

FACULTY OF CHEMISTRY					
<b>SUBJECT CARD</b>					
Name of the subject in Polish:	Inżynieria Chemiczna				
Name of the subject in English:	Chemical Engineering				
The main field of study (if applicable):	Biotechnology, Chemistry and industrial analytics, Chemical technology				
Specialization (if applicable):					
Profile:	academic				
Level and form of studies:	1st level, , full-time				
Kind of subject:	obligatory				
Subject code	ICC015005				
Group of courses:	NO				
	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)		30	30		
Number of hours of total student workload (CNPS)		60	60		
Form of crediting		crediting with grade	crediting with grade		
For a group of courses mark the final course with (X)					
Number of ECTS points		2	2		
including the number of ECTS points for practical (P) classes		2	2		
including the number of ECTS points for direct teacher-student contact (BU) classes		1,4	1,4		
<b>PREREQUISITES RELATING TO KNOWLEDGE, SKILLS, AND OTHER COMPETENCIES</b>					
1. Knowledge of mathematics at the high school level					
2. Knowledge of chemistry at the high school level					
3. Knowledge of physics at the high school level					
4. Can work in a team					
<b>SUBJECT OBJECTIVES</b>					
C1 Acquainting students with the basics of hydraulics, heat transport, mass transport					
C2. Acquiring the ability to perform momentum, heat, and mass balance calculations for apparatus and chemical engineering processes					
C3 Acquiring the ability to calculate the quantities determining the kinetics of chemical engineering processes					
C4 Acquisition of the ability to calculate the results of unit operations					
C5 Acquiring basic skills in making measurements of quantities important for unit operations and chemical engineering processes					
C6 Acquiring the ability to calculate important process quantities based on measurement data					
<b>SUBJECT LEARNING OUTCOMES</b>					
relating to the knowledge:					
PEU_W01					
PEU_W02					
...					
relating to skills:					

PEK_U01 - can calculate momentum, heat, and mass balance PEK_U02- can determine the pressure and velocity distribution in a process installation PEK_U03- can calculate the pressure drop during fluid flow in the pipeline PEK_U04 - can perform calculations related to the transfer of heat, PEK_U05- can determine the results of basic unit operations of chemical engineering PEK_U06 - can carry out the experiments necessary to determine the quantities important in chemical engineering unit operations relating to social competences: PEK_K01- can work in a team PEK_K02- can discuss the problems encountered in chemical engineering		
<b>PROGRAM CONTENT</b>		
<b>Classes</b>		<b>Number of hours</b>
CI 1	Syllabus presentation. Discussion of the requirements and conditions of course passing. Basic definitions and magnitudes useful in the course. Units applied and their conversion.	2
CI 2	Hydrostatics. Calculation of the pressure distribution in chemical installation.	2
CI 3	Hydrodynamics. Phenomena related to the fluid flow. Calculation of fluid flow resistance.	2
CI 4	Bernoulli equation and its application.	2
CI 5	Pumps and pump installation calculations. Pump selection rules.	2
CI 6	Test colloquium 1	2
CI 7	Particle settlement. Forces acting on a single particle during its fall. Stokes law. Suspension settlement.	2
CI 8	Calculation of settler, dust chamber, cyclone.	2
CI 9	Filtering. Filtration equation and its use in filter design.	2
CI 10	Heat conduction in flat and annular walls. Calculations of temperature distribution in solids.	2
CI 11	Heat transfer in natural and forced convection, liquid boiling and condensation. Calculation of heat transfer coefficients.	2
CI 12	Heat transfer. Calculation of heat exchangers.	2
CI 13	Basic processes of mass exchange. Rectification. Absorption. Extraction. Mass balance calculations.	2
CI 14	Calculation of the rectification column for the separation of the two-component solution.	2
CI 15	Test colloquium 2	2
	Total hours	30

