



## Subject card

Subject name and code	Refining and Petrochemical Technologies, PG_00048864						
Field of study	Engineering and Technologies of Energy Carriers						
Date of commencement of studies	February 2023	Academic year of realisation of subject			2022/2023		
Education level	second-cycle studies	Subject group			Obligatory subject group in the field of study Subject group related to practical vocational preparation		
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	1	Language of instruction			Polish		
Semester of study	1	ECTS credits			6.0		
Learning profile	practical profile	Assessment form			exam		
Conducting unit	Department of Chemistry and Technology of Functional Materials -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Anna Skwierawska					
	Teachers	dr hab. inż. Anna Skwierawska dr hab. inż. Andrzej Nowak dr inż. Radosław Pomećko					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	30.0	15.0	15.0	90
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours		Self-study	SUM	
	Number of study hours	90	10.0		50.0	150	
Subject objectives	The student learns the practical aspects of the production of petroleum products. The student is able to combine theoretical knowledge with the processes of the refinery and petrochemical industry.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	K7_W01	Has knowledge in the field of technologies implemented in refineries and the petrochemical industry.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
	K7_U08	The student is able to design a technological installation for selected unit operations or part of the process carried out at the refinery, taking into account technological principles and environmental considerations.	[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools
	K7_U07	Student based on literature and lecture is able to propose improvements to the unit operation or process enabling better use of raw materials and reduction of waste.	[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools
	K7_W02	The student is able to use the raw materials of the petrochemical industry in the most rational way.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
	K7_W09	Has knowledge of the catalytic processes of the refinery and petrochemical industry. Is able to characterize the methods of producing multifunctional catalysts. Is able to explain the mechanism of action of selected catalysts, as well as describe the methodology for activating fresh and regenerating used catalysts. Has knowledge of the construction of apparatus with a catalytic bed, in particular: methods of filling / removing the catalyst, thermal issues, distribution of raw materials, product separation.	[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation [SW3] Assessment of knowledge contained in written work and projects
Subject contents	Basic aspects of safety in a plant processing hydrocarbon raw materials. Refinery industry raw materials. Geochemistry of crude oil and natural gas deposits. Extraction and preparation for transporting oil and natural gas. Storage. Catalysts of the refining industry. Hydrotreating, isomerisation of gasolines. Catalytic reforming. Hydrocracking and catalytic cracking. Hydrogen production. Light hydrocarbon conversion. Production of oil bases, lubricants, hydraulic fluids and asphalts. Steam cracking. Production of polyethylene and polypropylene. Separation and application of aromatic compounds. Processes of thermal conversion of heavy fractions. The process of delayed coking and Visbreaking. Treatment of sewage, waste gases and management of solid waste.		
Prerequisites and co-requisites	Basic knowledge in the field of unit operations: distillation, extraction, crystallization and processes: hydrogenation, dehydrogenation, aromatization, isomerization, alkylation and hydrotreating. Apparatus of the chemical industry.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	project (15 hours); multimedia presentation and / or written study	0.0%	15.0%
	seminar (15 hours), multimedia presentation, report	0.0%	15.0%
	Written exam (2 hours)	60.0%	55.0%
	laboratory (30 hours); written test and reports	0.0%	15.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>Edward Grzywa and Jacek Molenda "Technology of basic organic syntheses" Wydawnictwo Naukowo-Techniczne, Warsaw 2000 and later editions</li> <li>Collective work edited by Ludwik Synoradzki and Jerzy Wisiański "Design of technological processes" Publishing House of the Warsaw University of Technology, Warsaw 2006</li> <li>Collective work edited by Jan Surygała "Vademecum refinera" Scientific and Technical Publishers, Warsaw 2006</li> <li>Maria Ziótek, Izabela Nowak "Heterogeneous catalysis - selected issues for laboratory exercises" Wydawnictwo Naukowe UAM, Poznań</li> <li>Lectures conducted by employees of LOTOS grup.</li> </ol>	
	Supplementary literature	<ol style="list-style-type: none"> <li>Romuald Bogoczek and Elżbieta Kociołek-Balawejder "Organic chemical technology" Publisher of the University of Economics in Wrocław, Wrocław 1992</li> <li>Congress and conference materials.</li> <li>Patents</li> <li>Magazines dedicated to energy carriers (oil and natural gas).</li> </ol>	

	eResources addresses	Adresy na platformie eNauczenie: Technologie Rafineryjno-Petrochemiczne - 2023 - Moodle ID: 29408 <a href="https://enauczenie.pg.edu.pl/moodle/course/view.php?id=29408">https://enauczenie.pg.edu.pl/moodle/course/view.php?id=29408</a>
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> <li>1. Compare hydrogen production technologies. List the main pros and cons of known processes (steam reforming of methane and light hydrocarbons; gasification of coal and residues from crude oil processing; electrolysis of water and aqueous hydroxide solutions).</li> <li>2. Methods of hydrocarbon exploration and extraction. Type of reservoir rocks, differences between conventional and unconventional deposits. Oil exploration methods, estimating potential resources. Drilling and methods of mining the deposit.</li> <li>3. Refinery operating rules. Energy and auxiliary utilities (electricity, water and steam systems, air and nitrogen, heating gas and heating oil).</li> <li>4. Thermal cracing, catalytic cracing and hydrocracking. Raw materials, process flow, products.</li> <li>5. Production of gasoline and diesel oil.</li> </ol>	
Work placement	Not applicable	