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| **Study program** Applied chemistry with the management basics |
| **Course title** Characterization of chemical compounds (H257C) |
| **Name of lecturer/lecturers** Gordana Stojanović, Dragan Đorđević |
| **Type of course** obligatory |
| **Number of ECTS allocated** 5 |
| **Course objectives** * learning about nuclear magnetic resonance (NMR) of carbon-13 (13C);
* developing the ability to understand the relationship between 13C NMR spectroscopic data of organic compounds and their structure;
* developing skills for determining the structure of organic compounds based on 13C NMR;
* basics of two-dimensional NMR methods;
* characterization of complex compounds;
* application of ultraviolet-visible (UV-VIS), infrared spectrophotometry, electron-spin resonance (ESR) spectrometry, microprobe electron microscopy and X-ray diffraction spectroscopy for the characterization of inorganic compound;
* determination of metals to characterize chemical compounds in different samples.
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| **Course outcomes**Upon successful competition of this course, the student is able to: * determine the structure of an organic compound based on 13C NMR and two-dimensional spectra.
* explain the position of the signal in 13C NMR spectra.
* explain the relationships between signals of two-dimensional NMR spectra.
* determine the structure of complex compounds
* determine the composition of unknown inorganic samples.
* determine the metal content of different samples.
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| **SYLLABUS***Lectures*Basics of 13C NMR spectroscopy. Chemical shifts of 13C in organic compounds. Calculation of chemical shifts based on empirical rules. Scalar coupling 13C. Basics of multipulse NMR experiments. Experiments of polarization transfer. The nuclear Overhauser effect. Basics of two-dimensional methods. Homonuclear correlated 2D NMR spectra (H,H COSY). Heteronuclear correlated 2D NMR spectra (HETCOR). 2D NOE spectra (NOESY). 2D spectra of heteronuclear multiple bond correlation (HMBC). Characterization of complex compounds. Application of UV-VIS, IR, ESR, microprobe electron microscopy and X-ray diffraction for characterization of inorganic compounds. Techniques for determination of metals in different samples.*Laboratory work*Determination of the structure of organic compounds based on 13C NMR and 2D NMR spectra. Determining the structure of inorganic compounds based on UV-VIS, IR, ESR spectra, diffractograms and electron microscopic images |
| **References**1. S. Milosavljević, Strukturne instrumentalne metode, Hemijski fakultet, Beograd, 1996.
2. P. Patnaik, Handbook of environmental analysis: chemical pollutants in air, water, soil and solid wastes. 2nd ed.. Boca Raton, 2010.
3. F. M. Dunnivant, Environmental laboratory exercises for instrumental analysis and environmental chemistry. Hoboken, 2004.
4. Lj. Karanović, D. Poleti, Rentgenska strukturna analiza, Zavod za udžbenike i nastavna sredstva, Beograd, 2003
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| **Active teaching classes** | **Lectures** 45 | **Laboratory work** 30 |
| **Teaching mode**Presentation of the lecture in PowerPoint, with the involvement of students in the discussion.Practical determination of the structure of chemical compounds based on spectra in exercise classes. |
| **ASSESSMENT METHODS AND CRITERIA (Max 100 points)** |
| **Pre exam duties** | **Points** | **Final exam**  | **Points** |
| Activity during lectures | 5 | Written examination | 40 |
| Practical teaching | 10 | Oral examination | - |
| Teaching colloquia | 45 |  |  |
| Seminar |  |  |  |