GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Identification of Organic Products, PG_00048565
Field of study	Chemical Technology

Date of commencement of studies	October 2021	Academic year of realisation of subject	2023/2024
Education level	first-cycle studies	Subject group	Optional subject group
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	3	Language of instruction	Polish
Semester of study	6	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment

Conducting unit	Department of Chemistry and Technology of Functional Materials -> Faculty of Chemistry

Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Ewa Wagner-Wysiecka
	Teachers	dr hab. inż. Ewa Wagner-Wysiecka
		Mateusz Malus
		dr hab. inż. Lidia Jasińska-Walc

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	15.0	0.0	15.0	30
	E-learning hours included: 0.0						
	Additional information:						

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	2.0	18.0	50

Subject objectives	Introduce students to basic methods of identifying organic compounds, primarily by spectroscopy, and prepare students to solve structural problems in practice.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	K6_U03	Uses information and knowledge of the structure of matter to identify substances, is able to use specialized databases, is able to carry out spectroscopic analysis of substances using basic spectroscopic methods and is able to ziterpertize the obtained results	[SU2] Assessment of ability to analyse information
	K6_W02	The student has basic knowledge regarding identification methods, mainly spectroscopic, organic substances.	[SW1] Assessment of factual knowledge

Subject contents	General methodology for determining the structure of organic compounds. Stages of an organic chemists work: experiment planning, product isolation and purification, identification of known compounds, determining the resolution and purification of organic compounds: conventional and chromatographic methods. Conventional methods for determining the structure of organic compounds. Basic spectroscopic methods for determining the structure of organic compounds: Nuclear Magnetic Resonance Spectroscopy (NMR), Mass Spectrometry (MS), Infrared Spectroscopy (IR), Raman Spectroscopy and Ultraviolet and Visible Light Spectroscopy (UV-Vis). The following aspects will be discussed for each spectral method: interaction between radiation and molecules, form of measurement results, type of information obtained and its usefulness. Resolution methods coupled with spectroscopic methods. Databases. Comparison of the spectra of test compounds with database spectra. Isolation and identification of organic impurities found in technical products.
Prerequisites and co-requisites	Knowledge of organic and analytical chemistry. Knowledge of laboratory methods.

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Seminar: completion of three tests and one oral presentation	50.0%	50.0%
	Laboratory: Performance of all prackical exercises, completion of two reports and two tests.	50.0%	50.0%

Recommended reading	Basic literature	1. R. M. Silverstein, F. X. Webster, D. J. Kiemle, Spektroskopowe metody identyfikacji związków organicznych. PWN 2007. 2. W. Zieliński, A. Rajca (red.), Metody spektroskopowe i ich zastosowanie do identyfikacji związków organicznych, WNT 1995. 3. E. Białecka-Floriańczyk, J. Włostowska, Ćwiczenia laboratoryjne z chemii organicznej, Wyd. SGGW , Warszawa 2007.
	Supplementary literature	1. J. Clayden, N. Greeves, S. Warren, P. Wothers, Chemia organiczna. Część I, WNT, Warszawa 2009. P. Suder, J. Silberring (red.), Spektrometria mas, Wyd. UJ, Kraków 2006.
	eResources addresses	Adresy na platformie eNauczanie: Identyfikacja produktów organicznych 2023/2024 - Moodle ID: 37069 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=37069

Example issues/ example questions/ tasks being completed	Classical methods of qualitative analysis of organic compounds. Application of selected chromatographic methods for isolation of organic compounds. The possibility of using UV-Vis spectroscopy to identify organic compounds. NMR spectroscopy. The basis of NMR. Chemical shift. ^{13}C NMR spectroscopy: main ranges on spectra. Main differences between carbon and proton magnetic resonance. What determines the chemical shift of proton signals in ^{1}H NMR spectra? Determination of the number of hydrogen atoms corresponding to given signals in the ^{1}H NMR spectrum. Couplings in ^{1}H NMR spectra: what do they result from? What will be the multiplicity of hydrocarbon group signals, e.g. ethyl, propyl, isopropyl? Interpret the ^{1}H NMR spectrum of a known organic compound. Calculate aromatic proton shifts in the 1H NMR spectrum of e.g. p-nitrophenol. Mass spectrometry (MS). In general: theoretical basic of mass spectrometry. Electron ionization method (EI). In what form is the mass spectrum presented? Isotope profiles in mass spectra. Determination of the atomic composition of the compound by MS. Fragmentation reactions (in general). Alkanes fragmentation. Ketone fragmentation. Fragmentation of alkylaromatic hydrocarbons. "Mild" ionization methods: CI and ESI. IR spectroscopy. In general, what information can be obtained from IR spectra? In general, what determines the frequency of stretching vibrations of chemical bonds? Main ranges in IR spectra. Sample preparation methodology. Hydrocarbon absorption in the infrared range. Characteristic bands in IR spectra, e.g. alcohols, primary amines, carboxylic acids, esters and amides. Special methods for recording IR spectra. Medium infrared spectroscopy and Raman spectroscopy as complementary methods for identifying organic substances. Compound separation methods coupled with selected spectroscopic techniques.
Work placement	Not applicable