COURSE DESCRIPTION CARD

BIALYSTOK UNIVERSITY OF TECHNOLOGY								**Faculty of Civil Engineering and Environmental Sciences**	
Field of study								**Level and form of study**	Full-time Bachelor Degree
A group of modules /specialty								**Education profile**	Academic profile
Course name	Practical Aspects of Bioinformatics							**Course code**	IS-FCEE-00277S
								Course type	*Mandatory*
Course form(s) and number of hours	**L**	**C**	**LC**	**P**	**SW**	**FW**	**S**	**Semester**	**summer**
				30				**ECTS credits**	**2**
The programme is valid from									
Introductory courses									

Course objectives	This course introduces students to practical tools and methods in bioinformatics, focusing on the analysis of biological data using databases and computational techniques. Students will gain hands-on experience in sequence analysis, phylogenetics, structural modeling, and genomic data interpretation, developing the skills to independently solve bioinformatics problems and apply computational approaches to biological research.
Framework programme content	Introduce course structure, objectives, key concepts, and assessment criteria. Present tasks and goals of bioinformatics. Access and search biological databases using appropriate strategies. Explore various bioinformatics databases. Perform pairwise and multiple sequence alignments. Conduct phylogenetic analyses to investigate evolutionary relationships. Apply structural bioinformatics techniques for protein modeling and visualization. Introduce genomic data analysis methods. Solve practical problems related to database searching and other bioinformatics challenges.Review and discuss projects to consolidate knowledge and skills.
Other information about the course	content of the course refers to the principles of sustainable development the course is related to the scientific activity conducted at the University

Calculation:

Student workload related to:	**Total number of hours**	**including contact**	**including practical**
participation in lectures	0	0	
participation in other forms of activities	30	30	30
individual substantive support of the learning process, participation in exams/assessments organized outside the scheduled classes	1	1	1,0
completion of professional training	0	0	0
preparation for the exam	0		
preparation for the credit	19		19
independent realization of tasks resulting from the scope of the diploma thesis	0		0
Total number of hours:	**50**	**31**	**50**
Total number of ECTS credits:	**2**	**1,2**	**2,0**

Expected discipline learning outcomes	Knowledge	Skills	Social competence
	BT1_W02	BT1_U03	BT1_K04

Objectives and framework content prepared by	dr inż. Urszula Wydro	Date: 23.02.2026

Implementation in the academic year **2026/2027**

Programme content

	Project
1	Introduction to the course: syllabus, learning outcomes, and assessment criteria. Objectives and Tasks of Bioinformatics. Key Concepts. (2h)
2	Databases. Search Strategies in Databases. Part I. (2h)
3	Databases. Search Strategies in Databases. Part II. (2h)
4	Bioinformatics databases. Part I. (2h)
5	Bioinformatics databases. Part II. (2h)
6	Pairwise sequence alignment. Part I. (2h)
7	Pairwise sequence alignment. Part II. (2h)
8	Multiple sequence alignment. Part I (2h)
9	Multiple sequence alignment. Part I (2h)
10	Phylogenetic Analysis. Part I. (2h)
11	Phylogenetic Analysis. Part II. (2h)
12	Structural bioinformatics – protein modeling and visualization. Part I (2h)
13	Structural bioinformatics – protein modeling and visualization. Part II (2h)
14	Genomic Data Analysis – Introduction (2h)
15	Solving Problems Related to Database Searching and Other Bioinformatics Issues. Projects summary. (2h)

Teaching methods (on-site classes)	P	multimedial presentation; project
Teaching methods (online classes)	-	
Forms of crediting	P	Problem-based projects
Conditions of crediting	P	The final grade is proportional to the total number of points obtained from individual assessment components. The point ranges, projects formats, and assessment criteria are communicated to students during the first class. The final mark is the product of all the points obtained. - The student receives a failing grade if less than 50% of the total points are obtained. - The student receives a '3' if 51-60% of the points are achieved. - the student receives a '3.5' if achieves 61-70% of the points - the student receives a '4' if achieves 71-80% of the points - the student obtains a '4.5' if achieves 81-90% of the points - the student receives a '5' if achieves 91-100% of the points. The condition for passing is achieving all learning outcomes.

Outcome symbols	Expected learning outcomes	Expected learning outcomes defined for the field of study		
		Knowlegde	Skills	Social competence
	Knowledge: the student knows and understands			
E1	the principles and tools of bioinformatics, including sequence analysis, phylogenetics, structural modeling, and database use, enabling the description, interpretation, and analysis of biological data in applied biotechnology.	BT1_W02		
	Skills: the student can			
E2	plan, execute, and document in silico experiments and bioinformatic workflows, including the retrieval of genomic and proteomic data from biological databases and their processing through specialized algorithms; analyze and compare different computational tools and pipelines in terms of their accuracy, efficiency, and biological relevance for solving problems in applied biotechnology.		BT1_U03	
	Social competence: the student is ready to			
E3	*critically assess the reliability of bioinformatics tools and the biological relevance of computational results, recognizing the essential role of up-to-date bioinformatic resources in solving complex problems in applied biotechnology, and to seek expert opinions and collaborate with the scientific community in cases of difficulties in interpreting large-scale biological datasets or resolving algorithmic uncertainties.*			BT1_K04

Outcome symbols	Methods of verification of learning outcomes	Course form subject to verification
E1	*Problem-based projects*	P
E2	*Problem-based projects*	P
E3	*Problem-based projects*	P

Basic references	1	*Paul Maria Selzer, Richard J. Marhöfer, Oliver Koch: Applied Bioinformatics. Springer International Publishing AG, 2018*
	2	*Jonathan Pevsner: Bioinformatics and functional genomics. Hoboken : Wiley-Blackwell, 2009.*
	3	*Arthur M Lesk: Introduction to Bioinformatics. Oxford University Pres, 2019*
	4	*Sayood Khalid: Bioinformatics: A One Semester Course. Springer International Publishing AG, 2023*
Supplementary references	1	*Xiaohua Hu Ed. Knowledge discovery in bioinformatics : techniques, methods, and applications. Hoboken : John Wiley a. Sons, 2007.*
	2	*Robert Gentleman: R programming for bioinformatics. Boca Raton : CRC Press : Taylor & Francis, 2009*
	3	*Current scientific publications in the fields of IT and statistical analysis*
	4	*Documentation of the software/tools used during the course.*

Course coordinator	*dr inż. Urszula Wydro*	**Date: 23.02.2026**