|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Study program** Master Studies | | | | |
| **Course title** Kinetics and catalysis (H212C) | | | | |
| **Name of lecturer/lecturers** Emilija T. Pecev-Marinković | | | | |
| **Type of course** Elective | | | | |
| **Number of ECTS allocated** 5 | | | | |
| **Course objectives**  Student learns in more detail about the field of kinetics and catalysis and the mechanisms of basic catalytic processes. Student learns through teaching and through the practical part and he follows its application in homogeneous and heterogeneous reactions. At the same time he acquires knowledge about the most common types of catalytic reactions through catalysis and the use of catalysts in various processes. | | | | |
| **Course outcomes**  Having finished this course successfully, a student will be able to:  - has knowledge of the basic mechanisms of catalytic processes,  - to examine and experimentally characterize the catalyst,  - to examine and characterize the parameters that influence the catalytic activity of the catalyst  - to experimentally demonstrate the techniques of characterization of catalytic systems  - accurately measures and analyzes experimental results and writes a report on the analysis performed. | | | | |
| **SYLLABUS**  *Lectures*  Collision theory. Transition state theory. Kinetics of complex reactions. Kinetics of chemical reactions in liquids. Chain reactions. Free radicals and atoms. Photochemical reactions. Kinetics of chemical reactions in heterogeneous systems. Catalysis and catalysts. Definition and essential features of catalysis. The goals achieved by the use of catalysts and the essence of catalytic action. Catalyst activity. Homogeneous catalysis. Heterogeneous catalysis. Heterogeneous catalysis and adsorption. Enzyme catalysis. Physical-chemical characterization of heterogeneous catalysts. Kinetics of heterogeneous catalytic reactions. Kinetic models. Preparation of the catalyst. Physical-chemical characterization of heterogeneous catalysts. Acid-base catalysis. Catalysis by metal-complex compounds.  Examples of reactions of homogeneous, heterogeneous and enzymatic catalysis. Zeolites as catalysts. Metal clusters in catalysis.  *Laboratory work*  Catalyst synthesis and determination of its characteristics. Catalytic effect of metal ions in some reactions. Determination of copper ions based on its catalytic effect in indicator reaction. Determination of cobalt ions based on its catalytic effect in the indicator reaction. Examination of the effect of temperature on the rate of catalytic and non-catalytic reactions. Photocatalytic degradation of crystal violet dye on titanium dioxide as a catalyst. Photocatalytic degradation of pesticides on titanium dioxide as a catalyst. | | | | |
| **References**  1. G. Bošković, Heterogena kataliza u teoriji i praksi, University of Novi Sad, Novi Sad, 2007.  2. V. Dondur, Hemijska kinetika, Belgrade 1992.  3. S.R. Logan, Fundamentals Chemical Kinetics, Longman 1966.  4. P. Putanov, Uvod u heterogenu katalizu, Novi Sad, 1995.  5. S. Veljković, Hemijska Kinetika, University of Belgrade, Belgrade, 1969.  6. Series of electronic teaching materials developed within the ERASMUS+ NETCHEM project  (http://mdl.netchem.ac.rs/course/view.php?id=67) | | | | |
| **Active teaching classes** | **Lectures**  30 | | **Laboratory work**  15 | |
| **Teaching mode**  Interactive lectures and experimental exercises, consultations | | | | |
| **ASSESSMENT METHODS AND CRITERIA (Max 100 points)** | | | | |
| **Pre exam duties** | **Points** | **Final exam** | | **Points** |
| Activity during lectures | 5 | Written examination | | - |
| Practical teaching | 20 | Oral examination | | 30 |
| Teaching colloquia | 40 |  | |  |
| Seminar | 5 |  | |  |