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 of lecturer (lecturers)	Subject supervisor	dr inż. Martyna Mroczyńska-Szeląg	
	Teachers	dr inż. Martyna Mroczyńska-Szeląg	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	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 didactic classes included in study plan	Participation in 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, students will solve a research problem by selecting an appropriate model organism for a specific experiment, providing a justified rationale for their choice.

Learning outcomes

Course outcome	Subject 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 *Escherichia coli* and *Bacillus subtilis*, are widely used in genetic, biochemical, and biotechnological research. Model fungi, including *Saccharomyces cerevisiae* and *Neurospora crassa*, play a crucial role in studies on metabolism, gene expression regulation, and inter-organism interactions. Invertebrates, such as *Caenorhabditis elegans* and *Galleria mellonella*, are gaining importance as models for studying infections and assessing the toxicity of chemical compounds. Vertebrates, including zebrafish (*Danio rerio*) and laboratory mice (*Mus musculus*), 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 *Stephanopyxis turris*, the ciliate *Stentor coeruleus*, and the amoeba *Naegleria gruberi*, 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	Passing threshold	Percentage of the final grade
The percentage share in the final grade is 50% for lectures and laboratories. Lecture components: colloquium + project task; component laboratories: reports and short tests	60.0%	100.0%

Recommended reading

Basic literature

Brylińska J., Kwiatkowska J. Laboratory animals. Methods of breeding and experiments. UNIVERSITAS, Krakow, 1996

Ankeny, Rachel A., and Sabina Leonelli. *Model organisms*. Cambridge University Press, 2020.

Striedter, Georg. *Model Systems in Biology: History, Philosophy, and Practical Concerns*. MIT Press, 202

	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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