GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Organic chemistry, PG_00049199						
Field of study	Chemistry						
Date of commencement of studies	October 2021		Academic year of realisation of subject		2023/2024		
Education level	first-cycle studies		Subject group		Obligatory subject group 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	6		ECTS credits		6.0		
Learning profile	general academic profile		Assessment form		exam		
Conducting unit	Department of Organic Chemistry -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Teresa Olszewska				
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	90.0	0.0	15.0	120
	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	120		5.0		25.0	150
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_U08] is capable to design and carry out the experiment which is necessary to confirm a given hypothesis and sees wider context, often beyond-technical, of the analysed phenomena	The student is able to propose and perform an alternative way of synthesizing a specific organic compound in the event of failure of the synthetic procedure.	[SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information
	[K6_W09] has knowledge on chemical management and the concept of sustainable development necessary to conduct the management of chemicals (including dangerous substances) in the industrial plant, knows health and safety issues and ergonomics.	A student knows the toxicity and danger associated with the use of specific substances from the class of organic compounds in question. He knows typical substitutes for harmful chemical solvents for less toxic to the environment.	[SW1] Assessment of factual knowledge
	[K6_K04] is aware of the importance of ethical behaviour in accordance with the principles of safety and health at work	The student is aware that the organic compounds synthesized by him must be carried out reliably. All health and safety regulations must be fulfilled during the work in laboratory. The products obtained as a result of synthesis are subject to qualitative and quantitative verification.	[SK5] Assessment of ability to solve problems that arise in practice [SK3] Assessment of ability to organize work
	[K6_U01] knows how to get information from literature, databases and other sources, can integrate the information obtained, interpret and critically evaluate it, and draw conclusions, and to formulate and justify the opinions	The student knows how to use literature databases to obtain information on a given topic, which he presents in the form of a presentation. He is able to select and combine the most important data from various sources concerning the discussed topic and present and justify his opinion.	[SU5] Assessment of ability to present the results of task [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment
	[K6_W07] has knowledge about basic polireactions making possible the production of various macromolecular compounds, including the idea of creating blends and polymer composites for specific applications	The student knows the methods of peptide synthesis. He also has knowledge of the structure of simple and complex sugars, the natural sources of their occurring and application in specific areas of life.	[SW1] Assessment of factual knowledge
	[K6_U03] can make detailed documentation of the results of self-conducted experiments and prepare a report describing these results	The student is able to keep the laboratory notebook in which he describes the experimental procedures of synthetized organic compounds as well as comments and observations regarding the experiments carried out. On the basis of the collected notes, he can explain the failure of the experiment, the reason for the high or low yield of the reactions.	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment

Subject contents	Introduction to stereochemistry 1. chirality, enantiomers, diastereomers 2. CIP and Fischer rules 3. chiral molecules devoid of asymmetric atoms 4. racemic mixtures, formation, separation of racemic mixtures 5. relative and absolute configuration, correlation of configuration Electrophilic and nucleophilic substitution in aromatic rings 1. aromaticity, benzenoic and nonbenzenoic aromatic systems 2. naphthalene, anthracene and phenanthrene and some other condensed benzene rings 3. aromatic and nonaromatic heterocyclic rings 4. electrophilic substitution of furan, pyrrole and thiophene 5. electrophilic and nucleophilic substitution of pyridine ring Diazomethane and diazoalkanes 1. preparation, structure and properties 2. alkylation reaction 3. Arndt-Eistert reaction 4. as a source of carbene, comparison with other sources Condensation reactions: 1. aldol 2. Michael 3. Knovenagel 4. Claisen 5. Perkin 6. benzoin condensation and the benzil-benzilic acid rearrangement Alkylation of reactive methylene systems 1. formation of an enolate anions 2. alkylation of reactive methylene compounds 3. alkylation of ketones Enamines preparation and application in organic synthesis Rearrangements: 1. Hofmann, Curtius, Schmidt stereochemistry 2. pinacolpinacolone, pinacol deamination 3. Beckmann 4. Fries 5. Benzidine 6. Bayer-Villiger Amino acids, peptides and proteins 1. syntheses of simple amino acids 2. sequential analysis of peptides and proteins 3. peptide synthesis (protection of amino and carboxylic groups) 4. peptide bond formation 5. solid phase synthesis Disaccharides and polysaccharides.
Prerequisites and co-requisites	Structure of elements and their compounds, especially carbon; acids, bases and salts; reaction types, geometry of molecules. Completion of part I and II of the course.
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
written and oral exam	60.0%	50.0%
Experimental work	60.0%	25.0%
Preparation and presentation of two reports on given subject	60.0%	25.0%

Recommended reading	Basic literature	R. T. Morrison, R. N. Boyd *Chemia organiczna* J. D Roberts, M. C. Caserio *Chemia organiczna* P. Mastalerz *Chemia organiczna* C. D. Nenitescu *Chemia organiczna* R. C. Fuson *Reakcje związków organicznych* J. March *Chemia organiczna. Reakcje, mechanizmy, budowa.* G. Hallas *Stereochemia związków organicznych*. M. Nogradi *Stereochemia, podstawy i zastosowania*
	Supplementary literature	A. I. Vogel *Preparatyka organiczna* wydanie drugie, Wydawnictwo Naukowo-Techniczne, Warszawa 1984. J. Gawroński, K. Gawrońska, K. Kacprzak, M. Kwit *Współczesna synteza organiczna*, WN PWN Warszawa 2004 T. W. G. Solomons *Organic Chemistry* - 6th ed, John Wiley & Sons, Inc. New York, 1996 L. M. Harwood, C. J. Moody, J. M. Percy *Experimental Organic Chemistry Standard and Microscale*, 2-nd ed, Blackwell Science Ltd, 1999
	eResources addresses	
Example issues/ example questions/ tasks being completed	1. Outline a Strecker synthesis of DL-alanine. 2. Write structural formulas for the (alfa)- and (beta)-methyl pyranosides formed by reaction of D-galactose with methanol in the presence of hydrogen chloride. 3. Give the products of periodic acid oxidation of each of the following. Haw many moles of reagent will be consumed per mole of substrate in each case? a) D-arabinose b) D-ribose c) methyl *(beta)*-D-glucopyranoside 4. What products would you expect to obtain from each of the following crossed Claisen condensations? a) ethyl propanoate + diethyl oxalate b) ethyl acetate + ethyl formate 5. Outline a synthesis of 4-nitroaniline from p-nitrotoluene.	
Work placement	Not applicable	