COURSE DESCRIPTION CARD - SYLLABUS

Course name
Industrial process design [S2TCh2-PTiB>PPP2]

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

dr inż. Maciej Staszak
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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 knowledge in the basic field related to the selection of materials used in the construction of chemical equipment and installations. Student knows the basics of design using Chemcad.

Course objective

The aim of the course is to learn how to design apparatus and equipment of the chemical industry in dynamic applications. The particular aim is to learn how to design automatic PID control systems for a wide range of chemical industry equipment.

Course-related learning outcomes

Knowledge:
The student acquires knowledge in the area of designing auto-matics and regulation of chemical equipment, applying appropriate computational approach, applied PID loop tuning algorithms and taking into account different levels of complexity in the project. The student understands the properties of parameters of numerical procedures by software and their significant influence on the way of

conducting calculations. (K_W01, K_W03, K_W06, K_W07)

Skills:
Students will be able to realize the project of direct control systems, in cascade and with split range control. The student identifies fast and slow-changing processes. The student knows the influence of PID regulator parameters on the quality of process regulation. (K_U01, K_U06, K_U07, K_U14)

Social competences:
The student is aware of the impact of applied solutions in the project on the environment. Particular emphasis is placed on the effective operation of the control devices, which is also optimized in terms of savings of apparatus and energy. (K_K02)

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Semester evaluation of the completed project, consisting of a preliminary pre-project analysis, the quality of the completed project and the preparation of the final report.
In the case of the classroom version of the class, assessment takes place in the computer lab, while in the case of online classes, assessment takes place using the university's network-computer infrastructure (VPN) via the Remote Desktop Protocol (RDP) using the remote desktop connection tool.

Programme content

Design of control and actuation systems from a dynamic perspective. Design of hydraulic systems with special emphasis on control valves. Coupling of control valves with a PID controller. Design of control loops in single, cascaded, and split-range control systems. Effect of control parameters on process quality. Use of excitations on regulated variables. Use of ramp functions to define time profiles. Taking into account the dynamics of unit operations by considering time delay in flow systems.

Teaching methods

Extensive presentation of the operation of the design support tool - Chemcad in dynamic mode. Detailed overview of individual unit operations in dynamic mode. Detailed analysis and explanation of the influence of the regulation elements on the process. Based on the presented examples, students perform initial, test dynamic projects of individual unit operations during the classes. At this stage, the teacher supports the students in the area of using the CAD tool without solving any given design problems.
During the realization of the target semester project, students are assisted in the functioning of the Chemcad program, but they make their own design decisions for which they are responsible. All solutions concerning schematic guidance, media usage, apparatus selection, process settings, design requirements, construction dimensions, adjustment parameters 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