



## Subject card

Subject name and code	, PG_00052348						
Field of study	Chemical Technology						
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		
Mode of study	Full-time studies		Mode of delivery		at the university		
Year of study	3		Language of instruction		Polish		
Semester of study	6		ECTS credits		2.0		
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 hab. inż. Jacek Gębicki				
	Teachers		dr inż. Izabela Wysocka				
			dr hab. inż. Jacek Gębicki				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	15.0	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		5.0		25.0	60
Subject objectives	To introduce students to the basic concepts related to the technological classification of reactors. Familiarization with the basic relationships used to calculate reactors. Description of ideal reactors. Shaping students' skills of basic calculations concerning the theory of reactors.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	K6_U04		The student is able to perform basic calculations using the knowledge of design equations for various types of ideal reactors		[SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment		
	K6_W04		The student has knowledge of the theory of chemical reactors and knows the principle of operation of the basic types of reactors in the chemical industry		[SW3] Assessment of knowledge contained in written work and projects		
Subject contents	Technological classification of reactors. Batch reactor. Flow reactor with perfect mixing. Plug flow reactor. Cascade of flow reactors with perfect mixing. Comparison of a cascade of reactors with perfect mixing with a plug flow reactor. Design of isothermal reactors with perfect mixing or plug flow. Influence of the transformation kinetics on the selection of the reactor type.						
Prerequisites and co-requisites	Knowledge of issues related to the kinetics and equilibrium of chemical reactions as well as mass and heat transfer. Knowledge of subjects: Physical chemistry, Chemical apparatus.						
Assessment methods and criteria	Subject passing criteria		Passing threshold		Percentage of the final grade		
	lecture - 2 test		60.0%		60.0%		
	project - project task		100.0%		20.0%		
	project - test		60.0%		20.0%		

Recommended reading	Basic literature	<p>1. A. Burghardt, Bartelmus G., Inżynieria reaktorów chemicznych, PWN 2001.</p> <p>2 J. Szarawara, J. Piotrowski: Podstawy teoretyczne technologii chemicznej, WNT 2010.</p> <p>3. S. Kucharski, J. Głowiński: Podstawy obliczeń projektowych w technologii chemicznej, Oficyna Wydawnicza Politechniki Wrocławskiej, 2005</p>
	Supplementary literature	<p>1. B. Tabiś, W. Żukowski: Przykłady i zadania z zakresu inżynierii reaktorów chemicznych, Politechnika Krakowska 2000</p> <p>2. K. Schmidt-Szałowski i in.: Technologia Chemiczna, PWN 2013</p>
	eResources addresses	<p>Adresy na platformie eNauczanie:</p> <p>Podstawy inżynierii reaktorów - projekt - Moodle ID: 37419  <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=37419">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=37419</a></p>
Example issues/ example questions/ tasks being completed	<p>Task 1 In a tank with a useful capacity of 0.5 m<sup>3</sup>, equipped with a stirrer, the A+B=C reaction is carried out, where the initial concentration of component A is 0.05 kmol/m<sup>3</sup>, and the concentration of component B is twice as high. The rate constant is 0.09 m<sup>3</sup>/(kmol*h). Determine the degree of transformation A.</p> <p>Task 2 The conversion rate <math>A=2P</math> is described by the first-order kinetic equation (<math>k=2.5\text{ h}^{-1}</math>). Determine the average residence time of the reaction mixture in a cascade of 4 identical reactors with perfect mixing if a conversion of <math>a=0.9</math> is needed. What residence time would be necessary to achieve this degree of conversion in a single stirred reactor?</p> <p>Task 3 In a two-stage reactor cascade with a stirrer, the reaction <math>A+B=C+D</math> is carried out. The reaction follows second order kinetics, where <math>k=0.25\text{ dm}^3/(\text{mol}\cdot\text{min})</math>. The initial concentrations of the reactants are equal and amount to 0.1 m/dm<sup>3</sup>. The residence time in the cascade, necessary to achieve the conversion degree of 0.8, should be determined</p>	
Work placement	Not applicable	