

**DOCTORAL SCHOOL OF WROCLAW UNIVERSITY OF SCIENCE AND  
TECHNOLOGY**

**SUPERVISOR DECLARING/CONDUCTING COURSE: Marek Bryjak**  
**DEPARTMENT: Chemical Department**  
**SCIENTIFIC DISCIPLINE: Chemical Engineering**

**COURSE CARD**

**Course name in Polish:** ... Technologie membranowe

**Course name in English:** Membrane Technologies

**Course language Polish / English\***

**University-wide general course type\*: Yes/ No**

**1) ~~basic course~~**

**2) specialist course**

**3) ~~seminar~~**

**4) ~~humanistic course~~**

**5) ~~language~~**

**Subject code:** CIQ100099W

\* delete as applicable

	Lecture	Foreign language course	Seminar	Mixed forms
Number of hours of organized classes in university (ZZU)	30			
Grading	Exam			
Number of ECTS points	<b>0</b>			

**PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES**

1. Principles of material science
2. Principles of chemical engineering (mas and energy transports)

**COURSE OBJECTIVES**

- C1. To present used methods of membrane separations  
 C2 To show new methods based on membranology approaches

**PROGRAM CONTENTS**

<b>Form of classes – lecture (Lec)</b>		Number of hours
Lec1	History of membrane separation use	
Lec2	Membranes: materials, morphology and modification	
Lec3	Transport phenomenon; separation effect	

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Lec4	Gas separation – principles and materials	
	Emerging technologies for gas separation	
	Vapor separation – principles, used membrane materials	
	New technologies for separation of organic vapors	
	Dialytic technologies	
	Electromembrane processes	
	Filtration processes	
	Hybrid processes	
	Preparation of selective membranes	
	Renewable sources of energy vs. membrane technologies	
	Membranes in medicine	
	Membrane for non-separation technologies	
	Total hours:	

<b>Form of classes – foreign language course (Lng)</b>		Number of hours
Lng1		
Lng2		
Lng3		
..		
	Total hours:	

<b>Form of classes – seminar (Sem)</b>		Number of hours
Sem1		
Sem2		
Sem3		
...		
	Total hours:	

<b>Form of classes – mixed forms (mix)</b>		Number of hours
Mix1		
Mix2		
Mix3		
...		
	Total hours:	

<b>TEACHING TOOLS USED</b>	
N1.Lectures N2.Literature survey	

<b>ACHIEVED SUBJECT LEARNING OUTCOMES</b>		
Type of learning outcome	Code of learning outcome	Assessment of learning outcome
Knowledge	P8U-W	Knows how to present contributions of other

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		authors, knows literature
Knowledge	P8S-WG	Has knowledge on membrane processes and technologies
...		
Skills	P8U-U	Knows how to use bases WoS and Scopus for a search of membrane processes
Skills		
...		
Social competence	P8S-KO	Knows what means collaboration in conducting the common research and analyses
Social competence		
...		

**PRIMARY AND SECONDARY LITERATURE**

**PRIMARY LITERATURE:**

- [1] F.W.Billmeyer, Textbook of Polymer Science, J.Wiley New York, 1984
- [2] J.F.Rabek, Współczesna wiedza o polimerach, PWN Warszawa, 2013
- [3] K.Li, Ceramic Membranes for Separation and Reaction, J.Wiley, 2007
- [4] N.Hilal, Membrane modification, CRC Press 2012
- [5] M.Bryjak, Innovative materials and methods for water treatment, CRC Press 20015

**SECONDARY LITERATURE:**

- [1] E.Hoek, Encyclopedia of Membrane Science and Technology, J.Wiley, 2013
- [2] A.Basile, Membrane for Membrane reactors, Elsevier, 2013

**SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)**

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