1. GENERAL INFORMATION				
1.1. Course teacher	Assistant Professor Sonja Koščak Kolin, PhD		1.6. Year of the study	II.
1.2. Name of the course	Exploitation of the unconventional oil and gas reservoirs		1.7. ECTS credits	4
1.3. Associate teachers	-		1.8. Type of instruction (number of hours L + E + S + e-learning)	30L+0E+20S+10e-learning
1.4. Study programme (undergraduate, graduate, integrated)	graduate		1.9. Expected enrolment in the course	10
1.5. Status of the course	☐ mandatory	☒ elective	1.10. Level of application of e-learning (level 1, 2, 3), percentage of online instruction (max. 20%)	level 2, 16,67% online
2. COUSE DESCRIPTION				
2.1. Course objectives	The main objective of the course is to enable students to apply new knowledge and software for determining the production possibilities of stimulated oil and gas wells in unconventional reservoirs, necessary to evaluate their overall reservoir development and economic viability. The purpose of implementing new technologies in design of fractured, horizontal and multy fractured horizontal wells in low permeability oil and gas reservoirs is to enable profitable production in a reasonable time. The application of new technology in unconventional reservoirs increases the proven reserves and the final oil and gas recovery in the discovered reservoirs, and it enables the increase of recoverable potential in yet undiscovered reservoirs. The possibility of increasing gas production from low permeability shales and sandstones is especially significant in the global trends of energy transition.			
2.2. Enrolment requirements and/or entry competences required for the course	Passed exams from *Oil and Gas Production Engineering* and from *Well Test Analysis*, from the 1st year of study.			
2.3. Learning outcomes at the level of the programme to which the course contributes	Analyse reservoir rock and reservoir fluids properties; Plan hydrocarbon and geothermal reservoir management; Predict reservoir behaviour and the behaviour of hydrocarbon and geothermal water production system; Appraise projects in petroleum engineering and geoenergy engineering; Analyse energy markets.			
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	Define the types of unconventional oil and gas reservoirs and their geological and petrophysical characteristics; Discuss categorization of reserves of conventional and unconventional oil and gas reservoirs; Explain the characteristics of production systems of stimulated wells (FW-fractured, HW-horizontal and MFHW-multy fractured HW) in unconventional oil and gas reservoirs; Analyse the decline curves in low permeability shales and sandstones; Apply the pressure build-up test analysis in wells of low permeability shales and sandstones;			

This document was prepared in the framework of the project InterRGN – Internationalization of the Faculty of Mining, Geology and Petroleum Engineering, funded by the European Union from the European Social Fund. The content of this document is the sole responsibility of the University of Zagreb, Faculty of Mining, Geology and Petroleum Engineering.

	Apply a computer program for economic analysis of production and reservoir systems in unconventional reservoirs; Discuss the energy transition and global trends of increasing gas production from low permeability reservoirs.
2.5. Course content (syllabus)	Introduction to the exploitation of unconventional oil and gas reservoirs; Geological and petrophysical characteristics of low permeability shales and sandstones; Flow regimes in oil and gas wells of low permeability shales and sandstones; Production systems of stimulated oil wells (FW-fractured, HW-horizontal and MFHW-multy fractured HW) in unconventional reservoirs (application of IPM software package); Production systems of stimulated gas wells (FW-fractured, HW-horizontal and MFHW-multy fractured HW) in unconventional reservoirs (application of IPM software package); Analysis of decline curves in low permeability shales (application of IPM software package); Analysis of decline curves in low-permeability sandstones (application of IPM software package); Pressure and rate transient analysis in wells of unconventional oil and gas reservoirs (Kappa Workstation software package); Application of new methods in the pressure build-up test analysis of low permeability shales (Kappa Workstation software package); Application of new methods in the pressure build-up test analysis of low permeability sandstones (Kappa Workstation software package); Characteristics of exploitation of coal bed methane; Exploitation of highly viscous oil reservoirs; Characteristics of gas hydrate exploitation; Economic analysis of unconventional oil and gas reservoirs (application of IPM software package); The role of the increased gas production from low permeability reservoirs in the transition process of world energy outlook.
2.6. Format of instruction:	☒ lectures ☒ seminars and workshops ☒ exercises ☐ online in entirety ☒ partial e-learning ☐ field work ☒ independent assignments ☒ multimedia and the internet ☐ laboratory ☒ work with mentor ☐ (other)
2.7. Comments:	-
2.8. Student responsibilities	Regularly attend classes (lectures, exercises and e-learning), prepare and present a seminar paper.

2.9. Monitoring student work									
	Class attendance	YES		Research		NO	Oral exam	YES	
	Experimental work		NO	Report		NO			
	Essay		NO	Seminar paper	YES				
	Preliminary exam	YES		Practical work		NO			
	Project	YES		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**
	Holditch, S.A., Spivey, J., Wang, J.Y. (2020.): *Tight Gas Reservoirs*, Society of Petroleum Engineers, 490 pp. - selected chapters	NO	YES
	Aguilera, R., (2018.): *Unconventional Gas and Tight Oil Exploitation*, Society of Petroleum Engineers, 430 pp. - selected chapters	NO	YES

This document was prepared in the framework of the project InterRGN – Internationalization of the Faculty of Mining, Geology and Petroleum Engineering, funded by the European Union from the European Social Fund. The content of this document is the sole responsibility of the University of Zagreb, Faculty of Mining, Geology and Petroleum Engineering.

	Economides, M.J., Nolte, G.N. (2000.): *Reservoir Stimulation*, John Wiley & Sons, 3rd edition, 20 Chapters. - selected chapters	YES	NO
	OnePetro – multi-society technical paper library	NO	YES
	Holditch, S.A. et al (2020): *Case Histories of Tight Gas Reservoir Development* (Adobe Digital Edition), Society of Petroleum Engineers. - selected chapters	NO	YES
2.11. Optional literature	Economides, M.J. (1984.): *Well Test Analysis for Tight Reservoirs*, Dowell Schlumberger, 1st edition, Paris. - selected chapters		
2.12. Other (as the proposer wishes to add)	-		

This document was prepared in the framework of the project InterRGN – Internationalization of the Faculty of Mining, Geology and Petroleum Engineering, funded by the European Union from the European Social Fund. The content of this document is the sole responsibility of the University of Zagreb, Faculty of Mining, Geology and Petroleum Engineering.