

## 。 GDAŃSK UNIVERSITY OF TECHNOLOGY

## Subject card

Subject name and code	MODEL ORGANISMS, PG_00063459							
Field of study	Biotechnology							
Date of commencement of studies	October 2024		Academic year of realisation of subject			2024/2025		
Education level	second-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	1		Language of instruction		Polish			
Semester of study	2		ECTS credits		2.0			
Learning profile	general academic profile		Assessment form		assessment			
Conducting unit	Department of Biotechnology and Microbiology -> Faculty of Chemistry							
Name and surname	Subject supervisor		dr inż. Martyna Mroczyńska-Szeląg					
of lecturer (lecturers)	Teachers		dr inż. Martyna Mroczyńska-Szeląg					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	t	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0		0.0	30
	E-learning hours included: 0.0							
	Additional information: Synchronous online lecture Laboratory classes conducted on-site at the university							
Learning activity and number of study hours	Learning activity Participation in classes includ plan		n didactic led in study	Jactic Participation in n study consultation hours		Self-study		SUM
	Number of study hours	30		2.0		18.0		50
Subject objectives	The aim of the course is to equip students with comprehensive knowledge of model organisms, their significance in scientific research, and the principles of their rational selection for various types of experiments. Students will learn the criteria for choosing model organisms, their limitations, and the ethical aspects related to their use in science.							
	As part of the course, a specific experiment	students will s , providing a ju	olve a research stified rationale	h problem by se e for their choice	electing e.	an app	ropriate mode	l organism for

Learning outcomes	arning outcomes Course outcome		Method of verification			
	[K7_U06] plans research and designs biotechnological products and processes taking into account legal regulations and bioethical principles	The student is able to distinguish organisms that require ethical committee approval and, based on this, select an appropriate model organism for the research hypothesis. They can design an experiment using suitable model organisms, considering ethical principles and legal requirements.	[SU4] Assessment of ability to use methods and tools			
	[K7_W01] defines the phenomena, processes and laws of living nature applied to the production of useful goods and the carrying out of services	The student is able to characterize the basic model organisms from the groups: bacteria, fungi, invertebrates, and vertebrates, describing their applications in scientific research and explaining the biological processes studied using them. They are familiar with the criteria for selecting model organisms for various types of research and understand their limitations. The student is aware of the ethical aspects associated with the use of model organisms in scientific research.	[SW2] Assessment of knowledge contained in presentation			
	[K7_U03] designs technological solutions for obtaining useful goods using biomolecules and living organisms based on the state of the art in accordance with the latest scientific literature	The student is able to identify the advantages and disadvantages of individual model organisms. They can select an appropriate model organism for research to obtain reliable results. They are capable of planning specific tasks and selecting control groups. The student is aware of the ethical aspects associated with the use of model organisms.	[SU2] Assessment of ability to analyse information			
	[K7_W03] selects methods using living organisms and biomolecules to produce and process consumer goods	The student is capable of formulating appropriate hypotheses and questions that facilitate the selection of an appropriate model organism for research.	[SW3] Assessment of knowledge contained in written work and projects			
Subject contents	The first studies utilizing model organisms laid the foundation for modern science, enabling a deeper understanding of fundamental biological processes. The use of these organisms offers numerous advantages but also presents challenges, such as limitations in extrapolating results to higher organisms. A key aspect of research design is the ability to select the appropriate model organism that best suits the specific study objectives. Model bacteria, such as <i>Escherichia coli</i> and <i>Bacillus subtilis</i> , are widely used in genetic, biochemical, and biotechnological research. Model fungi, including <i>Saccharomyces cerevisiae</i> and <i>Neurospora crassa</i> , play a crucial role in studies on metabolism, gene expression regulation, and inter- organism interactions. Invertebrates, such as <i>Caenorhabditis elegans</i> and <i>Galleria mellonella</i> , are gaining importance as models for studying infections and assessing the toxicity of chemical compounds. Vertebrates, including zebrafish ( <i>Danio rerio</i> ) and laboratory mice ( <i>Mus musculus</i> ), are invaluable models for research on organogenesis, physiology, immunology, and biomedical applications.Modern science is also exploring new model organisms that can provide unique insights into biological processes. Examples of such organisms include the diatom <i>Stephanopyxis turris</i> , the ciliate <i>Stentor coeruleus</i> , and the amoeba <i>Naegleria</i> <i>gruberi</i> , which exhibit remarkable regenerative, adaptive, and metabolic abilities, making them promising models for future research					
Prerequisites and co-requisites	The student must have knowledge about the hazards while working in a microbiological laboratory, and be able to use basic microbiological techniques. Therefore, it is advisable for the student to pass the subject of general microbiology.					
Assessment methods and criteria	Subject passing criteria The percentage share in the final grade is 50% for lectures and laboratories. Lecture components: colloquium + project task; component laboratories: reports and short tests	Passing threshold 60.0%	Percentage of the final grade 100.0%			
Recommended reading	Basic literature	<ul> <li>Brylińska J., Kwiatkowska J. Laboratory animals. Methods of breeding and experiments. UNIVERSITAS, Krakow, 1996</li> <li>Ankeny, Rachel A., and Sabina Leonelli. <i>Model organisms</i>. Cambridge University Press, 2020.</li> <li>Striedter, Georg. <i>Model Systems in Biology: History, Philosophy, and</i> <i>Practical Concerns</i>. MIT Press, 202</li> </ul>				

	Supplementary literature	Greczek-Stachura, Magdalena. Paramecium as a model organism in pharmacological research. Scientific Publishing House of the Pedagogical University, Kraków, 2013.		
	eResources addresses	Adresy na platformie eNauczanie: ORGANIZMY MODELOWE 2024/2025 - Moodle ID: 43015 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=43015		
Example issues/ example questions/ tasks being completed	1. Experiments with which model organisms require approval from the ethics committee? 2. List the advantages of G. mellonella as a model organism. 3. Describe one experiment you know of using an invertebrate model organism.			
Work placement	Not applicable			

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