

**Subject card**

<b>Subject name and code</b>	Biotechnology in medicine - The human organism - homeostasis and the pathological state - Fundaments (M05_B1), PG_00196941						
<b>Field of study</b>	Biotechnology						
<b>Date of commencement of studies</b>	October 2026	<b>Academic year of realisation of subject</b>			2028/2029		
<b>Education level</b>	Bachelor's studies	<b>Subject group</b>			Obligatory subject group in the field of study Subject group related to scientific research in the field of study		
<b>Mode of study</b>	full-time studies	<b>Mode of delivery</b>			at the university		
<b>Year of study</b>	3	<b>Language of instruction</b>			Polish		
<b>Semester of study</b>	5	<b>ECTS credits</b>			4.0		
<b>Learning profile</b>	academic	<b>Assessment form</b>			exam		
<b>Conducting unit</b>	Intercollegiate Faculty of Biotechnology UG-MUG -> Rector						
<b>Name and surname of lecturer (lecturers)</b>	<b>Subject supervisor</b>		dr Grzegorz Stasiłojć				
	<b>Teachers</b>						
<b>Lesson types</b>	<b>Lesson type</b>	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	<b>Number of study hours</b>	52.0	0.0	0.0	0.0	0.0	52
	E-learning hours included: 0.0						
<b>Learning activity and number of study hours</b>	<b>Learning activity</b>	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	<b>Number of study hours</b>	52		5.0		43.0	100
<b>Subject objectives</b>	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
	<p>[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; proposes advanced methods of assessing these disorders in the field of medical biotechnology and molecular diagnostics.</p>	<p>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.</p>	<p>[SW4] test/exam - oral or written [SW2] presentation/project/paper/report [SW3] text preparation/written work</p>
	<p>[BIOTECHL3_W04] The graduate has an advanced level of knowledge on the structure and functions of the human body in terms of anatomy, histology and physiology and understands their importance for medicine and medical biotechnology.</p>	<p>The student will be familiar with the 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.</p>	<p>[SW4] test/exam - oral or written</p>
	<p>[BIOTECHL3_W09] The graduate possesses structured and advanced knowledge of the terminology and concepts used in biological and medical sciences and related disciplines.</p>	<p>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.</p>	<p>[SW4] test/exam - oral or written [SW2] presentation/project/paper/report [SW3] text preparation/written work</p>
<p>Subject contents</p>	<ul style="list-style-type: none"> <li>• <b>F1. Pathobiochemistry of the human body Transformation of endobiotics</b></li> <li>1. Vitamins and trace minerals in human nutrition. Avitaminosis and mechanisms of their formation.</li> <li>2. Function of the gastrointestinal tract in the transport and digestion of nutrients. Digestive enzyme deficiencies, food intolerances and enteropathies induced by food components.</li> <li>3. Metabolism of the resorptive and post-resorptive state. Diabetes mellitus: a disorder of energy substrate metabolism in humans.</li> <li>4. Carbohydrate storage in liver and muscle. Glycogen storage diseases.</li> <li>5. Extracellular matrix, proteoglycans and diseases of deficiency of enzymes of degradation of extracellular matrix components.</li> <li>6. Plasma lipoprotein metabolism and its disorders. Deficiencies of enzymes of lipid metabolism. Disorders of cholesterol metabolism.</li> <li>7. Disorders of amino acid nitrogen metabolism and metabolism of individual amino acids and their clinical effects.</li> <li>8. Disorders of purine and pyrimidine metabolism and their clinical effects.</li> <li>9. Regulation of acid-base balance of the body. Acidoses and alkalosis.</li> <li>10. Regulation of water-electrolyte balance of the body. Destabilization of sodium and potassium ions in blood serum.</li> <li>11. <b>Transformation of xenobiotics</b></li> <li>12. Xenobiotics - definitions, nomenclature and classifications. The role of the lipid phase in the storage and metabolism of xenobiotics.</li> <li>13. Ethyl alcohol oxidation in man. Changes in hepatic metabolism induced by drugs and alcohol.</li> <li>14. Drugs as xenobiotics. Analogues of purines and pyrimidines, as pharmaceuticals used in cancer, viral diseases and as immunosuppressors.</li> <li>15. Metabolic relationships of the body and their changes induced by xenobiotics. Molecules of cell signaling pathways - target compounds for drugs.</li> <li>• <b>F2. Structure and function of human organs and their systems with aspects of pathology</b></li> <li>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 organs accessory organs, endocrine, urinary and reproductive organs and skin with its appendages</li> <li>2. Selected aspects of the pathology of the organs and systems in question associated with histopathological changes in tissues and organs</li> <li>• <b>F3. Molecular aspects of human cell pathology</b></li> <li>• Changes induced by the cell's response to damage at the genome level (mutagenesis, transposons, epigenetic changes, repair mechanisms repair mechanisms and their disorders, recombination and its disorders)</li> <li>• Changes induced by the cell's response to damage at the level of organelles (basic terms of cell pathology, impairment of the function of mitochondria, aging and cell death due to damage)</li> <li>• Changes associated with the process of tumorigenesis (introduction to the cancer cell)</li> </ul>		

Prerequisites and co-requisites	Knowledge of the content of Modules 01-04		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	F1-F3	51.0%	60.0%
	Comprehensive integrating exam	50.0%	40.0%
Recommended reading	Basic literature	<ul style="list-style-type: none"> <li>• Medical Biochemistry. J. Baynes, M.H. Dominiczak, Mosby, London 2003</li> <li>• Alberts et al. Fundamentals of cell biology. PWN 2009 or newer edition</li> <li>• JUNQUEIRA Histology, Textbook and Atlas, Urban &amp; Partner, XV edition; 1st Polish edition, 2022.</li> <li>• Histology, W. Sawicki, PZWL, 2012.</li> <li>• Histological atlas, edited by A. Myśliwski, OPERON, 2002</li> <li>• Literature sources provided in the lecture materials</li> </ul>	
	Supplementary literature	<ul style="list-style-type: none"> <li>• Textbook of Biochemistry with Clinical Correlations. Ed. T.M. Devlin, Wiley-Liss, New York 2002 (or later editions).</li> <li>• Fundamentals of ecotoxicology. C.H. Walker, S.P. Hopkin, R.M. Silby, D.B. Peakall, PWN Scientific Publishers, Warsaw 2002.</li> <li>• Histology. Textbook for students of medicine and dentistry Medical Publishing House Urban &amp; Partner 2013 ed. Maciej Zabel- Atlas of histology, Sobotta and Hammersen, Urban &amp; Partner, 2002</li> <li>• 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, Garland Science Publishing, 2008</li> <li>• Molecular Cell Biology, Fifth Edition (or newer), by: Harvey Lodish, Arnold Berk, Paul Matsudaira, Chris A. Kaiser, Monty Krieger,</li> </ul>	
	eResources addresses		
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		

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