

Subject card

Subject name and code	Microbiology, PG_00082049						
Field of study	Chemistry						
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 Optional subject group 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		3.0		
Learning profile	academic		Assessment form		exam		
Conducting unit	Laboratory of Bionanotechnology -> Department of Molecular Biotechnology -> Faculty of Chemistry -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. Piotr Skowron				
	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		40.0	75
Subject objectives	Familiarizing students with all issues mentioned in the program content of the lecture and laboratory exercises.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[CHEML3_K05] Observes established procedures in laboratory work and is responsible for the safety of her/his and others' work.	Is able to prepare a workstation, work aseptically, follows established research procedures and procedures for working with microorganisms, is careful when dealing with chemical substances and materials of biological origin.	[SK6] demonstration of practical skills [SK8] observation of student's independent or team work
	[CHEML3_W02] Describes the properties of elements and the most important chemical compounds, enumerates the methods of their preparation and methods of analysis.	Demonstrates knowledge of biochemical processes occurring in a living cell.	[SW4] test/exam - oral or written
	[CHEML3_K02] Works individually demonstrating initiative and independence of activity and cooperates in a team fulfilling various roles in it.	Works in the microbiology laboratory independently and in groups.	[SK1] oral statement/conversation/discussion
	[CHEML3_W12] Characterises the basic principles of health and safety at work in a chemical laboratory; knows and describes the hazards associated with working with hazardous substances, ways to counteract these hazards and rules of conduct during an accident.	Knows sterilization methods, types of microbiological media and breeding methods microorganisms in laboratory conditions.	[SW4] test/exam - oral or written
	[CHEML3_U07] Prepares documented elaboration on a specific problem in the field of selected chemical and physical issues.	Prepares a report on the results obtained in the laboratory.	[SU6] demonstration of practical skills [SU8] observation of student's independent or team work
	[CHEML3_K03] Establishes priorities in the right way for the implementation of tasks specified by herself/himself and/or by others.	Independently plans the course of microbiological experiments.	[SK1] oral statement/conversation/discussion [SK8] observation of student's independent or team work
	[CHEML3_W01] Enumerates basic laws and theories in chemistry, physics, mathematics and biology.	Demonstrates knowledge of the structure of the cell, methods of its observation and knows selected groups of microorganisms.	[SW4] test/exam - oral or written
	[CHEML3_U02] Performs analyses using experimental methods and draws conclusions based on them.	Performs experiments specified in the laboratory manual and speaks about microbiological issues in understandable professional language.	[SU6] demonstration of practical skills [SU8] observation of student's independent or team work
Subject contents	Characteristics of pro- and eukaryotic microorganisms. Unicellular and multicellular microorganisms. Infectious particles on the border of life: viruses, bacteriophages, viroids and prions. The molecular community of life on Earth and its origins. Similarities and differences in the cell structure of prokaryotic and eukaryotic organisms. Chemical composition of microbial cells, relationship between the structure and function of biological compounds. Morphological forms of cells. Types of ciliation, structure and functions of fimbriae and sexual pili. Cell covers: cell membranes, structure of the cell wall and envelopes of Gram (+), Gram (-) bacteria, archaeobacteria, algae, fungi and protozoa. Structure and functions of the periplasmic space and cytoplasmic membrane. Mechanisms of substance uptake by cells: simple diffusion, facilitated diffusion, active transport, group translocation. Nucleoid, its organization. Proteins related to the spatial organization of the nucleoid in a bacterial cell. Extrachromosomal genetic elements (plasmids). Ribosomes and translation. Magnetosomes. Carboxysomes. Chromatophore bodies. Spare substances. Persistent forms: endospores, conidia, microspores, cysts. Structure of bacteriophages and viruses. Growth and control of the growth of microorganisms. Development cycles. Microbiological media, their types, types of bacterial cultures. Culture growth curve, bacterial growth phases. The influence of physical and chemical factors on the growth of bacteria. The impact of microorganisms on the environment. Methods of observing microorganisms. Pathogenesis. Nutrition of microorganisms. Ways of getting food. Ectoenzymes. Division of microorganisms according to the carbon source used: autotrophs (photoautotrophs, chemolithoautotrophs) and heterotrophs (prototrophs, auxotrophs). Nitrogen sources. The process of fixing atmospheric nitrogen. Sources of sulfur and other elements. Division of bacteria according to the energy source used (phototrophs, chemolithotrophs, chemoorganotrophs). Basic metabolic processes. Catabolic and anabolic reactions. Aerobic and anaerobic respiration, fermentation. ATP production, types of phosphorylation; oxidative and substrate. Photosynthesis, characteristics, chlorophyll, and accompanying pigments. Organelles of photosynthesis. Chemosynthesis. Characteristics of chemosynthetic bacteria (nitrifying, sulfur, hydrogen and iron bacteria). Life cycles of microorganisms and viruses. Genotype and phenotype. Structure and organization of DNA and RNA. Genes and their expression products. Replication. Enzymes involved in DNA replication. Transcription. Gene expression control positive and negative regulation. Elements of genetic engineering and molecular biotechnology.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written exam	51.0%	100.0%

Recommended reading	Basic literature	1. Salyers, A.A., Whitt, D.D.: Mikrobiologia. Różnorodność, chorobotwórczość i środowisko. Wydawnictwo Naukowe PWN, Warszawa 2003 2. Kunicki-Goldfinger, W.J.H. Życie bakterii. Wydawnictwo Naukowe PWN, Warszawa 2005 3. Schlegel, H.G. Mikrobiologia ogólna. Wydawnictwo Naukowe PWN, Warszawa 2000 4. Libudysz, Z., Kowal, K., Żakowska, Z. (red.) Mikrobiologia techniczna. Mikroorganizmy i środowiska ich występowania. Wydawnictwo Naukowe PWN, Warszawa 2007 5. Libudysz, Z., Kowal, K., Żakowska, Z. (red.) Mikrobiologia techniczna. Mikroorganizmy w biotechnologii, ochronie środowiska i produkcji żywności. Wydawnictwo Naukowe PWN, Warszawa 2008 6. Kur, J.: Ćwiczenia z mikrobiologii ogólnej. Wydawnictwo Politechniki Gdańskiej, Gdańsk 1993 7. Tortora, G.J., Funke, B.R., Case, C.L. Microbiology. An introduction. Pearson International Edition, San Francisco 2007
	Supplementary literature	1. E. M. Szewczyk Diagnostyka bakteriologiczna. Wydawnictwo Naukowe PWN, Warszawa 2005 2. Brown T. A. [red. wyd. pol. Piotr Węglński] Genomy, Wydawnictwo Naukowe PWN, Warszawa 2009, wyd.2 3. Stryer L. Biochemia. Wydawnictwo Naukowe PWN, Warszawa 1999 4. J. Baj, Z. Markiewicz Biologia molekularna bakterii. Warszawa 2006
	eResources addresses	
Example issues/ example questions/ tasks being completed	single-choice, multiple-choice, matching, short descriptive questions	
Work placement	Not applicable	

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