University of Gdańsk

Subject card

Subject name and code	NMR spectroscopy, PG_00193187		
Field of study	Biotechnology		
Date of commencement of studies	October 2025	Academic year of realisation of subject	2025/2026
Education level	Bachelor's studies	Subject group	Obligatory subject group in the field of study Optional subject group Subject group related to scientific research in the field of study
Mode of study	full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	2	ECTS credits	2.0
Learning profile	academic	Assessment form	credit
Conducting unit			
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Stanisław Ołdziej, prof. UG	
	Teachers	dr hab. Stanisław Ołdziej, prof. UG dr Wioletta Żmudzińska	

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	0.0	0.0	30

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).

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<tr><td>Learning outcomes</td><td>
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<tr><th>Course outcome</th><th>Subject outcome</th><th>Method of verification</th></tr>
<tr><td>[BIOTECHL3_U03] The graduate applies mathematical and statistical methods to describe phenomena and analyze data and is able to use professional databases used in biotechnology.</td><td>The student has the knowledge and skills necessary for spectroscopic analysis of 1D and 2D NMR spectra of simple organic compounds, peptides, and proteins. They are familiar with methods for determining the primary and secondary structure of peptides and proteins based on 1D and 2D NMR spectra. They have knowledge of the analysis of homo- and heteronuclear correlation spectra (^{1}H, ^{13}C, ^{15}N NMR).</td><td>[SU5] implementation of a problem task</td></tr>
<tr><td>[BIOTECHL3_K01] The graduate is aware of the scope of their own knowledge and skills; demonstrates a willingness to continuously update them and pursue professional development.</td><td>The student is able to identify their limitations in knowledge and skills related to NMR spectroscopy. They demonstrate a willingness to further expand their knowledge of this technology.</td><td>[SK5] implementation of a problem task</td></tr>
<tr><td>[BIOTECHL3_W06] The graduate possesses structured and advanced knowledge of exact and natural sciences necessary to understand biological phenomena and processes, in particular cellular processes at the molecular level.</td><td>The student is familiar with basic concepts and terminology used in nuclear magnetic resonance (NMR) spectroscopy. They have mastered the knowledge and skills necessary for the spectroscopic analysis of 1D and 2D NMR spectra of simple organic compounds, peptides, and proteins. They are acquainted with methods for determining the primary and secondary structure of peptides and proteins based on 1D and 2D NMR spectra. They have familiarized themselves with the analysis of homo- and heteronuclear correlation spectra (^{1}H, ^{13}C, ^{15}N NMR).</td><td>[SW4] test/exam - oral or written
[SW5] implementation of a problem task</td></tr>
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<tr><td>Subject contents</td><td>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.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>not applicable</td></tr>
<tr><td>Assessment methods and criteria</td><td>
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<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Passing colloquium</td><td>51.0%</td><td>100.0%</td></tr>
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<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>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</td></tr>
<tr><td>Supplementary literature</td><td>Materials provided in class by the teacher</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td></td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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