



Subject card

Subject name and code	Advanced Heat and Mass Transfer Operations and Processes, PG_00048863						
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		6.0		
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						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	30.0	30.0	0.0	90
	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	90		10.0		50.0	150
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_U03		Student to solve project tasks uses knowledge of fluid flow, material and heat balances, criterion equation and physicochemical equilibria.		[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools		
	K7_W06		The student knows and understands the theoretical bakcgrounds of selected advanced processes of heat and mass transfer.		[SW1] Assessment of factual knowledge		
	K7_W04		The student knows and understands the designing methodology of selected advanced processes of heat and mass transfer.		[SW1] Assessment of factual knowledge		
	K7_U04		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.		[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject		
	K7_U09		The student is able to work in a team that performs a project task, including a team project manager.		[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU5] Assessment of ability to present the results of task		

Subject contents	Drying with superheated steam: thermodynamics of superheated steam, equilibrium and kinetics of drying of porous materials. Absorption and desorption: absorption equilibria, counter-current absorption of single component, multicomponent counter-current absorption, desorption, absorption with chemical reaction. 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
	Lecture tests	60.0%	24.0%
	Mini-projects and project	60.0%	16.0%
	Labs	60.0%	20.0%
	Test	60.0%	36.0%
	Test	60.0%	4.0%
Recommended reading	Basic literature	D. W. Green, R. H. Perry: Perry's Chemical Engineers' Handbook, 8th ed.	
	Supplementary literature	scientific papers	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		

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