



Subject card

Subject name and code	Organic chemistry, PG_00054692						
Field of study	Biotechnology						
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		3.0		
Learning profile	general academic profile		Assessment form		assessment		
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. Sławomir Makowiec				
	Teachers		dr hab. Sławomir Makowiec				
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						
	eNauczanie source addresses: Moodle ID: 7647 CHEMIA ORGANICZNA https://enauczanie.pg.edu.pl/2025/course/view.php?id=7647						
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 problems of organic chemistry including: the structure, properties reactions and reactions mechanisms of organic compounds						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	K6_U02		Is able to propose appropriate synthetic routes for the preparation of representative organic compounds from fundamental classes—such as alkenes, aromatic derivatives, carbonyl compounds, and nitrogen-containing compounds—and to outline the reaction mechanisms involved in these syntheses.		[SU2] Assessment of ability to analyse information		
	K6_W03		has the knowledge the methods of preparation and the reactivity of: halogen derivatives, unsaturated and aromatic compounds, hydroxy compounds, carbonyl and acyl compounds, and nitrogen-containing compounds.		[SW1] Assessment of factual knowledge		

Subject contents	Course content – lecture Chemical bonding and molecular properties. The nature of chemical bonding. Types of chemical bonds (ionic and covalent). Description of the covalent bond. Structures of methane, ethene, and ethyne – sp³, sp², and sp hybridization. Polar covalent bonds; electronegativity, dipole moment. Intermolecular interactions. Chemical structures, formal charges, resonance. Acids and bases in organic chemistry. Alkanes and cycloalkanes IUPAC nomenclature of alkanes. Spatial arrangement of atoms in saturated hydrocarbon molecules. Free-radical substitution. Fundamentals of conformational analysis. Halogen derivatives of aliphatic hydrocarbons. Structure, nomenclature, and synthesis of haloalkanes. Nucleophilic substitution and elimination reactions. Optical isomerism. Stereoisomers – chiral molecules, enantiomers and diastereomers, configuration, CIP rules. Unsaturated hydrocarbons – alkenes and alkynes. Classification and nomenclature (Z/E alkenes, alkynes, alkadienes). Physical and chemical properties of alkenes in relation to their structure. Radical and electrophilic addition reactions. Properties and synthesis of alkynes – the concept of tautomerism. Dienes Types of dienes, 1,2- and 1,4-addition, Diels-Alder cycloaddition. Aromatic compounds Rules of aromaticity, structure of aromatic compounds. Electrophilic substitution in aromatic systems. Side-chain reactions of aromatic compounds Alcohols, ethers, and epoxides Preparation methods, physical properties, and reactivity		
	Course content – exercises Practical application of skills acquired during the lecture, covering: Drawing Lewis structures; determining hybridization and molecular geometry. Nomenclature of organic compounds. Mechanisms of radical halogenation reactions and other aspects of saturated hydrocarbon reactivity. Conformational analysis in practice: torsional and steric interactions. Stereoisomerism of compounds, including configuration assignment and working with various spatial projections. Nucleophilic substitution reactions; identification of nucleophilic reagents. SN₁ and SN₂ reactions; overview of factors influencing the course of nucleophilic substitution. Elimination reactions, with particular emphasis on the competition between elimination and substitution. Reactivity of alkenes, specifically addition reactions. Reactivity of alkynes; introduction to organometallic compounds. Reactivity of dienes; cycloadditions. The concept of aromaticity and the reactivity of aromatic compounds (e.g., nitration, acylation, alkylation, sulfonation, etc.). Properties and reactivity of alcohols, ethers, and epoxides.		
Prerequisites and co-requisites	Structure of elements and their compounds, especially carbon; acids, bases and salts; reaction types, geometry of molecules		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Lecture: Three tests covering the lecture material.	60.0%	50.0%
	Tutorials: Three tests covering the tutorial material.	60.0%	50.0%
Recommended reading	Basic literature	1. J. D. Caserio, M. C. Roberts CHEMIA ORGANICZNA, PWN Warszawa, 1969 2. R. T. Morrison, R. N. Boyd CHEMIA ORGANICZNA, PWN Warszawa, 1997 3. J. McMurry CHEMIA ORGANICZNA, PWN Warszawa, 2017	
	Supplementary literature	1. J. Gawroński, K. Gawrońska, K. Kacprzak, M. Kwit WSPÓŁCZESNA SYNTEZA ORGANICZNA, WN PWN Warszawa 2004 2. J. March CHEMIA ORGANICZNA - Reakcje, mechanizmy, budowa, WNT Warszawa 1975 3. H. O. House NOWOCZESNE REAKCJE SYNTEZY ORGANICZNEJ, PWN Warszawa 1979 4. T. W. G. Solomons ORGANIC CHEMISTRY - 6th ed, John Wiley & Sons, Inc. New York, 1996	
	eResources addresses		

Example issues/ example questions/ tasks being completed	Why is nitrobenzene more difficult to nitrate than toluene, and to which position is the new substituent directed? Methods for preparing halogenated hydrocarbons. Chemical properties of alkenes. Substitution, addition, and elimination reactions. Why is methyl iodide toxic? What are carbocation rearrangements, and how can their course be predicted?
Practical activities within the subject	Not applicable

Document generated electronically. Does not require a seal or signature.