COURSE DESCRIPTION CARD - SYLLABUS

Course name
Molecular biophysics [S2FT2>BiofizMol]

Course

Field of study
Technical Physics

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
compulsory

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, microscopic and spectroscopic methods and laser techniques. The student is characterised by the ability to think logically, to combine facts, to evaluate analytically the applicability of experimental techniques to a given scientific problem. The student is characterised by an understanding of the need to learn and acquire new knowledge, as well as a broad, interdisciplinary perception of research problems.

Course objective

To learn and understand the broad spectrum of physical experimental methods and how they relate to the development of biological research.

Course-related learning outcomes

Knowledge:
The student:
- is familiar with the current state of knowledge, research and development in nanotechnology, condensed phase physics, surface physics, non-linear optics and materials science; has knowledge of technology transfer,

- selects and is able to apply physical models to describe and analyse physical processes and systems relevant for solving technical tasks,
- has knowledge of the achievements, challenges and limitations of selected advanced physics and physicochemistry topics relevant to modern technology,
- has detailed knowledge of selected branches of modern technology, which enables him/her to understand the operation and construction of selected complex devices and measurement and research systems.

Skills:
The student:
- is able to prepare and present in Polish and English a scientific report, an oral presentation, concerning issues in technical physics,
- is able to analyse concepts of selected, intensively developed new areas of Physics, assess their innovativeness and technical feasibility,
- is able to notice non-technical aspects when formulating and solving engineering tasks in the area of Technical Physics,
- he/she is able to obtain information from literature and databases on physical and technical problems, analyse it critically, integrate it and formulate opinions in the field of Technical Physics.

Social competences:
The student:
- understands the need for and knows the possibilities of continuous training - improving professional, personal and social competences; is aware of the necessity to use expert knowledge when solving engineering tasks in the scope exceeding own competences,
- is able to think and act in a creative and entrepreneurial way.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The following assessment thresholds apply to the methods used to verify the learning outcomes achieved:
50.1-60% dst;
60.1-70% dst+;
70.1-80% db;
80.1-90% db+;
90.1% bdb and above.
Assessment is based on individual written work and/or oral response.

Programme content

Broadly defined spectroscopic and microscopic methods used in biophysics. Discussion of stationary and time-resolved methods. Discussion of the advantages and disadvantages of the various experimental methods in the context of biophysical research.

Course topics

Lecture on research methods:
- Single molecule detection,
- Electron microscopy - cryogenic (cryo-electron microscopy),
- Multiphoton microscopy,
- Chemical reaction imaging,
- Photothermal imaging,
- Pump-probe methods: Transient absorption, Sum frequency 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