



## Subject card

Subject name and code	Optoelectronic Components and Circuits, PG_00048095						
Field of study	Electronics and Telecommunications						
Date of commencement of studies	October 2022	Academic year of realisation of subject			2025/2026		
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 employing these components.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[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.			[SU5] Assessment of ability to present the results of task [SU3] Assessment of ability to use knowledge gained from the subject		
	[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		

Subject contents	<ol style="list-style-type: none"> <li>1. Photon and thermal detectors. Spectral characteristics and transduction mechanisms</li> <li>2. PIN and PN photodiodes design, principles of operation, important electrical and spectral characteristics</li> <li>3. Detection setups using photodiodes</li> <li>4. Phototransistors and photoresistors</li> <li>5. Light Emitting Diodes principles of operation, materials</li> <li>6. Selected designs of LEDs. Coupling to optical fibres</li> <li>7. Driving circuits for LEDs. Intensity modulation</li> <li>8. Optocouplers and optoisolators principles of operation, main types</li> <li>9. Characteristics and applications of optocouplers</li> <li>10. Laser diodes principles of operation</li> <li>11. Light propagation mechanisms in laser diodes</li> <li>12. Overview of laser diode designs. Fabry-Perot laser diodes structure and characteristics</li> <li>13. DFB and DBR Laser diodes structures, characteristics wavelength tuning</li> <li>14. Superluminescent diodes structure and characteristics</li> <li>15. Remote control systems information coding, implementations</li> <li>16. Remote control systems example implementations</li> <li>17. Data transmission using the IrDA standards. Information encoding</li> <li>18. Design of circuits interfacing to detectors</li> <li>19. Design of circuits interfacing to light sources</li> <li>20. Design of circuits using optocouplers</li> </ol>											
Prerequisites and co-requisites	Command of English at a level sufficient to use technical documentation											
Assessment methods and criteria	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">Subject passing criteria</th> <th style="width: 33%;">Passing threshold</th> <th style="width: 33%;">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td>Project</td> <td>50.0%</td> <td>50.0%</td> </tr> <tr> <td>Midterm colloquium</td> <td>51.0%</td> <td>50.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Project	50.0%	50.0%	Midterm colloquium	51.0%	50.0%
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Recommended reading	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 45%;">Basic literature</td> <td colspan="2" data-bbox="804 732 1487 981"> <ol style="list-style-type: none"> <li>1. T. H. Wilmshurst, Signal recovery from noise in electronic instrumentation, Taylor and Francis, 1990</li> <li>2. M. Niedźwiecki, M. Rsiukiewicz, Nieliniowe elektroniczne układy analogowe, WNT Warszawa 1991</li> <li>3. S.O. Kasap, Optoelectronics and Photonics 2nd ed., Pearson Education, 2013</li> <li>4. P.Horowitz, W. Hill, The art of electronics, 3rd ed. Cambridge University Press 2015.</li> <li>5. Z. Bielecki, A. Rogalski, Detekcja sygnałów optycznych, wyd. 2, WNT Warszawa 2019</li> </ol> </td> </tr> <tr> <td>Supplementary literature</td> <td colspan="2" data-bbox="804 987 1487 1010">No requirements</td> </tr> <tr> <td>eResources addresses</td> <td colspan="2" data-bbox="804 1016 1487 1048">Adresy na platformie eNauczenie:</td> </tr> </table>			Basic literature	<ol style="list-style-type: none"> <li>1. T. H. Wilmshurst, Signal recovery from noise in electronic instrumentation, Taylor and Francis, 1990</li> <li>2. M. Niedźwiecki, M. Rsiukiewicz, Nieliniowe elektroniczne układy analogowe, WNT Warszawa 1991</li> <li>3. S.O. Kasap, Optoelectronics and Photonics 2nd ed., Pearson Education, 2013</li> <li>4. P.Horowitz, W. Hill, The art of electronics, 3rd ed. Cambridge University Press 2015.</li> <li>5. Z. Bielecki, A. Rogalski, Detekcja sygnałów optycznych, wyd. 2, WNT Warszawa 2019</li> </ol>		Supplementary literature	No requirements		eResources addresses	Adresy na platformie eNauczenie:	
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Example issues/ example questions/ tasks being completed												
Work placement	Not applicable											

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