COURSE DESCRIPTION CARD - SYLLABUS

Course name
Membrane treatment of pharmaceuticals and waste streams [S1IFar1>MOFoSO]

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 (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

1,00

Coordinators

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Lecturers

Prerequisites

Elementary knowledge in the field of general, inorganic, organic and physical chemistry as well as familiarity with the equipment of pharmaceutical industry; awarness of main environmental hazards resulting from industrial activity.

Course objective

The aim of course it to gain the knowledge and practical skills in membrane separation techniques used in pharmaceutical industry. Laboratory excercises are based on active practical learning of membrane filtration techniques in terms of separation of pharmaceuticals and sewage treatment in pharmaceutical industry.

Course-related learning outcomes

Knowledge:
*k_w8 knows the principles of environmental protection related to pharmceutrical technology and

waste management; has necessary knowledge on hazards related to implentation of chemical and pharmaceutical processes (p6s_wg p6s_wk)
*k_w15 has detailed knowledge in sepration processes and treatment of raw materials and products used in pharmaceutical, cometic and chemical industry (p6s_wg p6si_wg)
* k_w18 has basic knowledge in terms of construcion of equipment and installations in pharmaceutical industry and in related industries (p6s_wg p6si_wg)

Skills:
* k_u15 is able to identify basic unit processes and operations of pharmaceutical engineering and formulate their specifications (p6si_uw)
* k_u16 is able to select the proper approach and equipment tosolve elemenatry and complex engineering problems related to pharmaceutical engineering; is able to analyze and evaluate the functioning of basic equipment of pharmaceutical industry (p6s_uw p6si_uw)

Social competences:
*k_k2 is ready to: take the individual desicions and lead the team, to critically evaluathe 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 prefessional work environment (p6s_kk)
* k_k3 is aware of importance of understandint the non-technical aspects and consequences of engineering activity including its impact on the natural environment and the responsibility related to the decisions made in this area; he or she identifies properly the problems and take the right choices related to the professional activity according to the professional ethical rules and care about the output and traditions related to the profession (p6s_kr)

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
The writing assignment before each laboratory excersice 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 compulsary online teaching the course will be held on E-kursy platform and the same grading criteria will we applied (except the obligatory completing all experiments which will be substitted by video material).

Programme content

The content of the course includes pressure- and current-driven membrane techniques used in pharmaceutical industry for separation of pharmaceuticals and for treatment of sewage formed along with industrial production. The students are being familiar with practical work of installations for reverse osmosis, forward osmosis, biomemebrane reactors, ultrafiltration, classic and bipolar electrodialysis for treatment of waste streams. Moreover, the laboratory excercises include technical aspects of membrane processes, e.g. study on mass transport resistances in membrane separation or the work of different membrane modules

Teaching methods

The students plan the experiment, make the measurements, calculation, graphically present and discuss the results, formulate the conlcusions 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 aplications of membrane bioreators 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	20	0,70
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	10	0,30