

<b>Level:</b> bachelor			
<b>Course title:</b> Fundamentals of Biochemistry			
<b>Status:</b> obligatory			
<b>ECTS:</b> 9			
<b>Requirements:</b> none			
<b>Learning objectives</b> (1) To introduce students to fundamental concepts of biochemistry, necessary for higher biochemistry courses, (2) to provide students with understanding of the relationship between biomolecules function and structure, (3) to develop practical skills and ability to apply standard experimental methods in solving biochemical problems.			
<b>Learning outcomes</b> After completing the course, student is able to: (1) demonstrate basic knowledge of chemical principles underlying biochemical processes, and to explain characteristics of biochemical reactions and living matter, (2) describe structure, chemical properties and biological functions of main groups of biomolecules (carbohydrates, proteins, lipids, nucleotides), and demonstrate the relationship between three-dimensional structure and biological functions of biomolecules, (3) demonstrate basic understanding of enzyme catalysis mechanisms, and kinetics and thermodynamics of enzyme-catalyzed reactions, (4) search biochemical sources and independently write basic texts on selected biochemical topics, (5) apply experimental methods in solving practical biochemical problems, and interpret experimental results.			
<b>Syllabus</b> <i>Theoretical instruction</i> Origin of life. Cell structure. Amino acids – structure and properties. Peptides – nomenclature, peptide bond properties, biologically active peptides. Proteins – 1° structure, 3D structure and stabilizing interactions, 4° structure, examples of globular and fibrillar proteins. Carbohydrates (mono-, oligo-, polysaccharides) – structure, nomenclature, biological functions. Glycoproteins, proteoglycans, peptidoglycans. Lipids – classification, structure and function of lipids (fatty acids, acylglycerols, phosphoglycerides, sphingolipids, waxes, steroids, terpenoids, fat-soluble vitamins). Biological membranes, membrane proteins, membrane transport mechanisms. Nucleobases, nucleosides, nucleotides, nucleic acids (DNA, RNA) – structure, nomenclature, function. Introduction to enzymes – main properties, classification and nomenclature. Co-factors – classification, mechanism of action, water-soluble vitamins  <i>Practical instruction</i> Volumetric determination of amino acids $pK_a$ and $pI$ . pH-metric determination of protein $pI$ . Color tests for amino acids and proteins. Protein coagulation. Albumins and globulins separation. Protein separation by disc-electrophoresis. Protein determination after Lowry (spectrophotometric) and Kjeldahl (titrimetric). Qualitative tests for carbohydrate classes. Sugar determination after Bertrand. Investigation of enzymes' properties – specificity, factors affecting reaction rate. Qualitative tests for fats. Spectrophotometric determination of total lipids and phospholipids in serum. Color tests for nucleobases. Spectrophotometric determination of nucleic acids after Spirin and Dische. Identification by TLC of nucleobases in DNA hydrolysisate.			
<b>Weekly teaching load</b>			Other:
Lectures: 4	Exercises: 4	Other forms of teaching:	Student research: