0,75	Oral exam	1,5
	Written exam	1,25	Homework (Extra)	0,75
Type of exam, grades and evaluation of students work during class and on final exam	The final grade is based on the weight rating: 20% of laboratory exercises, 20% of homework, 25% of written exam, and 35% of oral exam.			
Mandatory literature (available in the Library and via other media)	International Society for Rock Mechanics (2007): The Complete ISRM Suggested Methods for Rock Characterization, Testing and Monitoring: 1974-2006. R. Ulusay and J.A. Hudson (eds.), the ISRM Turkish National Group, Ankara, Turkey.			
Aditional literature (at the moment of study program proposition application)	Jumikis, A. R. (1983): Rock Mechanics. Trans Tech Publications, Clausthal-Zellerfeld. Singh, B., Goel, R. K. (1999): Rock Mass Classification. Elsevier, Amsterdam. Hoek, E. (2000): Practical Rock Engineering. Rocscience, Toronto (www.rocscience.com).			
Examination terms	Every Tuesday within exam terms.			
Other				

Course Teacher:

Assoc. Prof. Petar Hrženjak, PhD