



## Subject card

Subject name and code	Organic Chemistry, PG_00048603						
Field of study	Chemistry in Construction Engineering						
Date of commencement of studies	October 2020	Academic year of realisation of subject			2020/2021		
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			6.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Organic Chemistry -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Witold Przychodzeń					
	Teachers	dr hab. inż. Witold Przychodzeń					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	15.0	30.0	0.0	0.0	75
	E-learning hours included: 0.0						
	Address on the e-learning platform: <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=3969#section-0">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=3969#section-0</a> Adresy na platformie eNauczanie:						
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	75	15.0	60.0	150		
Subject objectives	1. To familiarize the student with the structure of the major classes of organic compounds and their reactivity  2. To familiarize the student with the basic organic reaction mechanisms and with the methods of organic compounds synthesis  3. To familiarize the student with the isolation and the purity analysis procedures and protocols for compounds prepared in the laboratory						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	K6_U07	<ol style="list-style-type: none"> <li>1. Student has knowledge of the nomenclature of organic compounds according to IUPAC recommendations.</li> <li>2. Student identifies organic acids and bases, electrophilic and nucleophilic reagents.</li> <li>3. Student can determine the relative differences in the acidity / basicity of organic compounds.</li> </ol>	[SU2] Assessment of ability to analyse information
	K6_K03	<ol style="list-style-type: none"> <li>1. Student is able to synthesise organic compounds according to literature procedures</li> <li>2. Student is able to apply basic techniques of isolation and purification of organic compounds: distillation, crystallization and extraction</li> </ol>	[SK2] Assessment of progress of work
	K6_W03	<ol style="list-style-type: none"> <li>1. Student draws a correct structural and electronic formulas of organic compounds</li> <li>2. Student is able to recognize and name individual classes of organic compounds</li> <li>3. Student can determine and predict the effect of molecular structure on its physical and chemical properties</li> <li>4. Student knows the basic concepts of stereochemistry, distinguishes stereoisomers and determines their configurations</li> <li>5. Student recognizes and knows the basic mechanisms of organic reactions</li> <li>6. Student plans an organic synthesis consists of several steps</li> </ol>	[SW3] Assessment of knowledge contained in written work and projects
Subject contents	<p>LECTURE Common representation of structural formulas and reaction equations; isomerism and stereochemistry; resonance theory; structure influence on physico-chemical properties of compounds; acid-base reactions; concise characteristics of the main classes of organic compounds (aliphatic and cyclic hydrocarbons, aromatic hydrocarbons, alcohols, phenols and ethers, aldehydes and ketones, carboxylic acids and their derivatives, amines, bifunctional compounds, heteroaromatics) including their structure, nomenclature, physical and chemical properties, methods of their preparation with emphasis on the use of the selected representatives in the construction field; main reaction types in organic chemistry and their mechanisms; introduction to chemistry of polymers and their application in construction and building materials. TUTORIALS During tutorials student should practice her/his skills to independently use the knowledge acquired during lectures e.g. for writing organic compounds formulas, ascribing compound to particular class, predicting its chemical and physical properties based on its structure, proposing the route of the target compound synthesis, writing mechanisms of fundamental organic reactions, assigning every organic compound used in building chemistry to the correct class of compounds to which it belongs. LABORATORY During laboratory classes students become familiar with basic laboratory techniques for preparation, isolation and purification of organic compounds (filtration, extraction, distillation and crystallization). Student will learn to elaborate the proper synthetic protocol (calculation of reactants amount based on stoichiometry, recalculation of concentration of solutions, determination of the reaction yield) and to write correct lab reports. Assessment: test from lecture material (50% of the final note), test from tutorial material (25% of the final note), test and reports from the experimental work (25% of the final note)</p>		
Prerequisites and co-requisites	General Chemistry and Inorganic Chemistry		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Laboratory: reports, points for written entrance tests	60.0%	25.0%
	Written exam	50.0%	50.0%
	Seminars: three written tests	60.0%	25.0%

Recommended reading	Basic literature	<p>J. McMurry Chemia Organiczna, PWN, W-wa, 2005.</p> <p>P. Mastalerz Chemia Organiczna, PWN, W-wa, 1986. A.</p> <p>PREPARATYKA ORGANICZNA - Instrukcje do ćwiczeń laboratoryjnych: dla studentów II i III roku chemii Uniwersytet Łódzki 2017/2018, red. K. Gębicki i inni</p> <p>I. Vogel Preparatyka Organiczna, WNT, W-wa, 1984.</p>
	Supplementary literature	<p>P. Mastalerz Podręcznik Chemii Organicznej, Wyd. Chem., Wrocław, 1996.</p> <p>W. Przychodzeń, K. Darowicki Charakterystyka chemiczna żywic i rozpuszczalników do farb oraz powłok ochronnych, Wyd. PG, Gdańsk, 2011.</p> <p>O. Henning, L. Czarnecki, T. Broniewski, Chemia w budownictwie, Arkady, W-wa, 2000, 2010</p>
	eResources addresses	

<p>Example issues/ example questions/ tasks being completed</p>	<p>1. <b>Suggest 4-step syntheses for compounds shown below:</b></p> <p>a) 3-bromo-4-fluorotoluene from p-nitrotoluene</p> <p>b) 4-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>C(CH<sub>3</sub>)<sub>2</sub>COOH from isopropylbenzene</p> <p>2. <b>Draw the formula for an organic compound that is representative of the class mentioned:</b></p> <p>a) terminal alkene oxide</p> <p>b) β-alkylpyridine</p> <p>c) imide</p> <p>d) <i>terta</i>arylammonium phenolate</p> <p>3. <b>Draw a fragment of the polymer structure containing at least two mers and the monomer structure from which it was obtained:</b></p> <p>a) aromatic polycarbonate</p> <p>b) aromatic polyurethane</p> <p>4. <b>What is the acidity order of the following compounds (assign the pK<sub>a</sub> values)</b></p> <p>C<sub>6</sub>H<sub>5</sub>OH                  C<sub>6</sub>H<sub>11</sub>OH                  C<sub>6</sub>H<sub>11</sub>NH<sub>2</sub>                  C<sub>6</sub>H<sub>5</sub>CCH                  p-HOC<sub>6</sub>H<sub>4</sub>COOH</p> <p>5. <b>Draw the structures of the products A F:</b></p> <p>a) /<i>R</i>/-1-bromo-1,3,3-triethylcyclohexane + CF<sub>3</sub>CH<sub>2</sub>OH = <b>A + B</b></p> <p>b) sodium 4-nitrobenzoate + C<sub>6</sub>H<sub>5</sub>CH<sub>2</sub>Br = <b>C</b></p> <p>c) CH<sub>3</sub>CH(OH)CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>Br + CH<sub>3</sub>CCNa = <b>D</b> (cyclic product)</p> <p>d) Aniline + KNO<sub>2</sub>-H<sub>2</sub>SO<sub>4</sub> = <b>E</b></p> <p><b>E</b> + phenol dissolved in 10% aq NaOH = <b>F</b></p>
<p>Work placement</p>	<p>Not applicable</p>