



Subject card

Subject name and code	Optoelectronics, PG_00057030						
Field of study	Mechatronics						
Date of commencement of studies	February 2023		Academic year of realisation of subject		2023/2024		
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		dr inż. Marcin Strąkowski dr inż. Adam Mazikowski				
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, transmtion, and information processing systems.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K7_W10] knows development trends and most important new achievements in technical sciences and science disciplines: Mechanical Engineering, Automation, Electronics and Electrical Engineering and related: Informatics and Materials Engineering		Student knows and is able to apply the latest solutions in the field of optoelectronic systems, in particular light sources, detectors and components of optical guide systems. Has up-to-date knowledge of modern optoelectronic measurement systems.		[SW1] Assessment of factual knowledge		
	[K7_W04] has detailed, supported by the theory knowledge in terms of electronic circuits, microelectronics and optoelectronics		Student knows the optical phenomena that are the basis for the operation of optical and optoelectronic systems. Analyzes the principles of operation and properties of optoelectronic elements. He/She is able to choose optoelectronic elements for the configuration of the optoelectronic system.		[SW1] Assessment of factual knowledge		
	[K7_U06] is able to evaluate feasibility and possibility of application of new achievements (technical and technological) in terms of mechatronics		Student acquires and analysis the characteristics of optoelectronic components in time and spectral (frequency) domain, as well as finds relations and correlations between them. He/She is able to design and develop a basic optoelectronic systems.		[SU1] Assessment of task fulfilment		

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	No other requirements		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Tests during the semester	50.0%	60.0%
	Laboratory exercises	50.0%	40.0%
Recommended reading	Basic literature	<ol style="list-style-type: none">1. J. Siuzdak: Systemy i sieci fotoniczne, 20092. B. Ziętek: Optoelektronika, 20053. G. Einarsson: Podstawy telekomunikacji światłowodowej, 19984. BEA Saleh, MC Teich: Fundamentals of Photonics, 20075. S. Kasap: Optoelectronics and Photonics, 2001	
	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, 2007	
	eResources addresses	Adresy na platformie eNauczanie: Optoelektronika, WIMiO, Mechatronika II st., sem.02 - 23/24 (PG_00057030) - Moodle ID: 29052 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=29052	
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		