



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 2027		Academic year of realisation of subject		2026/2027		
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 -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Donata Konopacka-Łyskawa				
	Teachers						
Lesson types	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 familiarize 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		

Subject contents	Course content – lecture 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 swing 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.		
Prerequisites and co-requisites	Properties of liquids and gases. Basic knowledge of physical chemistry: equilibria and diffusion.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Mini-projects and project	60.0%	16.0%
	Lecture tests	60.0%	24.0%
	Test	60.0%	4.0%
	Test	60.0%	36.0%
	Labs	60.0%	20.0%
Recommended reading	Basic literature	D. W. Green, R. H. Perry: Perry's Chemical Engineers' Handbook, 8th ed. J. D. Seader, E. H. Henley, D. K. Roper: Separation processes principles	
	Supplementary literature	scientific papers	
	eResources addresses		
Example issues/ example questions/ tasks being completed			
Practical activities within the subject	Not applicable		

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