GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Membrane Processes, PG_00049379		
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2026/2027
Education level	first-cycle studies	Subject group	Optional subject group 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	4	Language of instruction	Polish
Semester of study	7	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Chemistry and Technology of Functional Materials -> Faculty of Chemistry -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Radosław Pomećko	
	Teachers		

Lesson types

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	3.0	42.0	75

Subject objectives

The aim of the course is to acquaint students with the new operational processes and using membranes. Clarify the concept of membranes and their classification, division into natural and synthetic. Elucidation of the mechanisms of separation and presentation of the process determinants such as differential pressure, concentration, etc.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U51] can conduct laboratory work connected with chemistry and biochemistry, specific to biomedical engineering	The student possesses the knowledge and skills related to the work being performed.	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools
[K6_U05] can plan and conduct experiments related to the field of study, including computer simulations and measurements; interpret obtained results and draw conclusions	The student is able to skillfully solve assigned tasks after properly analyzing them beforehand.	[SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment

Subject contents

Course content – lecture
Membrane processes, development and history; basic concepts, the membrane (definition), biological membranes; classification of the membranes and methods of their preparation; Membrane modules; The parameters characterizing the processes: the driving force, mass flow, the ability separation membranes, selectivity and efficiency of the process; Pressure membrane processes (nano-, ultra- and microfiltration, reverse osmosis); The processes of the driving force Δc: dialysis and hemodialysis, gas separation, pervaporation; Liquid membranes (BLM, SLM PIM), transport of ions and non-electrolytes; Media ion transport through the membrane: structure and properties of the compounds ionophore (conveyors). Current separation techniques - electrodialysis; membrane reactors. Examples of medical applications of membrane processes.

Prerequisites and co-requisites

Basics of organic chemistry, inorganic chemistry, physical chemistry and principles of polymers. Knowledge on equilibrium in particular Donnan equilibrium, chemical potentials and selectivity

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Written exam	51.0%	70.0%
Practical exercises	51.0%	30.0%

Recommended reading

Basic literature

1. R. Rautenbach: Procesy membranowe, WNT, Warszawa, 1996.
2. Praca zbiorowa, Red. R. Wódzki: Membrany teoria i praktyka UMK, Toruń, 2003
3. E. Biernacka, T. Suchecka: Techniki membranowe w ochronie środowiska, Wyd. SGGW, W-wa 2004

	Supplementary literature	1. R. Praca zbiorowa: Membrany i membranowe techniki rozdziału, pod red. A. Narębskiej UMK, Toruń 1997. 2. N.Li, A.G. Fane, T. Matsuura: Advanced Membrane Technology and Applications, J. Wiley & Sons, Ltd, 2008. 3. M. Mulder: Basic Principle of Membrane Technology, Kluwer, The Nederlands, 1991
	eResources addresses	
Example issues/ example questions/ tasks being completed	1. Definitions: membrane, the feed, permeate, retentate, Donnan equilibrium, 2. Mechanisms of membrane processes 3. Reverse Osmosis 4. Hemodialysis 5. The use of membrane processes in medicine	
Practical activites within the subject	Not applicable	

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