



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Membrane techniques in water technology

		Course
Field of study		Year/Semester
Environmental Protection Technologies		III/6
Area of study (specialization)		Profile of study
-		general academic
Level of study		Course offered in
First-cycle studies		polish
Form of study		Requirements
full-time		elective

		Number of hours
Lecture	Laboratory classes	Other (e.g. online)
0	0	0
Tutorials	Projects/seminars	
0	15	
Number of credit points		
2		

		Lecturers
Responsible for the course/lecturer:		Responsible for the course/lecturer:
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Prerequisites
Basic knowledge in general chemistry, inorganic and organic chemistry as well as physical chemistry and basics of environmental protection; English language skills at the level allowing studying the reserach papers

Course objective

Gaining theoretical knowledge and practical skills in industrial aplications of membrane techniques, especially in water treatment.



Course-related learning outcomes

Knowledge

* K_W11 has the knowledge allowing to describe basic trends related to technology for environmental protection (P6S_WG, P6S_WK)

*K_W12 knows the methods, techniques, tools and materials used for solving elementary engineering tasks related to technology for environmental protection (P6S_WG)

Skills

*K_U01 gains the data from literature, databases and other sources related to chemical sciences;

, integrates and interprets the data, draws the conclusions and formulated the opinions (P6S_UW)

* K_U05 is able to prepare and present the oral speech related to technology for environmental protection in Polish and foreign language (P6S_UK)

* K_U19 can make a project of the elementary process or object in technology for environmental protection (P6S_UW, P6SI_UW)

Social competences

*K_K02 is aware of importance and understands nontechnical aspects and consequences of engineering activity, including its impact on environment and responsibility for making the decisions (P6S_KK P6S_KR)

* K_K03 can cooperate and work in team playing different roles in the group (P6S_KR)

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Graded presentation (0-30 pts), participation in the discussion (0-5pts) and written assignment during the last class consisting of 5-10 open questions (0-40pts). The final grade will be set according to the scale:

3,0: 38-44 pts

3,5: 45-52- pts

4,0: 53-59 pts

4,5: 60-66 pts

5,0: above 67pts

In the case of remote teaching the learning outcome is verified by E-kursy platform using analogous forms and criteria as in classroom teaching.

Programme content

1. Microfiltration in treatment of ground and surface water



2. Membrane methods for desalination of sea water
3. Application of nanofiltration for treatment of potable water and water for farming.
4. Membrane techniques in preparation of water for energetic purposes
5. Fouling in membrane installation for water treatment
6. Ultrafiltration for ground and surface water treatment
7. Membrane methods for water degassing
8. Hybrid processes in water treatment
9. Water desalination using membrane distillation
10. Removing of water hardness by membrane methods

Teaching methods

Multimedia presentation of students based on scientific literature and group discussion

Bibliography

Basic

1. M. Bodzek, K. Konieczny, Wykorzystanie procesów membranowych w uzdatnianiu wody, Oficyna Wydawnicza Projprzem-EKO, Bydgoszcz 2005.
2. M. Bodzek, J. Bohdziewicz, K. Konieczny, Techniki membranowe w ochronie środowiska, Wydawnictwo Politechniki Śląskiej, Gliwice, 1997.
3. S. Judd, C. Judd (Red.) The MBR Book. Principles and applications of membrane bioreactors for water and wastewater treatment, 2nd ed., Elsevier, 2011

Additional

1. S. G. Salinas-Rodriguez, G. L. Amy, I. S. Kim, J.C. Schippers, M. D. Kennedy, Seawater Reverse Osmosis Desalination: Assessment & Pre-treatment of Fouling and Scaling, IWA Publishing, 2020
2. J. Mallevialle, P.E. Odendaal, M.R. Weisner (Red), Water treatment membrane processes, McGraw-Hill, 2020
3. Ceynowa, Membrany selektywne i procesy membranowe, Membrany teoria i praktyka, z. II, Wykłady monograficzne i specjalistyczne, Toruń 2009, 7–29.



Breakdown of average student's workload

	Hours	ECTS
Total workload	55	2,0
Classes requiring direct contact with the teacher	30	1,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) ¹	25	1,0

¹ delete or add other activities as appropriate