COURSE DESCRIPTION CARD - SYLLABUS

Course name
Process optimization [S2IChiP1>OP]

Course

Field of study
Chemical and Process Engineering

Year/Semester
1/2

Area of study (specialization)
Bioprocesses and Biomaterials Engineering

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
0

Other
0

Tutorials
0

Projects/seminars
30

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

The student starting this course should have basic knowledge of mathematics, numerical methods, chemical engineering. He should also have the ability to obtain information from the indicated sources and be ready to cooperate as part of the team.

Course objective

Provide students with basic knowledge in the field of modeling and optimization of chemical processes.

Course-related learning outcomes

Knowledge:
1. k_w01 the student has extended and deepened knowledge in the field of mathematics and computer science necessary for modeling, planning, optimization and characterization of industrial chemical processes as well as planning experiments and processing the results of experimental research.

Skills:
1. k_u01 the student has the ability to obtain and critically evaluate information from literature, databases and other sources and to formulate opinions and reports on this basis.

2. k_u09 the student has the ability to analyze and solve problems related to chemical technology and process engineering, using for this purpose theoretical, analytical, simulation and experimental methods.

Social competences:
1. k_k01 the student understands the need for lifelong learning; is able to inspire and organize the learning process of other people; is aware of the importance and non-technical aspects and effects of engineering activities, including its impact on the environment, and the related responsibility for decisions made.
2. k_k06 the student can think and act in a creative and entrepreneurial way.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The knowledge acquired during the cycle of lectures is verified by a 45-60 minute exam conducted during the last lecture. The exam consists of 3-5 open-ended questions or 10-20 short answers questions, each with varying poins.
The passing threshold is equal to 51% of the total number of points. The final grade for the lecture will be assigned according to the following criteria: 51%-60% (3.0), 60%-70% (3.5), 70%-80% (4.0), 80%-90% (4.5), 90%-100% (5.0). Topics for the exam, based on which the questions are prepared, will be provided to students during the lecture.
The skills acquired through the project will be evaluated based on the project assignment. Students will work on projects in groups of up to 3 people. The assignments must be submitted by the deadline set by the lecturer.

Programme content

1. Basic information about optimization methods.
2. Optimality conditions for tasks without constraints.
3. Optimum conditions for tasks with equality constraints.
4. Optimum conditions for tasks with inequality constraints.
5. Duality of optimization tasks.
6. Linear and nonlinear programming.
7. Multi-objective optimization.
8. Nondeterministic optimization methods.
9. Numerical methods used in optimization.

Course topics

Issues related to modeling and optimization of chemical processes.

Teaching methods

Lecture: multimedia presentation.
Project: Analysis and solving of selected optimization problems.

Bibliography

Basic
1. Roman Krupiczka, Henryk Merta, Optymalizacja Procesowa, Wydawnictwo Politechniki Śląskiej, 1998.
2. Krzysztof Urbaniec, Optymalizacja w projektowaniu aparatury procesowej, Wydawnictwa Naukowo_Techniczne, Warszawa 1979.
3. Stanisław Sieniutycz, Optymalizacja w inżynierii procesowej, Wydawnictwo Naukowo - Techniczne, 1991.
4. Władysław Findeisen, Jacek Szymanowski, Andrzej Wierzbicki, Metody obliczeniowe optymalizacji, Wydawnictwo Politechniki Warszawskiej, 1972.
Additional
1. W. W, Kafarow, Metody cybernetyki w chemii i technologii chemicznej, Wydawnictwa Naukowo_Techniczne, Warszawa 1979.
2. Andrzej Nowak, Optymalizacja. Teoria i zadania, Wydawnictwo Politechniki Śląskiej, 2007.
3. Anna Danielewska-Tułecka, Jan Kusiak, Piotr Oprocha, Optymalizacja. Wybrane metody z przykładami,

Wydawnictwo Naukowe PWN, 2021.

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	60	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	40	1,50