COURSE DESCRIPTION CARD - SYLLABUS

Course name
Molecular biophysics - how physics supports biology

Course

Field of study
Technical Physics

Year/Semester
2/3

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

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

4

Lecturers

Responsible for the course/lecturer:
dr hab. inż. Łukasz Piątkowski, prof. PP

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Wydział Inżynierii Materiałowej i Fizyki Technicznej

Piotrowo 3, 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

Basic knowledge of molecular physics, experimental methods, spectroscopic methods and laser techniques. The student has the ability to think logically, combine facts, analytically assess the suitability of experimental techniques to a given scientific problem. The student understands the need to learn and acquire new knowledge, as well as a broad perception of research problems.

Course objective

Knowledge and understanding of a broad spectrum of physical experimental methods and their relationship to the development of biological sciences.

Course-related learning outcomes

Knowledge

knows the current state of knowledge, research and development in the field of nanotechnology, condensed phase physics, surface physics, electronics, quantum computing, bioelectronics, spintronics, nonlinear and material optics and optoelectronics; has knowledge of technology transfer, K2-W10

selects and can use mathematical and physical models to describe and analyze physical processes and systems important in solving technical tasks, using nonlinear differential equations, partial differential equations, elements of harmonic analysis, mathematical theory of signal analysis and visualization, K2-W01

knows the achievements, challenges and limitations of selected, advanced problems of physics and physicochemistry applicable in modern technologies, K2-W02

Skills

is able to prepare and present in Polish and English a scientific report, an oral presentation and / or a well-documented study on technical physics issues, K2-U03

is able to analyze the concepts of selected, intensively developed new areas of physics, assess their innovation and technical feasibility, K2-U07

Social competences

can think and act in a creative and entrepreneurial way when carrying out an engineering / organizational task, K2-K02

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Self-presentation on the relationship between the research conducted as part of the master's thesis and the topic of the lecture.

Credit based on a test consisting of open questions; the test is passed after obtaining at least 55% of the points. The test is conducted at the end of the semester.

Programme content

Lecture on research methods:

- Detection of single molecules,

- Electron microscopy - cryogenic (cryoelectron microscopy),

- Multiphoton microscopy,

- Imaging of chemical reactions,

- photothermal imaging,

Teaching methods

Lecture: presentations supported by scientific materials in the form of illustrations, films and scientific publications.

Bibliography

Basic

1. Peter Atkins, Julio de Paula, James Keeler; Physical Chemistry 11th Edition; Oxford University Press

2. Jay L. Nadeau; Introduction to experimental biophysics-biological methods for physical scientists 2nd edition; CRC Press

Additional

Internet resources, scientific publications.

Breakdown of average student's workload

	Hours	ECTS
Total workload	30	4,0
Classes requiring direct contact with the teacher	26	3,5
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	4	0,5

[1] delete or add other activities as appropriate