

<b>Course title</b>	<b>Organic chemistry</b>
<b>Course code</b>	Ќĩmi1005
<b>Branch of science</b>	Chemistry
<b>Science sub-sector</b>	Chemistry
<b>Credits</b>	2
<b>ECTS</b>	3
<b>The total audience hours</b>	<b>32</b>
<i>Number of lectures</i>	16
<i>Seminars and practical work hours</i>	2
<i>Laboratory works</i>	14
<i>Course work hours allotted number</i>	-

**Course developer (s)**

Dr. chem., doc. Jelena Kirilova

**Preliminary knowledge (course title, part of the program where the course to learn)**

Ќĩmi1006, General and inorganic chemistry

**Course summary:**

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.

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.

**Results:**

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.

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.

**Course content:**

General principles and history of organic chemistry. General structure of organic compounds. Organic radical and functional group. Classification of organic compounds. Isolation, purification and identification of organic compounds. Bond formation, inductive and mesomeric effects, resonance. Isomerism. Structural

isomers. Classification of organic reactions. Structure and nomenclature of organic compounds. Hydrocarbons: alkanes, alkenes, alkadienes, alkynes, cycloalkanes, arenes. Its nomenclature, preparation methods, properties and uses. Halogen hydrocarbons: haloalkanes, haloalkenes, haloalkynes, haloarenes. Its isomerism, nomenclature, preparation methods, properties and uses. Organometallic compounds. Hydroxyl derivatives of hydrocarbons: saturated and unsaturated mono and polyalcohols, phenols. Its isomerism, nomenclature, preparation methods, properties and uses. Carbonyl derivatives of hydrocarbons: aldehydes and ketones. 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.

### ***Course plan:***

(Reflected in the course content, structure and calendar)

Course structure: Lectures - 16 h., Seminars - 2 hours. Laboratory works - 14 h.

### **Lecture topics:**

1. Organic Chemistry subject, its basic concepts. Organic chemistry history. Isolation, purification and identification methods of organic compound. Bond formation, inductive and mesomeric effects, resonance.
2. Organic compounds, its classification and nomenclature. The main functional groups. Isomerism in organic compounds. Organic reactions and reagents classification.
3. Hydrocarbons: alkanes, alkenes, dienes, alkynes, cycloalkanes, arenes. Isomers. Nomenclature. Obtaining. Physical and chemical properties. Use.
4. Halogenated hydrocarbons: halogen alkanes, halogen alkenes, halogen alkynes, halogen arenes. Isomers. Nomenclature. Obtaining. Physical and chemical properties. Organometallic compounds.
5. Hydroxyl compounds: mono-saturated and unsaturated alcohols, polyols. Isomer. Nomenclature. Obtaining. Physical and chemical properties. Use.
6. Carbonyl compounds: aldehydes and ketones. Physical and chemical properties. Use.
7. Carboxylic acid. Carboxylic acid functional derivatives. Isomer. Nomenclature. Obtaining. Physical and chemical properties. Use.
8. Nitrogen-containing compounds: alkyl- and arylamines, heterocyclic compounds. Isomer. Nomenclature. Obtaining. Physical and chemical properties. Use.

### **Seminar topics:**

1. Mutual transformations of organic compounds.

### **Laboratorijas work topics:**

1. Organic compounds analysis: C, H, Hal proof. Alkanes. Alkenes. Alkynes.
2. Arenes. Halogenated hydrocarbons.
3. Alcohols. Phenols.
4. Carbonyl compounds.
5. Carboxylic acid. Functional derivatives of carboxylic acids.
6. Unsaturated and aromatic carboxylic acids.
7. Dicarboxylic acids. Amines.

***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, Englwod 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 "Biology" Part A

***Course title in English:***

Organic Chemistry

***Annotation in English:***

The course is intended for students of bachelor study program "Biology". This course gives an introduction to organic chemistry, 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 synthesis and

functionality. Gained understanding of the principles and tools for analysis and characterization of organic compounds.