POZNAN UNIVERSITY OF TECHNOLOGY

EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)

COURSE DESCRIPTION CARD - SYLLABUS

Course name
Theoretical fundamentals of chemical technology [S1TOZ1>PTTC]

Course

Field of study
Circular System Technologies

Year/Semester
3/5

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
15

Other (e.g. online)
0

Tutorials
0

Projects/seminars
15

Number of credit points

3,00

Coordinators

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Lecturers

Prerequisites

Fundamental knowledge of math at academic level, general, organic and physical chemistry as well as chemical thermodynamics and process engineering; fundamental knowledge of process equipment and safety rules in chemical laboratory; basic skills in searching information in the available resources.

Course objective

The aim of course is to gain the knowledge and practical skills in fundamentals of chemical technology, particularly for making mass and energy balances of the processes, including circular systems; in addition the aim of the course is to develep the skills required for evaluation of kinetic, thermodynamic and environmental constraints in production process in chemical industry.

Course-related learning outcomes

Knowledge:
1. student has mathematical skills necessary for solving practical engineering problems [k_w01].

2. student has necessary knowledge of raw materials, products and processes used in circular system technologies [k_w10].
3. student has knowledge of physical and chemical fundamentals of unit processes in circular system technologies [k_w22].
4. student has fundamental knowledge of heat, mass and momentum exchange [k_w23].

Skills:
1. student is able to plan and organize the individual and team work [k_u08].
2. student is able to use professional software for graphical design of project documentation [k_u10].
3. student is able to select and evaluate the usefulness of tools and methods for solving problems regarding circular system technologies [k_u12].
4. student is able to plan the stages of modification and adaptation of exisitng objects and equipment as well as designing new ones according to the principles of circular system technologies; he/she is able to predict and evaluate the impact of the implentation of the project on the environement [k_u14].
5. student is able to make a mass and energy balance both for unit processes and for the whole installation used in circular system technologies [k_u17].
6. student is able to read and prepare technical drawings and process flowsheets [k_u18].

Social competences:
1. student is independent and creative in individual work and he/she works effectively in a team, playing various roles; he/she evaluates objectively the effects of his/her own work and team members [k_k02].
2. student supports the idea of harmonized, global develeopment of economy and civilization; he/she promotes the principles of closed-cycle technologies, sustainable development and rational management of natural resources at local and global scale [k_k09].

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
An exam - writing assignment consisting of 20-30 open and test questions graded in the range 0-100 pts and the following grading scale is applied:
3 51 - 60 pts
3,5 61 - 70 pts
4,0 71 - 80 pts
4,5 81 - 90 pts
5,0 91-100 pts
Project: Graded projects. Consecutive evaluation of calculations and effects of the projects. Written assingment including solving the problems regarding kinetics and static equilibrium of chemical reaction.
Laboratory classes: completing all laboratory classes, written assignment before each laboratory class (3-5 open questions), acceptance of all laboratory reports. The final grade is the average of all obtained grades.
In the case of mandatory online teaching the course will be available in Ekursy platform and analogous methods for veryfing learning outcomes and assesment criteria will be applied (excepet completing laboratory classes which will be replaced by video material).

Programme content

Lecture:
1. Introduction to chemical technology, fundamental definitions.
2. Stages in technological process design.
3. Chemical concept of the process (process stochiometry, and chemical equilibria, thermodynamic and kinetics of chemical reactions).
4. Technological concept of the process (technological priniciples and green chemistry principles).
5. Mass and energy balance in technological process.
6. Classification and characterization of chemical reactors.
7. Principles of circular systems technologies.
Project:
During the classes, students solve the problems regarding the kinetics of elementary and complex reactions using nonlinear algebraic and differential equations. Students analyze the impact of stoichiometry and various conditions on the course of chemical reactions.

Laboratory classes
Practical experiments made by students using reserach equipment in the laboratory.

Teaching methods

Lecture illustrated by multimedia presentation and the team discussion.
Laboratory classes: Fisrt-hand experience provided by practical experiments.

Bibliography

Basic
1. M. Wiśniewski, K. Alejski, Podstawy technologii chemicznej i inżynierii reaktorów, Wyd. Politechniki Poznańskiej, Poznań 2017.
2. J. Szarawara, J. Piotrowski, "Podstawy teoretyczne Technologii Chemicznej", WNT, Warszawa 2010.
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Additional
1. J. Ciborowski, Inżynieria chemiczna, inżynieria procesowa, WNT, Warszawa 1965.
2. J. Szarawara, J. Skrzypek, A. Gawdzik, "Podstawy inżynierii reaktorów chemicznych", WNT Warszawa 1991.
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4. M. Rojewska, M. Skrzypiec, K. Prochaska, The wetting properties of Langmuir–Blodgett and Langmuir–Schaefer films formed by DPPC and POSS compounds, Chemistry and Physics of Lipids 221 (2019) 158-166.
5. M. Skrzypiec, G.A. Georgiev, M. Rojewska, K. Prochaska, Interaction of polyhedral oligomeric silsesquioxanes and dipalmitoylphosphatidylcholine at the air/water interface: Thermodynamic and rheological study, Biochimica et Biophysica Acta – Biomembranes 1859(10), 2017, 1838-1850.
6. A. Bartkowiak, M. Rojewska, A. Biadasz, J. Lulek, K. Prochaska, Surface properties and morphology of selected polymers and their blends designed to mucoadhesive dosage forms, Reactive and Functional Polymers 118, (2017) 10-19 .
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Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	50	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	25	1,00