

FACULTY OF CHEMISTRY					
SUBJECT CARD					
Name of subject in Polish	Podstawy chemii fizycznej (kurs w jęz. ang.)				
Name of subject in English	Fundamentals of physical chemistry				
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	CHC020054				
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	X				
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. Elemental mathematics: Analysis I and II, algebra					
2. Elemental physics: Physics I and II					
3. Elemental chemistry: General chemistry, introductory inorganic chemistry					
4. The English language					
SUBJECT OBJECTIVES					
C1 Application of thermodynamics for description of chemical reactions					
C2 Elements of laboratory methods using the principles of phase equilibria: distillation, crystallization, extraction, chromatography					
C3 Electrochemical measurements in laboratory: potentiometry, conductometry, polarography, amperometry					
C4 Application of formal kinetic rate laws to describe rates of real world chemical reactions					
SUBJECT LEARNING OUTCOMES					
Relating to knowledge:					
A person who passed the subject					
PEK_W01 – knows fundamentals of thermodynamics					
PEK_W02 – knows fundamentals of the description of phase transitions					
PEK_W03– knows fundamentals of the functioning of electrochemical cells and the basic behavior of ions in water solutions					
PEK_W04– knows fundamentals of chemical kinetics					
Relating to skills:					
A person who passed the subject					
PEK_U01 – can solve elementary thermodynamics problems: computation of the reaction heat, computation of the equilibrium constant					
PEK_U02– can compute phase transition effects: vapor pressure depending on the conditions, the composition of the distillate etc.					

PEK_U02– can compute the electromotive force of cells, values of pH of solutions, solubility of a salt in water etc.		
PEK_U02– can calculate reaction rate constant, order of reaction and its activation energy based upon results of the dependence of concentration on time at different temperatures.		
Relating to social competences:		
A person who passed the subject		
PEK_K01 – possesses ability of combining information from disparate fields of science (mathematics, physics, chemistry) to arrive at coherent conclusions		
PEK_K02– is prepared to carry out computations involving elementary numerical methods in physical chemistry and can assess objectively the validity of the obtained result.		
PROGRAMME CONTENT		
Form of classes - lecture		Number of hours
Lec 1	Chemical thermodynamics. Heat and work. 1 st law of thermodynamics. Thermochemistry.	2
Lec 2	2 nd law of thermodynamics. Entropy, free energy and free enthalpy.	2
Lec 3	Chemical potential and chemical affinity. Chemical equilibrium. van't Hoff's isobar.	2
Lec 4	Kinetic theory of gases. Equations of state. Real gases, fugacity.	2
Lec 5	Phase equilibria. Gibbs' phase rule. Phase equilibria in one-component system (Clausius-Clapeyron equation).	2
Lec 6	Two-component systems. Liquid-vapor equilibrium (Raoult's and Henry's equations). Distillation. Liquid-liquid equilibrium. Liquid-solid equilibrium.	2
Lec 7	Three-component systems. Nernst's partition coefficient. Extraction.	2
Lec 8	Surface phenomena. Adsorption. Adsorption isotherms. Chromatography. Surface tension.	2
Lec 9	Dispersed systems. Electrokinetic phenomena. Properties of colloids. Transport phenomena: diffusion, viscous flow.	2
Lec 10	Electrochemistry. Electrochemical cells. Electromotive force. electrochemical potentials. Cells as sources of energy.	2
Lec 11	Conductivity of electrolyte solutions. Electrolysis. Polarography. Electrochemical methods in chemical analysis.	2
Lec 12	Chemical kinetics. Reaction rate. Formal kinetics: reaction order. Non-elementary reactions.	2
Lec 13	Temperature dependence of reaction rates. Activation energy. Theoretical description.	2
Lec 14	Homogeneous and heterogeneous catalysis. Autocatalytic reactions. Kinetics of ionic reactions. Kinetics of reactions in multiphase systems.	2
Lec 15	Kinetics of reactions in solids / Osmotic phenomena.	2
	Total hours	30
TEACHING TOOLS USED		
N1	Lecture: multimedial presentation	
N2	Lecture: multiple choice test	
N3	traditional written test	
EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT		
Evaluation (F – forming (during semester), P – concluding (at semester	Learning outcomes number	Way of evaluating learning outcomes achievement

end)		
F1	PEK_U01, PEK_U02	Test 1
F2	PEK_U03, PEK_U04	Test 2
F3	PEK_W01 PEK_W02 PEK_W03 PEK_W04 PEK_K01 PEK_K02	Exam
P= 0,3(F1+F2)+0,4F3 Condition of passing: P=50% or more		
PRIMARY AND SECONDARY LITERATURE		
PRIMARY LITERATURE:		
[1]	Peter Atkins, Julio De Paula, "Atkins' Physical Chemistry", Eighth edition, Oxford University Press, Oxford 2006	
[2]	Peter Atkins and Julio de Paula, „Atkins' Physical Chemistry”, Ninth Edition, Oxford University Press, Oxford 2009	
[3]	Charles Trapp, Marshall Cady, and Carmen Giunta, „Student's solutions manual to accompany Atkins' Physical Chemistry 9/e”, Oxford University Press, Oxford 2010	
[4]		
SECONDARY LITERATURE:		
[1]	H. Kuhn i H.-D. Försterling, Principles of Physical Chemistry. Understanding Molecules, Molecular Assemblies, Supramolecular Machines, J. Wiley, Chichester 1999	
[2]	Clifford E. Dykstra, Physical Chemistry: A Modern Introduction, CRC Press, 2012	
SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)		
Prof. Marek Samoć, marek.samoc@pwr.edu.pl		