

FACULTY OF CHEMISTRY					
SUBJECT CARD					
Name in Polish		Nowe trendy w inżynierii chemicznej			
Name in English		New concepts and solutions in chemical engineering			
Main field of study (if applicable):		Inżynieria chemiczna i procesowa			
Specialization (if applicable):		Advanced Chemical Engineering and Nanotechnology			
Level and form of studies:		2nd level, full-time			
Kind of subject:		selectable			
Subject code		ICC020011			
Group of courses		NO			
	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30				
Number of hours of total student workload (CNPS)	60				
Form of crediting	credit				
For group of courses mark (X) final course					
Number of ECTS points	2				
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	1				
PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES 1. Fundamentals of physics, chemistry and chemical engineering.					
SUBJECT OBJECTIVES					
C1	To understand role of chemical engineering in modern global economy.				
C2	To understand direction of development of chemical engineering.				
C3	To understand role of nanotechnology in chemical industry.				
C4	To understand role of advanced analytical methods in chemical industry.				
C5	To understand role of advanced computer modeling methods in chemical industry.				
SUBJECT LEARNING OUTCOMES					
Related to knowledge: The person who completed the course: P2P_W01 – knows the fundamental challenges in chemical industry, P2P_W03 – knows advanced computational and analytical methods used in chemical engineering, P2P_W07 – understands the role of new technologies in the design of technological processes, P2A_W05 – knows directions of development of new technologies in chemical engineering.					
Related to skills: The person who completed the course: P2K_U01 - is able to find in the literature information concerning advances in chemical engineering, P2K_U02 – is able to propose application of new technologies in chemical industry, P2K_U07 – is able to identify directions of development of chemical engineering.					

With a range of social skills: The person who completed the course: P2K_K01 - is able to work in a group consisting of several people interchanging and formulating opinions		
PROGRAMME CONTENT		
Form of classes - project		Number of hours
Lec1	Challenges of the XXI century.	2
Lec2	Advanced analytical methods process I: spectrometric methods in the analysis of the crystallization process.	2
Lec3	Advanced analytical methods for process II: observations in the near-infrared spectroscopy and image analysis in search of pollution during the production of drugs.	2
Lec4	The intensification of the process: nanofluids.	2
Lec5	Nano-biocomposites in chemical engineering.	2
Lec6	Design and development of targeted drug carriers.	2
Lec7	Energy industry based on hydrogen I: methods of energy generation.	2
Lec8	Energy industry based on hydrogen II: storage.	2
Lec9	Nanotechnology in water treatment technologies.	2
Lec10	Radioactive waste treatment.	2
Lec11	Non-invasive measurement methods: tomographic methods, laser methods, advanced image analysis.	2
Lec12	Novel methods of sequestration, distribution and processing of carbon dioxide.	2
Lec13	Microreactors I.	2
Lec14	Microreactors II.	2
Lec15	The future of chemical engineering.	2
Total hours		30
TEACHING TOOLS USED		
N1	Lecture	
N2	Consultation	
EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT		
Evaluation (F – forming (during semester), P – concluding (at semester end))	Learning outcomes number	Way of evaluating learning outcomes achievement
P (lecture)	PEK_W01-W15	exam
grade	2,0 if P < 14,5 pnt. 3,0 if P = 14,5– 18,0 pnt. 3,5 if P = 18,5 – 21,5 pnt. 4,0 if P = 20 – 22 pnt. 4,5 if P = 22,5- 24,5 pnt. 5,0 if P = 25 - 27 pnt. 5,5 if P = 27,5-30 pnt.	

PRIMARY AND SECONDARY LITERATURE	
<u>PRIMARY LITERATURE:</u> [1] Wirth Thomas, Microreactors in Organic Chemistry and Catalysis, Wiley-Vch, Singapore, 2013 [2] Jigihai Li, Advances in Chemical Engineering: Characterization of Flow, Particles and Interfaces, Academic Press, 2009.	
<u>SECONDARY LITERATURE:</u> [1] Internet sources	
SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)	
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