GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	KINETICS AND CATALYSIC, PG_00064399		
Field of study	Chemistry		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2026/2027
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 -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Joanna Krakowiak	
	Teachers		

Lesson types

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

eNauczanie source address: https://enauczanie.pg.edu.pl/2025/course/view.php?id=5967

Moodle ID: 5991 Kinetyka i kataliza (2026/27)
https://enauczanie.pg.edu.pl/2025/course/view.php?id=5991

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_U06] analyses the operation of equipment, apparatus and process lines used in laboratories and the chemical industry	understands the diverse instrumentation requirements for investigating chemical reactions and catalytic processes, as well as the importance of process parameter control arising from reaction rates and the physicochemical properties of reagents.	[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools
[K6_K05] is aware of his/her social role as a graduate of a technical university, particularly in terms of communicating information and opinions to the public, and undertakes to communicate such information in an understandable way	recognizes the importance of kinetics and catalysis in solving technological and environmental problems and is able to communicate information related to these issues to various groups of recipients	[SK4] Assessment of communication skills, including language correctness
[K6_W03] demonstrates knowledge in the area of theoretical chemistry and related engineering disciplines, necessary to predict structures, design and conduct basic process operations using molecular mechanics tools	applies kinetic models and elements of theoretical chemistry to determine kinetic parameters, analyse reaction mechanisms, and describe selected catalytic processes	[SW1] Assessment of factual knowledge

<table>
<tr><td>Subject contents</td><td>Course content – lecture
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.
Course content – exercises
The calculation exercises address the kinetics of elementary chemical reactions, including zero-, first-, and second-order reactions, and the application of the Arrhenius equation to evaluate the effect of temperature on reaction rate constants. Students determine reaction orders using three calculation-based methods. The course also covers the analysis of selected complex reaction mechanisms, including reversible, parallel, and consecutive reactions.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>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).</td></tr>
<tr><td>Assessment methods and criteria</td><td>
<table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>presence at lectures</td><td>80.0%</td><td>10.0%</td></tr>
<tr><td>lecture test</td><td>60.0%</td><td>40.0%</td></tr>
<tr><td>test of kinetics calculations</td><td>50.0%</td><td>50.0%</td></tr>
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<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>P. Atkins, J. De Paula, Atkins Physical Chemistry, Oxford

Henry Eyring, Edward Eyring Modern chemical kinetics, Reinhold,</td></tr>
<tr><td>Supplementary literature</td><td>M. R. Wright, An Introduction to Chemical Kinetics, John Wiley & Sons Ltd.,</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td>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?</td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
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