



Subject card

Subject name and code	Optoelectronics, PG_00064791						
Field of study	Mechatronics						
Date of commencement of studies	February 2025		Academic year of realisation of subject			2025/2026	
Education level	second-cycle studies		Subject group			Obligatory subject group in the field of study 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	2		ECTS credits			2.0	
Learning profile	general academic profile		Assessment form			assessment	
Conducting unit	Department of Metrology and Optoelectronics -> Faculty of Electronics, Telecommunications and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Marcin Strąkowski				
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0	0.0	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		4.0		16.0	50
Subject objectives	The course "Optoelectronics" is for students of mechanical and mechatronics faculties to study the phenomena of optics, optical systems, optical and electronic systems integration, to learn about the selected optoelectronic elements, the applications of modern optical measurement methods, detection of optical signals, technological processes, and optical acquisition, transmission, and information processing systems.						
Learning outcomes	Course outcome		Subject outcome			Method of verification	
	[K7_U13] evaluates the feasibility and potential for utilizing new technical and technological achievements in accomplishing tasks characteristic for the field of study		Characterize selected optoelectronic components and measures their interdependencies, correctly identifies and appropriately selects elements of the optoelectronic path, and is capable of constructing basic optoelectronic systems.			[SU1] Assessment of task fulfilment	
	[K7_W01] explains and describes, based on general knowledge in the field of scientific disciplines forming the theoretical foundations of Mechatronics, the construction and principles of operation of mechatronic systems, processes and their components, as well as methods and means of their integration		Understand the optical phenomena that form the basis of optical and optoelectronic systems. They analyze the principles of operation and properties of optoelectronic components and select optoelectronic elements for the configuration of an optoelectronic system.			[SW1] Assessment of factual knowledge	
	[K7_W12] identifies and interprets the main developmental trends and significant new achievements in the field of engineering and technical sciences and disciplines relevant to the course of study		know and is able to utilize the latest solutions in the field of optoelectronic systems, particularly light sources, detectors, and elements of the optical signal transmission path. They possess up-to-date knowledge of contemporary optoelectronic measurement systems.			[SW1] Assessment of factual knowledge	

Subject contents	<ol style="list-style-type: none">1. Optoelectronic system and components2. Methods of optical radiation description, radiometry, photometry. Radio- and photometric units.3. Light guiding in an optical system. Light interactions with matter, absorption, transmission and reflection coefficients.4. Optical scattering phenomena in optical media5. Boundary effects in light transmission, Fresnel equations6. The phenomenon of optical interference.7. Interferometers, filters8. Fabry-Pérot resonator9. Applications of interferometry10. Light sources: thermal, EL, VF, LED11. Lasers, conditions for the laser beam emission.12. Properties of the laser beam, types of lasers, applications.13. Laser diodes, construction, principle of operation, parameters, characteristics, applications14. Optical detectors, thermal and photon detectors (PMT, PIN, APD, CCD, CMOS), properties, characteristics, applications15. Work safety with optical systems16. Optical systems for visualization of information17. Construction and classification of optical fibers18. Basic parameters of optical fibers: numerical aperture, acceptance angle, attenuation19. Optical fiber with a stepwise refractive index profile20. Dispersion in optical fibers, influence on transmission properties21. Optical fiber with a gradient refractive index profile22. Optical transmission of signals23. Mono-mode optical fiber, its properties24. Optical reflectometry OTDR25. Passive optical elements26. Designing optoelectronic systems27. New trends and achievements in optoelectronics		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Laboratory exercises	50.0%	40.0%
	Tests during the semester	50.0%	60.0%
Recommended reading	Basic literature	<ol style="list-style-type: none">1. J. Siuzdak: Systemy i sieci fotoniczne, 20092. B. Ziętek: Optoelektronika, 20113. G. Einarsson: Podstawy telekomunikacji światłowodowej, 19984. BEA Saleh, MC Teich: Fundamentals of Photonics, 2007	
	Supplementary literature	<ol style="list-style-type: none">1. M. Born, E. Wolf: Principles of optics : electromagnetic theory of propagation, interference and diffraction of light, 19992. W. Drexler, JG. Fujimoto: Optical Coherence Tomography, 20153. S. Kasap: Optoelectronics and Photonics (2nd ed.), 20124. A.W. Rogalski, Z. Bielecki: Detekcja sygnałów optycznych, 2020	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none">1. The principles of the light beam and methods for their characterization.2. The phenomena of optical interference and its metrological applications.3. Lights source and their features.4. Lasers: types, constructions, features, and applications.5. Optical detectors, their types, constructions, and features.6. The influence on optical beam propagation of fiber dispersion.7. Fibers: types, features, and applications		
Work placement	Not applicable		

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