



Subject card

Subject name and code	Chemistry III, PG_00039786						
Field of study	Materials Engineering						
Date of commencement of studies	October 2021	Academic year of realisation of subject			2023/2024		
Education level	first-cycle studies	Subject group					
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			5.0		
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. Grzegorz Cholewiński					
	Teachers						
Lesson types and methods of instruction	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						
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	15.0		65.0		125
Subject objectives	The main goal is to acquaint the student with the basics of organic chemistry including: structure, chemical and physical properties of organic compounds.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K6_K01	A student understands the need to improve professional and personal competences; is aware of its own limitations and knows when to turn to experts, it can properly set priorities for the implementation of its or other tasks			[SK5] Assessment of ability to solve problems that arise in practice [SK4] Assessment of communication skills, including language correctness		
	K6_U01	A student is able to use properly selected analytical, simulation and experimental methods and devices enabling measurement of basic quantities characterizing materials and technological processes			[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject		
	K6_U05	A student is able to learn independently			[SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information		
	K6_W02	A student has knowledge of physics and chemistry useful for formulating and solving simple tasks in the field of materials science			[SW1] Assessment of factual knowledge		

Subject contents	<p><b>1. Structure of organic compounds:</b> Chemical bonds: covalent, polar covalent and ionic. Writing Lewis structures, formal charge, resonance. <math>sp^3</math>, <math>sp^2</math>, <math>sp</math> Hybridization in molecules of organic compounds. Acids and bases in organic chemistry. Molecular dipole moments. Intermolecular interactions.</p> <p><b>2. Alkanes and cycloalkanes:</b> The homologous series of organic compounds. IUPAC nomenclature of alkanes and cycloalkanes. Conformation of molecules. Isomerism: constitutional isomers and stereoisomers. Halogenation of alkanes. Radical substitution reactions.</p> <p><b>3. Alkyl Halides:</b> Enantiomers and chiral molecules. Nomenclature of enantiomers: the (<i>R,S</i>) system. Nucleophilic substitution and elimination reactions of alkyl halides.</p> <p><b>4. Unsaturated Hydrocarbons:</b> Alkenes and alkynes – structure, properties and synthesis. Addition reactions of alkenes and alkynes. Keto-enol tautomerism. Conjugated unsaturated systems : alkadienes and polyunsaturated hydrocarbons. The Diels-Alder reaction.</p> <p><b>5. Aromatic compounds:</b> benzene – structure and properties. Nomenclature of benzene derivatives. Representative electrophilic aromatic substitution reactions of benzene. Mechanistic principles of electrophilic aromatic substitution and substituent effects. Polycyclic aromatic hydrocarbons.</p> <p><b>6. Alcohols and phenols:</b> Physical properties of alcohols and phenols. Synthesis of alcohols using Grignard Reagents.</p> <p><b>7. Ethers, epoxides:</b> Structure, physical properties and preparation of ethers and epoxides. Acid-catalyzed cleavage of ethers. Nucleophilic ring opening of epoxides. Crown ethers.</p> <p><b>8. Aldehydes and ketones:</b> Nomenclature and physical properties. Sources of aldehydes and ketones. Nucleophilic addition to the carbonyl group. Reactions of aldehydes and ketones: oxidation, reduction, the Cannizzaro reaction, enols and enolate ions, the aldol condensation.</p> <p><b>9. Amines:</b> Nomenclature, physical properties and structure of amines. Basicity of amines – amine salts. Preparations and reactions of amines. Arenediazonium salts and azo dyes.</p> <p><b>10. Carboxylic acids and their derivatives:</b> Structure and nomenclature of carboxylic acids. Structure and reactivity of carboxylic acid derivatives: acyl chlorides, esters, amides, nitriles and carboxylic acid anhydrides. Nucleophilic substitution at the acyl carbon.</p>														
Prerequisites and co-requisites	Knowledge of the structure of elements, especially carbon; the concept of acids, bases and salts; reaction types; geometry of molecules														
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="448 1487 794 1525">Subject passing criteria</th> <th data-bbox="794 1487 1141 1525">Passing threshold</th> <th data-bbox="1141 1487 1487 1525">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="448 1532 794 1581">colloquia written during the lectures</td> <td data-bbox="794 1532 1141 1581">50.0%</td> <td data-bbox="1141 1532 1487 1581">25.0%</td> </tr> <tr> <td data-bbox="448 1588 794 1615">tests written during tutorials</td> <td data-bbox="794 1588 1141 1615">50.0%</td> <td data-bbox="1141 1588 1487 1615">25.0%</td> </tr> <tr> <td data-bbox="448 1621 794 1653">exam</td> <td data-bbox="794 1621 1141 1653">60.0%</td> <td data-bbox="1141 1621 1487 1653">50.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	colloquia written during the lectures	50.0%	25.0%	tests written during tutorials	50.0%	25.0%	exam	60.0%	50.0%
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Recommended reading	<table border="1"> <tr> <td data-bbox="448 1659 794 2047">Basic literature</td> <td colspan="2" data-bbox="794 1659 1487 2047">           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, 2002             4. T. W. G. Solomons ORGANIC CHEMISTRY - 6th ed, John Wiley &amp; Sons, Inc. New York, 1996         </td> </tr> </table>			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, 2002  4. T. W. G. Solomons ORGANIC CHEMISTRY - 6th ed, John Wiley & Sons, Inc. New York, 1996										
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	Supplementary literature	1. J. March CHEMIA ORGANICZNA - Reakcje, mechanizmy, budowa, WNT Warszawa 1975  2. F. A. Carey ORGANIC CHEMISTRY - 4th ed, McGraw-Hill Higher Education, 2000
	eResources addresses	Adresy na platformie eNauczenie:
Example issues/ example questions/ tasks being completed	Show how: a) /Z/-1-Phenyl-1-propene, b) /E/-1-Phenyl-1-propene, c) 1-Phenyl-1-butyne can be prepared from phenylacetylene and any inorganic and organic reagents.	
Work placement	Not applicable	

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