COURSE DESCRIPTION CARD - SYLLABUS

Course name
Projektowanie procesów przemysłowych (Industrial process design)

Course

Field of study
Technologia chemiczna (Chemical Technology)
Year/Semester
I/2
Area of study (specialization)
Technologia organiczna (Organic Technology)
Profile of study
general academic
Level of study
Second-cycle studies
Course offered in
Polish
Form of study
full-time
Requirements
compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
Tutorials	Projects/seminars	
	30	

Number of credit points

3

Lecturers

Responsible for the course/lecturer:
dr inż. Maciej Staszak

Responsible for the course/lecturer:

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.

Programme content

Dynamic design of systems. Design of hydraulic systems with particular emphasis on control valves. Coupling of control valves to the PID regulator. Design of control loops. Influence of regulation parameters on process quality. Using signals enforced on regulated variables. Ramp function. Dynamics of individual operations. Time delays 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	60	2,0
Classes requiring direct contact with the teacher	35	1,2
Student's own work (literature studies, preparation for project classes, project preparation and final report) [1]	25	0,8

[1] delete or add other activities as appropriate