

Subject card

Subject name and code	Microbiology, PG_00188265						
Field of study	Mikrobiologia (Wykład)						
Date of commencement of studies	October 2026		Academic year of realisation of subject			2026/2027	
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	1		Language of instruction			Polish polish	
Semester of study	1		ECTS credits			2.0	
Learning profile	academic		Assessment form			exam	
Conducting unit	Faculty of Chemistry -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr Joanna Żebrowska				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	0.0	0.0	30
	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	30		5.0		15.0	50
Subject objectives	The aim of the lecture is to provide students with comprehensive knowledge of the structure, functioning, variability and significance of microorganisms, as well as their role in health, disease, and forensic and environmental analysis. Students acquire the theoretical foundations necessary for independent laboratory work and understanding of microbiological phenomena.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[AKRL3_W04] The graduate knows and understands the basics of biological analysis of evidence material, including principles of DNA identification, proteins and other biological traces.	The student knows the basics of microbiological analysis of evidence, including the role of microflora in biological trace analysis, the basics of microorganism DNA identification, mechanisms of biological material transfer, and factors affecting the preservation of microbiological traces.	[SW4] test/egzamin - ustny lub pisemny
	[AKRL3_W10] The graduate knows and understands the principles of safe work in chemical and biological laboratories, including procedures for handling hazardous and infectious materials.	The student knows the principles of safe work with microorganisms, disinfection and sterilisation procedures, classification of biological agents, as well as the principles of handling infectious material and laboratory documentation.	[SW4] test/egzamin - ustny lub pisemny [SW5] realizacja zadania problemowego
	[AKRL3_W01] The graduate knows and understands, at an advanced level, the laws and theories in the field of chemistry, as well as the basics of biology, mathematics and law constituting general knowledge in the scientific disciplines forming the theoretical foundations relevant to the study program.	The student knows and understands the basic laws, theories and biological processes related to the functioning of microorganisms, their metabolism, growth, variability and interaction with the environment, to an extent that enables them to understand their significance in forensic analysis.	[SW4] test/egzamin - ustny lub pisemny [SW2] prezentacja/projekt/referat/raport
	[AKRL3_U01] The graduate is able to identify, analyse and solve complex research problems in chemistry and forensic science by selecting appropriate methods and information sources.	The student is able to analyse microbiological problems relevant to laboratory and forensic work, selecting appropriate methods for identifying microorganisms and relevant sources of scientific information for their interpretation.	[SU1] wypowiedź ustna/rozmowa/dyskusja [SU3] opracowanie tekstowe/praca pisemna [SU4] test/egzamin - ustny lub pisemny
	[AKRL3_K01] The graduate is ready to critically evaluate their own knowledge, understand its importance for solving cognitive and practical problems, and to seek expert opinions when necessary.	The student is able to critically interpret information in the field of general microbiology, distinguishing reliable data from unverified data, and recognises the need to constantly update their knowledge of microorganisms and their importance in forensics, medicine and laboratory analysis.	[SK1] wypowiedź ustna/rozmowa/dyskusja [SK4] test/egzamin - ustny lub pisemny

Subject contents	Introduction to microbiology The scope and significance of microbiology in modern science and forensics. The diversity of the microorganism world: bacteria, archaea, fungi, viruses, prions. 2. Structure and functions of a bacterial cell Cellular structures: cell wall, cytoplasmic membrane, organelles, flagella, fimbriae, capsules. Comparison of Gram-positive and Gram-negative bacteria. Spore formation by bacteria (e.g. Bacillus, Clostridium). 3. Physiology and metabolism of microorganisms Aerobic and anaerobic respiration, fermentation. Sources of energy and nutrients. Bacterial growth curve and factors modifying it. Growth conditions: cardinal factors (minimum, optimum, maximum). 4. Genetics of bacteria Replication, transcription, translation. Bacterial recombination: conjugation, transduction, transformation. Plasmids and mobile elements. Mutations and resistance mechanisms. 5. Sterilisation, disinfection and microbial control Physical, chemical and mechanical methods. Autoclave parameters, principle of operation, operating errors. Antibacterial drugs: mechanisms of action and resistance. 6. Basics of microbial classification and identification Classic phenotypic methods (staining, biochemical characteristics). Diagnostic media. Modern methods: PCR, qPCR, NGS, MALDI-TOF MS. Systematics and nomenclature of bacteria. 7. Pathogenicity of microorganisms Key bacterial, viral and fungal pathogens. Virulence factors, biofilms and toxins. Pathogenesis of infections. 8. Human microflora Permanent and transient flora. The role of the microbiome in health and disease. Diagnosis of infections. 9. Environmental and forensic microbiology Microbiological contamination of soil, water and air. Biodegradation. The use of microorganisms in forensics: identification of biological traces, microbiome testing as a microbiological fingerprint, microbiological tools in the analysis of deaths and decomposition of corpses (the so-called microbial clock). 10. Food microbiology and biological safety Microorganisms that spoil food. Transmission of pathogens through food. HACCP and hygiene rules. 11. Fundamentals of virology and mycology Structure and infectious cycle of viruses. DNA and RNA viruses. Fundamentals of mycology: pathogenic fungi and their characteristics. 12. Summary and revision of the material Key issues in general microbiology. Preparation for the final examination.		
Prerequisites and co-requisites	biology chemistry and organic chemistry basics of chemical analysis		
Assessment methods and criteria	Subject passing criteria exam	Passing threshold 51.0%	Percentage of the final grade 100.0%
Recommended reading	Basic literature Salyers, A.A., Whitt, D.D.: Microbiology. Diversity, Pathogenicity and Environment. Wydawnictwo Naukowe PWN, Warsaw 2003 Kunicki-Goldfinger, W.J.H. The Life of Bacteria. Wydawnictwo Naukowe PWN, Warsaw 2005 Schlegel, H.G. General Microbiology. PWN Scientific Publishers, Warsaw 2000 Libudzisz, Z., Kowal, K., Żakowska, Z. (eds.) Technical Microbiology. Microorganisms and their environments. PWN Scientific Publishers, Warsaw 2007 Libudzisz, Z., Kowal, K., Żakowska, Z. (eds.) Technical Microbiology. Microorganisms in Biotechnology, Environmental Protection and Food Production. PWN Scientific Publishers, Warsaw 2008 Kur, J.: Exercises in General Microbiology. Gdańsk University of Technology Press, Gdańsk 1993 Tortora, G.J., Funke, B.R., Case, C.L. Microbiology. An introduction. Pearson International Edition, San Francisco 2007		

	Supplementary literature	E. M. Szewczyk Bacteriological Diagnostics. Wydawnictwo Naukowe PWN, Warsaw 2005 Brown T. A. [Polish edition edited by Piotr Węglński] Genomes, PWN Scientific Publishers, Warsaw 2009, 2nd edition B. Supplementary reading Stryer L. Biochemistry. PWN Scientific Publishers, Warsaw 1999 J. Baj, Z. Markiewicz Molecular Biology of Bacteria. Warsaw 2006
	eResources addresses	
Example issues/ example questions/ tasks being completed	Define the term microorganism and list the main groups of microorganisms with examples. Discuss the importance of microorganisms in the environment, biotechnology and forensics. Present the basic differences between prokaryotic and eukaryotic cells. Characterise the structure of the cell wall of Gram-positive and Gram-negative bacteria. Characterise the basic catabolic pathways of bacteria (fermentation, aerobic respiration, anaerobic respiration). Explain the importance of the bacterial envelope for pathogenicity and resistance. What is an operon? Discuss the lactose operon as an example of gene expression regulation.	
Work placement	Not applicable	

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