GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Organic Chemistry, PG_00061904		
Field of study	Materials Engineering, Materials Engineering		
Date of commencement of studies	October 2025	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	2	Language of instruction	Polish
Semester of study	3	ECTS credits	5.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Organic Chemistry -> 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	0.0	30.0	0.0	0.0	60

E-learning hours included: 0.0

eNauczanie source addresses:

Moodle ID: 8177 Chemia organiczna
https://enauczanie.pg.edu.pl/2025/course/view.php?id=8177

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	60	5.0	60.0	125

Subject objectives

Getting familiar with the structure, physicochemical properties, and reactivity of basic groups of organic compounds

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W02] has knowledge of physics and chemistry, useful for formulating and solving simple problems within the scope of materials science	Knows the structure of basic groups of chemical compounds and its influence on the reactivity and physicochemical properties of substances that are components of materials.	[SW1] Assessment of factual knowledge
[K6_U01] Can properly use selected analytical, simulation and experimental methods, as well as devices for measuring the fundamental properties of materials and technological processes.	Measurement of parameters during a chemical reaction (temperature, pressure, mass, volume), identification or verification of the purity of a substance (boiling point, melting point, refractive index).	[SU1] Assessment of task fulfilment
[K6_K01] Understands the need to improve professional and personal competencies; is conscious of own limitations and knows when to turn to experts, properly establishes priorities helping to accomplish tasks defined by oneself or others.	Due to the interdisciplinary nature of materials engineering, the diversity of factors determining the properties of materials, including organic compounds, the student understands the need to improve professional and personal competences; is aware of his/her own limitations and knows when to turn to experts, and is able to appropriately define priorities for the implementation of tasks defined by himself/herself or others.	[SK2] Assessment of progress of work

Subject contents	Course content – lecture 1. Structure of organic compounds: Chemical bonds: covalent, polar, ionic. Lewis structures, formal charge, resonance. Hybridized orbitals sp3, sp2, sp in the structures of organic molecules. Acids and bases in organic chemistry. Polarity of molecules. Intermolecular interactions. 2. Alkanes and cycloalkanes: Homologous series of organic compounds. IUPAC nomenclature. Conformation of molecules. Constitutional and geometric isomerism. Free radical substitution. 3. Halogenated derivatives of aliphatic hydrocarbons: Optical isomerism, chiral molecules, enantiomers. Rules of priority in determining configuration (R, S). Nucleophilic substitution and elimination reactions. 4. Unsaturated hydrocarbons: Alkenes and alkynes structure, preparation, properties. Addition reactions to double and triple bonds. The concept of tautomerism. Properties of conjugated unsaturated systems: dienes and polyenes. Diels-Alder reaction. 5. Aromatic hydrocarbons: benzene - structure and basic properties. Electrophilic substitution reactions, reaction mechanism, directing influence of substituents. Aromatic hydrocarbons with fused rings. 6. Alcohols and phenols: Structure, properties, basic reactions of alcohols and phenols. Synthesis of alcohols based on organomagnesium compounds. 7. Ethers, epoxides: Structure, properties and methods of synthesis of ethers. Acid cleavage of ethers. Epoxide ring opening reactions. Crown ethers. 8. Aldehydes and ketones: Nomenclature, synthesis and chemical properties. Nucleophilic addition to the carbonyl group. Oxidation and reduction, Cannizzaro reaction, enolate ions, aldol condensation. 9. Carboxylic acids and their derivatives: Structure and nomenclature of carboxylic acids. Carboxylic acid derivatives: esters, acid halides, anhydrides, nitriles and amides. Nucleophilic substitution in the acyl group. 10. Amines: Nomenclature, structure, basicity and preparation of amines. Basic reactions, diazonium salts, azo dyes.
Prerequisites and co-requisites	
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
exam	60.0%	50.0%
tests	50.0%	25.0%
laboratory basics	50.0%	25.0%

Recommended reading	Basic literature	1. R.T. Morrison, R.N. Boyd, Organic Chemistry, PWN, Warszawa 1998. 2. J. McMurry, Organic Chemistry, PWN, Warszawa 2005. 3. K. Dzierzbicka, G. Cholewiński, J. Rachoń, Organic Chemistry for Beginners, Publishing House at GUT, Gdańsk 2014. 4. D. Witt, K. Dzierzbicka, J. Rachoń: Synthesis and Transformations of Organic Compounds. Publishing House at GUT, Gdańsk 2007. 5. 1. A. I. Vogel: Practical Organic Chemistry, WNT, Warszawa 2006.

	Supplementary literature	1. F. A. Carey, Organic Chemistry, McGraw-Hill, Inc. 2nd. ed., New York 1992. 2. K. Dzierzbicka, G. Cholewiński, J. Rachoń, Organic Chemistry for Advanced, Publishing House at GUT, Gdańsk 2016.
	eResources addresses	
Example issues/ example questions/ tasks being completed	1. Pentaerythritol (formally: 2,2-bis(hydroxymethyl)-propane-1,3-diol) is a tetrahydric alcohol widely used as an intermediate in chemistry and technology, e.g. a substrate for the synthesis of stabilizers for polymer materials. It is formed in the reaction of formaldehyde with an excess of ethanal under basic conditions. Present the chemical reactions that proceed in sequence. 2. Acetic anhydride is an important acylating reagent used in organic synthesis on both a laboratory and industrial scale. For example, in the reaction with 4-aminophenol, paracetamol is formed - the active substance of analgesics and antipyretics. Present the mechanism of this *N*-acylation. 3. Diethyl ether can be used as a solvent to extract aniline from an aqueous suspension. Which of the following is true for this solvent: a) perfectly soluble in water, b) density greater than water, c) flammable.	
Practical activites within the subject	Not applicable	

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