COURSE DESCRIPTION CARD - SYLLABUS

Course name
Biophysics - modern physical methods supporting the development of biology [S2ETI2>BNMFWRB]

Course

Field of study
Education in Technology and Informatics

Year/Semester
2/3

Area of study (specialization)
–

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
30

Laboratory classes
0

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

dr hab. inż. Łukasz Piątkowski prof. PP
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Lecturers

Prerequisites

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

Course objective

Knowledge and understanding of a wide range of physical experimental methods and their relationship to the development of biological research, with particular emphasis on technical aspects.

Course-related learning outcomes

Knowledge:
has in-depth knowledge of physics, chemistry, electronics and other fields necessary to design selected types of devices and systems
has knowledge of the basic measurement methods and techniques used in fields related to the field of study as well as development trends and the most important achievements in the field of experimental

techniques appropriate for the field of study being studied

Skills:
can obtain information from literature, databases and other sources (in the mother tongue and in English), integrate them, interpret and critically evaluate them, draw conclusions and formulate and exhaustively justify opinions,
can assess the usefulness and possibility of using both routine and new experimental techniques in the field of study,

Social competences:
can think and act creatively and enterprisingly

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 conducted at the end of the semester.
Assessment criteria/assessment: in accordance with the study regulations

Programme content

The lecture program covers modern research methods used in the analysis of physical and chemical processes at the micro- and nanoscale. Techniques for detecting single molecules, cryo-electron microscopy, and multiphoton microscopy are discussed. The course also covers chemical and photothermal imaging, as well as advanced pump-probe methods used to study ultrafast phenomena in materials.

Course topics

Lecture on research methods:
- Detection of single molecules,
- Electron microscopy - cryogenic (cryoelectron microscopy),
- Multiphoton microscopy,
- Imaging of chemical reactions,
- photothermal imaging,
- Pump-probe methods: Transient absorption, Frequency sum generation, Ultrafast microscopy.

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	50	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	20	1,00