

FACULTY OF CHEMISTRY

SUBJECT CARD

Name of subject in Polish: Podstawowe procesy jednostkowe w technologii chemicznej
 Name of subject in English: Basic unit processes in chemical technology
 Main field of study (if applicable):
 Specialization (if applicable): -
 Profile: academic
 Level and form of studies: 2nd level – supplementary semester, full-time
 Kind of subject: Optional
 Subject code: TCC020024
 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)	90				
Form of crediting	credit				
For group of courses mark (X) final course					
Number of ECTS points	3				
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. Basic knowledge of general and physical chemistry
2. Knowledge of elementary mathematics

SUBJECT OBJECTIVES

C1 To familiarize students with the concepts of processes and unit operations
 C2 Learning the principles of operation of basic apparatus and reactors for the implementation of processes and unit operations in various phase systems
 C3 Introduction to the principles of the implementation of chemical processes in a continuous system
 C4 To familiarize with the principles of the technological sequences of processes and unit operations
 C5 To familiarize students with selected processes of chemical technology, non-catalytic and catalytic processes in a stationary fluid bed
 C6 To familiarize students with the specificity of biotechnological processes
 C7 To familiarize students with modern separation operations of chemical substances

SUBJECT LEARNING OUTCOMES**Relating to knowledge:**

PEK_W01 student can correctly characterize operations and unit processes used in chemical technology
 PEK_W02 student is able to draw up the technological scheme of the installation and select the apparatus for it, indicate the appropriate processes and unit operations in it
 PEK_W03 student can characterize the chemical materials flow in various phase systems
 PEK_W04 knows the principles of catalytic and non-catalytic processes, can describe and characterize them
 PEK_W05 has a basic knowledge of separation techniques
 PEK_W06 has basic knowledge about the biofuels production methods
 PEK_W07 has basic knowledge on the polymerization processes and properties of the obtained materials
 PEK_W08 has basic knowledge in the field of biotechnological processes

relating to skills:

PEK_U01 can practically develop a technological scheme of the process and define necessary operations and

unit processes PEK_U02 can describe basic operations and unit processes for selected chemical technologies from various fields of chemistry PEK_U03 can perform simple laboratory experiments as individual processes, and perform basic calculations related to their course PEK_U04 can plan and perform simple separation process using membrane techniques PEK_U05 can determine the efficiency of the process PEK_U06 can determine the physico-chemical properties of the reaction products PEK_U07 can plan and carry out the process of raw material chemical modification		
PROGRAMME CONTENT		
Lectures		Number of hours
Lec 1	Basic information, unit process, unit operation, definitions, characteristics	2
Lec 2	Diagram of the chemical process, operations and unit processes as components of the technological process. Raw materials, products and by-products of processes and unit operations	2
Lec 3	Regime and parameters of processes and unit operations. Mixing and mass and heat exchange. Balance in chemical processes, efficiency and conversion of reagents in a chemical process.	2
Lec 4	The concept of the reaction driving force in systems of various flows, methods of increasing the reaction speed in unit processes	2
Lec 5	Examples of apparatus solutions for unit processes and operations in the gas-solid, gas-liquid system, three-phase system in a catalytic and non-catalytic system, apparatus solutions for various forms of the catalyst in unit processes.	2
Lec 6	Examples of technological processes, catalytic processes in a fluidized bed, catalytic processes occurring in the presence of a stationary catalyst bed	2
Lec 7	Non-catalytic processes, high temperature in a heterogeneous system, electrolytic processes	2
Lec 8	Non-catalytic processes, Enzymatic processes with native and immobilized enzymes. Stability of the systems	2
Lec 9	Microorganisms. Microbiological processes. Kinetics. Distribution of products.	2
Lec 10	Separation operations: extraction. distillation, chromatography, sedimentation, flocculation.	2
Lec 11	Simple membrane operations: microfiltration, ultrafiltration, nanofiltration, reverse osmosis, electrodialysis.	2
Lec 12	Advanced membrane processes: pervaporation, membrane distillation, membrane processors, hybrid processes.	2
Lec 13	Addition polymerization: reaction mechanisms, initiators, inhibitors. Condensation polymerization	2
Lec 14	Molecular masses. Molecular weight distributions. Polymer solutions. Condensed phases	2
Lec 15	Mixtures. Crystallinity. Temperatures of phase transformations.	2
	Total hours	30
TEACHING TOOLS USED		
N1. Multimedia presentation N2. Laboratory exercises N3. Reports on the obtained laboratory results		

N4. 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 –PEK_W07	2,0, when 0-50% points 3,0, when 51-60% points 3,5, when 61-70% points 4,0, when 71-80% points 4,5, when 81-90% points 5,0, when 91-98 % points 5,5, when >98 % points
PRIMARY AND SECONDARY LITERATURE		
<u>PRIMARY LITERATURE:</u>		
[1] I. Mukhlyonov et al. The Theoretical Foundations of Chemical Technology, Part 1 and Part 2. Mir Publishers, Moscow. 1977. [2] M. Bodzek, J. Bohodziejewicz, K. Konieczny, Techniki membranowe w ochronie środowiska, Wydawnictwo Politechniki Śląskiej, Gliwice 1997 [3] Praca zbiorowa pod red. Z. Florjańczyka, S. Penczka, Chemia polimerów t. III, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 1998 [4] Szlachta Z., „Zasilanie silników wysokoprężnych paliwami rzepakowymi”, WKŁ Warszawa 2002. [5] Baczewski K., Kałdoński T. „Paliwa do silników o zapłonie samoczynnym”, WKŁ Warszawa 2008 [6] Morrison R.T., Boyd R.N. „Chemia organiczna T.1” Wydawnictwo Naukowe PWN, Warszawa 2010		
<u>SECONDARY LITERATURE:</u>		
[1] T. Winnicki, Polimery w ochronie środowiska, Arkady, Warszawa 1978		
SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)		
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