Politechnika Białostocka

Szkoła Doktorska

COURSE DESCRIPTION CARD

<table>
<tr><td>Course name</td><td colspan="5">Bioinformatics</td></tr>
<tr><td>Course type</td><td>optional</td><td>Course code</td><td>SDPB0041</td><td>ECTS credits</td><td>2</td></tr>
<tr><td>Forms and number of hours</td><td>lecture: 10 h
laboratory: 10 h</td><td>Scientific discipline</td><td colspan="3">information and communication technology</td></tr>
<tr><td>Course objectives</td><td colspan="5">The aim of the course is to teach how to use modern tools for searching and analyzing biological information. Typical algorithms, computational and statistical methods for solving formal and practical problems arising from the collection and analysis of huge amounts of data from biological experiments will be presented.</td></tr>
<tr><td>Course content</td><td colspan="5">Lecture:
1. Basics of bioinformatics (DNA, RNA, proteins; genes, genome; scope and tasks of bioinformatics)
2. Sequence alignment algorithms (types of alignment; scoring method, using dynamic programming)
3. Searching for similar sequences in databases (FASTA algorithms, BLAST) gene prediction
4. DNA microarrays, gene expression analysis (clustering, classification)
Laboratory:
1. Bioinformatics databases and web services (PubMed, GenBank, Ensemble)
2. Existing tools for sequence analysis in computational biology
3. Use of R and Python language in bioinformatics
4. The Galaxy web platform
5. Large-scale techniques - next generation sequencing (NGS) and microarray data analysis</td></tr>
<tr><td>Teaching methods</td><td colspan="5">• Lecture supported by multimedia tools
• Solving biological problems by computational methods
• Computational experiments using different programming environments, tools and data
• Discussion and consultations</td></tr>
<tr><td>Assessment method</td><td colspan="5">Lecture - written test
Laboratory - tasks to be completed</td></tr>
<tr><td>Symbol of learning outcome</td><td colspan="2">Learning outcomes</td><td colspan="2">Reference to the learning outcomes for the field of study for the 8th level of Polish Qualification</td><td>Methods of assessing the learning outcomes</td></tr>
</table>

		Framework (PRK)	
LO1	Has well-ordered, theoretically grounded general knowledge, including computational methods and databases in the field of molecular biology	SD_W1	Written exam
LO2	Is able to use existing databases and bioinformatic computational tools and implement a bioinformatic algorithm.	SD_U1	Tasks to be done during classes

Student workload (in hours)	
Lecture / laboratory	10 / 10
Consultations	1
The unassisted student work	20
Implementation of project tasks and preparation for and participation in exams/tests	10
Total	**51**
ECTS credits	**2**

Basic references	1. A.D. Baxevanis, G.D. Bader, D.s. Wishart: Bioinformatics, Wiley; 4th edition 2020 2. E. Klipp, W. Liebermeister, C. Wierling, A. Kowald, Systems Biology: a Textbook, Wiley, 2016 3. P.G. Higgs, T.K. Attwood, Bioinformatyka i ewolucja molekularna, Wydawnictwo Naukowe PWN, Warszawa, 2012 4. J. Xiong, Podstawy bioinformatyki, Wydawnictwo Uniwersytetu Warszawskiego, Warszawa, 2011
Supplementary references	1. N. Jabalia, N.J. Lakshimi, Bioinformatics, System Biology and Big Data Analysis: Emerging Trends: Bioinformatics, System Biology and Big Data Analysis, LAP LAMBERT Academic Publishing 2020 2. A.D. Baxevanis, B.F Bioinformatyka. Podręcznik do analizy genów i białek. Ouellette PWN, 2005 3. P. Pawłowski, A. Polański, A. Świerniak, P. Zielenkiewicz (red), Bioinformatyka, Exit 2014
Author of the programme	prof. dr hab. inż. Marek Krętowski, dr inż. Marcin Czajkowski
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