Faculty of Metalurgy and Technology / CHEMICAL TECHNOLOGY / CHEMICAL KINETICS AND CATALYSIS

Course:	CHEMICAL KINETICS AND CATALYSIS			
Course ID	**Course status**	**Semester**	**ECTS credits**	**Lessons** (Lessons+Exercises+Laboratory)
12286	Mandatory	2	6	2+1+1
Programs	CHEMICAL TECHNOLOGY			
Prerequisites	-			
Aims	Through the subject, the student should become familiar with the kinetics and chemistry of the process, the connection between the reaction mechanism and kinetic parameters, as well as with the catalytic processes of accelerating chemical reactions, the laws during these processes and the types and properties of catalysts.			
Learning outcomes	Upon completion of this course, the student will be able to: - understands the time courses of chemical reactions and the laws that describe the speed of complex chemical processes, - determine the order of the reaction using integral and differential methods, -interpret the connection between the reaction mechanism, bond energy and kinetic parameters, - explain the theoretical foundations of chemical reactions (collision theory of monomolecular and bimolecular reactions, transition state theory) and their models, - describe the basic mechanisms of catalytic processes, -apply the basic laws of accelerating chemical reactions to a specific catalytic system - interprets the application of different types of catalysts in technology and environmental protection, -differentiates parameters that characterize catalysts such as: activity, selectivity, stability, regenerability, etc. - state contemporary trends in research and production of new catalysts.			
Lecturer / Teaching assistant	Prof. Dr. Ivana Bošković, Dr. Jana Mišurović			
Methodology	Lectures, exercises (calculations and laboratory). Seminar paper. Consultations.			
Plan and program of work				
Preparing week	Preparation and registration of the semester			
I week lectures	Conversion of reactants into products. Kinetics and conversion. Thermodynamics of conversion.			
I week exercises	Calculations.			
II week lectures	Elementary reactions. Complex reactions. Reaction pathway.			
II week exercises	Calculations.			
III week lectures	Chemical reaction rate laws. Integral and differential form. Determining the order of the reaction by integral and differential methods.			
III week exercises	Calculations.			
IV week lectures	The influence of temperature on the speed of chemical reactions. Arrhenius equation. Nearrenius behavior.			
IV week exercises	Calculations.			
V week lectures	Speed laws of consecutive, parallel and chain reactions.			
V week exercises	Calculations.			
VI week lectures	Collision theory of bimolecular reactions.			
VI week exercises	Experimental exercise: Alkaline hydrolysis of ethyl acetate.			
VII week lectures	Transition state theory. Enthalpy, entropy, and free energy in transition state theory.			
VII week exercises	The first colloquium.			
VIII week lectures	Theory of monomolecular reactions and their models.			
VIII week exercises	Remedial first colloquium.			
IX week lectures	Definition and essential features of catalysis. The essence of catalytic action. Classification cat. reaction.			
IX week exercises	Experimental exercise: Decomposition of malachite green in basic medium.			
X week lectures	Types of catalysis. Homogeneous and heterogeneous catalysis.			
X week exercises	Experimental exercise: Decomposition of phenolphthalein in an alkaline environment.			

XI week lectures	Solid acids and bases in heterogeneous catalysis. Metal clusters in catalysis.
XI week exercises	Experimental exercise: Decomposition of murexide in an acidic environment.
XII week lectures	Catalyst activity, selectivity and yield.
XII week exercises	Experimental exercise: Acid-base catalysis - Halogenation of acetone.
XIII week lectures	Catalyst deactivation.
XIII week exercises	Experimental exercise: Autocatalytic mechanism of tartrate ion oxidation by hydrogen peroxide in the presence of cobalt as a catalyst.
XIV week lectures	Design and synthesis of catalysts.
XIV week exercises	Second colloquium.
XV week lectures	Metal-support interactions. Catalytic reactors.
XV week exercises	Correct the second colloquium.
Student workload	Weekly: 6 credits x 40/30 = 8 hours Total workload during the semester: 6x30 = 180 hours

Per week	**Per semester**
6 credits x 40/30=8 hours and 0 minuts 2 sat(a) theoretical classes 1 sat(a) practical classes 1 excercises **4 hour(s) i 0 minuts** of independent work, including consultations	Classes and final exam: **8 hour(s) i 0 minuts x 16 =128 hour(s) i 0 minuts** Necessary preparation before the beginning of the semester (administration, registration, certification): **8 hour(s) i 0 minuts x 2 =16 hour(s) i 0 minuts** Total workload for the subject: **6 x 30=180 hour(s)** Additional work for exam preparation in the preparing exam period, including taking the remedial exam from 0 to 30 hours (remaining time from the first two items to the total load for the item) **36 hour(s) i 0 minuts** Workload structure: **128 hour(s) i 0 minuts (cources), 16 hour(s) i 0 minuts (preparation), 36 hour(s) i 0 minuts (additional work)**
Student obligations	Students are required to attend classes, do all laboratory exercises and do colloquium and seminar work. If the student takes the remedial colloquium (exam), only the points earned from the remedial period are counted.
Consultations	Friday: 9-11 h
Literature	1. D. Šepa, Osnovi hemijske kinetika, Beograd, 2001. 2. P. Putanov, Uvod u heterogenu katalizu, Novi Sad, 1995 3. G. Bošković, Heterogena kataliza u teoriji i praksi, Novi Sad, 2007
Examination methods	Activity during lectures: (0 - 5 points), - Activity during exercises: (0 - 5 points), - I colloquium: (0 - 20 points), - II colloquium: (0 - 20 points), - Final exam: (0 - 50 points)
Special remarks	-
Comment	-

Grade:	F	E	D	C	B	A
Number of points	less than 50 points	greater than or equal to 50 points and less than 60 points	greater than or equal to 60 points and less than 70 points	greater than or equal to 70 points and less than 80 points	greater than or equal to 80 points and less than 90 points	greater than or equal to 90 points