GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Membrane technologies in enviromental protection, PG_00052323		
Field of study	Chemical Technology		
Date of commencement of studies	October 2021	Academic year of realisation of subject	2023/2024
Education level	first-cycle studies	Subject group	Obligatory subject group 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	6	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Chemistry and Technology of Functional Materials -> Faculty of Chemistry		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Radosław Pomećko	
	Teachers	dr inż. Radosław Pomećko dr inż. Mariusz Szkoda dr inż. Konrad Trzciński Daria Roda	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	15.0	0.0	0.0	30

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	30	5.0	15.0	50

Subject objectives

The aim of the course is to familiarize with membrane processes currently used on an industrial scale. Mechanisms of mass transport in membrane processes as well as parameters characterizing these processes will be presented.

Learning outcomes

Course outcome	Subject outcome	Method of verification
K6_W04	The student knows the basic groups of membranę processes, their characteristics and proces parameters. The student can give examples of the membrane proces applications, leading to the reductions of pollutant emitions or more favorable use of raw materials.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
K6_U04	The student can propose a membrane process which gives expected separation effects for the specified mixture. The student uses information on membranę transport to control laboratory experiments.	[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject

Subject contents	1) Definitions and key parameters of porous membranes selectivity. 2) Dimensions and types of solutes separated by MF, UF, NF and RO techniques. 3) Schematic classification of membrane morphology. 4) Methods for synthesis of porous membranes. 5) Advantages of asymmetric porous membranes in comparison to symmetric membranes. 6) Scaling and fouling phenomena. How to limit these effects? 7) Comparison of NF and RO techniques in terms of parameters and effects of these processes. 8) Mass transport mechanisms in liquid membranes. 9) Phenomena affect the stability of liquid SLM membrane. 10) Parameters of polymers applied as a matrix for SLM membranes.
Prerequisites and co-requisites	Knowledge: mathematics, basics of physical chemistry, basic of organic chemistry

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
	60.0%	60.0%
	51.0%	40.0%

Recommended reading

Basic literature

1. Robert Rautenbach: Membrane Processes, Wiley, 1989 (1 edition)

2. Marcel Mulder: "Basic principles of membrane technology, Kluwer Academic Publishers, 1996

3. A.Figoli , A.Criscuoli (eds.): Sustainable Membrane Technology for Water and Wastewater Treatment, Springer Nature Singapore Pte Ltd. 2017

4. R.W. Baker: Membrane technology and applications, J. Wiley 2004.

	Supplementary literature	1. K.W. Böddeker: Liquid Separations with Membranes 2nd edition, Springer Nature Switzerland AG, 2018 2. B.Ladewig, M.Nadhim, Z. Al-Shaeli: Fundamentals of Membrane Bioreactors, Springer Nature Singapore Pte Ltd. 2017 3. L.K. Wang, J.P. Chen, Y.-T. Hung, N.K. Shammas: Membrane and Desalination Technologies, Springer New York Dordrecht Heidelberg London 2011 4. W.S. Winston "Membrane Handbook", Springer Science+Business Media New York, 1992 5 G.L. Amidon "Membrane Transporters as Drug Targets", Kluwer Academic Publishers, 2002 6. M. Mulder: "Basic principles of membrane technology, Kluwer Academic Publishers, 1996
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	1) Definitions and key parameters of porous membranes selectivity. 2) Dimensions and types of solutes separated by MF, UF, NF and RO techniques. 3) Schematic classification of membrane morphology. 4) Methods for synthesis of porous membranes. 5) Advantages of asymmetric porous membranes in comparison to symmetric membranes. 6) Scaling and fouling phenomena. How to limit these effects? 7) Comparison of NF and RO techniques in terms of parameters and effects of these processes. 8) Mass transport mechanisms in liquid membranes. 9) Phenomena affect the stability of liquid SLM membrane. 10) Parameters of polymers applied as a matrix for SLM membranes	
Work placement	Not applicable	