



Subject card

Subject name and code	Fundamentals of organic chemistry, PG_00072326						
Field of study	Nanotechnology						
Date of commencement of studies	October 2026		Academic year of realisation of subject			2026/2027	
Education level	first-cycle studies		Subject group			Obligatory subject group in the field of study 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			3.0	
Learning profile	general academic profile		Assessment form			assessment	
Conducting unit	Department of Chemistry and Technology of Functional Materials -> Faculty of Chemistry -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Grzegorz Cholewiński				
	Teachers		dr hab. inż. Grzegorz Cholewiński				
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	15.0	0.0	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		3.0		27.0	75
Subject objectives	Acquisition by students of basic knowledge of organic chemistry						
Learning outcomes	Course outcome		Subject outcome			Method of verification	
	[K6_W03] possesses structured knowledge of physics and chemistry, including facts, concepts, methods, and theories enabling the description and explanation of complex phenomena and processes in the field of nanotechnology.		Student recognizes the influence of the structure of a chemical compound and possible intermolecular interactions on the parameters of materials.			[SW1] Assessment of factual knowledge	
	[K6_W01] understands the civilizational significance of materials science and is familiar with the processes occurring throughout the material life cycle (design, manufacturing, use, and disposal).		Student discusses relations between substance properties and types of underlying bonds. Student is also able to bind the properties of materials with the possibility of their use.			[SW1] Assessment of factual knowledge	
	[K6_U01] is able to engage in lifelong self-directed learning and to acquire and synthesize information from literature, databases, and other appropriately selected sources.		Student can individually in the textbooks or other literature search for relevant information.			[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information	
	[K6_U04] is able to independently or in a team plan and conduct experiments in nanotechnology and related disciplines, including physics, materials engineering, and chemistry, as well as analyze and interpret the obtained results and formulate conclusions.		Student is able to draw conclusions and formulate opinions. Student is able to analyze the obtained results.			[SU2] Assessment of ability to analyse information	

Subject contents	Course content – lecture Organic compounds: classification, nomenclature, isomerism, properties, reactivity. Main groups of organic compounds (preparation, properties, uses): aliphatic and aromatic hydrocarbons, organic halides, alcohols and phenols, aldehydes and ketones, organic acids and their derivatives, organic compounds bearing nitrogen and other heteroatoms, heterocyclic compounds. Mechanisms of organic reactions. Methods of identification of organic substances. Macromolecules: methods of polymer synthesis, chemical structure of a polymer versus its properties. Biologically important organic molecules and macromolecules: structure and properties of proteins, lipids, sugars and nucleic acids. Course content – exercises 1. Nomenclature of chain and cyclic hydrocarbons. Providing the correct systematic name for a given structure and reconstruct the structure according to the systematic name and the current nomenclature. 2. Free-radical substitution. Alkyl halides, order. Predicting the structure of the product of free-radical substitution of hydrocarbons based on an understanding of the reaction mechanism. 3. Constitutional isomers. Conformers of alkanes and cycloalkanes. Recognizing constitutional isomers of organic compounds. Relating structure to the physical and chemical properties of the compounds. 4. Absolute configuration. Recognizing symmetry and asymmetry in the structure of a chemical compound and their influence on the reaction. 5. Nucleophilic substitution, elimination reactions. An attempt to predict reactivity based on general concepts: nucleophile/electrophile, acid/base, nucleophilic substitution/elimination. 6. Groups of compounds with carbon-carbon multiple bonds: alkenes, alkynes, dienes. The most important methods of preparation and reaction directions, examples. 7. Aromatic compounds. Identification of the aromatic structure in molecular structure. Examples of electrophilic substitution as the most important type of reaction for this class of compounds, taking into account commercial significance, e.g., the synthetic route for the active ingredient of a known drug. 8. Alcohols, phenols, ethers, epoxides, aldehydes, ketones, carboxylic acids and their derivatives, and amines. The most important methods for introducing key functional groups into the molecular structure, which determine the physical and chemical properties of these compounds. Selected examples of reactions and applications on a laboratory and industrial scale.
Prerequisites and co-requisites	Properties of chemical elements and their compounds, structure of chemical compounds versus their properties, theories of acids and bases, kinetics and thermodynamics of chemical reactions

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written colloquium	50.0%	50.0%
	Two tests during exercises	50.0%	50.0%
Recommended reading	Basic literature	R. T. Morison; R. N. Boyd; Chemia organiczna, Wydawnictwo Naukowe PWN, Warszawa 2012.	
		J. McMurry, Chemia organiczna, Wydawnictwo Naukowe PWN, Warszawa, 2011	
		M. Cook, P. Cranwell, Chemia organiczna (seria Zrozumieć chemię), Wydawnictwo Naukowe PWN, Warszawa, 2021	
		J. D. Caserio, M. C. Roberts, Chemia organiczna, PWN Warszawa, 1969	
Supplementary literature	P. Mastalerz, Chemia organiczna, Wydawnictwo Chemiczne, Wrocław, 2016		
	J. Gawroński, K. Gawrońska, K. Kacprzak, M. Kwit, Współczesna synteza organiczna, Wydawnictwo Naukowe PWN, Warszawa, 2004		
	J. March, Chemia organiczna - reakcje, mechanizmy, budowa, Wydawnictwo Naukowe PWN, Warszawa, 1975.		
eResources addresses			
Example issues/ example questions/ tasks being completed	Constitutional isomerism of organic compounds: types, examples. Alkane nomenclature. Nomenclature of particular classes of organic compounds. Transformations of organic compounds: short characteristics of ionic and radical reactions. Changes in organic compounds: substitution, addition, elimination and rearrangement reactions (general scheme and examples). Electronic effects of substituents: inductive and resonant effects. Influence of electronic substituent effects on the reactivity of aromatic compounds. Techniques of isolation and purification of organic compounds. Addition polymerization of vinyl monomers. Condensation polymers: structure, preparation, application. Influence of macromolecule structure on its physical properties. Protein amino acids: structure, configuration (optical isomerism). Ionic structure of amino acids and their physical properties, building blocks of peptides and proteins. Lipids: an example of a triglyceride. Sugars: how is D-glucose built? Why do we digest starch and not digest cellulose? Nucleic acids: structural elements.		
Practical activities within the subject	Not applicable		

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