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| **Study program:** Master studies Chemistry | | | | |
| **Course title:** Green Analytical Chemistry (H241C) | | | | |
| **Name of lecturer/lecturers:** Vesna Stankov Jovanović | | | | |
| **Type of course:** elective | | | | |
| **Number of ECTS allocated:** 7 | | | | |
| **Course objectives**  Acquiring knowledge about the origin and place of green analytical chemistry in the modern world, green evaluation of existing analytical methods, procedures and strategies in analytical chemistry that are in accordance with the principles of green analytical chemistry. | | | | |
| **Course outcomes**  Upon successful completion of this course, the student is able to  - define the principles of green analytical chemistry  - enumerate and describe analytical techniques where is possible to evaluate them, respecting the principles of green chemistry  -analyze analytical methods and evaluate the degree of their compliance with the principles of green analytical chemistry  - make the correct choice of green analytical chemistry method  - argues ideas for the promotion of a change in practice and mentality  -looks at the practical consequences of green analytical chemistry | | | | |
| **SYLLABUS**  *Lectures*  The origins of green analytical chemistry. The state of modern green analytical chemistry. Green evaluation of existing analytical methods. Avoidance of sample treatment. Remote measurement. Sensors. Non-invasive measurements. Direct analysis without damaging the sample. Vibrational spectroscopy (infrared spectroscopy, Raman spectroscopy, infrared and Raman microscopy, chemical imaging, surface spectroscopy techniques, nuclear magnetic resonance). Direct methods with sample damage (indicated coupled plasma methods, laser ablation sources for atomic and mass spectrometry, laser induced spectroscopy, direct analysis in real time, secondary ion mass spectroscopy). Comparison of multi-analysis with analysis of single analytes. Application of multi-analysis in spectroscopy. Multi-analysis in chromatography. Reducing methods. Minimization of reagent consumption by automation. Miniaturization of sample preparation systems. Electrochemical detection. Spectroscopic detection. Transition from waste to clean waste. The problem of analytical waste. Ideas for changing mentality and practice. Practical implications of green analytical chemistry. The need for criteria for the classification of analytical methods concerning sustainability. Practices to avoid waste in analytical laboratories. Practices to improve work in analytical laboratories.  *Laboratory work*  Project assignments and defense of seminar papers. | | | | |
| **References**   1. M. De la Guardia, S. Armenta (editors), *Green Analytical Chemistry: Theory & Practice Comprehensive Analytical* *Chemistry*, Volume 57, Elsevier, The Netherlands, 2011 2. M. Lancaster, *Green Chemistry - An Introductory Text*, RSC, 2002, Cambridge 3. H.W. Roesky, D. K. Kennepohl (editors*): Experiments in Green and Sustainable Chemistry*, Wiley-VCH, 2007, Weiheim 4. Materials from lectures and exercises | | | | |
| **Active teaching classes** | **Lectures 45** | | **Laboratory work 30** | |
| **Teaching mode:** lectures, demonstration, simulation, seminar papers, panel discussion | | | | |
| **ASSESSMENT METHODS AND CRITERIA (Max 100 points)** | | | | |
| **Pre exam duties** | **Points** | **Final exam** | | **Points** |
| Activity during lectures | 10 | Written examination | | 40 |
| Practical teaching | 10 | Oral examination | |  |
| Teaching colloquia | 20 |  | |  |
| Seminar | 20 |  | |  |