University of Gdańsk

Subject card

Subject name and code	Biotechnology in medicine - The human organism - homeostasis and the pathological state - Fundaments (M05_B1), PG_00197646						
Field of study	Biotechnology						
Date of commencement of studies	October 2025		Academic year of realisation of subject	2027/2028			
Education level	Bachelor's 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	3		Language of instruction	Polish			
Semester of study	5		ECTS credits	4.0			
Learning profile	academic		Assessment form	exam			
Conducting unit	Intercollegiate Faculty of Biotechnology UG-MUG -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr Grzegorz Stasiłojć				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	52.0	0.0	0.0	0.0	0.0	52
	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	52		5.0	43.0	100	
Subject objectives	Gaining a thorough understanding of biological processes at the molecular level, including the causes of disease and the effects of outside influences on the human body, is the aim of the first block of the course. Students will gain knowledge of the relationship between structure and function at the cellular and organismal levels, as well as the part played by various organs and systems in preserving homeostasis.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[BIOTECHL3_W05] The graduate understands at an advanced level the mechanisms of vital function disorders and knows the causes, symptoms and methods of assessing selected disorders and pathological changes in the field of pathophysiology, biochemical disorders, and neoplasia; knows the methods of assessing these disorders in the field of medical biotechnology and molecular diagnostics.	Student possesses in-depth understanding of the physiological features of human metabolism's enzyme functioning. can be used to characterize metabolic diseases brought on by deficiencies in functioning proteins and enzymes, which might be innate or brought on by external substances (drugs, toxins, stimulants). Student is aware of the connections between pathology and the microscopic structure and function of the organs that comprise the body's fundamental functioning systems.	[SW4] test/exam - oral or written [SW2] presentation/project/paper/ report [SW3] text preparation/written work
[BIOTECHL3_W04] The graduate has advanced knowledge of the structure and functions of the human body in terms of anatomy, histology and physiology and understands their importance for medicine and medical biotechnology.	The student will be familiar with the basic mechanisms behind the operation of human organs as well as their structure, including at the microscopic level. Student will be aware of the connection between the functions of the organs and their microscopic structure, which together comprise the fundamental functional systems of the organism.	[SW4] test/exam - oral or written
[BIOTECHL3_W09] The graduate possesses structured and advanced knowledge of the terminology and concepts used in biological and medical sciences and related disciplines.	Key terms in biochemistry, physiology, pathology, and pharmacognosy will be defined and explained by the student, who will also be able to connect them to molecular, cellular, tissue, and organ processes in the human body.	[SW4] test/exam - oral or written [SW2] presentation/project/paper/ report [SW3] text preparation/written work

Subject contents

- **F1. Pathobiochemistry of the human bodyTransformation of endobiotics**

1. Vitamins and trace minerals in human nutrition. Avitaminosis and mechanisms of their formation.
2. Function of the gastrointestinal tract in the transport and digestion of nutrients. Digestive enzyme deficiencies, food intolerances and enteropathies induced by food components.
3. Metabolism of the resorptive and post-resorptive state. Diabetes mellitus: a disorder of energy substrate metabolism in humans.
4. Carbohydrate storage in liver and muscle. Glycogen storage diseases.
5. Extracellular matrix, proteoglycans and diseases of deficiency of enzymes of degradation of extracellular matrix components.
6. Plasma lipoprotein metabolism and its disorders. Deficiencies of enzymes of lipid metabolism. Disorders of cholesterol metabolism.
7. Disorders of amino acid nitrogen metabolism and metabolism of individual amino acids and their clinical effects.
8. Disorders of purine and pyrimidine metabolism and their clinical effects.
9. Regulation of acid-base balance of the body. Acidoses and alkalosis.
10. Regulation of water-electrolyte balance of the body. Destabilization of sodium and potassium ions in blood serum.
11. **Transformation of xenobiotics**
12. Xenobiotics - definitions, nomenclature and classifications. The role of the lipid phase in the storage and metabolism of xenobiotics.
13. Ethyl alcohol oxidation in man. Changes in hepatic metabolism induced by drugs and alcohol.
14. Drugs as xenobiotics. Analogues of purines and pyrimidines, as pharmaceuticals used in cancer, viral diseases and asimmunosuppressors.
15. Metabolic relationships of the body and their changes induced by xenobiotics. Molecules of cell signaling pathways - target compounds for drugs.

- **F2. Structure and function of human organs and their systems with aspects of pathology**

1. The structure of human organs with special emphasis on their histological structure, the link between structure and function, and the links between structural-functional relationships between organs related to the formation of the following systems: vascular, respiratory, gastrointestinal along with accessory organsaccessory organs, endocrine, urinary and reproductive organs and skin with its appendages
2. Selected aspects of the pathology of the organs and systems in question associated with histopathological changes in tissues and organs

- **F3. Molecular basis of human cell pathology**
- Changes induced by the cell's response to damage at the genome level (mutagenesis, transposons, epigenetic changes, repair mechanismsrepair mechanisms and their disorders, recombination and its disorders)
- Changes induced by the cell's response to damage at the level of organelles (basic terms of cell pathology, impairment of the function ofmitochondria, aging and cell death due to damage)
- Changes associated with the process of tumorigenesis (introduction to the cancer cell)

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="2">Knowledge of the content of Modules 01-04</td></tr>
<tr><td>Assessment methods and criteria</td><td colspan="2"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>F1</td><td>0.0%</td><td>32.0%</td></tr>
<tr><td>F2</td><td>0.0%</td><td>20.0%</td></tr>
<tr><td>F3</td><td>0.0%</td><td>8.0%</td></tr>
<tr><td>Integrative exam</td><td>50.0%</td><td>40.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>• Medical Biochemistry. J. Baynes, M.H. Dominiczak, Mosby, London 2003
• Alberts et al. Fundamentals of cell biology. PWN 2009 or newer edition
• JUNQUEIRA Histology, Textbook and Atlas, Urban & Partner, XV edition; 1st Polish edition, 2022.
• Histology, W. Sawicki, PZWL, 2012.
• Histological atlas, edited by A. Myśliwski, OPERON, 2002
• Literature sources provided in the lecture materials</td></tr>
<tr><td>Supplementary literature</td><td>• Textbook of Biochemistry with Clinical Correlations. Ed. T.M. Devlin, Wiley-Liss, New York 2002 (or later editions).
• Fundamentals of ecotoxicology. C.H. Walker, S.P. Hopkin, R.M. Silby, D.B. Peakall, PWN Scientific Publishers, Warsaw 2002.
• Histology. Textbook for students of medicine and dentistry Medical Publishing House Urban & Partner 2013 ed. Maciej Zabel- Atlas of histology, Sobotta and Hammersen, Urban & Partner, 2002
• Another textbook on cell biology or molecular biology of the cell e.g.:Molecular Biology of the Cell, Fifth Edition (or newer), by: Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts and Peter Walter, Gerland Science Publishing, 2008
• Molecular Cell Biology, Fifth Edition (or newer), by: Harvey Lodish, Arnold Berk, Paul Matsudaira, Chris A. Kaiser, Monty Krieger,</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2"></td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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