



Subject card

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|---|--|--|---|-------------------------------------|--|------------|-----|
| Subject name and code | Chemistry III, PG_00039786 | | | | | | |
| Field of study | Materials Engineering, Materials Engineering, Materials Engineering | | | | | | |
| Date of commencement of studies | October 2021 | | Academic year of realisation of subject | | 2022/2023 | | |
| 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 | | 5.0 | | |
| 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. Grzegorz Cholewiński | | | | |
| | Teachers | | dr hab. inż. Grzegorz Cholewiński | | | | |
| 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_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 | | |
| | K6_U05 | | A student is able to learn independently | | [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject | | |
| | 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 | | [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information | | |
| | 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 | | [SK4] Assessment of communication skills, including language correctness [SK5] Assessment of ability to solve problems that arise in practice | | |

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| Subject contents | <p>1. Structure of organic compounds: Chemical bonds: covalent, polar covalent and ionic. Writing Lewis structures, formal charge, resonance. sp^3, sp^2, sp Hybridization in molecules of organic compounds. Acids and bases in organic chemistry. Molecular dipole moments. Intermolecular interactions.</p> <p>2. Alkanes and cycloalkanes: 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>3. Alkyl Halides: Enantiomers and chiral molecules. Nomenclature of enantiomers: the (<i>R,S</i>) system. Nucleophilic substitution and elimination reactions of alkyl halides.</p> <p>4. Unsaturated Hydrocarbons: 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>5. Aromatic compounds: 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>6. Alcohols and phenols: Physical properties of alcohols and phenols. Synthesis of alcohols using Grignard Reagents.</p> <p>7. Ethers, epoxides: Structure, physical properties and preparation of ethers and epoxides. Acid-catalyzed cleavage of ethers. Nucleophilic ring opening of epoxides. Crown ethers.</p> <p>8. Aldehydes and ketones: 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>9. Amines: Nomenclature, physical properties and structure of amines. Basicity of amines – amine salts. Preparations and reactions of amines. Arenediazonium salts and azo dyes.</p> <p>10. Carboxylic acids and their derivatives: 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 | Subject passing criteria | Passing threshold | Percentage of the final grade |
| | exam | 60.0% | 50.0% |
| | tests written during tutorials | 50.0% | 25.0% |
| | colloquia written during the lectures | 50.0% | 25.0% |
| Recommended reading | <p>Basic literature</p> <p>1. J. D. Caserio, M. C. Roberts CHEMIA ORGANICZNA, PWN Warszawa, 1969</p> <p>2. R. T. Morrison, R. N. Boyd CHEMIA ORGANICZNA, PWN Warszawa, 1997</p> <p>3. J. McMurry CHEMIA ORGANICZNA, PWN Warszawa, 2002</p> <p>4. T. W. G. Solomons ORGANIC CHEMISTRY - 6th ed, John Wiley & Sons, Inc. New York, 1996</p> | | |

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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 eNauczanie: |
| 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 | |