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MODULE DESCRIPTION CARD – SYLLABUS

This module is a part of the Intensive International Education Programs in the field of the … organised at Poznan University of Technology as part of the „IMPACT – Innowacyjne Międzynarodowe Programy w AI, Cyberbezpieczeństwie i Teleinformatyce" project implemented SPINAKER Program of the National Agency for Academic Exchange, financed by the European Social Development Fund 2021–2027 (ESDF).

Module name:	Number of hours:	Lecturer:
Bioinformatics	10	Piotr Formanowicz, Prof.

Module Descriptions:

The module introduces students to selected basic problems of bioinformatics. It explains the idea of bioinformatics and the need to apply methods of computer science and mathematics in biological sciences. The module presents basic concepts and notions of molecular biology necessary for understanding the discussed topics in bioinformatics. The main part of the course covers selected bioinformatics issues related to the analysis of nucleotide sequences as well as complex biological systems.

Purpose of the support under Module:

The overall objective of the Innovative International Education Program in Artificial Intelligence is to help students enter the interdisciplinary fileld of bioinformatics, understand selected fundamental problems and methods of bioinformatics as well as develop skills in applying computer science knowledge in biological sciences.

The specific objective of the module is to provide competencies and promote activities carried out at the Poznań University of Technology in the area of bioinformatics, including:

- basic notions of molecular biology,
- DNA sequencing,
- sequence alignment,
- phylogenetic trees,
- RNA structures,
- complex biological systems,
- DNA computing.

Method of support under Module:

Support within the module is provided with the participation of the instructor and divided into the following elements:

- 6-week self-study program using teaching materials provided by the instructor on the e-learning platform;
- 6 weeks of support from the instructor in the form of online consultations using tools that enable meetings to be held;
- a test to verify the acquisition of competences.

Module-related learning outcomes:

Descriptions of the new competences:

The primary goal of the module is to introduce students to the field of bioinformatics. Participants gain knowledge about basic problems and methods of bioinformatics. They understand how to formulate biological problems as computational computational and how to apply algorithmic and mathematical methods to solve them.

Knowledge:

1. Student has knowledge of basic notions of molecular biology and understands the need to use algorithmic and mathematical methods in biological sciences.
2. Student knows selected fundamental problems of bioinformatics and understands the importance of mathematical models of biological phenomena.
3. Student knows algorithmic approaches to solving biological problems.
4. Student understands the basic concepts and challenges of systems biology.
5. Student understands the idea of using DNA molecules to perform computations.

Skills:

1. Student is able to analyze bioinformatics algorithms.
2. Student is able to formulate biological problems as computational problems.
3. Student is able to apply algorithmic methods to solve biological problems.
4. Student is able to design Petri net-based models of biological systems.
5. Student is able to develop a simple DNA-based algorithm.

Social competences:

1. Student understands that bioinformatics is a rapidly developing interdisciplinary field of science and recognizes the need for continuous learning.
2. Student is prepared to work in interdisciplinary teams and communicate the results of applying algorithmic or mathematical methods in a form accessible to non-experts.
3. Student understands the potential impact of bioinformatics analyses on other fields, such as medicine.

Criteria for verifying learning outcomes

Learning outcomes are assessed using an on-line multiple-choice test that evaluates student's knowledge and understanding of bioinformatics concepts. A minimum of 50% of the answers must be correct to pass.

Method of verification/validation of learning outcomes

Verification is conducted on the basis of an on-line multiple-choice test delivered on the dedicated e-learning platform. The test is conducted individually, without access to supporting materials, and evaluates the extent to which the student has achieved the intended knowledge. The results are automatically recorded and validated according to predefined assessment criteria.

Workload

25 h (including work with teaching materials provided by the lecturer, consultation, and the student's own work) – 1 ECTS point

Level of the European Qualifications Framework