Zał. nr 5 do ZW 78/2023

Attachment no. 4. to the Program of Studies

FACULTY OF CHEMISTRY

SUBJECT CARD

Name of subject in Polish Optymalizacja i zarządzanie procesami chemicznymi
Name of subject in English Chemical Process Optimisation and Management
Main field of study (if applicable): Chemical Engineering and Technology
Specialization (if applicable): Advanced Chemical Engineering.
Profile: academic / practical*
Level and form of studies: 2nd level, full-time / part-time*
Kind of subject: obligatory
Subject code W03CET-SM2011W, W03CET-SM2011P
Group of courses NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	15			60	
Number of hours of total student workload (CNPS)	50			100	
Form of crediting (Examination / crediting with grade)	crediting with grade			crediting with grade	
For group of courses mark (X) final course					
Number of ECTS points	2			4	
including number of ECTS points for practical classes (P)				4	
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)	0,6			2,4	

*delete as not necessary

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Basic knowledge of unit processes and equipment solutions in chemical engineering and technology.
2. Basic knowledge of chemical process design.
3. Basic knowledge and skills in the field of computer-aided design and optimization of chemical processes

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SUBJECT OBJECTIVES

C1. Obtaining basic knowledge about designing industrial installations and managing the manufacturing process
C2. To familiarize students with the concepts of production economics.
C3. Understanding and practical application of knowledge about modeling and optimization of chemical processes
C4. Understanding the principles of developing project documentation.
C5. Understanding the principles of integrated process design.
C6. Acquiring the ability to present work results.
C7. Acquiring the ability to use specialized computer software to design and optimize chemical processes

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEU_W01 – Has basic knowledge of designing industrial installations and managing the manufacturing process

PEU_W02 – Has the knowledge needed to develop an economic analysis of an industrial installation used to obtain a product with the required parameters.

PEU_W03 – Knows methods of optimizing unit processes and technological lines.

relating to skills:

PEU_U01 – Is able to prepare basic design documentation.

PEU_U02 – Is able to perform process optimization calculations.

PEU_U03 – Is able to select a sequence of unit operations for a technological process.

PEU_U04 – Is able to make an economic analysis of a chemical installation.

PEU_U05 – Is able to use selected computer programs to design and optimize industrial installations

PEU_U06 – Is able to present the goals and results of scientific work in the form of an oral presentation using modern information and communication techniques.

relating to social competences:

PEU_K01 – Is ready to act and think in an entrepreneurial way.

PEU_K02 – Is able to cooperate in a project group.

PEU_K03 – Is able to present the results of work.

PROGRAMME CONTENT

Lecture		**Number of hours**
Lec 1	Design basics	2
Lec 2	Mass and energy balances	2
Lec 3	Technical drawings	2
Lec 4	Technological diagrams and control and measurement equipment	2
Lec 5	Modeling and optimization	2
Lec 6	Cost estimates and management	2
Lec 7	Waste management	2
Lec 8	Test	1
	Total hours	**15**

Classes		**Number of hours**
Cl 1		
Cl 2		
Cl 3		
Cl 4		
..		
	Total hours	

Laboratory		**Number of hours**
Lab 1		
Lab 2		

Lab 3		
Lab 4		
Lab 5		
…		
	Total hours	

Project		**Number of hours**
Part I		
Pr1	Analysis of the selected technology and presentation of the process concept. Presentation of the schematic diagram and mass balance.	4
Pr2	Development of the process flow diagram and selection of control and measurement equipment	4
Pr3	Process modeling and optimization.	4
Pr4	Preparation of an executive or assembly drawing of one of the devices used (or its parts)	4
Pr5	Development of a spatial layout diagram,, installation view. Preparation of a piping and instrumentation diagram	4
Pr6	Preparation of cost estimate	4
Pr7	Preparation of a multimedia presentation. Presentation rules	4
Part II		
Pr8	SuperProdesigner introduction.	4
Pr9	Process timeline. Up-stream and down-stream processes	4
Pr10	Order and costs of processes.	4
Pr11	Membrane processes. Diffusion processes.	4
Pr12	Gantt graphs. Resources management. Economical analysis.	4
Pr13	Optimal process parameters. Optimalisation of construction.	4
Pr14	Bottlenecks. Environmental impact of designed proces.	4
Final part		
Pr15	Project defenses (part 1 and 2)	2+2
	Total hours	60

Seminar		**Number of hours**
Semin 1		
Semin 2		
Semin 3		
…		
	Total hours	

TEACHING TOOLS USED

N1. Lecture with multimedia presentation.
N2. Preparation and presentation of the project.
N3. Preparation of design documentation using computer program packages.
N4. Use of specialized software to create projects
N5. Consultations

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P – concluding (at semester end)	Learning outcomes code	Way of evaluating learning outcomes achievement
F1(Lecture)	PEU_W01 - PEU_W03	Test
P1 = F1		P1 = F1
F2 (proj. Part I)	PEU_U01 - PEU_U06 PEU_K01 - PEU_K06	Completed project
F3 (proj. Part II)	PEU_U01 - PEU_U06 PEU_K01 - PEU_K06	The project made using specialized software
P2 = (F2+F3)/2		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] B. Sujak-Cyrul, Quality management systems: an introduction to the project of documenting and audit of quality management systems, Wrocław, Wrocław University of Technology; Łódź: PRINTPAP, 2011.
[2] S.E. Windsor, An introduction to green process management, Milwaukee, Wis.: ASQ Quality Press, cop. 2011.
[3] F.N. Fraser, Global engineering economics, Financial decision making for engineers, 4th Ed., Prentice Hall, Toronto, 2009.
[4] E. Heinzle, A.P. Biwer, C.L. Cooney - Development of Sustainable Bioprocesses: Modeling and Assessment, Viley 2006.
[5] L.T. Blank, A. Tarquin, Engineering Economy, 6th Ed., McGraw-Hill, Boston, 2005.
[6] R. Turton, R. C. Bailie, W. B. Whiting, J. A. Shaeiwitz, D. Bhattacharyya, Analysis, Synthesis and Design of Chemical Processes, 4th Edition, Prentice Hall, 2012.
[7] W.D. Seider, D.R. Lewin, J.D. Seader, S. Widagdo, R. Gani, K- Ming. Ng, Product and Process Design Principles: Synthesis, Analysis and Evaluation, 4th Edition, Wiley, 2016.

SECONDARY LITERATURE:

[1] Woodard & Curran, Inc., Industrial Waste Treatment Handbook, Elsevier, 2006.
[2] H.V. Mott, Environmental Process Analysis: Principles and Modeling, Wiley, 2013.
[3] R.G. Harrison, P. Todd, S.R. Rudge, D.P. Petrides - Bioseparations Science and Engineering, Oxford, 2002.
[4] SuperPro Designer user manual.

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