GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Methods of Structural Studies, PG_00048870						
Field of study	Engineering and Technologies of Energy Carriers						
Date of commencement of studies	February 2022		Academic year of realisation of subject	2022/2023			
Education level	second-cycle studies		Subject group	Obligatory subject group 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	3.0			
Learning profile	practical profile		Assessment form	assessment			
Conducting unit	Department of Organic Chemistry -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Sławomir Makowiec				
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	30.0	0.0	0.0	45
	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	45		5.0	25.0		75
Subject objectives	A main goal is to teach students basic spectroscopic methods including: NMR, IR, UV, and MS, and their application in the analysis of the structure of organic compounds						

Learning outcomes

Course outcome	Subject outcome	Method of verification
K7_W03	The student knows and understands the basic processes and phenomena occurring in measuring devices and regulation systems, as well as their impact on technological processes, knows and understands in a deepened degree - selected devices and their components for measuring physicochemical parameters, regulators and their characteristics and relays of set values and their methods and theories describing the complex relationships between them, providing advanced general knowledge in the fields of chemistry, physics, mathematics, engineering and chemical technology forming theoretical foundations, ordered and theoretically founded knowledge covering key issues and selected issues in the field of advanced detailed knowledge about process control technological know-how, knows and understands the main development trends in the field of measurement, regulation and control of technological processes	[SW1] Assessment of factual knowledge
K7_U01	The student is able to plan and carry out experiments, interpret the results obtained and draw conclusions. He can also formulate and test hypotheses related to engineering problems and simple research problems in the fields of chemistry, physics and engineering and chemical technology	[SU1] Assessment of task fulfilment

Subject contents

Principles of spectroscopy – electromagnetic radiation, energy levels in molecules, absorption of radiation, line shape, selection rules, application of the Fourier transformation in spectroscopy.

NMR – magnetic properties of atomic nuclei, the chemical shift, the spin-spin coupling, diamagnetic anisotropy of molecules, interpretation of the proton NMR spectra, spin systems, two-dimensional spectra (2D-NMR), basics of ^{19}F and ^{13}C NMR.

Infrared spectroscopy (IR) – harmonic and anharmonic oscillator, vibrations of multiatom molecules, the normal vibrations, transition probability, group frequencies, measurements of the IR spectra, interpretation of the IR spectra, hydrogen bonds in the IR spectroscopy.

Mass spectroscopy (MS) – physical basis of the MS spectroscopy, methods of sample ionization, ion types in MS, determination of molecular mass and molecular formula, fragmentation of molecules.

Prerequisites and co-requisites

1. Knowledge of theoretical basis of spectroscopy

2. Knowledge of structures of organic compounds

3. Knowledge of nomenclature of organic compounds

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Four tests during semester	60.0%	100.0%

Recommended reading	Basic literature	1. R. M. Silverstein, F. X. Webster, D. J. Kiemle "Spektroskopowe metody identyfikacji związków organicznych", PWN, Warszawa, 2007. 2. "Spektroskopowe metody badania struktury związków organicznych", praca zbiorowa red. A. Rajca, WNT, Warszawa, 1996 lub 2000. 3. R. M. Silverstein, G. C. Bassler "Spektroskopowe metody identyfikacji związków organicznych", PWN, Warszawa, 1970. 4. L. K. Kazicyna, N. B. Kuplerska "Metody spektroskopowe wyznaczania struktury związków organicznych", PWN, Warszawa, 1974
	Supplementary literature	1. R. A.W. Johnstone, M. E. Rose "Spektrometria mas – podręcznik dla chemików i biochemików", PWN, Warszawa, 2001. 2. A. Zschunke "Spektroskopia magnetycznego rezonansu jądrowego w chemii organicznej", PWN Warszawa, 1976. 3. Z. Kęcki "Podstawy spektroskopii molekularnej", PWN, Warszawa, 1972. 4. H. Günther, "Spektroskopia magnetycznego rezonansu jądrowego", PWN, Warszawa, 1983. 5. M. Szafran, Z. Dega-Szafran "Określenie struktury związków organicznych metodami spektroskopowymi", PWN, Warszawa, 1988
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	