COURSE DESCRIPTION CARD - SYLLABUS

Course name
Modeling of technological processes [S2TCh2-PTiB>MPT]

Course

Field of study
Chemical Technology

Year/Semester
1/2

Area of study (specialization)
Technological Processes and Bioprocesses

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
0

Laboratory classes
0

Other (e.g. online)
0

Tutorials
0

Projects/seminars
30

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

Student has knowledge of mathematics to the extent that allows him to use mathematical methods to describe chemical processes and make calculations needed in engineering practice. Student has ability to analyze and solve problems related to chemical technology and process engineering, using theoretical, experimental and simulation methods Student knows the basics of design using Chemcad and working with Mathcad.

Course objective

The aim of the course is to learn how to build mathematical models of unit operations of the chemical industry. The particular aim is to learn how to build and solve mathematical models using CAD type tools.

Course-related learning outcomes

Knowledge:
The student acquires knowledge in the area of building a full, closed mathematical description of

selected denotation operations. The student knows the methods of applying appropriate computational approach, applied algorithms and taking into account different levels of complexity in the project. The student understands the properties of parameters of numerical procedures used by the software and their significant influence on the way of conducting calculations. (K_W01, K_W03, K_W06, K_W07)

Skills:
The student is able to build a description in the form of mathematical equations for reactors, heat exchangers, distillation columns and hydraulic networks. The student identifies and selects the appropriate calculation approach depending on the description and design requirements. The student is able to select numerical parameters influencing the quality of obtained solutions. (K_U01, K_U06, K_U07, K_U14)

Social competences:
The student is aware of the cost of conducting numerical calculations. The student understands the importance of using a digital approach to solving issues in an engineering environment. Additionally, the student is aware of the necessity of using solutions in terms of apparatus and energy savings. (K_K02)

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Semester evaluation of the completed projects, consisting of a preliminary pre-project analysis, the quality of the completed project and the preparation of the final report along with a statistical assessment of the uncertainty of the model.
In the case of stationary classes, credit is given in a computer laboratory, while in the case of online classes credit is given using the university's network and computer infrastructure (VPN) via the Remote Desktop Protocol (RDP) using a remote desktop connection tool.

Programme content

Building mathematical models and solving them with a numerical tool - Mathcad. Using the physicochemical database in Chemcad. Implementation of selected thermodynamic models e.g.: description by means of relative volatility, Wilson's model with the use of binary interaction factors. Construction of models for tank reactors, tubular reactors, shell and tube heat exchangers, distillation in column apparatus and hydraulic issues - pipeline networks calculated based on defined pressures. Comparing mathematical models with models implemented in Chemcad.

Teaching methods

Presentation of methods for obtaining physicochemical data from the design support tool - Chemcad. A detailed overview of individual unit operations and building their models using the Mathcad tool. Based on the presented examples, students perform preliminary, test projects of individual unit operations during the classes. At this stage, the teacher assists students in the use of the CAD tool without solving any design problems.
During the course of the final course projects, students are assisted in the functioning of the Chemcad and Mathcad programs, but they make their own design decisions for which they are responsible. All solutions concerning schematic streams, media usage, equation selection, numerical parameters, constructional dimensions are the students' responsibility.

Bibliography

Basic:
Ruch ciepła i wymienniki / Tadeusz Hobler. Autor: Hobler, Tadeusz. Wydawnictwa Naukowo-Techniczne, 1986.
Dyfuzyjny ruch masy i absorbery / Tadeusz Hobler. Autor: Hobler, Tadeusz. Autor, Wydawnictwa Naukowo-Techniczne. Wydawnictwa Naukowo-Techniczne, 1976.

Additional:
Projektowanie systemów procesowych, Krzysztof Alejski, Maciej Staszak, Piotr Wesołowski. Politechnika Poznańska. Wydawnictwo Politechniki Poznańskiej, 2013.

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	20	1,00