

Course title	Organic Chemistry II
Course code	<i>Ķīmi2001</i>
Branch of science	Chemistry
Science sub-sector	Organic Chemistry
Credits	4
ECTS credits	6
The total audience hours	64
<i>Number of lectures</i>	32
<i>Seminars and practical work hours</i>	8
<i>Laboratory works</i>	24
<i>Course work hours allotted number</i>	-

Course developer(s)

Dr. chem., doc. Jeļena Kirilova

Preliminary knowledge (course title, part of the program where the course to learn)
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Ķīmi1008, Organic Chemistry I

Course summary:

<p>Aim of the course: To develop students' active and creative attitude to learning, providing a solid foundation of organic chemistry for understanding the diversity and interrelationships of organic substances, its physical and chemical properties and practical application possibilities. Practical research skills and abilities are developed during laboratory works.</p> <p>Course objectives: 1) to introduce students to the basic principles of organic compounds nomenclature and theoretical problems of organic chemistry; 2) to develop an understanding of chemical transformations of organic molecules; 3) to acquire the laboratory work techniques in organic chemistry laboratory.</p>
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Results:

<p>Academic competences: A course to give an understanding of the most important properties of organic compounds, their interconnections and important fields of application, as well as basic skills in the characterization and preparation of organic substances.</p> <p>Professional competences: as a result of the course students acquire skills in the purification and isolation of organic compounds, in the implementation and application of learned research methods for the investigation of the main organic substances.</p>

Course content:

<p>Carboxylic acids. Saturated, unsaturated, aromatic carboxylic acids, mono and dicarboxylic acids. Isomerism. Nomenclature. Preparation methods. The physical and chemical properties. Use. Carboxylic acids functional derivatives (esters, anhydrides, halogenanhydrides, amides, nitriles). Isomerism. Nomenclature. Acquisition. The physical and chemical properties. Uses. Substituted carboxylic acids: halogen, hydroxy, keto, and amino carboxylic acids. Isomerism. Nomenclature. Preparation. The physical and chemical properties. Uses. Nitrogen containing compounds: nitro compounds, alkyl, aryl and alkylarylamines, ammonium salts, diazonium salts, azo derivatives. Its isomerism, nomenclature, preparation, physical and chemical properties, uses. Heterocyclic compounds. Isomers. Nomenclature. Preparation. The physical and chemical properties.</p>

Course plan:

(Reflected in the course content, structure and calendar)

Course structure: Lectures - 32 h., Seminars - 8 hours. Laboratory works - 24 h.

Lecture topics:

1. Saturated carboxylic acids. Isomerism. Nomenclature. Preparation methods. The physical and chemical properties. Use.
2. Unsaturated carboxylic acids. Isomerism. Nomenclature. Preparation methods. The physical and chemical properties. Use.
3. Aromatic carboxylic acids. Isomerism. Nomenclature. Preparation methods. The physical and chemical properties. Use.
4. Dicarboxylic acids. Isomerism. Nomenclature. Preparation methods. The physical and chemical properties. Use.
5. Carboxylic acids functional derivatives (esters, anhydrides). Isomerism. Nomenclature. Acquisition. The physical and chemical properties. Uses.
6. Carboxylic acids functional derivatives (halogen anhydrides, amides, nitriles). Isomerism. Nomenclature. Acquisition. The physical and chemical properties. Uses.
7. Substituted carboxylic acids: halogen carboxylic acids. Isomerism. Nomenclature. Preparation. The physical and chemical properties. Uses.
8. Hydroxy carboxylic acids. Isomerism. Nomenclature. Preparation. The physical and chemical properties.
9. Keto carboxylic acids. Isomerism. Nomenclature. Preparation. The physical and chemical properties.
10. Amino carboxylic acids. Isomerism. Nomenclature. Preparation. The physical and chemical properties.
11. Nitro compounds, its classification. Nitroalkanes and nitroarenes. Isomerism. Nomenclature. Preparation. The physical and chemical properties. Uses.
12. Amines, its classification and nomenclature. Alkylamines. Isomerism. Nomenclature. Preparation. The physical and chemical properties. Uses.
13. Arylamines and alkylarylamines. Isomerism. Nomenclature. Preparation. The physical and chemical properties. Uses.
14. Ammonium salts, diazonium salts, azo derivatives. Its isomerism, nomenclature, preparation, physical and chemical properties.
15. Heterocyclic compounds. Five-membered heterocycles (furan, furfural, thiophene, pyrrole, indole, indigo). Structure. Nomenclature. Preparation methods. Chemical properties. Use.
16. Six-membered heterocycles (pyridine, quinoline, isoquinoline). Structure. Nomenclature. Preparation methods. Chemical properties. Use.

Seminar topics:

1. Synthesis and properties of carboxylic acids.
2. Functional derivatives of carboxylic acids.
3. Properties of amines.
4. Reactions of functional groups.

Laboratory work topics:

1. Properties of saturated monocarboxylic acids.
2. Functional derivatives of carboxylic acids and their properties.
3. Properties of unsaturated carboxylic acids.
4. Properties of aromatic carboxylic acids.
5. Properties of dicarboxylic acids.
6. Halo, oxy, oxo, amino carboxylic acids.
7. Properties of alkyl amines.
8. Properties of aryl amines.

9. Azo coupling reactions, azo dyes.
10. Properties of heterocyclic compounds.
11. Complex synthesis.
12. Complex synthesis.

Requirements for credits:

Successful execution of laboratory work (20%), passed seminar (10%); Examination end of the course (70%)

Basic training:

1. **Klein, David.** Organic chemistry / David Klein. - Hoboken, N.J. : John Wiley, 2012.
2. **Carey, Francis A.** Advanced organic chemistry / Francis A. Carey and Richard J. Sundberg. - 5th ed. - New York : Springer, 2007.
3. **Baum, Stuart J.** Introduction to organic and biological chemistry / S. J. Baum, J. W. Hill. - New York : Macmillan Publishing Company, 1993.
4. **Bettelheim, Frederick.** Laboratory manual for general, organic & biochemistry / Frederick Bettelheim, Joseph Landesberg. - Fort Worth : Harcourt Brace Jovanovich College Publishers, 1991.

Further reading:

1. **R.T.Morrison, R.N. Boyd.** Organic Chemistry. Prentice Hall, Englewood Cliffs, New Jersey, 1992.
2. **Starkey, Laurie Shaffer.** Introduction to the strategies of organic synthesis / Laurie S. Starkey. - Hoboken, NJ : Wiley, 2012.
3. **Нейланд О. Я.** Органическая химия: Учебник для вузов / О.Я.Нейланд. - Москва: Высшая школа, 1990.
4. **Потапов В. М.** Органическая химия. - Москва : Просвещение, 1992.

Periodicals and other information sources:

Journal of Organic Chemistry

Remarks:**We identify programs and portions (A, B, C, D) belonging to this course is:**

BSP „Chemistry”, A part

Course title in English:

Organic chemistry II

Annotation in English:

The course is intended for students of bachelor study programmes “Chemistry”. This course gives an introduction to nomenclature and classification of organic compounds. The course is aimed to provide students with knowledge about physical and chemical properties of organic compounds and about their synthesis and functionality. Gained understanding of the principles and tools for analysis and characterization of organic compounds.