KAPITAŁ LUDZKI
NARODOWA STRATEGIA SPÓJNOŚCI

Projekt współfinansowany przez Unię Europejską w ramach Europejskiego Funduszu Społecznego

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Course title	ECTS code
Chemical spectroscopy	13.3.0501

Name of unit administrating study

Faculty of Chemistry

Studies

faculty	field of study		
Wydział Chemii	Chemia	type	pierwszego stopnia
		form	stacjonarne
		specialty	chemia biomedyczna, chemia kosmetyków, analityka i diagnostyka chemiczna, chemia żywności
		specialization	wszystkie

Teaching staff

prof. dr hab. Sylwia Rodziewicz-Motowidło; dr Julia Witkowska; dr Marta Orlikowska; dr hab. Emilia Sikorska, profesor uczelni

Forms of classes, the realization and number of hours

Forms of classes

Auditorium classes, Lecture

The realization of activities

classroom instruction

Number of hours

Lecture: 15 hours, Auditorium classes: 30 hours

ECTS credits

4
classes - 45 h
tutorial classes – 20 h
student's own work – 35 h

Total: 100 h - 4 ECTS

The academic cycle

2025/2026 winter semester

Type of course

obligatory

Language of instruction

Polish

Teaching methods

- multimedia-based lecture
- •4-5 obligatory 10 minutes tests from previously trained material
•current knowledge control based on spectroscopic problems previously given for practice by the teacher
•quizzes on the fastest correct solution of spectroscopic problems given by the teacher during seminars

Form and method of assessment and basic criteria for eveluation or examination requirements

Final evaluation

- Graded credit
- Examination

Assessment methods

- (mid-term / end-term) test
- written exam with open questions
- Auditorium classes:
  • 2-4 Obligatory control tests on previously practiced material (for points)
  • Current control of knowledge based on assigned materials (for points)
  • Quizzes for the correct solution to the problems set by the teacher during the exercises (for points)

Lecture:
• A written exam consisting of 5-10 problems covering the topics presented during the lecture and auditorium classes. Passed classes tests (see below) is prerequisite.
• Attendance at lectures are not obligatory (although presence is recommended), and the lack of knowledge resulting from the absence may be made up on the basis of other students' notes and literature.

The basic criteria for evaluation

C. The basic criteria for evaluation or exam requirements

Lecture:
• pass the written exam
91-100%: 5.0
81-90%: 4.5
71-80%: 4.0
61-70%: 3.5
51-60%: 3.0
Less than 51% 2.0

Auditorium classes:
• completed all tests, additional problems and quizzes
91-100%: 5.0
81-90%: 4.5
71-80%: 4.0
61-70%: 3.5
51-60%: 3.0
Less than 51% 2.0

Method of verifying required learning outcomes

Methods of verifying the acquisition of knowledge:
Student solves the structures of medium-complex chemical compounds on the basis of a spectrum or a set of spectra during the exam and the final exam;
Student uses the chemical knowledge necessary to interpret the results of spectroscopic studies; (K_W01, K_W03, K_W04, K_W07).
Methods of verifying the acquisition of skills:
Student solves the problems set before him using the skills and knowledge in the field of chemistry and related scientific disciplines;
Student chooses a spectroscopic technique to solve a specific practical problem (K_U02, K_U03, K_U07).
Methods of verifying the acquisition of social competences:
Teacher keeps records of students' attendance at auditorium exercises;
Teacher assesses activities of student during the classes and the ability to formulate opinions and argue for the knowledge in the field of spectroscopy (K_K03).

Required courses and introductory requirements

A. Formal requirements
none

B. Prerequisites
Organic and physical chemistry

Aims of education

Presenting the physical basics of the interactions of electromagnetic radiation with matter and the theoretical basis of spectroscopic methods to students
Familiarize the students with the fundamentals of mass spectrometry (MS), oscillation spectroscopy (IR) and 1D and 2D nuclear magnetic resonance (NMR) spectroscopy;
Familiarize the students with interpretation of MS, IR and NMR spectra of compounds up to ~ 300 D to identify the topology, hydrogen bonds, stereochemistry, dynamics etc. including the advantages and disadvantages of the used methods

Course contents

A. Topics of the lecture: The properties of the electromagnetic radiation and its interactions with molecular systems: absorption, emission, dispersion. Overview of techniques: MS, IR, and NMR, including 2D NMR methods such as: COSY, TOCSY, HSQC/HMQC, NOESY; spin systems analysis, identification of molecules up to ~ 300 D; configuration, conformation, dynamic of the molecules; integrated usage of the spectroscopic methods; elements of conformational analysis of biomolecules.

B. Auditorium classes: Interpretation of the spectra; practical use of spectroscopic methods in structural and dynamics studies of molecules up to ~300D; to familiarize of the students with the probability of several different solutions of the same problem and verification of the correct solution; learning of the correct description of the spectra; to know the disadvantages and advantages of the particular spectroscopic methods, complementarity of the spectroscopic methods.

Bibliography of literature

Literature required to pass the course

Collective red.. W. Zieliński i A. Rajca: Metody spektroskopowe ich zastosowanie do identyfikacji związków organicznych, WNT W-wa 1995, 2000.
R.M. Silverstein, F.X. Webster, D.J. Kiemle: Spectrometric Identification of Organic Compounds, John Wiley & Sons, 2005, 2014.
Internet: independent study, verified by the teacher.

B. Extracurricular readings
S. Płaziak: Spektrometria masowa związków organicznych, Wydaw. Naukowe UAM Poznań 1997
R.A.W. Johnstone, M.E. Rose: Mass spectrometry for chemists and biochemists. Cambridge University, 1982, 1996
Z. Kęcki: Podstawy spektroskopii molekularnej, PWN Warszawa 1998.
I.Z. Siemion: Biostereochemia, PWN Warszawa 1985.
K. Wüthrich: NMR in biological research: peptides and proteins, North-Holland, Amsterdam 1976.

The learning outcomes (for the field of study and specialization)

Knowledge

Students know theoretical basis for spectroscopic methods utilized in identification of simple organic compounds
Students know the advantages and disadvantages of spectroscopic methods
Students have basic knowledge about conformational analysis of biomolecules using spectroscopic methods
Students can present the current trends in the development of spectroscopic methods

Skills

Students are able to interpret MS, IR, NMR spectra of simple organic compounds,
Students have skills of drawing correct conclusions based on available data.

Social competence

Individually and/or in a team-work:
-Students can establish and realize a defined action plan setting priorities for its implementation.
-Students can identify their level of knowledge and skills and understand the necessity of life-long learning in chemical spectroscopy and personal development.

Contact

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