GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	KINETICS AND CALALYSIC, PG_00036530		
Field of study	Chemistry		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2024/2025
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 Physical Chemistry -> Faculty Of Chemistry -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Joanna Krakowiak	
	Teachers	dr hab. inż. Joanna Krakowiak	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	15.0	0.0	0.0	0.0	45
	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	45	5.0	25.0	75

Subject objectives	The students have to learn a fundamental concepts of chemical kinetics and catalysis. These topics are colligated with the chosen subjects studied during the Physical Chemistry course. The presented processes deal with the phenomena running in homogeneous, heterogeneous and microheterogeneous (i.e. with enzymes) environments.

Learning outcomes

Course outcome	Subject outcome	Method of verification
K6_W03	The student is aware of the influence of conditions on the rate of a chemical reaction. They become familiar with the nature of the interactions between the catalyst and reagent molecules, as well as with the importance of the catalyst's surface structure and the electronic configuration of atoms at active sites in heterogeneous reactions. The student understands that the catalytic bed should also meet specific mechanical parameters in technological processes, and its active part is individually tailored to a particular reaction under specified conditions	[SW1] Assessment of factual knowledge
[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	The student is aware of the fundamental difference between homogeneous and heterogeneous catalytic processes. In the case of heterogeneous reactions, they become familiar with the structure of a catalytic bed and the general principles of designing such a bed. They are also aware of the basic phenomena of catalytic bed deactivation and the methods to mitigate this phenomenon. The basic types of reactors with a catalytic bed are presented.	[SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment

Subject contents

Basic knowledge of chemical kinetics: rate of reaction, dependence of rate on concentration, rate constant, chemical reaction order. The influence of the temperature on the rate Arrhenius equation and activation energy. Chemical kinetics of the simple and complex processes. The basic and the using of the Stady State Assumption. Reactions in a gas phase and in a solution. The Collision Theory and the Transition State Theory for description of a chemical reaction. Homogeneous, heterogeneous and enzymatic catalysis. Adsorption. Contact processes. The structure and features of catalysts. Autocatalysis. The elements of: electrode reactions, chain reaction, oscillating reactions, photochemistry and polymerisation.

Prerequisites and co-requisites

Basic knowledge of general, inorganic and organic chemistry and mathematics (basic types of functions and their plots, basic of differential calculus, the calculation of simple integral).

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
test of kinetics calculations	50.0%	50.0%
lecture test	60.0%	40.0%
presence at lectures	80.0%	10.0%

Recommended reading

Basic literature	P. Atkins, J. De Paula, “Atkin’s Physical Chemistry”, Oxford Henry Eyring, Edward Eyring „Modern chemical kinetics”, Reinhold,
Supplementary literature	M. R. Wright, “An Introduction to Chemical Kinetics”, John Wiley & Sons Ltd.,
eResources addresses	Adresy na platformie eNauczanie: Kinetyka i kataliza - 2024/2025 - Moodle ID: 39346 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=39346

Example issues/ example questions/ tasks being completed

1. The reaction between A + B is first order in A and second order in B. Give the rate expression, and then find the units of k (assume time in minutes).

2. Trichloroethanoic acid is readily decarboxylated in aqueous solution. Why is it possible in this case that the actual concentrations of the acid are not needed for the first order plot?

Work placement

Not applicable