GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Optoelectronic Components and Circuits, PG_00048095
Field of study	Electronics and Telecommunications

Date of commencement of studies	October 2023	Academic year of realisation of subject	2026/2027
Education level	first-cycle studies	Subject group	Optional 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	4	Language of instruction	Polish
Semester of study	7	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 hab. inż. Paweł Wierzba
	Teachers	dr hab. inż. Paweł Wierzba

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	15.0	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	2.0	18.0	50

Subject objectives	Provision of knowledge about the principles of operation and key characteristics of selected optoelectronic components and skills needed for correct use of these components and for design of circuits emplying these components.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_W32] Knows the parameters, functions and methods of analysis, design and optimization of analogue and digital circuits and electronic systems	knows principle of operation of semiconductor sources and detectors of optical radiation, encoders and optocouplers, as well as the circuits working with them; designs circuits working with photodiodes, circuits powering LEDs and laser diodes, as well as selected circuits using optical isolation	[SW1] Assessment of factual knowledge
	[K6_U06] can analyse the operation of components, circuits and systems related to the field of study, measure their parameters and examine technical specifications	can perform the analysis of operation of semiconductor sources and detectors of optical radiation, encoders and optocouplers, as well as the circuits working with them.	[SU3] Assessment of ability to use knowledge gained from the subject [SU5] Assessment of ability to present the results of task

Subject contents	1. Photon and thermal detectors. Spectral characteristics and transduction mechanisms 2. PIN and PN photodiodes design, principles of operation, important electrical and spectral characteristics 3. Detection setups using photodiodes 4. Phototransistors and photoresistors 5. Light Emitting Diodes principles of operation, materials 6. Selected designs of LEDs. Coupling to optical fibres 7. Driving circuits for LEDs. Intensity modulation 8. Optocouplers and optoisolators principles of operation, main types 9. Characteristics and applications of optocouplers 10. Laser diodes principles of operation 11. Light propagation mechanisms in laser diodes 12. Overview of laser diode designs. Fabry-Perot laser diodes structure and characteristics 13. DFB and DBR Laser diodes structures, characteristics wavelength tuning 14. Superluminescent diodes structure and characteristics 15. Remote control systems information coding, implementations 16. Remote control systems example implementations 17. Data transmission using the IrDA standards. Information encoding 18. Design of circuits interfacing to detectors 19. Design of circuits interfacing to light sources 20. Design of circuits using optocouplers
Prerequisites and co-requisites	Command of English at a level sufficient to use technical documemntation

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Midterm colloquium	51.0%	50.0%
	Project	50.0%	50.0%

Recommended reading	Basic literature	1. T. H. Wilmshurst, Signal recovery from noise in electronic instrumentation, Taylor and Francis, 1990 2. M. Niedźwiecki, M. Rsiukiewicz, NIeliniowe elektroniczne układy analogowe, WNT Warszawa 1991 3. S.O. Kasap, Optoelectronics and Photonics 2nd ed., Pearson Education, 2013 4. P.Horowitz, W. Hill, The art of electronics, 3rd ed. Cambridge University Press 2015. 5. Z. Bielecki, A. Rogalski, Detekcja sygnałów optycznych, wyd. 2, WNT Warszawa 2019
	Supplementary literature	No requirements
	eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed	
Work placement	Not applicable