<b>Laboratory</b>		<b>Number of hours</b>
Lab 1	Organizational classes. Acquaintance with the principles of health and safety in the research laboratory. Discussion on the conditions of passing the course. Getting to know the apparatus used during the exercises.	3
Lab 2	Determination of fluid velocity profile in a circular pipe section.	3
Lab 3	Pump characteristics.	3
Lab 4	Determination of the flow factor in measuring orifices for gas.	3
Lab 5	Double pipe heat exchanger.	3
Lab 6	Heat transfer in boiling liquid.	3
Lab 7	The influence of mixing energy on the mass transfer coefficient in a solid-liquid system.	3
Lab 8	Determination of height equivalent to a theoretical plate (HETP) in the rectification packed column.	3
Lab 9	Steam distillation.	3
Lab 10	The degree of extraction in a liquid-liquid system.	3
	Total hours	30
<b>TEACHING TOOLS USED</b>		
[1] N1. Problem-solving [2] N2. Performing the experiment [3] N3. The report preparation		
<b>EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT</b>		
<b>Evaluation</b> (F – forming (during the semester), P – concluding (at semester end))	Learning outcomes number	Way of evaluating learning outcomes achievement
F1 (exercise)	PEK_U01, PEK_U02, PEK_U03	Partial test 1
F2 (exercise)	PEK_U04, PEK_U05	Partial test 2
P (exercise)= (F1+F2)/2		
F2 (lab)	PEK_U01, PEK_U02	Partial test, report
F3 (lab)	PEK_U01, PEK_U02	Partial test, report
F4 (lab)	PEK_U01, PEK_U02	Partial test, report
F5 (lab)	PEK_U01, PEK_U02	Partial test, report
F6 (lab)	PEK_U05, PEK_U06	Partial test, report
F7 (lab)	PEK_U05, PEK_U06	Partial test, report
F8 (lab)	PEK_U05, PEK_U06	Partial test, report
F9 (lab)	PEK_U05, PEK_U06	Partial test, report
F10 (lab)	PEK_U05, PEK_U06	Partial test, report
P (lab)= (F2+F3+F4+F5+F6+F7+F8+F9+F10)/9		

<b>PRIMARY AND SECONDARY LITERATURE</b>	
<b><u>PRIMARY LITERATURE:</u></b>	
[4]	Zadania z mechaniki płynów w inżynierii środowiska. Z.Orzechowski, J. Prywer, R. Zarzycki. WNT. 2001.
[5]	Zbiór zadań z podstawowych procesów inżynierii chemicznej cz.I. Przenoszenie pędu. Praca pod redakcją prof. Zdzisława Ziolkowskiego. Politechnika Wroclawska.1973.
[6]	Zbiór zadań z podstawowych procesów inżynierii chemicznej cz.II. Przenoszenie ciepła. Z. Kawala, M. Pająk, J. Szust. Politechnika Wroclawska.1979.
[7]	Zbiór zadań z podstawowych procesów inżynierii chemicznej cz.II. Przenoszenie masy. Z. Kawala, M. Pająk, J. Szust. Politechnika Wroclawska.1980.
[8]	Przykłady i zadania z zakresu aparatury i inżynierii chemicznej. K.F. Pawłow, P.G. Romankow, A.A. Noskow.WNT. 1981.
[9]	Laboratorium inżynierii procesowej cz. I. Przenoszenie pędu i procesy mechaniczne. Praca zbiorowa pod redakcją Danuty Beliny-Freundlich, Politechnika Wroclawska, Wrocław 1981
[10]	Laboratorium inżynierii procesowej cz. II. Przenoszenie ciepła i masy. Praca zbiorowa pod redakcją Danuty Beliny-Freundlich, Politechnika Wroclawska, Wrocław 1981
[11]	<a href="http://zich.pwr.edu.pl/studenci/inzynieria-chemiczna-laboratorium">http://zich.pwr.edu.pl/studenci/inzynieria-chemiczna-laboratorium</a>
<b><u>SECONDARY LITERATURE:</u></b>	
[1]	
[2]	
[3]	
<b>SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)</b>	

\*delete if not necessary