



## Subject card

Subject name and code	Heat and mass transport, PG_00057373						
Field of study	Mechanical Engineering						
Date of commencement of studies	February 2024		Academic year of realisation of subject		2023/2024		
Education level	second-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	1		Language of instruction		Polish		
Semester of study	1		ECTS credits		4.0		
Learning profile	general academic profile		Assessment form		exam		
Conducting unit	Zakład Ekoinżynierii i Silników Spalinowych -> Institute of Energy -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. inż. Janusz Cieśliński				
	Teachers		prof. dr hab. inż. Janusz Cieśliński				
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		8.0		47.0	100
Subject objectives	Presentation of theoretical basics of heat and mass transfer processes.Paying attention to the analogy of heat and mass transfer processes. Supporting theoretical considerations with examples of calculations.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K7_U08] is able to design a procedural equipment or device compliant with the specifications using a design aid system in the form of a design documentation, selecting the appropriate model, performing critical analysis with the proper selection of tools and technologies		The student knows the procedures for calculating surface area of heat and mass exchangers		[SU4] Assessment of ability to use methods and tools		
	[K7_W03] possesses a profound knowledge on thermodynamic processes and their simulation, knows simulation methods and programs aiding the design and operation of power generating machines and process equipment, including renewable energy sources, air conditioning and cooling  renewable energy sources, air conditioning and cooling		The student knows the procedures for calculating heat and mass flux		[SW1] Assessment of factual knowledge		
	[K7_W08] possesses widened knowledge within the range of design methods of hydraulic systems, heating and fluid-flow machines and transport devices		The student knows and understands the mechanisms of heat and mass transport.		[SW3] Assessment of knowledge contained in written work and projects		

Subject contents	A. Heat transfer		
	1. Conduction, convection, radiation		
	2. Common heat transfer		
	3. Heat transfer with phase change		
	4. Heat exchangers		
	B. Mass transfer		
	1. Diffusion, convection,		
	2. Analogy between heat and mass transfer		
	3. Simultaneous heat and mass tarnser		
	Prerequisites and co-requisites	Applied thermodynamics, heat transfer	
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Lecture	56.0%	50.0%
	Numerical exercises	56.0%	50.0%
Recommended reading	Basic literature	1.Bergman T.L., Lavine A.S., Incropera F.P., Dewitt D.P.: Fundamentals of heat and mass transfer, J. Wiley&Sons, 2011  2.Kreith F., Manglik R.M., Bohn M.S., Tiwari S.: Principles of heat transfer, Cengage Learning, 2011  3.Serth R.W., Lestina T.G.: Process heat transfer, Elsevier, 2014  4.Gupta J.P.: Heat exchanger and pressure vessel technology, Hemisphere Publishing Corporation, 1986	
	Supplementary literature	1.Bird R.B., Stewart W.E., Lightfoot E.N.: Transport phenomena, John Wiley&Sons, 1960  2. Brodowicz K.: Wymienniki ciepła i masy, Wydawn. PW, 1980	
	eResources addresses	Adresy na platformie eNauczanie: Heat and mass transport - Moodle ID: 37732 <a href="https://enauzanie.pg.edu.pl/moodle/course/view.php?id=37732">https://enauzanie.pg.edu.pl/moodle/course/view.php?id=37732</a> Heat and mass transport - Moodle ID: 37732 <a href="https://enauzanie.pg.edu.pl/moodle/course/view.php?id=37732">https://enauzanie.pg.edu.pl/moodle/course/view.php?id=37732</a>	
Example issues/ example questions/ tasks being completed	1. Diffusion mechanism of heat and mass transport. 2. Equation of conservation of energy and mass.3. Thermal and concentration boundary layers4. Lewis law5. Lewis number6. Peclet's law. Mean log temperature		
Work placement	Not applicable		