COURSE DESCRIPTION CARD - SYLLABUS

Course name
Geometric biocrystallography [S1Bioinf1>BKG]

Course

Field of study
Bioinformatics

Year/Semester
3/5

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
30

Laboratory classes
30

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

The student should have knowledge of the basics of inorganic and organic chemistry, mathematics and physics. The student should be able to obtain information from literature, databases and other properly selected sources

Course objective

The aim of the course is to learn the basics of crystallography as a scientific field with tools and methods for determining the molecular structure of biologically active molecules. Students will learn basic information about crystalline bodies, gain knowledge of the hierarchy of intermolecular interactions and their role in shaping structures. In addition, they will learn the skills of determining the relationship between the structural structure of a solid and its physicochemical properties.

Course-related learning outcomes

Knowledge:
The graduate knows and understands:
K_W04 issues in the field of chemistry useful for the formulation and solving of simple bioinformatics tasks, covering the basic concepts and laws of chemistry, organic chemistry and biochemistry

K_W19 techniques and methods for the identification of biomolecules and biologically active compounds

Skills:
The graduate is able to:
K_U01 obtain information from literature, databases and other properly selected sources, also in English
K_U04 use analytical methods for the quantitative and qualitative determination of biochemical compounds, evaluate their suitability
K_U05 use basic techniques and laboratory tools to solve problems in the field of bioinformatics, biotechnology and related disciplines, assess their usefulness
K_U07 under the supervision of a research tutor, use analytical, simulation and experimental methods to formulate and solve research tasks

Social competences:
The graduate is ready to:
K_K01 learning throughout life and improving one"s competences
K_K03 determining priorities for the implementation of a task defined by himself or others

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
The knowledge acquired during the lectures is verified by an exam held after the end of the lecture cycle.
The skills acquired in the laboratories are verified on an ongoing basis - short tests.

Programme content

• Application of biocrystallography, perspectives and directions of its development
• Symmetry in the world of crystals and molecules
• Definition of a crystal, unit cell, basic tetrahedron
• Crystallographic geometry: open and closed symmetry, point and space groups, Bravaise cells, parameters describing crystal structures
• Rules for joining symmetry elements, Becke"s degrees of symmetry
• Types of chemical bonds and interactions, coordination polyhedron, crystal types and coordination number
• Orientation and texture in solids and methods of their determination
• Determination of Miller indices of planes and directions, including proteins and nucleic acids
• Protein crystallization process
• Determination and modeling of protein and nucleic acid structures
• Elements of crystallochemistry, structure and classification of protein roll and types of structure of nucleic acids
• The phenomenon of polymorphism of crystalline compounds and the influence on the physicochemical properties
• Relationships between the supermolecular structure and macroscopic properties of biomaterials
• X-ray diffraction on a crystal structure, Bragg diffraction conditions. X-ray diffraction methods. Location and intensity of diffraction reflections.
• Qualitative and quantitative analysis by X-ray diffraction method, application of the PDF-4 database in the identification analysis

Teaching methods

1. Lecture: multimedia presentations illustrated with examples given on the blackboard.
2. Laboratories: practical classes, individual and team work.

Bibliography

Basic
1. J .Dereń, J. Haber, R .Pampuch, Chemia ciała stałego, PWN 1975.
2. Ch. A. Wert, R. M. Thomson, Fizyka ciała stałego, PWN 1974.
3. W. Przygocki, A Włochowicz, Uporządkowanie makrocząsteczek w polimerach i włóknach, WNT 2006.

Additional
1. Von Meerssche, J.Feneau-Dupont, Krystalografia i chemia strukturalna, PWN, 1984.

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	60	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	40	1,50