University of Gdańsk

Subject card

Subject name and code	Methods in molecular biology, PG_00147833						
Field of study	Genetics and Experimental Biology						
Date of commencement of studies	October 2024		Academic year of realisation of subject		2026/2027		
Education level	undergraduate studies		Subject group		Obligatory subject group in the field of study Optional subject group		
Mode of study	full-time studies		Mode of delivery		at the university		
Year of study	3		Language of instruction		Polish		
Semester of study	6		ECTS credits		2.0		
Learning profile	academic		Assessment form				
Conducting unit							
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Monika Glinkowska				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	30.0	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		3.0		17.0	50
Subject objectives	- Familiarizing students with classical and cutting-edge tools used in molecular biology, with a particularfocus on methods for studying protein-DNA and protein-protein interactions in vitro and in cells.- Introducing students to the potential applications of these methods for solving research and practicalproblems.- Developing skills for selecting appropriate research tools to solve biological problems.- Cultivating the ability to independently read specialized literature and learn.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[GBEL3_U06] Prepare and deliver oral presentations in Polish and English on specific topics within the field of biology, as well as present ideas and results in written and oral form.	student is able to prepare and present oral presentations in Polish and English on specific topics in biology, as well as present their ideas and results in written and oral form.	[SU1] oral statement/conversation/ discussion [SU2] presentation/project/paper/ report [SU5] implementation of a problem task
[GBEL3_K02] Critical assessment of one's own knowledge and methods in the field of molecular biology and related disciplines, as well as the commercialization of research.	student can do critical evaluation of one's own knowledge and methods in the field of molecular biology and related disciplines, as well as commercialization of research	[SK1] oral statement/conversation/ discussion
[GBEL3_U04] Capable of reading scientific texts in English and Polish with comprehension, synthesizing the knowledge contained within them, preparing well-documented studies on biological issues, as well as those related to research commercialization.	student is Capable of reading scientific texts in English and Polish with comprehension, synthesizing the knowledge contained within them, preparing well-documented studies on biological issues, as well as those related to research commercialization.	[SU1] oral statement/conversation/ discussion [SU2] presentation/project/paper/ report
[GBEL3_W05] the principles of research planning based on achievements in biological sciences and related fields, the potential application of their results in practice, the principles of operation of equipment and apparatus used in molecular genetics research, and the principle of interpreting biological phenomena and processes based on empirical data in research and practical activities, with consideration for sustainable use of biological diversity.	Understands the principles of planning research based on achievements in biological sciences and related disciplines, the potential applications of their results in practice, the functioning principles of equipment and apparatus used in molecular genetics research, as well as the principle of interpreting biological phenomena and processes based on empirical data in research work and practical activities.	[SW1] oral statement/ conversation/discussion [SW2] presentation/project/paper/ report
[GBEL3_W06] the development and current state of knowledge, as well as the latest trends in molecular genetics and related fields; indicating their relationship with other disciplines in the natural or medical sciences and the possibilities of their practical application.	student is familiar with the development and current state of knowledge, as well as the latest trends in molecular genetics and related fields; they identify their connection to other disciplines of natural sciences or medicine and their potential applications in practice.	[SW1] oral statement/ conversation/discussion [SW2] presentation/project/paper/ report
[GBEL3_U07] Work in a team and organize work while adhering to occupational health and safety principles and ergonomics.	Student is able to work as a part of team	[SU1] oral statement/conversation/ discussion [SU2] presentation/project/paper/ report
[GBEL3_K01] The utilization of theoretical knowledge in laboratory and production practice.	student is able to apply theoretical knowledge in laboratory and production practice.	[SK1] oral statement/conversation/ discussion [SK2] presentation/project/paper/ report

Subject contents

- DNA and protein labeling- Methods for studying protein-DNA interactions in vitro, including gel retardation assays, footprintingtechniques, surface plasmon resonance- Methods for studying protein-DNA interactions in vivo, including chromatin immunoprecipitation, the use ofreporter systems to assess the kinetics of protein-DNA interaction in the cell, in vivo footprinting, study of therelationship between DNA structure and protein interaction- Methods for studying DNA modification and its structure in cells- Methods for studying protein-protein interactions: including immunoprecipitation, pull-down techniques,crosslinking, FRET (Foerster Resonance Energy Transfer), two-hybrid systems, study of protein-ligandinteractions using microcalorimetry- Methods for studying gene expression regulation in vivo and in vitro: reporter systems, methods foridentifying regulatory factors; RT-PCR and transcriptomics; assessment of the kinetics of individualtranscription stages in vitro and in vivo; study of RNA stability.

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="2">basic knowledge in biochemistry of proteins and nucleic acids, basic knowledge on processes such as DNAreplication, transcription and translation</td></tr>
<tr><td>Assessment methods and criteria</td><td colspan="2"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>discussion</td><td>51.0%</td><td>20.0%</td></tr>
<tr><td>presentation</td><td>51.0%</td><td>80.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>Moss T. Protein-DNA interactions. Principles and Protocols. 3rd edition.Humana Press 2009Meyerkord C.L., Fu H. (Ed.) Protein-proteininteractions. Methods and Applications. Springer 2015</td></tr>
<tr><td>Supplementary literature</td><td>Moss T. Protein-DNA interactions. Principles and Protocols. 3rd edition.Humana Press 2009Meyerkord C.L., Fu H. (Ed.) Protein-proteininteractions. Methods and Applications. Springer 2015</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">How can we determine if a protein interacts with a specific DNA sequence? How can we identify the DNAsequences that interact with the protein of interest in a cell? How can we identify the components of aprotein complex?</td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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