



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Macromolecular biocrystallography

Course

Field of study

Bioinformatics

Area of study (specialization)

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Level of study

First-cycle studies

Form of study

full-time

Year/Semester

3/5

Profile of study

general academic

Course offered in

Polish

Requirements

elective

Number of hours

Lecture

30

Laboratory classes

30

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

4

Lecturers

Responsible for the course/lecturer:

dr inż. Aleksandra Grzábka-Zasadzińska

Responsible for the course/lecturer:

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Faculty of Chemical Technology

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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 obtain knowledge by students related to the crystallographic structure of solids, the possibilities of controlling the process of crystallization of macromolecules, the spatial



structure of these compounds and the influence of selected parameters on the macrostructure of materials.

Course-related learning outcomes

Knowledge

The graduate knows and understands:

K_W02 problems in the field of mathematics useful for formulating and solving simple bioinformatics tasks, including discrete mathematics, algebra, mathematical analysis, probability calculus and statistics

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_W18 issues in the field of structural bioinformatics and molecular modeling

Skills

The graduate is able to:

K_U01 obtain information from literature, databases and other properly selected sources, also in English

K_U02 integrate and interpret the information obtained, as well as draw conclusions and formulate and justify one's opinions

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:

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, based on tests.

Programme content

The essence of biocrystallography, its importance in the context of biological sciences

Crystalline and amorphous materials, the concept of crystal and crystal lattice



Operations and elements of symmetry, point symmetry, coexistence of symmetry elements, point groups, symmetry of solids and particles

Types of bonds and chemical interactions occurring in macromolecules

Methods of generating X rays, methods of its filtering and detection

X-ray diffraction on crystals - X-ray structural analysis

Interpretation of the results of X-ray structural analysis with the use of databases, numerical methods enabling the analysis of X-ray images

Structure of macromolecule structure based on electron density maps of the atomic model

Basics of crystallization of low and high molecular weight compounds

Shaping the supermolecular structure during synthesis and processing

Morphology and topography of macromolecular compounds

Polymorphism of biologically active substances

Protein expression and purification for crystallography

Protein anatomy, structure of nucleic acids, methods of improving the model of the crystal structure of a protein

Structure and properties of mineral biomaterials and polysaccharides

Possibilities of modeling supermolecular structures in order to design properties of biomaterials

Liquid crystal compounds, the degree of order in liquid crystals, interaction of liquid crystal compounds in an electric field

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	4,0
Classes requiring direct contact with the teacher	60	2,5
Student's own work (literature studies, preparation for laboratory classes, preparation for tests/exam) ¹	40	1,5

¹ delete or add other activities as appropriate