GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	ORGANIC CHEMISTRY, PG_00064465						
Field of study	Chemistry						
Date of commencement of studies	October 2026		Academic year of realisation of subject	2028/2029			
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	3		Language of instruction	Polish			
Semester of study	5		ECTS credits	7.0			
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. inż. Teresa Olszewska				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	45.0	30.0	15.0	0.0	0.0	90
	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	90		10.0	100.0		200
Subject objectives	The aim of the subject is to familiarize students with the basics of organic chemistry covering the structure, properties, reactions and reaction mechanisms of organic compounds. Furthermore, to familiarize students with the glassware and apparatus used in the synthesis of organic compounds, as well as with the techniques and procedures employed for the purification of reaction products.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U03] operates typical laboratory apparatus and carries out analyses to identify chemical compounds and materials, integrating computational methods and application software	is able to assemble and operate apparatus used for distillation, crystallization, and extraction. They can use a rotary evaporator and a cryometer in laboratory practice. They are able to identify reaction products and evaluate their purity using thin-layer chromatography (TLC).	[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject
[K6_W02] classifies acquired information, assessing its usefulness in solving the posed problems concerning the synthesis and analysis of selected groups of compounds, determining their physical and chemical properties, making measurements and determining the parameters of chemical reactions and processes	demonstrates knowledge of the fundamental properties of the discussed classes of organic compounds and the mechanisms of the reactions they undergo. They understand the factors influencing differences in reactivity among compounds belonging to the same class.	[SW1] Assessment of factual knowledge
[K6_U01] gathers information from literature, databases and other sources, interpreting, critically evaluating, summarising, formulating and justifying opinions, independently analyses and produces technical drawings with the use of computer assistance	is able to design a synthesis pathway for a given organic compound starting from an appropriate substrate. Furthermore, the student can assess and rank the reactivity of derivatives within a specific class of organic compounds and is familiar with classical tests used for the identification of functional groups.	[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject
[K6_U07] is able to undertake accurate and precise analytical measurements, to synthesise simple and large-molecular chemical compounds, to purify and analyse their composition and to determine their structure using classical and instrumental methods	is able to purify reaction products using distillation and crystallization techniques. They can separate acidic, basic, and neutral compounds by extraction. They are capable of confirming the structure of the obtained products on the basis of their physicochemical properties and classical instrumental analytical methods.	[SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment

Subject contents

Course content – lecture

To familiarize students with the structure, reactivity, and synthetic methods of aromatic hydrocarbons, carbonyl compounds, organometallic compounds, phenols, amines, carboxylic acids and their derivatives, and heterocyclic compounds. To provide an understanding of the reaction mechanisms associated with these classes of compounds, including electrophilic and nucleophilic substitution in aromatic systems, nucleophilic addition to carbonyl groups, nucleophilic acyl substitution, and condensation reactions of carbonyl compounds.

Course content – exercises

Designing multi-step pathways for the synthesis of organic molecules with a given structure from a given substrate. Applying/utilizing known reaction mechanisms to explain chemical transformations based on the structure of the substrate, product, and reagent molecules. Comparing the relative reactivity of molecules belonging to the same class of organic compounds based on their structures. Determining the conditions for conducting reactions based on the knowledge of the physicochemical properties of particular classes of organic compounds.

Course content – laboratory

To provide students with practical training in the fundamental techniques and operations used in organic synthesis, including filtration, distillation, extraction, and crystallization, as well as methods for product identification. Additionally, to familiarize students with reaction monitoring techniques and proper laboratory notebook maintenance.

Prerequisites and co-requisites

Structure of elements and their compounds, especially carbon; concepts of acids, bases, and salts; types of reactions; geometry of molecules.

Completion of Part I of the course.

<table>
<tr><td>Assessment methods and criteria</td><td colspan="2"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Tutorials: tests covering the material discussed during tutorials.</td><td>60.0%</td><td>45.0%</td></tr>
<tr><td>Laboratory: successful completion of the scheduled laboratory experiments and a written test.</td><td>60.0%</td><td>10.0%</td></tr>
<tr><td>Lecture: successful completion of three tests covering the material presented during the lectures.</td><td>60.0%</td><td>45.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>1) J. McMurry Chemia Organiczna, PWN Warszawa, 2002

2) R. T. Morrison, R. N. Boyd Chemia Organiczna, PWN Warszawa, 1997

3) T. W. G. Solomons Organic Chemistry - 6th ed, John Wiley & Sons, Inc. New York, 1996

4) K. Dzierzbicka, G. Cholewiński, J. Rachoń Tajemnice i sekrety laboratorium chemii organicznej, Wydawnictwo Politechniki Gdańskiej, 2013

5) D. Witt, K. Dzierzbicka, J. Rachoń Syntezy i transformacje związków organicznych, Wydawnictwo Politechniki Gdańskiej, 2007</td></tr>
<tr><td>Supplementary literature</td><td>1) J. D. Caserio, M. C. Roberts CHEMIA ORGANICZNA, PWN Warszawa, 1969

2) F. A. Carey Organic Chemistry 4th ed, Mc Graw Hill Companies, Inc. USA, 2000</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">1) Starting from 1-bromobutane and using any necessary organic or inorganic reagents, propose efficient syntheses of the following alcohols: (a) 1-pentanol, (b) 2-hexanol, and (c) 1-butylcyclobutanol.

2) Write equations describing two different ways in which benzyl ethyl ether can be prepared using a Williamson ether synthesis.

3) Suggest an efficient synthesis of m-nitrobenzoic acid from toluene.

4) Give the structures of the crossed aldol condensation products obtained from benzaldehydeand (a) acetophenone, (b) cyclohexanone, and (c) tert-butyl methyl ketone.

5) What characteristics should a solvent used for crystallization possess?
6) Describe how you would separate a mixture of sodium chloride and naphthalene using only extraction.</td></tr>
<tr><td>Practical activites within the subject</td><td colspan="2">Not applicable</td></tr>
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