GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Photophysics of biological systems, PG_00053322		
Field of study	Biomedical Engineering, Biomedical Engineering		
Date of commencement of studies	February 2026	Academic year of realisation of subject	2025/2026
Education level	second-cycle studies	Subject group	Optional subject group Specialty subject group Subject group related to scientific research in the field of study
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	1	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department Of Physics Of Electronic Phenomena -> Faculty Of Applied Physics And Mathematics -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Marcin Dampc	
	Teachers	dr inż. Marcin Dampc	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	0.0	0.0	15.0	30

E-learning hours included: 0.0

Learning activity and number of study hours

Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
Number of study hours	30	5.0	40.0	75

Subject objectives

The interactions between emectromagnetic radiation and biological systems will be presented and discussed. Biological systems will be represented by wide range of systems from isolated biomolecules to macroscopic sytems. Phenomena of radiation absorption and emission will serve as a foundation for further discussion of photochemistry in biosystems.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U02] can perform tasks related to the field of study as well as formulate and solve problems applying recent knowledge of physics and other areas of science	Is capable of selecting apropriate experimental method for investigated phenomenon and determine the properities of biological systems.	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject
[K7_W02] knows and understands, to an increased extent, selected laws of physics and physical phenomena, as well as methods and theories explaining the complex relationships between them, constituting advanced general knowledge in the field of technical sciences related to the field of study	Advanced knowledge on atomic and molecular excitations enable student to understand processes behind the spectroscopic data from experiment.	[SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge

Subject contents

Radiation interactions with matter. Electronic, vibrational, rotational excitation. Photoionization. Fragmentation. Jabłoński`s diagram. Radiatian emission. Photochemistry. Multiphoton processes. Femtosecond photophysics. Free radicals. Photosynthesis. Radiation demage to DNA. Bioluminescence. Clinical phototherapies.

Prerequisites and co-requisites

Introduction to spectroscopy.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Written assessment	50.0%	50.0%
Seminar	50.0%	50.0%

Recommended reading	Basic literature	1. Z. Kęcki "Introduction to molecular spectroscopy" PWN 1975 2. P. Suppan Chemistry and light, PWN 1997
	Supplementary literature	1. B. Mielewska "Biophysics" Wydawnictwo PG, 2015
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	1. Selection rules for optical transitions. 2. Present and discuss one expamle of bioluminescence 3. Present and discuss one example of photoisomerisation process with practical application in medicine.	
Work placement	Not applicable	

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