COURSE DESCRIPTION CARD - SYLLABUS

Course name

Macromolecular biocrystallography

Course

Field of study

Bioinformatics

Year/Semester

1/2

Area of study (specialization)

-

Profile of study

general academic

Level of study

Second-cycle studies

Course offered in

Polish

Form of study

full-time

Requirements

compulsory

Number of hours

Lecture

30

Laboratory classes

30

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

5

Lecturers

Responsible for the course/lecturer:

dr inż. Aleksandra Grząbka-Zasadzińska

e-mail: aleksandra.grzabka-zasadzinska@put.poznan.pl

phone +48 61 665 36 05

Faculty of Chemical Technology

Berdychowo 4, 60-965 Poznan

Responsible for the course/lecturer:

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 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_W01 complex biological phenomena and processes, and their interpretation in research and practical activities is based on a strict and consistent approach using empirical data

K_W02 complex physicochemical and biochemical processes, including the principles of the appropriate selection of materials, raw materials, apparatus and devices for their implementation and product characterization

K_W12 development trends in bioinformatics

Skills

The graduate is able to:

K_U01 fluently use and integrate information obtained from literature and electronic sources, in Polish and English, interpret and critically evaluate it

K_U03 perform advanced measurements and laboratory experiments and interpret their results

K_U06, under the supervision of a research tutor, plan and perform research tasks using analytical, simulation and experimental methods

Social competences

The graduate is ready to:

K_K01 lifelong learning, to inspire and organize the learning process of other people

K_K03 determining priorities for the implementation of a task defined by himself or others

K_K06 taking responsibility for the assessment of risks resulting from the research techniques used and for creating safe working conditions

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 examination 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	125	5,0
Classes requiring direct contact with the teacher	60	2,5
Student's own work (literature studies, preparation for laboratory classes, preparation for tests) [1]	65	2,5

[1] delete or add other activities as appropriate