

Subject card

Subject name and code	, PG_00165901						
Field of study	Medical Physics						
Date of commencement of studies	October 2024		Academic year of realisation of subject		2024/2025		
Education level	postgraduate studies		Subject group		Obligatory subject group in the field of study Optional subject group		
Mode of study	full-time studies		Mode of delivery		at the university		
Year of study	1		Language of instruction		Polish nie dotyczy		
Semester of study	2		ECTS credits		6.0		
Learning profile	academic		Assessment form				
Conducting unit	Instytut Fizyki Doświadczalnej -> Faculty of Mathematics, Physics and Informatics -> Rektor						
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. Piotr Bojarski				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	30.0	0.0	0.0	0.0	60
	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	60		0.0		0.0	60
Subject objectives	To familiarize students with modern technologies and research trends in selected issues related to biospectroscopy, biodetection, and biomedicine.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[FIZMEDMU2_U06] is able to adapt the knowledge and methodology of physics as well as the experimental and theoretical methods used to related scientific disciplines	The student is able to: - present the laws of physics governing the course of phenomena related to medical physics and related fields of science, - competently formulate opinions on professional issues, - use the scientific achievements of other researchers and other sources of knowledge in an ethical manner - appreciate the role of physics and its contribution to the development of various fields of science - understand the role of experience in natural sciences, is able to determine the appropriate conditions of experiments for selected biomaterials	[SU1] oral statement/conversation/discussion [SU2] presentation/project/paper/report [SU5] implementation of a problem task
	[FIZMEDMU2_W06] has knowledge of current directions in the development of physics, in particular within the chosen specialization	Student -knows and understands the basics of modern experimental methods along with data analysis -understands the principle of operation of typical biosensors using the luminescence phenomenon -understands the influence of other fields of science on the development of medical physics	[SW1] oral statement/conversation/discussion [SW2] presentation/project/paper/report
	[FIZMEDMU2_U05] has the ability to synthesize methods and ideas from various areas of physics and other natural sciences; is able to notice that distant phenomena are sometimes described by similar models	Student: - is able to use knowledge of key models of physical phenomena used in the creation of functional optical biomaterials, - is able to concisely present the laws of physics governing the course of various phenomena in medical physics and related fields, - is able to present the latest scientific achievements related to medical physics and related fields of science in an accessible manner	[SU1] oral statement/conversation/discussion [SU2] presentation/project/paper/report [SU5] implementation of a problem task
Subject contents	Fundamentals of Fluorescence Spectroscopy Selected Natural Biological Absorbers and Fluorophores Selected Biocompatible Molecules and Materials Classical and Non-Standard Measurement Equipment: from UV-Vis Spectroscopy to High Spatial and Time Resolution Microscopy. Characterization of Physicochemical Properties of Selected Biomolecules and Materials. Nanoscale. Single Molecule Spectroscopy and Imaging. Examples of Indicators and Biosensors. Surface Plasmon Resonance (SPR), Plasmon Enhanced Emission (MEF), Plasmon and Directionally Enhanced Emission (SPCE). Electronic Excitation Energy Transfer as a Tool in Biosensing. Enhanced Energy Transfer. Sensitive Detection of Biomolecules, Plasmonic Platforms. Core-Shell Nanoparticles. Applications in Biomaterials and Biomedical Sciences. Drug delivery system. Miniaturization and multifunctionality in measurements. Advantages and disadvantages. Lab on chip.		
Prerequisites and co-requisites	understanding principles of physics		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
		51.0%	50.0%
		51.0%	50.0%

Recommended reading	Basic literature	A.Kawski, Fotoluminescencja roztworów, PWN, 1992. J.R. Lakowicz, Principles of Fluorescence spectroscopy, Plenum Press, 2006 Z.Gryczynski i I.Gryczynski, Practical Fluorescence spectroscopy, CRC Press, 2020 Biofizyka, pod redakcją F. Jaroszyka, Wydawnictwa lekarskie PZWL, 2006. Handbook of Molecular Biophysics, ed. H.G.Bohr, WILEY-VCH Verlag GmbH&Co.KGaA, 2009. A.H-P.Ho, D.Kim, M.G.Somekh, Handbook of Photonics for biomedical Engineering, Springer 2017.
	Supplementary literature	Own materials and data
	eResources addresses	Adresy na platformie eNauczanie:
	Example issues/ example questions/ tasks being completed	nie dotyczy
Work placement	Not applicable	

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