FACULTY OF CHEMISTRY

SUBJECT CARD

Name in Polish	**Podstawy inżynierii chemicznej**
Name in English	**Basis of Chemical Engineering**
Main field of study (if applicable):	**All fields of Faculty of Chemistry**
Specialization (if applicable):	
Level and form of studies:	**1st level, full-time**
Kind of subject:	**obligatory**
Subject code	**ICC013010w**
Group of courses	**YES**

	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	Examination				
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. Knowledge of physics and mathematics on the high school (secondary school) level

SUBJECT OBJECTIVES

C1 Material and energy balancing of equipment and processes
C2 Cognition of quantitative description of fluid flow processes in apparatus
C3 Application of Bernoulli's law for quantitative description of metering equipment and heat and mass transfer apparatus
C4 Mass transfer methods and apparatus
C5 Heat transfer methods and apparatus
C6 Cognition of construction rules and operation of selected industrial equipment and apparatus.

SUBJECT LEARNING OUTCOMES

relating to knowledge:
PEK_W01 Material and heat balancing of equipment and processes
PEK_W02 Obtaining basic knowledge in momentum, mass and heat transfer
PEK_W03 Application of Benoulli's Law to fluid flow
PEK_W04 Cognition of construction rules and influence of operating parameters on the processes in selected apparatus: pumps, sedimentors, filters, cyclones, mixers, chemical reactors, and distillation, absorption, extraction, adsorption, drying apparatus.
…
relating to skills:

PEK_U01 Student is able to make material and energy balances of equipment and processes
PEK_U02 Student is able to calculate power requirements of pumps
PEK_U03 Student is able to calculate main parameters of selected mass and heat transfer apparatus
…
relating to social competences:
PEK_K01 Student gained knowledge that will enable him/her successful continuation of studies in chemical engineering related fields

PROGRAMME CONTENT

Form of classes - lecture		**Number of hours**
Lec 1	Interest area of chemical engineering; Concept of momentum transfer and continuum; Thermodynamic properties of fluids; Types of fluids; Ideal gas	2
Lec 2	Real gas; Equations of State: van der Waals, Redlich-Kwong, Soave and Peng-Robinson EOS for pure components and mixtures	2
Lec 3	Material balances of equipment and processes	2
Lec 4	Energy balances of equipment and processes	2
Lec 5	Flow in pipes and Bernoulli's equation; pressure drop in pipeline and in selected apparatus.	2
Lec 6	Pumps – characteristics of pump and pipeline; power requirements of pumps	2
Lec 7	Distillation of binary mixtures; Rectification column; McCabe-Thiele's method	2
Lec 8	Batch distillation; Extraction – ternary diagrams	2
Lec 9	One stage and multistage extraction; Absorption processes	2
Lec 10	Mixing, Fluidisation and Filtration; Basic parameters for apparatus design	2
Lec 11	Drying processes; Molier diagram; Heat transfer by conduction	2
Lec 12	Heat transfer by convection; Heat exchangers	2
Lec 13	Stoichiometry of chemical reaction; Rate of chemical reaction; Mathematical models of ideal chemical reactors	2
Lec 14	Isothermal performance of Continuous stirred tank reactor, Plug-flow reactor and Batch reactor	2
Lec 15	Credit colloquium	2
Total hours		30

TEACHING TOOLS USED

N1. Informational lecture
N2. Multimedia presentation

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
C (lecture)	PEK_W01 – PEK_W04	Colloquium

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] J, M. Coulson and J. F. Richardson, J. R. Backhurst J. H. Marker, Fluid Flow, Heat Transfer and Mass Transfer, Coulson & Richardson's Chemical Engineering, Volume 1, Sixth edition, Butterworth –Heinemann 1999.
[2] J. R. Welty, C. E. Wicks, R. E. Wilson, G. L. Rorrer, Fundamentals of Momentum, Heat, and Mass Transfer, Fifth edition, Wiley 2008
[3] R.K. Sinnott, Chemical Engineering Design, Coulson & Richardson's Chemical Engineering Series Volume 6, Fourth edition, Elsevier, 2005
[4] J.F. Richardson, J.H. Harker, J.R. Backhurst, Particle Technology and Separation Processes, Coulson & Richardson's Chemical Engineering Series Volume 2, Fifth edition, Butterworth –Heinemann 2002.

SECONDARY LITERATURE:

[1] O. Levenspiel, Chemical Reaction Engineering, Third edition, John Wiley & Sons 1999.
[2] D. Morton, Chemical Engineering An Introduction, Cambrige University Press 2012

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

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