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| **Study program** Master Studies Chemistry |
| **Course title** Bioanalytical chemistry (H211C) |
| **Name of lecturer/lecturers** Ivana D. Rašić Mišić |
| **Type of course** Electory |
| **Number of ECTS allocated** 6 |
| **Course objectives**Educating students to work in a bioanalytical laboratory through analyzing the theoretical principles of appropriate instrumental techniques and their application. Enabling the student to make the correct choice and apply the analytical method for the determination of biomolecules in biological materials. Developing the student's ability to implement quality control in bioanalytical laboratories and validation of new bioanalytical methods. |
| **Course outcomes**Having finished this course successfully, a student will be able to:- make an adequate choice and apply the method of analysis of biomolecules in biological materials,- explain the principles of enzymatic reactions in bioanalytical methods,- distinguish between the application of dissolved and immobilized enzymes,- explain and apply instrumental techniques in order to analyze biomolecules,- define the basic principles of immunochemical analysis methods and biosensors- define and implement quality control of bioanalytical laboratories. |
| **SYLLABUS***Lectures*Spectroscopic methods for matrix characterization. Methods for determining total proteins. Determination of total DNA. Determination of total RNAs. Determination of total carbohydrates. Determination of free fatty acids. Enzymes in bioanalytical chemistry. Enzyme kinetics. Enzyme kinetics with a single substrate. Experimental determination of Michaelis-Menten parameters by different methods. Comparison of methods for determining the value of Km. Kinetics of one-substrate-two-product reactions. Enzymatic kinetics of reactions with two substrates. Examples of enzyme-catalyzed reactions and their processing. Enzyme activators. Enzyme inhibitors. Types of enzyme inhibition. Enzyme units and concentrations. Quantification of enzymes and their substrates. Direct and coupled measurements. Classification of methods. Instrumental methods. Consideration of some practical determinations. Immobilized enzymes. Methods of immobilization. Characteristics of immobilized enzymes. Reactors for immobilized enzymes. Antibodies. Polyclonal and monoclonal antibodies. Antibody-antigen reactions. Analytical applications of secondary antibody-antigen interactions. Quantitative immuno-techniques.Biosensors. Enzyme biosensors. Examples of biosensors. Evaluation of biosensor performance. Validation of new bioanalytical methods.*Laboratory work*Determination of enzyme activity. Determination of Michaelis-Menten parameters. Proving RNA. Effect of temperature and pH on enzyme activity. Influence of activators and inhibitors on enzyme activity. Determination of calcium content in serum by the Arsenazo III method. Determination of protein content by the Biure method. Determination of ascorbic acid content. |
| **References**1. N.V. Tietz, Fundamentals of clinical chemistry, Velarta, Belgrade, 1997.2. S. Mikkelsen, E. Corton, Bioana1ytical chemistry, John Wiley & Sons, Inc., Hoboken, New Jersey, 2004.3. A. Manz, N. Pamme, D. Iossifidis, Bioanalytical chemistry, Imperial College Press, London, 2004.4. Đ. Petrović, Osnovi enzimologije, Zavod za udžbenike i nastavna sredstva, Belgrade, 1998. 6. A. J Bard, L. R Faulkner, Electrochemical Methods, Fundamentals and Applications, Wiley, 2001. |
| **Active teaching classes** | **Lectures** 45 | **Laboratory work** 15 |
| **Teaching mode**Lectures, interactive classes, laboratory exercises, seminars, consultations |
| **ASSESSMENT METHODS AND CRITERIA (Max 100 points)** |
| **Pre exam duties** | **Points** | **Final exam**  | **Points** |
| Activity during lectures | 10 | Written examination | 30 |
| Practical teaching | 20 | Oral examination | - |
| Teaching colloquia | 30 |  |  |
| Seminar | 10 |  |  |