



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Separation of mixtures - membrane water purification for the pharmaceutical industry  
[S1IFar2>ORMmowdpf]

### Course

Field of study

Pharmaceutical Engineering

Year/Semester

4/7

Area of study (specialization)

–

Profile of study

general academic

Level of study

first-cycle

Course offered in

Polish

Form of study

full-time

Requirements

elective

### Number of hours

Lecture

0

Laboratory classes

15

Other

0

Tutorials

0

Projects/seminars

0

### Number of credit points

1,00

### Coordinators

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### Lecturers

### Prerequisites

Basic knowledge in the field of general, inorganic, organic and physical chemistry as well as familiarity with the elementary equipment of pharmaceutical industry.

### Course objective

The aim of course is to gain the knowledge and practical skills in membrane separation techniques used in pharmaceutical industry. Laboratory exercises are based on active practical learning of membrane filtration techniques for water treatment for pharmaceutical industry.

### Course-related learning outcomes

Knowledge:

1. Student has detailed knowledge in separation processes and treatment of raw materials and products used in pharmaceutical, cosmetic and chemical industry. [K\_W15]

2. Student has basic knowledge in terms of construction of equipment and installations in pharmaceutical industry and in related industries. [K\_W18]

Skills:

1. Student is able to identify basic unit processes and operations of pharmaceutical engineering and formulate their specifications. [K\_U15]

2. Student is able to select the proper approach and equipment to solve elementary and complex engineering problems related to pharmaceutical engineering; is able to analyze and evaluate the functioning of basic equipment of pharmaceutical industry. [K\_U16]

Social competences:

1. Student is ready to: take the individual decisions and lead the team, to critically evaluate his or her own activity and activity of the team, to take the responsibility for the effects of those activities; he or she is able to collaborate and work in group, inspire and integrate the people in his or her professional work environment. [K\_K2]

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The writing assignment before each laboratory exercise composed of 3-5 questions and graded in the range: 0-10 pts. The following grading scale will be used

3,0: 5,5-6,5 pts,

3,5: 6,5-7,0 pts,

4,0: 7,5-8,0 pts,

4,5: 8,5-9,0 pts,

5,0: 9,5-10 pts,

All experiments must be completed and correct reports from each laboratory class must be prepared in a team. The final grade is the average of all the grades. In the case of compulsory online teaching the course will be held on E-kursy platform and the same grading criteria will be applied (except the obligatory completing all experiments which will be substituted by video material).

### Programme content

The program covers the following topics:

1. Pressure and current membrane techniques.

2. Technical aspects of membrane processes in water purification.

### Course topics

The content of the course includes pressure- and current-driven membrane techniques used in pharmaceutical industry for water preparation. The students are being familiar with run of installations for reverse osmosis, forward osmosis, ultrafiltration, classic and bipolar electrodialysis for water treatment. Moreover, the laboratory exercises include practical study on technical aspects of membrane processes, e.g. mass transport resistances in membrane separation for water treatment.

### Teaching methods

The students plan the experiment, make the measurements, calculation, graphically present and discuss the results, formulate the conclusions and write the report. The students participate in these activities in teams.

### Bibliography

Basic:

1. M. Bodzek, J. Bohdziewicz, K. Konieczny, Techniki membranowe w ochronie środowiska, Wydawnictwo Politechniki Śląskiej, Gliwice, 1997.

2. K. Prochaska (Red.) Membranowe techniki separacji, Skrypt, Wydawnictwo Politechniki Poznańskiej, Poznań, 2013

3. J. Rautenbach, Procesy membranowe, WNT, Warszawa 1996

4. Biernacka, T. Suchecka, Techniki membranowe w ochronie środowiska, Wyd. SGGW, Warszawa 2004

Additional:

1. S. Judd, C. Judd (Red.) The MBR Book. Principles and applications of membrane bioreactors for water and wastewater treatment, 2nd ed., Elsevier, 2011
2. Z. Zhang, W. Zhang, E. Lichtfouse, Membranes for Environmental Applications, Springer, 2020
3. K. Scott, Handbook of industrial membranes, Elsevier Advanced Technology, 1998

### Breakdown of average student's workload

	Hours	ECTS
Total workload	30	1,00
Classes requiring direct contact with the teacher	15	0,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	15	0,50