NAME OF THE COURSE	Physical Chemistry I					
Code	PMC111	Year of study	1			
Course teacher	Assistant Professor PhD Perica Bošković	Credits (ECTS)	5.0			
Associate teachers		Type of instruction (number of hours)	L	S	E	F
			45	15		
Status of the course	basic	Percentage of application of e-learning				

COURSE DESCRIPTION	
Course objectives	Objectives of the course are to introduce students with 1. Application of basic concepts, laws and principles of thermodynamic and kinetic approach to physical and chemical changes, 2. solving various physicochemical problems, 3. Apply acquired knowledge and skills in professional and specialist subjects
Course enrolment requirements and entry competences required for the course	Entry competences required for this course are knowledge of mathematics (calculus) and general physics and chemistry.
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	After successfully passing a course, students will be able to: 1. describe the basic concepts and apply the laws and principles of thermodynamic and kinetic approaches to the physical and chemical changes, 2. Explain the various physico-chemical dependencies of the studied systems, 3. Calculate the physico-chemical parameters using thermodynamic and kinetic equations, 4. Interpret experimental and computational data.
Course content broken down in detail by weekly class schedule (syllabus)	<u>Lectures (3 hours per week):</u> Week 1: Introduction: Contents of the subject. Basic terms. System and environment. Intensive and extensively thermodynamic quantities. Reaction rate. Zero law of thermodynamics. 1st and 2nd week: Properties of gases: Equilibrium of the state of ideal gas. Temperature scale of ideal gas. Mixtures of ideal gases and Dalton's law. Kinetic model of gases. Van der Waals equation of state. 2nd, 3rd and 4th Week: First Law of Thermodynamics: Work and Heat. Inner energy. Enthalpy. Thermal capacities. Joule-Thomson's Expansion. Adiabatic processes with gases. Thermochemistry. Enthalpies of Formation. Calorimetry. 4th, 5th and 6th week: Second and Third Law of Thermodynamics: Spontaneous Changes. Entropy as a state function and second law. Entropy change in the system and environment. Entropy of irreversible changes. Phase transition entropy. Entropy of mixing ideal gases. Calorimetric determination of entropy and third law. Gibbs's energy. Properties of Gibbs Energy. 6th and 7th Week: Phase Balance: Condition of Stability. The influence of pressure on Gibbs energy. The influence of temperature on Gibbs energy. Phase diagram of pure substance and phase limits. Significance of chemical potential. Fugacity. 8th and 9th week: Properties of Simple Mixtures: Partial Molar Properties. Gibbs-Duhem equation. The chemical potential of the substance in the mixture. Ideal solutions. Ideal-diluted solutions. Coligative properties. Phase diagrams of the mixture. Ternary diagrams. 10th and 11th Week: Chemical Balance: Homogeneous and heterogeneous reactions. Reaction Gibbs energy. The composition of the reaction in balance. Balance constant and its determination. The standard reaction Gibbs energy. The influence of temperature on the equilibrium constant. Balance response to pressure change, reactant or product addition and addition of inert gas. 12th and 13th Week: Chemical Kinetics: Empirical Chemical Kinetics. Velocity laws and velocity coefficients. Order of reaction. Half time. Influence of temperature on reaction rate. Simple reversible process. Elemental reactions. Parallel and subsequent chemical reactions. Aproximation of the steady state. Enzymatic kinetics. 14th and 15th week: Molecules and ions in motion: Diffuse. Viscosity. Conductivity of

	electrolytic solutions. Conductometric cell. Molar conductance of strong and weak electrolytes. Ion Mobility. Transference numbers of ions. Conductivity and interaction of ion-ions: Debye-Huckel's theory of ionic solutions. Relaxation and electrophoretic effect. Debye-Huckel-Onsager's theory. Seminars (1 hour per week): Solving 30 numerical tasks.

Format of instruction	☒ lectures ☒ seminars and workshops ☐ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☒ independent assignments ☒ multimedia ☐ laboratory ☐ work with mentor ☐ (other)
Student responsibilities	Attendance and activity in lectures and seminars in the amount of at least 70% of the anticipated hourly rate. The examination can be carried out continuously through partial tests during the semester in which theoretical and practical exercises are combined, or whole exam (written and oral exam).	

Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*						
	Class attendance	0.5	Research		Practical training	0.2
	Experimental work		Report		(Other)	
	Essay		Seminar essay	0.5	(Other)	
	Tests	2.0	Oral exam		(Other)	
	Written exam	0.8	Project		(Other)	

Grading and evaluating student work in class and at the final exam	Continuous evaluation: efficacy(%) / percentage in grade (%)) attendance and activity: (70-100 / 10) • first partial test: (60-100 / 30) • second partial test (60-100 / 30) • second partial test (60-100 / 30 • third partial test (60-100 / 30) Final evaluation: efficacy(%) / percentage in grade (%)) Written exam: (50 - 100/40) • oral exam: (50 - 100/45) Activities (Continuous Evaluation): (50 - 100/15)

Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	P. Atkins, J. de Paula, Elements of Physical Chemistry, 4th Edition, Oxford University Press, Oxford, 2005.		
	R. J. Silbey, R. A. Alberty, M. G. Bawendi, Physical Chemistry, 4th Edition, John Wiley and Sons, New Jersey, 2005.		

Optional literature (at the time of submission of study programme proposal)	
Quality assurance methods that ensure the acquisition of exit competences	Continuous evaluation by monitoring activities and testing, anonymous survey.
Other (as the proposer wishes to add)	