GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Advanced Heat and Mass Transfer Operations and Processes, PG_00066037		
Field of study	Engineering and Technologies of Energy Carriers		
Date of commencement of studies	February 2025	Academic year of realisation of subject	2024/2025
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	4.0
Learning profile	practical profile	Assessment form	assessment
Conducting unit	Faculty of Chemistry		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Donata Konopacka-Łyskawa	
	Teachers	dr hab. inż. Donata Konopacka-Łyskawa dr inż. Iwona Hołowacz	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	20.0	0.0	30.0	30.0	0.0	80
	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	80	5.0	15.0	100

Subject objectives

To faimiliarize students with the selected advanced heat transfer and mass transfer processes: drying with using of superheated steam, absorption, adsorption processes, membrane processes, crystallization processes and processes with using of supercritical fluids. Presenting students the opportunities to use mathematical equations in the description of the presenting processes. Deloping students' computing skills for the selected processes.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U04] prepares a critical analysis of existing technical solutions and is able to propose their improvements (improvements).	The student indicates the advantages and disadvantages of the discussed advanced processes of heat and mass transfer. Student is able to apply a mathematical description to design selected heat and mass transfer processes.	[SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information
[K7_U02] is able to plan and conduct experiments, interpret the obtained results and draw conclusions	is able to plan and conduct experiments related to the operations discussed during classes, is able to present the results in a clear form and discuss them and draw conclusions on this basis	[SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task [SU1] Assessment of task fulfilment
[K7_W05] recognizes and describes phenomena in the field of physics and chemistry, including elements of chemical engineering necessary to predict the course of a technological process.	describes the mechanisms of the operations discussed during classes, indicates the driving force of the process, and analyzes the possibilities of intensifying the processes	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
[K7_U09] is able to manage the work of a team, coordinate the execution of a design or research task	is able to work in a team that performs a project task, including a team project manager.	[SU5] Assessment of ability to present the results of task [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment

<table>
<tr><td>Subject contents</td><td>Drying with superheated steam: thermodynamics of superheated steam, equilibrium and kinetics of drying of porous materials. Adsorption processes: sorption isotherms, adsorption and desorption kinetics, pressure swing processes and temperature seing processes. Membrane processes: membrane types and structure, gas permeation, gas diffusion, pervaporation, microfiltration, ultrafiltration, reverse osmosis, dialysis and electrodialysis. Crystallization methods: zone refining and additive crystallization. Processes using supercritical fluids: supercritical extraction and crystallization using supercritical fluids.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Properties of liquids and gases. Basic knowledge of physical chemistry: equilibria and diffusion.</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>Mini-projects and project</td><td>60.0%</td><td>16.0%</td></tr>
<tr><td>Lecture tests</td><td>60.0%</td><td>24.0%</td></tr>
<tr><td>Test</td><td>60.0%</td><td>4.0%</td></tr>
<tr><td>Test</td><td>60.0%</td><td>36.0%</td></tr>
<tr><td>Labs</td><td>60.0%</td><td>20.0%</td></tr>
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<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>D. W. Green, R. H. Perry: Perry's Chemical Engineers' Handbook, 8th ed.

J. D. Seader, E. H. Henley, D. K. Roper: Sparation processes principles</td></tr>
<tr><td>Supplementary literature</td><td>scientific papers</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td></td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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