KAPITAŁ LUDZKI
NARODOWA STRATEGIA SPÓJNOŚCI

Projekt współfinansowany przez Unię Europejską w ramach Europejskiego Funduszu Społecznego

UNIA EUROPEJSKA
EUROPEJSKI FUNDUSZ SPOŁECZNY

Course title

Organic chemistry

ECTS code

13.3.0748

Name of unit administrating study

null

Studies

faculty	field of study		
Faculty of Chemistry	Chemical Business	type	all
		form	all
		specialty	all
		specialization	all

Teaching staff

prof. dr hab. Adam Prahl; dr Daria Grzywacz; dr hab. Elżbieta Jankowska, profesor uczelni; dr Aleksandra Walewska; mgr Katarzyna Olkiewicz; dr hab. Beata Liberek, profesor uczelni; dr Justyna Samaszko-Fiertek; dr hab. Andrzej Nowacki; dr Przemysław Karpowicz; dr Katarzyna Guzow; dr inż. Emilia Iłowska; dr Izabela Małuch; dr hab. Aneta Szymańska, profesor uczelni

Forms of classes, the realization and number of hours

Forms of classes

Auditorium classes, Laboratory classes, Lecture

The realization of activities

classroom instruction

Number of hours

Auditorium classes: 60 hours, Lecture: 60 hours, Laboratory classes: 90 hours

ECTS credits

15

classes - 210 h

tutorial classes – 60 h

student's own work – 80 h

Total: 350 h – 14 ECTS

The academic cycle

2022/2023 summer semester

Type of course

obligatory

Language of instruction

polish

Teaching methods

- conducting experiments
- multimedia-based lecture
- problem solving

Form and method of assessment and basic criteria for eveluation or examination requirements

Final evaluation

- Graded credit
- Examination

Assessment methods

- written exam with open questions
- written exam with open questions (tasks)

written exam

The basic criteria for evaluation

The basic criteria for evaluation or exam requirements
• positive evaluation of the written exam, consisting of 8-10 open questions covering issues mentioned in the lecture's program;
• oral exam - extensiom of the written exam, but only for those students who obtained more than 40% of the points possible to receive from the written exam;
• passing two written tests (one in each semester), covering issues mentioned in the content of the auditorium exercises;
• positive assessment of seven initial tests, covering the subject of performed experiments as part of laboratory exercises and selected health and safety regulations, implementation of the experimental part included in the teaching program and elaboration of results obtained in the experimental part (report).

Method of verifying required learning outcomes

Required courses and introductory requirements

A. Formal requirements

none

B. Prerequisites

none

Aims of education

Aims of education

• making students familiar with all the issues listed in the contents of the lecture program, basic types of organic compounds, methods of writing their structures and prediction of their spatial structures

• developing of skills in planning of a number of consecutive reactions, leading to a specific product;

• introducing students to the possibility of predicting the behavior of bi-functional;

• developing of self-experimentation skills and problem solving while conducting chemical experiments

• making students familiar with both the toxicity, as well as the healing properties of selected organic compounds

Course contents

Course contents

A. Lecture : chemical nomenclature, electronic structure of organic compounds, atomic and molecular orbitals, hybridization, isomerism (constitutional, stereoisomerism). Alkanes, cycloalkanes, alkenes, alkynes: synthesis and reactivity. Radical substitution, addition to multiple bonds. The structure and stability of radicals and carbocations, rearrangement of carbocations. Con-jugated dienes, resonance. Electrophilic addition to alkynes. The stereochemistry: chiral centers, the enantiomers, diastereoisomers, meso compounds, racemic mixtures and their separation. Conformational analysis of ethane, butane, cyclohexane (axial and equatorial bonds), three-dimensional and Newman projections. Aromatic compounds. The aromaticity criteria. Electrophilic aromatic substitution. Isomerism of polysubstituted aromatic compounds. The mechanism of the nucleophilic substitution of aromatic compounds. Polycyclic aromatic hydrocarbons. Alcohols, phenols, ethers, and epoxides - synthesis and reactivity. The reactions with alkyl halides, the dehydration, the reactions with metals, oxidation, acylation. Nucleophilic substitution: Sn1 and Sn2. Elimination reactions: E1 and E2 - mechanism and stereochemistry. Aldehydes and ketones. The structure and properties of the carbonyl group. Nucleophilic addition of water, alcohols, amines and Grignard compounds to carbonyl group. Aldol condensation, Cannizzaro reaction, Wittig reaction. Carboxylic acids and their derivatives. Synthesis of carboxylic acids and their reactivity. Esterification reactions, the formation of acid halides, anhydrides, amides and others. Substitution inside acyl group . Keto-enol tautomerism. The use of ethyl acetoacetate and diethyl malonate in organic synthesis. The condensation reactions e.g. aldol, Claisen, Michael addition and similar reactions. Amines, alkalinity and nucleophilicity. Synthesis and reactions of amines. Heterocyclic compounds. Structure and nomenclature. Reactions with electrophilic and nucleophilic reagents, oxidation and reduction, acid-base properties. Organophosphorus compounds, Halo and hydroxy acids, amino acids and peptides. Modern strategies of organic synthesis, such as retrosynthesis, protection and transformation of functional groups.

B. Tutorial classes: The exercises program coincide with lecture program and aims to facilitate the understanding and fixation of the issues discussed, such as: systematic and customary nomenclature, three-dimensional structure, methods of preparation and physicochemical properties of the different classes of organic compounds. Particular emphasis is placed on mechanisms of selected reaction and to use the acquired knowledge in planning the synthesis of organic compounds.

C. Laboratory classes: practical acquisition and improvement of skills in the chemical laboratory, performing of exercises/experiences related with thin-layer chromatography, crystallization and identification of selected organic compounds, synthesis of four preparations.

Bibliography of literature

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Literature required to pass the course

R. Morrison, R. Boyd – Organic chemistry, vol. 1-2;

J. McMurry – Organic chemistry;

L.G. Wade Jr. - Organic chemistry;

G. Kupryszewski, M. Sobocińska, R. Walczyna – Basics of preparation of organic chemical compounds;

A.I. Vogel - Organic preparations

B. Extracurricular readings

The learning outcomes (for the field of study and specialization)	Knowledge
	Knowledge understands and describes the electron structure of individual organic compounds; knows the main principles of naming organic compounds; formulates and defines laws and concepts in the field of organic chemistry; characterizes and understands the systematics of the most important classes of organic compounds; knows the methods of obtaining specific organic compounds; illustrates and describes by means of chemical equations the properties of organic compounds; recognizes and names the basic types of organic reactions; knows the basic laboratory techniques.

	Skills skills in a comprehensible way (in both speech and in writing), presents correct chemical reasoning; understands differences in the structure and reactivity of individual classes of organic compounds, (including stereochemistry and mechanisms); correctly designs the synthesis of the organic compound and selects appropriate methods for their separation, purification and identification; recognizes basic laboratory equipment and uses it to carry out chemical experiments; carefully observes the experiment, keeping laboratory notes up to date; predicts, verifies and criticizes the results of conducted experiments, independently searches for information in the chemical literature; talks about chemical issues in correct chemical language.
	Social competence Social competence 1. understands the need for further education; 2. has responsibility in working with chemical reagents; 3. shows creativity in both, independent and team work; 4. follows established research procedures; 5. is careful in dealing with hazardous chemicals.

Contact

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