University of Gdańsk

Subject card

Subject name and code	Molecular Biology and Genetics, PG_00193521		
Field of study	Bioinformatics		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2027/2028
Education level	Bachelor's 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	7.0
Learning profile	academic	Assessment form	exam
Conducting unit	Department of Molecular Genetics of Bacteria -> Faculty of Biology -> Rector		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Barbara Kędzierska	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	45.0	0.0	30.0	0.0	0.0	75

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	75	0.0	100.0	175

Subject objectives

To familiarize students with the molecular basis of heredity and genetic information flow. Students will learn and acquire the ability to independently use various bioinformatics tools used in molecular biology. Students will learn the principles of Mendelian, quantitative and population genetics and acquire the ability to independently analyze the results of genetic crosses. Students will learn the most important methods used in genetic analysis and acquire the ability to independently interpret published research results obtained using genetic analysis.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[BIOINL3_U05] Graduate has the ability to use scientific literature, including English-language sources on bioinformatics; has the ability to use appropriate databases	The student is able to:use scientific publications and electronic resources including databases in English to obtain information necessary for the design and use of molecular tools.	[SU1] oral statement/conversation/ discussion [SU2] presentation/project/paper/ report [SU3] text preparation/written work [SU8] observation of student's independent or team work
	[BIOINL3_U02] Graduate is able to apply knowledge of natural sciences and science to formulate, analyze and solve problems related to bioinformatics	The student is able to use various bioinformatics tools used in molecular biology and genetic engineering, as well as analyze the results of crossbreeding using Mendelian genetics.	[SU2] presentation/project/paper/ report [SU3] text preparation/written work [SU5] implementation of a problem task [SU8] observation of student's independent or team work
	[BIOINL3_W02] Has advanced scientific knowledge necessary to understand the basic processes in living organisms.	The student knows: - the molecular structure of the gene and the mechanisms of genome replication.and the principles of the flow of genetic information from nucleic acids to proteins. - the most important methods and techniques used in molecular biology and genetics. - principles of Mendelian genetics and basic principles of quantitative and population genetics.	[SW4] test/exam - oral or written
	[BIOINL3_U06] Is able to use English at the B2 level of the Common European Framework of Reference for Languages, enabling him to understand spoken statements and to read and comprehend literature and simple scientific studies in the fields of science and scientific disciplines relevant to bioinformatics; he is able to prepare a short written paper and an oral presentation in both Polish and English on specific issues in bioinformatics	The student is able to independently analyze the results of research published in English obtained using the methods and techniques discussed in class.	[SU1] oral statement/conversation/ discussion [SU2] presentation/project/paper/ report [SU3] text preparation/written work

Subject contents

Molecular biology - lecture 30 hrs.

- Molecular structure and organization of the gene in prokaryotes and eukaryotes.
- Molecular basis of replication, repair and recombination of prokaryotic and eukaryotic DNA.
- Mutations, mutagenesis, mutagenic agents.
- Expression of genetic information: transcription, translation.
- Mechanisms of gene expression in prokaryotes and eukaryotes.
- Genetic engineering - techniques that allow modifications and changes in the expression of plasmid and chromosomal genes.
- GMOs - analysis of strategies used to modify specific organisms.

Molecular biology - computer-based exercises 20 hrs.

- DNA amplification using PCR and real time PCR - preparation of primers and development of reaction conditions, analysis of literature data.
- Methods of cloning sequences into plasmid vectors - independent planning of cloning strategies,
- Getting to know various bioinformatics programs that allow to analyze nucleic acid sequences, including searching for key genetic elements in DNA sequences.
- Getting to know programs that allow visualization of nucleic acids and proteins.

Genetics - lecture 15 hrs.

- Fundamentals of Mendelian genetics
- Genetic variation- mutations, recombination, environmental variation, genotype-environment interaction.
- Coupling and recombination of genes on a chromosome, genetic mapping, genetic markers.
- Quantitative genetics, quantitative trait location (QTL) mapping.
- Basics of population genetics.

Genetics - laboratory/computer exercises - 10 hrs

- Basic methods and techniques used in genetic research: analysis of the results of genetic crosses using Mendelian genetics, independent inheritance, coupling, recombination, sex-linked inheritance.
- Basic methods and techniques of population genetics, analysis of gene frequencies in a population.
- Quantitative genetics.

Prerequisites and co-requisites

The student, after completing the compulsory subjects in the first two semesters, has the knowledge and skills to qualify him to participate and pass the subject.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
activity	0.0%	10.0%
colloqiua	51.0%	40.0%
writing exam	51.0%	50.0%

Recommended reading

Basic literature	• W. Widlak Wprowadzenie do biologii molekularnej dla bioinformatyków, PJWSTK 2010 • P. Węgleński, Genetyka molekularna, PWN 2012 • D.L. Hartl, A.G. Clark, Podstawy genetyki populacji, Uniwersytet Warszawski, Warszawa 2009 • Publications on molecular biology methods discussed during the exercises - indicated by the lecturer
Supplementary literature	• Biologia molekularna. Krótkie wykłady - PC Turner i wsp., PWN 2020 • Genetyka medyczna i molekularna. J. Bal. Wyd. Nauk PWN, Warszawa 2017 • Genetyka zwierząt. K. M. Charon, M. Świtoński. PWN Warszawa, 2006. • Genetyka i genomika zwierząt. K. M. Charon, M. Świtoński. PWN Warszawa, 2019 • Genetyka człowieka. Rozwiązywanie problemów medycznych. B. R. Korf. PWN Warszawa, 2003.. • Zbiór zadań i pytań z genetyki, cz. I Genetyka ogólna. B. Piątkowska, A. Goc, G. Dąbrowska. Wydawnictwo UMK, Toruń 1998.
eResources addresses	

Example issues/ example questions/ tasks being completed

Work placement

Not applicable

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