Sveučilište u Zagrebu
RUDARSKO-GEOLOŠKO-NAFTNI FAKULTET

1. GENERAL INFORMATION					
Study programme title	University graduate study programme in mining engineering				
Course title	Underground chambers and tunnels ventilation			**Semester**	III
Teacher	Assist. Prof. Mario Klanfar, PhD			**Course code**	
Course type	☐ obligatory ☒ elective			**ECTS**	5
Location	Faculty of Mining, Geology and Petroleum Engineering, Pierottijeva 6, Zagreb				
Language	☐ Croatian ☒ English				
Class type	**Weekly hours**	**Teaching staff**	**Office hours**	**Room**	**E-mail**
Class	30	Mario Klanfar		V507	mario.klanfar@rgn.hr
Practice	15	Vjekoslav Herceg		V505	
Field lecture	7,5	Mario Klanfar, Vjekoslav Herceg			
E-learning level		1	**Percentage of on-line class (max. 20%)**		

2. COURSE DESCRIPTION	
Course aims	Introduction into underground ventilation systems for roadway tunnels, railway tunnels, urban traffic and underground parking lots. Basic analysis and design of tunnel ventilation systems. Measurement of ventilation parameters. Understanding of fire safety measures and role of ventilation in fire hazards.
Requirements for applicants	
Programme level learning outcomes with course contribution	
Expected course level learning outcomes (4-10 outcomes)	Define and explain types of underground ventilation systems, their elements and characteristics. Explain role of ventilation in fire events. Use measurement devices for ventilation parameters. Calculate airflow requirements and design auxiliary ventilation for tunnel excavation.

Course contents by individual lessons	
Class	Practice
• Introduction • Ventilation basics • Auxiliary ventilation	• Introduction • Flow measuring devices • Pressure drop measuring devices

• Airflow requirements • Design and analysis • Road tunnels ventilation systems • Railway tunnels ventilation systems • Underground parking lots • Ventilation and fire safety • Smoke control and fire suppression • Seminar paper (4 lessons)	• Fan characteristic curve • Fan combinations • Airway pressure drop • Airway resistance • Air loss measurement • Auxiliary ventilation analysis • Fan and duct selection • Project work (4 lessons)

Students' obligations	Regular attendance at class, laboratory exercises and completion of project work/seminar paper			
Students' work track *(indicate share in ECTS points for each activity so that overall ECTS number corresponds to class credits score):*	Class attendance	2	Research	
	Project		Report	
	Colloquium		Seminar paper	1
	Practical work	1	Oral exam	1
	Written exam		(Extra)	
Type of exam, grades and evaluation of students work during class and on final exam	Evaluation of practical work/seminar paper. Oral exam.			
Mandatory literature (available in the Library and via other media)	Course lectures and texts via online platform			
Aditional literature (at the moment of study program proposition application)	McPearson, M.J. (1993): Subsurface ventilation engineering Bickel, J.O., Kuesel, T.R., King, E.H. (1996): Tunnel enginnering handbook			
Examination terms	According to current calendar			
Other				

Course Teacher:

Assist. Prof. Mario Klanfar, PhD