



Subject card

Subject name and code	Design of Technological Processes, PG_00036528						
Field of study	Chemistry						
Date of commencement of studies	October 2021	Academic year of realisation of subject			2023/2024		
Education level	first-cycle studies	Subject group			Obligatory subject group in the field of study Subject group related to scientific research in the field of study		
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	3	Language of instruction			Polish		
Semester of study	5	ECTS credits			3.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Process Engineering and Chemical Technology -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Robert Aranowski					
	Teachers	dr inż. Robert Aranowski					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	0.0	30.0	0.0	30
	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	30		10.0		35.0	75
Subject objectives	Student after finishing the course should obtain knowledge and skills necessary for complex chemical and technological processes design.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K6_W10	Student has the necessary knowledge to make basic calculations enabling the selection of devices and apparatus for technical process.			[SW3] Assessment of knowledge contained in written work and projects		
	[K6_K03] understands the importance of group and team activities in which members adopt various roles	Student is able to work in a group, share the implementation and development of individual issues of the technological process.			[SK1] Assessment of group work skills		
	[K6_U08] is capable to design and carry out the experiment which is necessary to confirm a given hypothesis and sees wider context, often beyond-technical, of the analysed phenomena	Student is able to determine the impact of the designed technology on the environment, taking into account waste, pollution and social effects connected with designed process			[SU1] Assessment of task fulfilment		
	[K6_U06] can analyze the functioning of equipment, apparatus and technology lines used in laboratories and chemical industry, and can recognize and propose methods to solve the simple engineering tasks which he can meet as an Engineer and select and use routine methods, chemical apparatus and tools to solve practical engineering tasks, including also technological processes; can himself/herself read and make technical drawings using CAD software	Student is able to draw technical schemes (block diagram, flow sheet diagram, P&ID diagram, Sankey diagram) using CAD software			[SU1] Assessment of task fulfilment		

Subject contents	Basics of teamwork. Essence of the process design. Chemical concept of the technological project: the general description of the proposed production method, characterisation of the materials, main product, side products, wastes and waste waters with the discussion of the possibility of their utilization, storing or neutralizing. Block, flow and P&ID diagrams of the industrial process, the parameters of unit process. Calculation of the physico-chemical propriety of the streams (gravity, viscosity, critical parameters). Material balance (Himmelblau's method, solving material balance system of equations, calculation mass balance of chemical reaction). Energy balance, calculation of the changes of the enthalpy, the enthalpy of dissolving, the enthalpy of the reaction, the influence of temperature and pressure on the enthalpy of reaction, Business plan.		
Prerequisites and co-requisites	The basic knowledge of operation and processes unit, organic and inorganic technologies, construction of apparatuses and equipments of the chemical industry.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Teamwork	60.0%	20.0%
	Design of technological process	60.0%	80.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. J. Głowiński, Przykłady i zadania do przedmiotu Podstawy technologii chemicznej, Politechnika Wrocławska, Wrocław 1991.</li> <li>2. S. Kucharski, J. Głowiński, Podstawy obliczeń projektowych w technologii chemicznej, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2000.</li> <li>3. Stelecki, L. Gradaoń, Podstawowe procesy przemysłu chemicznego, WNT, Warszawa 1985.</li> <li>4. N.G. Anderson, Practical Process Research and Development, Academic Press, San Diego, California, USA 2000.</li> <li>5. P.W. Atkins, Chemia fizyczna, PWN, Warszawa 2001.</li> <li>6. Grzywa, Edward Jan, Technologia podstawowych syntez organicznych. T. 1, Surowce do syntez, Warszawa : Wydaw. Nauk.-Techn., 1995.</li> <li>7. J. Pikoń Jerzy, Podstawy konstrukcji aparatury chemicznej. Cz. 1, Tworzywa konstrukcyjne, Warszawa: Państw. Wydaw. Nauk., 1979.</li> <li>8. Myers Alan L., Obliczenia komputerowe w inżynierii chemicznej, Warszawa : Wydaw. Naukowo-Techniczne, 1979.</li> <li>9. Pavlov, Konstantin Feofanovič, Przykłady i zadania z zakresu aparatury i inżynierii chemicznej. Tł.z j. ros, Warszawa : Państw. Wydaw. Tech., 1964.</li> <li>10. Pikoń Jerzy, Aparatura chemiczna, Gliwice : Politechnika Śląska, 1971.</li> <li>11. Szarawara Józef, Podstawy inżynierii reaktorów chemicznych, Warszawa : Nauk.-Techn., 1980.</li> </ol>	
	Supplementary literature	<ol style="list-style-type: none"> <li>1. Myers Alan L., Obliczenia komputerowe w inżynierii chemicznej, Warszawa : Wydaw. Naukowo-Techniczne, 1979.</li> <li>2. Marlewski, Adam Derive, Pomocnik matematyczny. Wersja 2.0, Poznań, Wydaw. NAKOM, 1992.</li> <li>3. Linkiewicz Grzegorz, Mathcad 4.0/5.0 for Windows, Warszawa, Wydaw. EXIT, 1994.</li> </ol>	
	eResources addresses	Adresy na platformie eNauczanie: Projektowanie Procesów Technologicznych, projekt, Chemia, 2023-24, semestr zimowy - nowy - Moodle ID: 34694 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=34694">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=34694</a>	
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> <li>1. The diethyl ether was obtained by the catalytic dehydration of ethanol at 450-500K. The raw material fed to the reactor after the initial evaporation and steam heated to a temperature of 450K. The reactor consists of a bundle of tubes inside which provided a solid catalyst. It is assumed that catalyst consumption is low and its presence in the stream exiting the reactor can be omitted. The product stream from the reactor pre-cooled to a temperature of 345K and subjected to separation column from which the ether is withdrawn as a pure distillate. The residue from the first column containing ethanol and water is subjected to separation in a second column, and the resultant overflow having 92 mole% of ethanol is recycled to the reactor. For the production of ether use of ethyl alcohol of 95 mole% ethanol. The conversion of ethanol is 0.9, and the process at atmospheric pressure. Introduce the process material balance for process efficiency DEE 1 kmol / h.</li> <li>2. Draw the flow diagram of a catalytic cracking of crude oil vacuum distillation residues.</li> </ol>		
Work placement	Not applicable		

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