GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Biochemistry, PG_00068174		
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2026/2027
Education level	first-cycle studies	Subject group	Obligatory subject group in the field of study Subject group related to scientific research in the field of study
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	2	ECTS credits	4.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Pharmaceutical Technology and Biochemistry -> Faculty of Chemistry -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Sławomir Milewski	
	Teachers	dr inż. Kamila Rząd dr inż. Andrzej Skwarecki prof. dr hab. inż. Sławomir Milewski	

Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	15.0	0.0	0.0	45
	E-learning hours included: 0.0						

Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
	Number of study hours	45	4.0	51.0	100

Subject objectives	The main purpose of this course is gaining knowledge about the structure and role of components of the living cells, including proteins, nucleic acids, polysaccharides and lipids and the main pathways of cellular metabolism.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W02] knows and understands, to an advanced extent, selected laws of physics and physical phenomena as well as methods and theories explaining the complex relationships between them, constituting the basic general knowledge in the field of technical sciences related to the field of study	The student knows the physical and biochemical foundations of biocatalysis.	[SW1] Assessment of factual knowledge
[K6_W52] Knows and understands, to an advanced extent, selected aspects of chemistry and biochemistry, constituting general knowledge related to the field of study	Student knows the main metabolic pathways and is able to estimate the consequences of metabolic disorders	[SW1] Assessment of factual knowledge
[K6_U12] can analyze the operation of components, circuits and systems related to the field of study, as well as measure their parameters and examine technical specifications, and plan and conduct experiments related to the field of study, including computer simulations and measurements, and interpret obtained results and draw conclusions	The student knows the basic principles of planning and conducting experimental work in biochemistry and is able to analyze experimental data.	[SU1] Assessment of task fulfilment [SU5] Assessment of ability to present the results of task
[K6_W03] knows and understands, to an advanced extent, the construction and operating principles of components and systems related to the field of study, including theories, methods and complex relationships between them and selected specific issues - appropriate for the curriculum	The student is able to determine the biochemical basis of selected instrumental techniques used in medical diagnostics.	[SW1] Assessment of factual knowledge

Subject contents

Course content – lecture
1. Structure of prokaryotic and eukaryotic cells
2. Biomolecules - aminoacids, peptides and proteins
3. Biomolecules - sugars and polysaccharides
4. Biomolecules - lipids. Structure of biological membranes
5. Biomolecules - nucleic acids
6. Enzymes - structure, mechanisms of action and regulation
7. Main catabolic pathways - glycolysis, Krebs cycle, respiratory chain, fatty acids oxidation
8. Examples of anabolic pathways
9. Energetic couping of metabolism. High-energy compounds
10. Integration and control of metabolic pathways
11. Genetic information and its transfer. Genetic code
12. DNA replication
13. Mutations in DNA. Mechanisms of mutagenesis and DNA repair
14. Etiology of hereditary metabolic diseases
15. Transcription
16. Protein biosynthesis. Role of chaperones
17. Biochemistry of selected physiological processes
18. Recombinant DNA technology
19. Biological and biochemical basis of tissue engineering

Course content – laboratory
1. Basic laboratory procedures: principles of correct pipetting using automatic pipettes
2. UV-VIS Spectroscopy in biochemical analysis
3. Application of chromatographic methods to separate biomolecules
4. Determining the kinetic parameters of an enzymatic reaction
5. Isolation of chromosomal DNA from *Escherichia coli* cells

Prerequisites and co-requisites

Knowledge of the selected topics of general chemistry: chemical bonds; intermolecular interactions, types and mechanisms of chemical reactions, properties of water, aqueous solutions, colloidal solutions.
Knowledge of the selected topics of organic and physical chemistry: organic compounds - types and reactivity; theory of catalysis, thermodynamics and reaction kinetics

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Written test II	50.0%	50.0%
Written test I	50.0%	50.0%

Recommended reading

Basic literature	D.B. Hames, N.M. Hooper, Biochemia. Krótkie wykłady, PWN W-wa 2007
Supplementary literature	J.M. Berg, L. Stryer, J. Tymoczko, Biochemia, PWN W-wa, 2007
eResources addresses	

Example issues/ example questions/ tasks being completed	1. Draw the structure and name an amino acid found in large quantities in the basic protein of skin, tendons, and bones. This protein also contains a 4-OH derivative of this amino acid, in the biosynthesis of which ascorbic acid (vitamin C) plays a significant role. 2. Compare the structures of keratin, fibroin, and collagen. Identify the basic structural elements. 3. The amino acid phenylalanine diffuses through a lipid bilayer membrane more than 1,000 times slower than N-acetylphenylalanine methyl ester. What is the reason for this difference? 4. Explain the biochemical basis for the use of [18F]2-fluoro-2-deoxyglucose in the diagnosis of cancer using positron emission tomography. 5. Describe the mechanism of adrenaline's biological action. What is the relationship between the action of this hormone and the biological action of caffeine? 6. DNA mutations types, causing factors and mechanisms protecting against mutations during DNA replication.
Practical activites within the subject	Not applicable

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