

Course title	Fundamentals of Biochemistry
Course code	Ќimi3004
Branch of science	Chemistry
Science sub-sector	Biochemistry
Credits	3
ECTS	4.5
The total audience hours	48
<i>Number of lectures</i>	32
<i>Seminars and practical work hours</i>	4
<i>Laboratory works</i>	12
<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)
General Chemistry (Part A); Chemistry (Part A); Organic Chemistry (A)

Course summary:
Aim of the course: To develop students' active and creative attitude to learning, to provide a modern concept of the biological chemistry, to give knowledge of the fundamental bio-organic processes and chemical composition of the human body. Practical research skills and abilities are developed during laboratory works. Course objectives: 1) to introduce students to the basic classes of bioorganic compounds, their structure and properties; 2) to give an idea of the most important metabolic processes in the body and their regulation; 3) to acquire the laboratory work techniques in biochemistry laboratory.

Results:
Academic competences: the course to give an understanding of the ongoing processes in living organisms, their nature and importance; give a systematic knowledge of the composition and the main biochemical processes in the human body. Professional competence: after the execution of the course students will have acquired skills in purification and isolation of biochemical compounds, biochemical research methods, etc. for their application for characterization of biologically important substances and living organisms components. Successful completion of the course, students gain understanding of biologically important classes of compounds, their properties and key areas of use, as well as basic skills in working on characterization and analysis of bioorganic substances.

Course content:
The chemical composition of the body. Characteristics of molecules involved in biochemical processes. The importance of water in biochemical processes. Carbohydrates Overview of the most important monosaccharides, oligosaccharides and polysaccharides. Lipids.

Phospholipids and their role in the living organism. Steroids. Proteins, their functions, structure, classification, content in tissues and organs. Enzyme activity mechanism. Classification of enzymes. Vitamin action mechanism. Vitamin classification. Antivitamins. Hormonal activity mechanism. Hormone classification. Nucleic acid: structure and functions. Substances and energy exchange in the living organism. The main regularities of metabolic processes. Carbohydrate exchange in the body. Lipids and proteins metabolism in the body. Nucleic Acid exchange in the body. Water and minerals exchange. Metabolism relationships.

Course plan:

(Reflected in the course content, structure and calendar)

Course structure: Lectures - 32 h., Seminars - 4 hours. Laboratory works - 12 h.

Lecture topics:

1. The chemical composition of the body. Properties of molecules participating in biochemical processes.
2. Water importance in biochemical processes. Buffers, their role in the body.
3. Carbohydrates. An overview of the most important monosaccharides, oligosaccharides and polysaccharides.
4. Lipids. Phospholipids and their role in the living body. Steroids.
5. Proteins, their functions, structure, classification and content of the tissues and organs.
6. The mechanism of action of enzymes. Enzyme classification.
7. Classification of vitamins. Antivitamins.
8. Nucleic acids: classification, structure, functions.
9. Hormone classification. The mechanism of action of hormones.
10. The main metabolic processes regularities.
11. Exchanging the live energy of the body. ATF.
12. Carbohydrate exchange in the body.
13. Lipid exchange in the body.
14. Protein exchange in the body.
15. Exchange of nucleic acid in the body.
16. Water and mineral exchange. Metabolism relationships.

Seminar topics:

- 1 Peptide and lipids formation.
3. Nucleic acid composition.

Laboratorijas work topics:

1. Buffer preparation and properties. Monosaccharides, disaccharides and polysaccharides properties.
2. Determination of iodine and saponification values of lipids.
3. Protein reaction, denaturation, dialysis. Isoelectric point determination for proteins.
4. Enzyme properties and specificity.
5. Effects of activators and inhibitors on the amylase activity.
6. Hydrolysis of nucleoproteids.

Requirements for credits:

Successful execution of laboratory work (20%), credited seminars (20%); exam end of the course (60%)

Basic training:

1. **Hames, David.** Biochemistry / David Hames & Nigel Hooper. - 3rd ed. - New York : Taylor & Francis, 2006.
2. **Voet, Donald.** Biochemistry / Donald Voet, Judith G. Voet. - 4th ed. - Hoboken, NJ : John Wiley & Sons, 2011.
3. **Campbell, Peter N.** Biochemistry Illustrated / Peter N.Campbell,Anthony D.Smith. - 4th Ed. - London : Churchill Livingstone, 2000.
4. Principles and techniques of biochemistry and molecular biology / edited by Keith Wilson and John Walker. - 7th ed. - Cambridge, UK : Cambridge University Press ; New York, 2009.

Further reading:

1. **Bettelheim, Frederick.** Laboratory manual for general, organic & biochemistry / Frederick Bettelheim, Joseph Landesberg. - Fort Worth : Harcourt Brace Jovanovich College Publishers, 1991
2. **Stryer, Lubert.** Biochemistry / Lubert Stryer. - Third Ed. - New York : W.H.Freeman and Company, 1988
3. **Проскурина, И. К.** Биохимия : учеб. пособие для вузов / И. К. Проскурина. - Москва : Владос-Пресс, 2003.

Periodicals and other information sources

Clinical Biochemistry

Remarks:

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

Part A

Course title in English:

Fundamentals of Biochemistry

Annotation in English:

The course is aimed to provide students with knowledge about history and basic principles of biochemistry, about the biological structure and reactions occurring in living systems. Acquired knowledge of the following problems: a) basic biomolecules of human body (their structure and biofunctions); b) overview of metabolism of carbohydrates, lipids, amino acids, nucleic acids; c) the regulation of metabolism. Gained understanding of the biochemical analysis principles and tools.