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	**Integrated Chemical Engineering**		
Code	ChEn_1A_S_C18a		
Field of specialisation			
Administering faculty	Katedra Fizykochemii Nanomateriałów		
ECTS	9,0	*ECTS (forms)*	9,0
Form of course credit	examination	*Language*	english
Electives	7	*Elective group*	

Form of instruction	*Code*	*Semester*	*Hours*	*ECTS*	*Weight*	*Credit*
lecture	W	5	30	3,0	0,40	examination
lecturing course	A	5	30	2,0	0,30	credits
project course	P	5	60	4,0	0,30	credits

Leading teacher	Ambrożek Bogdan (Bogdan.Ambrozek@zut.edu.pl)
Other teachers	Ambrożek Bogdan (Bogdan.Ambrozek@zut.edu.pl), Chen Xuecheng (Xuecheng.Chen@zut.edu.pl), Cudak Magdalena (Magdalena.Cudak@zut.edu.pl), Kaleńczuk Ryszard (Ryszard.Kalenczuk@zut.edu.pl), Kiełbus-Rąpała Anna (Anna.Kielbus-Rapala@zut.edu.pl), Major-Godlewska Marta (Marta.Major@zut.edu.pl), Mijowska Ewa (Ewa.Borowiak-Palen@zut.edu.pl), Szoplik Jolanta (Jolanta.Szoplik@zut.edu.pl)

Prerequisites

W-1	Fundamentals of chemical engineering

Module/course unit objectives

C-1	To provide students with an engaging and interdisciplinary view of chemical engineering.
C-2	To identify and define the requirements, constraints and design parameters of a project.
C-3	To learn how to evaluate the economic and environmental aspects of a project.

Course content divided into various forms of instruction		*Number of hours*
T-W-1	Strategy for Chemical Process Design and Integration	2
T-W-2	Process Economics and Optimization	2
T-W-3	Pinch analysis	4
T-W-4	Choice of Process Equipment	2
T-W-5	Systems for Continuous and Batch Processes	2
T-W-6	Heat Integration. Heat Exchanger Networks	3
T-W-7	Steam Systems and Cogeneration	2
T-W-8	Cooling and Refrigeration Systems	2
T-W-9	Water System Design	2
T-W-10	Environmental Design	3
T-W-11	Process Safety	4
T-W-12	Clean Process Technology	2
T-A-1	Formulation of the Design Problem	2
T-A-2	Estimation of Capital Operating Costs	2
T-A-3	Solving Optimization problems	2
T-A-4	Heat Exchanger Networks Calculation	4
T-A-5	The Heat Integration Characteristics of Distillation	2
T-A-6	Heat Integration of Evaporators and Dryers	2
T-A-7	Steam and Power Balances	2
T-A-8	Targeting Minimum Cooling Water Flowrate	2

Course content divided into various forms of instruction		*Number of hours*
T-A-9	Control of Atmospheric Pollution	2
T-A-10	Targeting Maximum Water Reuse for Single Contaminants	2
T-A-11	Analysis of Clean Process Technology for Chemical Systems	2
T-A-12	Pinch analysis	6
T-P-1	The design of the selected process system	60

Student workload - forms of activity		*Number of hours*
A-W-1	Class participation	30
A-W-2	Tutorial	10
A-W-3	Individual work	50
A-A-1	Class participation	30
A-A-2	Tutorial	6
A-A-3	Solving computational problems	24
A-P-1	Class participation	60
A-P-2	Tutorial	10
A-P-3	Independent solving of a project task	50

Teaching methods / tools	
M-1	metoda podająca: wykład
M-2	metoda praktyczna: ćwiczenia przedmiotowe
M-3	metoda praktyczna: projekt

Evaluation methods (F - progressive, P - final)		
S-1	F	ocena okresowych osiągnięć studenta
S-2	F	ocena pod koniec przedmiotu

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_C18a_W01 The student has an engaging and interdisciplinary view of chemical engineering.	ChEn_1A_W07 ChEn_1A_W12 ChEn_1A_W14	P6S_WG_TA11	P6S_WG_IA11	C-1	T-A-9 T-W-3 T-A-10 T-W-9 T-A-11 T-W-10 T-A-12 T-W-11 T-W-1 T-W-12	M-1 M-2 M-3	S-1 S-2
Skills							
ChEn_1A_C18a_U01 The student is capable to identify and define the requirements, constraints and design parameters of a project.	ChEn_1A_U01 ChEn_1A_U03 ChEn_1A_U05 ChEn_1A_U07 ChEn_1A_U08 ChEn_1A_U10 ChEn_1A_U16	P6S_UO P6S_UU P6S_UW_TA11 P6S_UW_TA13 P6S_UW_TA14	P6S_UW_IA11 P6S_UW_IA14	C-2	T-W-1 T-W-7 T-W-2 T-W-8 T-W-3 T-W-10 T-W-6	M-1 M-2 M-3	S-1 S-2
Other social / personal competences							
ChEn_1A_C18a_K01 The student knows how to evaluate the economic and environmental aspects of a project.	ChEn_1A_K01 ChEn_1A_K03 ChEn_1A_K04 ChEn_1A_K05	P6S_KK P6S_KO P6S_KR		C-3	T-A-9 T-W-6 T-A-10 T-W-7 T-A-12 T-W-9 T-W-2 T-W-10 T-W-3 T-W-12	M-1 M-2 M-3	S-1 S-2

Required reading

1. Cussler, E.L. and Moggridge, G.D., Chemical Product Design, Cambridge University Press, Cambridge, 2001

2. El-Halwagi, M. M., Process Integration, Elsevier, Amsterdam, 2006

3. El-Halwagi, M. M., Pollution Prevention through Process Integration, Academic Press, New York, 1997

4. Kemp, I.C., Pinch Analysis and Process Integration: A User Guide on Process Integration for the Efficient Use of Energy, Butterworth-Heinemann, 2006

5. Smith, R., Chemical Process Design and Integration, Wiley, New York, 2005

Supplementary reading

1. Shenoy, U.V., Heat Exchanger Network Synthesis: Process Optimization by Energy and Resource Analysis". Includes two computer disks, Gulf Publishing Company, Houston, 1995