University of Gdańsk

Subject card

Subject name and code	NMR spectroscopy - basis and applications, PG_00153666		
Field of study	Biotechnology		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2024/2025
Education level	undergraduate studies	Subject group	
Mode of study	full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish Course language - Polish
Semester of study	2	ECTS credits	2.0
Learning profile	academic	Assessment form	
Conducting unit			
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Stanisław Ołdziej	
	Teachers		

Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	5.0	0.0	25.0	0.0	0.0	30
	E-learning hours included: 0.0						

Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
	Number of study hours	30	10.0	30.0	70

Subject objectives	Learn and acquire the basic concepts and terminology used in nuclear magnetic resonance spectroscopy. Master the knowledge and skills necessary for the spectroscopic analysis of 1D, 2D NMR spectra of simple organic compounds, peptides, proteins. Become familiar with the methods of determining the primary and secondary structure of peptides and proteins on the basis of 1D and 2D NMR spectra. Getting acquainted with the analysis of homo- and heterocorrelation spectra (1H, 13C, 15N NMR).

Learning outcomes

Course outcome	Subject outcome	Method of verification
[BIOTECHL3_K01] The graduate is willing to know the limitations of his/her own knowledge and skills; constantly improve, update knowledge, and raise qualifications in biotechnology in the sicience and natural sciences, as well as medical sciences and health sciences	Become familiar with the methods of determining the primary and secondary structure of peptides and proteins on the basis of 1D and 2D NMR spectra. Getting acquainted with the analysis of homo- and heterocorrelation spectra (1H, 13C, 15N NMR).	[SK5] implementation of a problem task
[BIOTECHL3_U03] The graduate is able to use basic mathematical and statistical methods to describe phenomena and analyse data; analyse basic data in professional databases used in biotechnology	Master the knowledge and skills necessary for the spectroscopic analysis of 1D, 2D NMR spectra of simple organic compounds, peptides, proteins. Become familiar with the methods of determining the primary and secondary structure of peptides and proteins on the basis of 1D and 2D NMR spectra. Getting acquainted with the analysis of homo- and heterocorrelation spectra (1H, 13C, 15N NMR).	[SU5] implementation of a problem task
[BIOTECHL3_W06] The graduate knows and understands basic knowledge in science and natural sciences necessary for understanding the phenomena and biological processes, particular cellular processes at the molecular level	Learn and acquire the basic concepts and terminology used in nuclear magnetic resonance spectroscopy. Master the knowledge and skills necessary for the spectroscopic analysis of 1D, 2D NMR spectra of simple organic compounds, peptides, proteins. Become familiar with the methods of determining the primary and secondary structure of peptides and proteins on the basis of 1D and 2D NMR spectra. Getting acquainted with the analysis of homo- and heterocorrelation spectra (1H, 13C, 15N NMR).	[SW4] test/exam - oral or written [SW5] implementation of a problem task

Subject contents

Nuclear magnetic resonance spectroscopy. The phenomenon of nuclear magnetic resonance. Physical basis of NMR spectrum measurement. NMR spectrum recording apparatus and methods. Proton magnetic resonance spectroscopy: chemical shift, factors affecting its magnitude and its importance for the interpretation of 1H NMR spectra. Spin-spin coupling, coupling constant, multiplicity of the signal. Use of spin-spin coupling and dipole coupling (NOE effect) to determine the structure of a chemical compound. Coupling of a proton with other nuclei. One-dimensional and multidimensional NMR experiments. Types of 2D NMR spectra (COSY, TOCSY, NOESY/ROESY). Nuclear magnetic resonance spectroscopy of carbon 13C and nitrogen 15N. Application of one- and two-dimensional NMR techniques for structural analysis of chemical compounds. Interpretation of two-dimensional NMR spectra: COSY, TOCSY, NOESY of peptides.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Passing colloquium	51.0%	100.0%

Recommended reading

Basic literature	Zieliński W., Rajca A., Metody spektroskopowe i ich zastosowanie do identyfikacji związków organicznych, WNT, Warszawa, 1995 R.M. Silverstein, F.X. Webster, D.J. Kiemle, Spektroskopowe metody identyfikacji związków organicznych, PWN, 2007 John McMurry. Chemia organiczna. T. 2, (rozdział 13) Wydanie IV - PWN 2019
Supplementary literature	Materials provided in class by the teacher
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed

Work placement

Not applicable

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