



## Subject card

Subject name and code	General Microbiology, PG_00037400						
Field of study	Biotechnology						
Date of commencement of studies	October 2020	Academic year of realisation of subject			2021/2022		
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	2	Language of instruction			Polish		
Semester of study	3	ECTS credits			6.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Department of Microbiology -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Anna Brillowska-Dąbrowska					
	Teachers	dr hab. inż. Roman Kotłowski dr hab. inż. Rafał Piątek dr hab. inż. Anna Brillowska-Dąbrowska dr hab. Beata Zalewska-Piątek					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	30.0	0.0	0.0	60
	E-learning hours included: 0.0						
Adresy na platformie eNauczenie: Mikrobiologia ogólna - Moodle ID: 18486 <a href="https://enauczenie.pg.edu.pl/moodle/course/view.php?id=18486">https://enauczenie.pg.edu.pl/moodle/course/view.php?id=18486</a>							
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	60		4.0		86.0	150
Subject objectives	Acquisition of knowledge on basic problems of microbiology used in the area of biotechnology. Acquisition of skills in selected microbiological techniques including those used in biotechnology.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	K6_U04		Student acquires knowledge about using basic microbiological techniques.		[SU4] Assessment of ability to use methods and tools		
	K6_W04		Student is familiar with biology, physiology and functions of microorganisms.		[SW1] Assessment of factual knowledge		

Subject contents	LECTURE Microorganisms and microbiology. Microorganisms as cells. Microorganisms and their natural environments. The impact of microorganisms on humans. Pathways of discovery in microbiology. An overview of microbial life (cell structure and evolutionary life, the tree of life, physiological diversity of microorganisms, prokaryotic diversity, eukaryotic diversity). Macromolecules (chemical bonding and water in living systems, noninformational macromolecules, informational macromolecules). Cell structure and function (microscopy and cell morphology, cell membranes and cell walls, surface structures and inclusion of prokaryotes, microbial locomotion). Nutrition, laboratory culture and metabolism of microorganism. Microbial growth (bacterial cell division, growth of bacterial populations, measuring microbial growth, environmental effects on microbial growth). Molecular biology of microorganisms (genes and gene expression, DNA structure, DNA replication, tools for manipulation DNA, RNA synthesis, protein synthesis). Metabolic regulation (regulation of enzyme activity, DNA-binding proteins and regulation of transcription, global regulatory mechanisms, other mechanisms of regulation). Virology (virus and virion, growth and quantification, viral replication, viral diversity). Bacterial genetics (mutation and recombination, transformation, transduction, plasmids, transposons and insertion sequences, bacterial genetics and gene cloning, bacterial chromosome). Microbial taxonomy. The phylogeny of bacteria. The phylogeny of archaea. Eukaryotic cell biology and eukaryotic microorganisms. Microbial ecology (carbon, nitrogen, phosphorous, sulfur cycles and microorganisms, nitrogen fixation, water microbiology, waterborne diseases, hygiene monitoring, food spoilage microorganisms, foodborne pathogens). Microorganisms as tools for industry and research. LABORATORY Laboratory organization. Safety in microorganisms handling - hazard groups. Sterilization and disinfection (principles of sterilization and disinfection, physical sterilization, chemical disinfectants). Cultivation of microorganisms (growth curve, culture media). Nutritional requirements of cells. Microorganisms in the laboratory environment (colony morphology, growth patterns in broth, agar slant and agar deep-tube). Pure culture techniques (spread plate technique, streak plate technique, specific media). Environmental factors affecting microbial growth (temperature, pH, osmotic pressure, ultraviolet light). Oxygen requirements – cultivation of anaerobes. Enumeration of bacteria. Antimicrobial agents. Metabolic activities of microorganisms (hydrolysis of starch, fats, proteins, fermentation of and $\beta$ -galactosidase activity). Microbial relationships (bacterial commensalism, synergism, antagonism). Microscopic techniques and bacteria staining (microscope slide techniques, Gram staining). Identification of unknown bacteria from environmental samples. Microbial genetics (isolation of plasmid DNA, bacterial transformation).											
Prerequisites and co-requisites	Student has to finish Fundamental of Biotechnology											
Assessment methods and criteria	<table border="1"> <thead> <tr> <th>Subject passing criteria</th> <th>Passing threshold</th> <th>Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td>Written exam</td> <td>60.0%</td> <td>70.0%</td> </tr> <tr> <td>Practical exercise</td> <td>60.0%</td> <td>30.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Written exam	60.0%	70.0%	Practical exercise	60.0%	30.0%
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Example issues/ example questions/ tasks being completed	1.How can you distinguish bacteria from archaea: based on 16S rRNA sequences based on the microscopic method of staining spores based on 18S rRNA sequences based on transposon sequences 2.The generation time is: time required for cell division time required to divide genetic material logarithmic time for bacterial growth in stationary culture time required for bacteria to adapt in the new environment 3.Anaeroby: grow in microaerophilic conditions grow in the presence of 21% oxygen in the atmosphere grow in anaerobic conditions do not grow in anaerobic conditions											
Work placement	Not applicable											