



University of
Zagreb



University of Zagreb
FACULTY OF MINING,
GEOLOGY AND PETROLEUM
ENGINEERING



1. GENERAL INFORMATION			
1.1. Course teacher	Tenured professor Nediljka Gaurina-Međimurec, PhD; Assistant Professor, Karolina Novak Mavar, PhD		1.6. Year of the study
1.2. Name of the course	Deep Well Injection of Petroleum Engineering Waste		1.7. ECTS credits
1.3. Associate teachers	Teaching Assistant Igor Medved, MSc		1.8. Type of instruction (number of hours L + E + S + e-learning)
1.4. Study programme (undergraduate, graduate, integrated)	graduate		1.9. Expected enrolment in the course
1.5. Status of the course	<input type="checkbox"/> mandatory	<input checked="" type="checkbox"/> elective	1.10. Level of application of e-learning (level 1, 2, 3), percentage of online instruction (max. 20%)
2. COUSE DESCRIPTION			
2.1. Course objectives	Acquiring knowledge for selection waste underground injection technologies, injection formation selection, tracking of underground spreading the injected waste fluid, and monitoring of injection quality and injection well integrity.		
2.2. Enrolment requirements and/or entry competences required for the course	Passed exams from <i>Drilling engineering</i> from first year of graduate study.		
2.3. Learning outcomes at the level of the programme to which the course contributes	Assess the environmental impact of petroleum engineering and geoenery engineering; Plan the methods and procedures for avoiding or minimizing environmental impact of petroleum engineering and geoenery engineering activities.		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	Apply legal regulations in the field of injection of petroleum waste into deep wells; Compare the classes of injection wells for hazardous and non-hazardous waste; Valorise waste fluid injection methods; Assess the injection well and geological formations suitable for waste injection; Design the process of CO ₂ underground injection.		
2.5. Course content (syllabus)	Legal basis in the Republic of Croatia in the field of waste injection into deep wells; History of petroleum waste underground injection; Selection of waste disposal sites. Injection wells; Waste injection technology; Regulations and criteria for injection wells; Area of Review (AoR) (modelling of underground waste spreading); Monitoring of the injection process and mechanical integrity of injection wells; Underground injection of CO ₂ (CO ₂ injection well construction, impact of CO ₂ on set cement and casing); Waste disposal through wells in salt caverns; Analysis of examples from practice.		
2.6. Format of instruction:	<input checked="" type="checkbox"/> lectures	<input type="checkbox"/> independent assignments	2.7. Comments:

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	<input checked="" type="checkbox"/> seminars and workshops <input checked="" type="checkbox"/> exercises <input type="checkbox"/> online in entirety <input type="checkbox"/> partial e-learning <input checked="" type="checkbox"/> field work	<input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)	-			
2.8. Student responsibilities	Active participation in lectures, auditory exercises and fieldwork, writing preliminary exam, preparation and presentation of seminar paper, oral exams.					
2.9. Monitoring student work	Class attendance	YES	Research	NO	Oral exam	YES
	Experimental work		Report	NO	Seminar presentation	YES
	Essay		Seminar paper	YES		
	Preliminary exam	YES	Practical work	NO		
	Project		Written exam	NO	ECTS credits (total)	4
2.10. Required literature (available in the library and/or via other media)	Title				Number of copies in the library	Availability via other media
	Gaurina-Međimurec, N. (2015): <i>The Underground Injection of Drilling Waste</i> , Handbook of Research on Advancements in Environmental Engineering/Gaurina-Međimurec, N. (Ed.). Hershey, PA, USA: IGI Global, pp. 400-437.				YES	YES
	Gaurina-Međimurec, N., Pašić, B. (2013.): <i>Chapter 15. CO2 Underground Storage and Wellbore Integrity</i> , Risk Analysis for Prevention of Hazardous Situations in Petroleum and Natural Gas Engineering/Matanović, D.; Gaurina-Međimurec, N.; Simon, K. (Ed.). Hershey, PA, USA: IGI Global, pp. 322-357.				YES	YES
	Wojtanowicz, A. K. (1996.): <i>Environmental Control Technology in Petroleum Drilling and Production</i> , Environmental Technology in the Oil Industry, Blackie Academic&Professional, London. – selected chapters.				NO	YES
	Reis, J.C. (1996.): <i>Environmental Control in Petroleum Engineering</i> , Gulf Publishing Company, Houston. - selected chapters.				NO	YES
	Wojtanowicz, A.K.(1996.): <i>Environmental Control Technology in Petroleum Drilling and Production</i> , Environmental Technology in the Oil Industry,Blackie Academic&Professional, London. – selected chapters.				NO	YES
2.11. Optional literature	OnePetro papers					
2.12. Other (as the proposer wishes to add)						

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