



## Subject card

Subject name and code	Elements of Bioinformatics, PG_00054280						
Field of study	Informatics						
Date of commencement of studies	February 2027	Academic year of realisation of subject			2027/2028		
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 Algorithms and Systems Modelling -> Faculty of Electronics Telecommunications and Informatics -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Krzysztof Giaro					
	Teachers	prof. dr hab. inż. Krzysztof Giaro dr inż. Joanna Raczek dr inż. Krzysztof Pastuszek					
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	15.0	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	5.0		15.0	50	
Subject objectives	Bioinformatics is a relatively new branch of computer science whose aim is to support biological research by computers. The scope of methods used by bioinformatics is very wide: we have fast text processing, discrete optimization algorithms, statistical analysis, artificial intelligence and machine learning, computational geometry and even computational models of physical systems. This subject is devoted to presentation of selected computational problems connected with the analysis of information obtained from biological data e.g. DNA and protein sequences.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_U08] while identifying and formulating engineering tasks specifications and solving these tasks, can: - apply analytical, simulation and experimental methods, - notice their systemic and non-technical aspects, - make a preliminary economic assessment of suggested solutions and engineering work	The student understands the biological meaning of the processed bioinformatics data, and recognizes its role in the functioning of living organisms.	[SU3] Assessment of ability to use knowledge gained from the subject
	[K7_U02] can perform tasks related to the field of study as well as formulate and solve problems applying recent knowledge of physics and other areas of science	The student analyzes bioinformatic data using the software he creates, analyzes the obtained results, evaluates the usefulness of selected methods.	[SU4] Assessment of ability to use methods and tools
	[K7_U43] can apply information technologies in market economy and information society conditions as well as algorithmize and computerize cognitive and decision-making processes in other areas of knowledge	The student implements bioinformatics software for aligning two or many biological sequences, modeling their evolution or analyzing phylogenetic history.	[SU4] Assessment of ability to use methods and tools
	[K7_W02] knows and understands, to an increased extent, selected laws of physics and physical phenomena, as well as methods and theories explaining the complex relationships between them, constituting advanced general knowledge in the field of technical sciences related to the field of study	The student knows the mathematical methods supporting the acquisition of information from biological sequences and uses them in practice.	[SW3] Assessment of knowledge contained in written work and projects
Subject contents	<p>Course content – lecture</p> <ol style="list-style-type: none"> <li>1. Biological introduction.</li> <li>2. Linear matching of two sequences.</li> <li>3. Linear matching of multiple sequences.</li> <li>4. Modeling the evolution of biological sequences.</li> <li>5. Introduction to phylogenetics, distance methods.</li> <li>6. Reading evolution history: the parsimony method.</li> <li>7. Theme search, hidden Markov models.</li> </ol> <p>Course content – project</p> <ol style="list-style-type: none"> <li>1. Algorithms for searching sequence databases BLAST and its variants.</li> <li>2. Analysis of genetic variants searching for and identifying SNP mutations using the example of hemochromatosis and anemia.</li> <li>3. Protein structure databases record content, origin, and data interpretation.</li> <li>4. Protein, protein family, and domain databases classification and functional annotations.</li> <li>5. Ensembl genome browser structure, functionality, and applications.</li> <li>6. The use of programming in bioinformatics and genetic analyses.</li> </ol>		
Prerequisites and co-requisites	<p>Basics of:</p> <ul style="list-style-type: none"> <li>- programming</li> <li>- algorithms and data structures or algorithm analysis</li> <li>- probability calculus and statistics</li> </ul>		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Project	52.0%	50.0%
	Midterm colloquium	44.0%	50.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. P. Higgs, T. Attwood, "Bioinformatics and Molecular Evolution", Wiley-Blackwell, 2005.</li> <li>2. A. Baxevanis, B. Ouellette i inni, "Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins", Wiley-Interscience, 2004.</li> <li>3. R. Durbin, S. Eddy, A. Krogh, G. Mitchison, "Biological Sequence Analysis: Probabilistic Models of Proteins and Nucleic Acids", Cambridge University Press, 1999.</li> </ol>	

	Supplementary literature	<ol style="list-style-type: none"> <li>1. P. Winter, G. Hickey, H. Fletcher, "BIOS Instant Notes in Genetics", Taylor &amp; Francis, 2006.</li> <li>2. D. Gusfield, "Algorithms on Strings, Trees, and Sequences: Computer Science and Computational Biology", Cambridge University Press, 1997.</li> <li>3. M. Waterman, "Introduction to Computational Biology: Maps, Sequences and Genomes", Chapman &amp; Hall, 1995.</li> <li>4. M. Nei, S. Kumar, "Molecular Evolution and Phylogenetics", Oxford University Press, 2000.</li> </ol>
	eResources addresses	
Example issues/ example questions/ tasks being completed		
Practical activities within the subject	Not applicable	

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