Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Faculty of Chemical Technology and Engineering

Field of study	Chemical Engineering		
Mode of study	stationary	*Level*	first cycle
Graduate's qualification	inżynier		
Area(s) of study	nauki techniczne		
Educational profile	general academic		
Module			
Course unit	**Process Dynamics, Operations and Control**		
Code	ChEn_1A_S_C12		
Field of specialisation			
Administering faculty	Institute of Chemical Engineering and Environmental Protection Processes		
ECTS	4,0	*ECTS (forms)*	4,0
Form of course credit	credits	*Language*	english
Electives		*Elective group*	

Form of instruction	*Code*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
lecture	W	4	15	1,5	0,40	credits
laboratory course	L	4	30	1,5	0,30	credits
project course	P	4	15	1,0	0,30	credits

Leading teacher	Rakoczy Rafał (Rafal.Rakoczy@zut.edu.pl)
Other teachers	Konopacki Maciej (Maciej.Konopacki@zut.edu.pl)

Prerequisites

W-1	Mathematics
W-2	Industrial Automation
W-3	Bacic knowledge in chemical engineering.

Module/course unit objectives

C-1	This course will present an introduction to process dynamics and control. Students will learn how to construct dynamic models of process systems, how to analyze process dynamics using Laplace transforms and transfer functions, the characteristic responses of dynamic processes, and the design and implementation of feedback control. Students will also learn to use computer software to model process dynamics and control.

Course content divided into various forms of instruction		*Number of hours*
T-W-1	basic concepts; process dynamics fundamentals; dynamic behavior of processes; modelling of stagewise process; differential flow and reaction applications; simulation tools; examples of chemical engineering processes; process control; feedback and feedforward control;	15
T-L-1	Practical studies of dynamics of chemical engineering systems	30
T-P-1	Poject of chemical engienering systems with the application of Matlab software.	15

Student workload - forms of activity		*Number of hours*
A-W-1	Participation in lectures	15
A-W-2	Individual literature study	15
A-W-3	Preparation for exam	15
A-L-1	Participation in labs	30
A-L-2	Preparation of reports	10
A-L-3	Proeparation to pass	5
A-P-1	preparation of classes	15
A-P-2	Individual calculations	15

Teaching methods / tools

M-1	Information lecture with the use of a multimedia projector
M-2	Discussion
M-3	Laboratory
M-4	Project

Evaluation methods (F - progressive, P - final)

S-1	P	Written test

Evaluation methods (F - progressive, P - final)		
S-2	P	Written pass
S-3	F	Reports
S-4	F	Active participation in auditory classes

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Reference to the learning outcomes defined for the particular areas of education	Reference to learning outcomes leading to the degree of "inżynier"	Course objectives	Course content	Teaching methods	Evaluation methods
Knowledge							
ChEn_1A_C12_W01 Student has knowledge in process dynamics, operations and control, including calculation useful for solving tasks connected with the dynamic models of chemical engineering systems and the control of chemical engineering processes and systems.	ChEn_1A_W04 ChEn_1A_W11 ChEn_1A_W15	P6S_WG_TA11	P6S_WG_IA11	C-1	T-L-1 T-W-1 T-P-1	M-1 M-2 M-3 M-4	S-1 S-2 S-3
Skills							
ChEn_1A_C12_U01 Student will be able to: construct dynamic models of chemical processes; solve differential equations using Laplace transforms; build and analyze transfer function and state-space models; understand the dynamic response of representative processes; develop empirical dynamic process models; implement and tune PID controllers; use frequency response methods to analyze processes and design controllers; understand and implement feed-forward, ratio, cascade and multi-variable control.	ChEn_1A_U01 ChEn_1A_U03 ChEn_1A_U05 ChEn_1A_U07 ChEn_1A_U08 ChEn_1A_U16	P6S_UO P6S_UU P6S_UW_TA11 P6S_UW_TA14	P6S_UW_IA11 P6S_UW_IA14	C-1	T-L-1 T-W-1 T-P-1	M-2 M-3 M-4	S-1 S-2 S-3 S-4
Other social / personal competences							
ChEn_1A_C12_K01 Student is able to work in a group and perform as a group leader; he/she is able to estimate the time necessary to accomplish the assigned tasks.	ChEn_1A_K01 ChEn_1A_K03 ChEn_1A_K04 ChEn_1A_K05	P6S_KK P6S_KO P6S_KR		C-1	T-L-1 T-W-1 T-P-1	M-2 M-3 M-4	S-1 S-2 S-3 S-4

Required reading

1. Roffel, Brian, LinkProcess dynamics and control : modeling for control and prediction, John Wiley & Sons, cop., Chichester, 2006

2. J. Ingham, I. J. Dunn, E. Heinzle, J. E. Prenosil, J. B. Snape, Chemical Engineering Dynamics, WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim, 2007

Supplementary reading

1. Ingham J., Dunn I.J., Heinzle E., Prenosil J.E., Chemical Engineering Dynamics, Wiley-Vch, Verlag, 2000