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| **Study program** Applied chemistry with the management basics | | | | |
| **Course title** Modern methods of instrumental analysis (H246C) | | | | |
| **Name of lecturer/lecturers** Vesna P. Stankov-Jovanović | | | | |
| **Type of course** obligatory | | | | |
| **Number of ECTS allocated** 6 | | | | |
| **Course objectives**  Acquiring knowledge about the physico-chemical principles of the most important modern optical and electroanalytical methods of analysis, familiarization with the principles of the functioning of instruments and  analytical signals that are measured and used in qualitative/quantitative analysis. | | | | |
| **Course outcomes**  Upon successful completion of this course, the student is able to:  - define and analyze physical and chemical processes that are used as a basis for instrumental methods,  - apply and connect physical and chemical principles with the construction of instruments for obtaining analytical signal,  - describe and compare the constructions of apparatus used in instrumental analysis,  -analyze the connection between physical-chemical characteristics and the analytical signal,  -differentiate phenomena and methods used for qualitative and quantitative analysis,  - apply appropriate methods in the analysis of real samples. | | | | |
| **SYLLABUS**  *Lectures*  Electromagnetic radiation and optical methods of analysis. Principles of Raman spectroscopy. Principles of Nuclear magnetic resonance. Principles of Electron spin resonance. Principles of X-ray diffraction. Principles of Photoelectron spectroscopy. Principles of Electron microscopy. Principles of Mass spectrometry. Principles of Induced coupled plasma spectroscopy with optical emission detection and with mass detection. Principle of Atomic fluorescence. Principle of X-ray fluorescence. Principle of Molecular fluorescence and phosphorescence. Principle of Chemiluminescence. Areas of application of optical methods of analysis. Division of electroanalytical methods of analysis. Types of electrodes and electrode processes. Membrane and ion-selective electrodes-construction. Principles of potentiometric titrations. Principles of potentiometric sensors and biosensors. Drip processes and other types of mercury electrodes. Principles of modern Polarographic methods. Principles of Voltammetry. Principles of Amperometry and Biamperometry. Principles of Chronopotentiometry and Chronoamperometry. Principle of Oscillometry. Areas of application of electroanalytical methods of analysis.  *Laboratory work*  Exercises from certain areas that are included in the theoretical lectures. | | | | |
| **References**  1. D. A. Skoog, D. M. West, F. J. Holler, Principles of Instrumental Analysis, Saunders College Publishing,  Thomson Learning, 1998.  2. D. A. Skoog, D. M. West, F. J. Holler, Osnove analitičke hemije, Školska knjiga, Zagreb, 1999.  3. F. Rouessac, A. Rouessac, Chemical Analysis, Modern Instrumental Methods and Techniques, John Wiley &  Sons, Chichester, 2000.  4. S. Mitić, Elektroanalitička hemija, PMF, Niš, 2008.  5. S. Mentus, Elektrohemija, Fakultet za fizičku hemiju, Beograd, 1996.  6. A. J. Bard, L. R. Faulkner, Electrochemical Methods, Fundamentals and Applications, Wiley, 2001.  7. J. Barker, Mass spectrometry: analytical chemistry by open learning, 2. ed., Chichester [etc.], 1999.  8. J. T. Watson, Introduction to mass spectrometry, 3rd ed., Philadelphia; New York, 1997.  9. I. Stojković Simatović, Elektrohemija: teorijske osnove i primena, Beograd, 2018. | | | | |
| **Active teaching classes** | **Lectures** 45 | | **Laboratory work** 30 | |
| **Teaching mode**  Lectures, demonstration, simulation, seminar | | | | |
| **ASSESSMENT METHODS AND CRITERIA (Max 100 points)** | | | | |
| **Pre exam duties** | **Points** | **Final exam** | | **Points** |
| Activity during lectures | 5 | Written examination | | 35 |
| Practical teaching | 10 | Oral examination | |  |
| Teaching colloquia | 40 |  | |  |
| Seminar | 10 |  | |  |