

Course title: BIOCHEMISTRY

ECTS credit allocation (and other scores): 4

Semester: autumn

Level of study: ISCED-6 - first-cycle programmes (EQF-6)

Branch of science: Natural sciences

Language: English

Number of hours per semester: 60 h.

Course coordinator/ Department and e-mail: Małgorzata Dmitryjuk; Department of Biochemistry;  
m.dmit@uwm.edu.pl

Type of classes: classes and lectures

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#### Substantive content

**CLASSES:** Characteristic reactions and physicochemical properties of amino acids and proteins. Quantitative determination of proteins and one-dimensional protein electrophoresis. Determination of standard curves for glucose using the oxidase method and for albumin using the Bradford method. Determination of invertase activity from yeast. Qualitative and quantitative analysis of carbohydrates. Lipids – isolation and determination of the composition of polar lipids of the brain; thin layer chromatography TLC. Real-time polymerase chain reaction – real-time PCR.

**LECTURES:** Metabolism and equilibrium of organisms. Differences and similarities in the metabolism of prokaryotic and eukaryotic organisms. Bacterial metabolism and food types. Amino acids, peptides and proteins - structure, division, properties and biological functions, catabolism. Structure, types and functions of nucleic acids. Gene expression and protein biosynthesis. Enzymes - structure, classification, nomenclature and regulation of activity. Structure, functions and metabolism of carbohydrates. Lipids - structure, functions and metabolism. Interdependence of nitrogen, lipid and carbohydrate metabolism, tricarboxylic acid cycle, Enter-Doudoroff pathway, fermentations. Aerobic and anaerobic respiration. Oxygenic and anoxygenic photosynthesis. Regulation and energetics of metabolic processes, high-energy compounds, potential of redox systems, respiratory chains, oxidative and substrate phosphorylations. Vitamins. Hormones. Antibiotics. Vaccines. Multiomics in biochemical research, molecular biology and medical diagnostics. Omics: concepts and definitions. History and strategies of omics research. Examples of multiomics studies of microorganisms, plants and animal tissues. Integration of metabolism and systems biology.

**LEARNING PURPOSE:** Explain the structure and function of the main components of prokaryotic and eukaryotic cells and learn about the main metabolic pathways. Identify the mechanisms of control and maintenance of the dynamic balance of the organism.

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On completion of the study programme the graduate will gain:

**KNOWLEDGE:** student knows and understands biochemical processes and their regulation at the molecular and cellular level; knows the structure of macromolecules and their transformations and understands the connections between the structure and function of biomolecules

**SKILLS:** student is able to operate simple research equipment in the biochemistry laboratory and to perform simple research tasks assigned under the supervision of a teacher

**SOCIAL COMPETENCIES:** student is ready to undertake continuing education in biochemistry and is ready to work in a team, taking on a variety of roles and setting priorities,

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Basic literature: 1.) David S. Franklin et al., Lippincott Illustrated Reviews: Biochemistry, Wolters Kluwer Health, 2022.  
2) Kennelly P. , Botham K., McGuinness O., Rodwell V., P. Weil A., Harper's Illustrated Biochemistry,, Tom 32nd Edition,  
Wyd. McGraw Hill Medical, LLC, NY, USA, R. 2023. 3) Berg J., Gatto Jr. GJ., Hines JK., Tymoczko JL.,Stryer L.,  
Biochemistry, Tom 10th Edition, Wyd. Macmillan Learning, NY, USA, R. 2023.

Supplementary literature: 1.) Berg J., Gatto Jr. GJ., Hines JK., Tymoczko JL.,Stryer L., Biochemistry, Tom 10th Edition, Wyd.  
Macmillan Learning, NY, USA, R. 2023

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The allocated number of ECTS points consists of:

Contact hours with an academic teacher: 64 h.

Student's independent work: 36 h.