

1. GENERAL INFORMATION					
Study programme title	University undergraduate study programme in geological engineering				
Course title	Geology of fossil fuels		Semester	winter	
Teacher	Assoc. Prof. Bruno Saftić, PhD & Assist. Prof. Iva Kolenković Močilac, PhD			Course code	
Course type	<input checked="" type="checkbox"/> obligatory <input type="checkbox"/> elective			ECTS	6
Location					
Language	<input type="checkbox"/> Croatian <input checked="" type="checkbox"/> English				
Class type	Weekly hours	Teaching staff	Office hours	Room	E-mail
Class	2	Assoc. Prof. Bruno Saftić, PhD & Assist. Prof. Iva Kolenković Močilac, PhD	..., Monday 10.00-12.00	V407, V408	bruno.saftic@rgn.hr iva.kolenkovic@rgn.hr
Practice	3	Assist. Prof. Iva Kolenković Močilac, PhD	Monday 10.00-12.00		iva.kolenkovic@rgn.hr
Field lecture					
E-learning level	1		Percentage of on-line class (max. 20%)		5%

2. COURSE DESCRIPTION	
Course aims	<p>Aims of this course are to:</p> <ul style="list-style-type: none"> - Explain the role of coal as energy source, metallurgical and chemical raw material - Define genesis of coal by coalification of plant material - Classify coal by type (genetic classification) and rank (classification based on level of carbonization) - Define coal reserves and give an overview of production worldwide - Define composition of hydrocarbons, groups of compounds and their basic properties - Explain hydrocarbon formation in source rocks by thermal alteration of original organic matter - Explain the basic concept of petroleum migration

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	<ul style="list-style-type: none"> - Explain basic concept of petroleum accumulation of oil and gas - Define exploration methods, geological works in exploration and in synthesis of results - Give an overview of petroleum production worldwide and perspectives
Requirements for applicants	<p>Applicants are required to:</p> <ul style="list-style-type: none"> - Define and apply main principles from the domain of Physical geology, Historical geology and Sedimentary petrology - Define basic compounds in organic chemistry (proteins, lipids, carbohydrates, alcohols, ethers)
Programme level learning outcomes with course contribution	
Expected course level learning outcomes (4-10 outcomes)	<p>Upon finishing the course, student will be able to:</p> <ul style="list-style-type: none"> - Define coal reserves and give an overview of production worldwide - Define organic and inorganic compounds in plant structure - Define depositional environments and explain accumulation and degradation of plant matter - biochemical processes resulting in formation of peat and sapropel - Explain geochemical processes of coalification - Classify coal after the practical value, carbonisation level, and genesis - Define composition of hydrocarbons, groups of compounds and their basic properties - Explain hydrocarbon formation, source rocks, types of kerogen and maturity of organic matter - Explain the basic concept of petroleum migration, compaction of sediments, changes of porosity and permeability - Explain basic concept of petroleum accumulation of oil and gas - Define exploration methods, geological works in exploration and in synthesis of results
Course contents by individual lessons	
Class	Practice



<p>C 1 –</p> <p>Getting to know students. Criteria for signature and passing the course. Structure of course.</p>	<p>P 1 –</p> <p>Auditory exercise</p> <p>Technical analysis of coal.</p>
<p>C2 –</p> <p>Basic terminology. Use of Coal as energy source and raw material used in metallurgy and chemical industry.</p>	<p>P2 –</p> <p>Auditory exercise</p> <p>Definition of coal resources and reserves, economic and non-economic reserves,</p>
<p>C3 –</p> <p>Fossil plants from which the original organic matter for coal has been derived. Composition of plant material.</p>	<p>P3 –</p> <p>Coal exploitation – underground and surface exploitation.</p>
<p>C4 –</p> <p>Biochemical processes of coalification – decay, humification, biochemical gellification, sapropelization. Geochemical processes of coalification, importance of temperature and pressure change with depth of burial.</p>	<p>P4 –</p> <p>Practical problem – Estimation of reserves of a coal seam</p> <p>Construction of contour map of the top and the bottom of the coal seam</p>
<p>C5 –</p> <p>Depositional systems of coal and coal-bearing strata. Continental and transitional depositional environments. Ombrotrophic and rheotrophic mires. Stages of evolution of swamps.</p>	<p>V5 –</p> <p>Practical problem – Estimation of reserves of a coal seam</p> <p>Construction of isochore map of the coal seam and construction of the cross-section of the coal seam</p>
<p>C6 –</p> <p>Petrographic constituents of coal – coal lithotypes, microlithotypes and macerals.</p> <p>Genetic classification of coal.</p>	<p>V6 –</p> <p>Practical problem – Estimation of reserves of a coal seam</p> <p>Calculation of the reserves of the coal seam.</p>
<p>P7 –</p> <p>Coal reserves worldwide. New technologies of coal exploitation.</p>	<p>V7 –</p> <p>Demonstration exercise</p> <p>Display of the Department's coal collection</p>



P8 – History of petroleum exploration. Use of crude oil and natural gas.	V8 – Overview of oil and natural gas reserves worldwide.
P9 – Composition of crude oil and natural gas. Main compounds – saturated and unsaturated hydrocarbons, asphaltenes.	V9 – Electrolog interpretation as a basis for correlation.
P10 – Influences of different factors on source rocks' sedimentation. Definition of kerogen and bitumen.	V10 – Practical problem – Correlation cross-section and map of thickness.
P11 – Maturation of source rocks and their thermal alteration. Diagenesis, catagenesis and metagenesis. Oil window. Modified van Krevelen diagram.	V11 – Practical problem – Correlation cross-section and map of thickness.
P12 – Definition of reservoir rocks and cap-rocks. Petrophysical properties of reservoir rocks and cap-rocks.	V12 – Practical problem – Correlation cross-section and map of thickness.
P13 – Primary and secondary migration of hydrocarbons.	V13 – Auditory exercise Classification of traps
P14 – Petroleum exploration – surface geophysical exploration.	V14 – Auditory exercise Production of crude oil and natural gas worldwide.
P15 –	V15 –



Petroleum exploration – drilling and well logging.	Demonstration exercise Display of the Department's collection of source rocks, reservoir rocks and crude oil samples			
Students' obligations	Regular presence at the consultation meetings (maximum absence 2 times), preparation for consultation meetings (reading of literature), practical exercise			
Students' work track <i>(indicate share in ECTS points for each activity so that overall ECTS number corresponds to class credits score):</i>	Class attendance	1	Research	
	Project		Report	
	Colloquium		Seminar paper	
	Practical work	2	Oral exam	3
	Written exam		(Extra)	
Type of exam, grades and evaluation of students work during class and on final exam	Oral exam			
Mandatory literature (available in the Library and via other media)	<p>McCabe, P.J. (1984): Depositional environments of coal and coal-bearing strata. In: Rahmani, R.A., Flores, R.M. <i>Sedimentology of Coal and Coal-bearing Sequences, Spec. Publs int. Ass. Sediment.</i>, 13-42.</p> <p>Miller, B.G.(2005): Coal Energy Systems. 1st chapter Introduction to Coal, 1-27 p. Elsevier Academic Press, San Diego, California: USA</p> <p>Thomas, L. (2013): Coal Geology, Second Edition. Chapter 3: Age and Occurrence of Coal (53-85 pp.), Chapter 5: Coal Sampling and Analysis (137-150 pp.), Chapter 6: Coal Exploration and Data Collection (151-184 pp.), Chapter 7: Coal Resources and Reserves (185-210 pp.), Chapter 8: Geophysics of Coal (211-252 pp.), Chapter 10: Geology and Coal Mining (271-302), John Wiley & Sons, Ltd., Chichester, UK</p> <p>Selley,R.C. (1998): Elements of Petroleum Geology. Second edition, Academic Press, San Diego, California, USA.</p>			
Additional literature (at the moment of study program proposition application)	<p>O'Keefe, J.M.K., Bechtel, A., Christinis; K., Dai, S., DiMichele, W.A., Eble, C.F., Esterle, J.S., Mastalerz, M., Raymond, A.L., Valentim, B.V., Wagner, N.J., Ward, C.R., Hower, J.C. (2013): On the fundamental difference between coal rank and coal type. <i>International Journal of Coal Geology</i>, 118, 58-87 pp.</p>			
Examination terms	Every Thursday within exam-terms (at 10 AM).			
Other				

