University of Gdańsk

Subject card

Subject name and code	Biology of the Cell and Metabolism, PG_00193514		
Field of study	Bioinformatics		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2026/2027
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	1	Language of instruction	Polish
Semester of study	2	ECTS credits	5.0
Learning profile	academic	Assessment form	exam
Conducting unit	Faculty of Biology -> Rector		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Rafał Dutkiewicz, prof. UG	
	Teachers		

Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	20.0	0.0	0.0	50
	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	50	0.0	75.0	125

Subject objectives	To familiarize the student with the structure and functioning of the cell as the basic unit of life. The student will gain basic knowledge about the organization of prokaryotic cells and eukaryotic cells. He will learn the methodology used to study both the morphology and functions of entire cells, organelles and cellular structures. The student will learn about the functioning of the most important metabolic pathways in the cell, taking into account both individual enzymatic reactions as well as the location of metabolic pathways in the cell and their regulation.

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	Student is able to: 1. Independently search for scientific information about enzymes and metabolic pathways using scientific publications and databases in English. 2. Independently interpret published results of scientific research performed using the methods and techniques discussed in classes.	[SU1] oral statement/conversation/ discussion [SU2] presentation/project/paper/ report [SU3] text preparation/written work
[BIOINL3_U02] Graduate is able to apply knowledge of natural sciences and science to formulate, analyze and solve problems related to bioinformatics	Student is able to: 1. Identify different types of cells and indicate their common features 2. Analyze the results of cell growth in culture. 3. Justify the choice of methods for examining the structures and functions of cells and cell organelles. 4. Analyze the measurement results of the enzymatic reaction carried out using the purified enzyme and cell extract. 5. Analyze the results of measuring the enzymatic reaction in the presence of inhibitors and the results of measuring the interaction of ligands and coenzymes with the enzyme.	[SU1] oral statement/conversation/ discussion [SU3] text preparation/written work [SU4] test/exam - oral or written [SU6] demonstration of practical skills
[BIOINL3_W02] Has advanced scientific knowledge necessary to understand the basic processes in living organisms.	Student knows: 1. The structure and functions of the cell as the basic unit of life. 2. Principles of functioning of metabolic pathways and their regulations	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion [SW3] text preparation/written work
[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	Student is able to: Independently interpret published results of scientific research performed using the methods and techniques discussed in classes.	[SU1] oral statement/conversation/ discussion [SU4] test/exam - oral or written

Subject contents	Biology of the Cell - lecture 10 hoursPorokaryotic cell - morphology and organization; division and growth of bacterial cells; traffic and transport. Eukaryotic cell, fungi and animals - morphology, cell organelles, cell membrane, cytoskeleton, cell connections, intracellular transport, origin and evolution of the eukaryotic cell. Eukaryotic plant cell - morphology, cell wall and membrane, interaction of organelles in a plant cell, origin and evolution of a plant cell. Mobile phone - laboratory exercises (computer) 10 hours Microbial cell (bacterial and yeast) - Microscopy - demonstration. Labeling of microbial cells. Testing the growth of microorganisms on a liquid medium and on a solid medium - demonstration. Analysis of growth curves and colony growth on plates. Cell of multicellular organisms (animal and plant) Microscopy techniques - light, fluorescence, confocal, electron; cell and tissue cultures; flow cytometry; immunolocalization; DNA tagging; staining of cell organelles; - getting acquainted with the methodology of these analyzes and demonstrating their application. Plant cell fractionation and preparation of plant tissue extracts - demonstration.Metabolism - lecture 20 hoursIntracellular localization and regulation of metabolic pathways Basic catabolic pathways: Glycolysis, Krebs cycle, oxidative decarboxylation of pyruvic acid, respiratory chain (electron transport in the respiratory chain and oxidative phosphorylation), polysaccharide catabolism, lipolysis, amino acid nitrogen metabolism in animals. Basic anabolic pathways: gluconeogenesis, pentose phosphate cycle (formation of NADPH and its participation in oxidation-reduction systems), metabolism of complex sugars, synthesis of glycogen, starch, cellulose and mucopolysaccharides, amino acid synthesis, lipogenesis. Iron and heme metabolism. Metabolism - laboratory/computer exercises 10 hours Methods of measuring enzymatic activity using purified enzyme and cell extract: colorimetric, spectrophotometric, isotope-based methods, real-time measurements - demonstration of selected methods. Determining the rate of an enzymatic reaction, determining the kinetic constants of an enzymatic reaction - demonstration. Analysis of the measurement results of the enzymatic reaction, including determination of the kinetic parameters of the reaction. Cooperativity of the enzymatic reaction. Inhibition and its types. Binding constants of substrate, ligand and cofactors. Analysis of the flow of metabolites through metabolic pathways. Methods for testing enzyme monomers and oligomers.
Prerequisites and co-requisites	
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
	51.0%	20.0%
	51.0%	20.0%
	51.0%	20.0%
	51.0%	40.0%

Recommended reading	Basic literature	not applicable
	Supplementary literature	not applicable
	eResources addresses	
Example issues/ example questions/ tasks being completed	not applicable	
Work placement	Not applicable	

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