



## Subject card

Subject name and code	Electroluminescent diodes, PG_00031963						
Field of study	Technical Physics						
Date of commencement of studies	February 2024	Academic year of realisation of subject			2024/2025		
Education level	second-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	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 Physics of Electronic Phenomena -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Waldemar Stampor				
	Teachers		dr hab. inż. Waldemar Stampor				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	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	LED basics and design of LEDs						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K7_W03] Has general knowledge of current development paths and discoveries in the scope of physics and related fields of science and technology.		Knows physical principles of electroluminescence		[SW1] Assessment of factual knowledge		
	[K7_W05] Knows the theoretical basis of the functioning of physical scientific equipment.		Knows the physical principles of operation of devices to determine the technical parameters of LEDs		[SW1] Assessment of factual knowledge		

Subject contents	<ol style="list-style-type: none"> <li>1. Types of luminescence.</li> <li>2. From CRTs to OLEDs, or on modern flat panel TV displays.</li> <li>3. EL diodes - history.</li> <li>4. Recombination of electron-hole pairs. Radiative and non-radiative transitions</li> <li>5. LED basics - electrical properties. p-n junction.</li> <li>6. LED basics - optical properties,</li> <li>7. Light extraction from EL diodes.</li> <li>8. Design of LEDS and technical details.</li> <li>9. EL diodes - photometry and colorimetry.</li> <li>10. Organic light emitting diodes (OLEDs).</li> <li>11. White LEDs.</li> <li>12. EL diodes versus laser diodes..</li> </ol>											
Prerequisites and co-requisites	<p>Basic quantum mechanics.</p> <p>Introduction to solid state physics.</p>											
Assessment methods and criteria	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 40%;">Subject passing criteria</th> <th style="width: 30%;">Passing threshold</th> <th style="width: 30%;">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td>written test</td> <td>50.0%</td> <td>100.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	written test	50.0%	100.0%			
Subject passing criteria	Passing threshold	Percentage of the final grade										
written test	50.0%	100.0%										
Recommended reading	<table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td style="width: 45%;">Basic literature</td> <td colspan="2" data-bbox="799 1267 1487 1473"> <ol style="list-style-type: none"> <li>1. E.Fred Schubert, Light emitting diodes, Cambridge University Press, Cambridge 2006.</li> <li>2. M. Schwoerer and H.C. Wolf, Organic Molecular Solids, Wiley VCH, Weinheim, 2007, chapter 11.</li> </ol> </td> </tr> <tr> <td>Supplementary literature</td> <td colspan="2" data-bbox="799 1473 1487 1536"> <ol style="list-style-type: none"> <li>1. Jan Kalinowski, Organic light-emitting diodes, Marcel Dekker, New York 2005.</li> </ol> </td> </tr> <tr> <td>eResources addresses</td> <td colspan="2" data-bbox="799 1536 1487 1576">Adresy na platformie eNauczanie:</td> </tr> </tbody> </table>			Basic literature	<ol style="list-style-type: none"> <li>1. E.Fred Schubert, Light emitting diodes, Cambridge University Press, Cambridge 2006.</li> <li>2. M. Schwoerer and H.C. Wolf, Organic Molecular Solids, Wiley VCH, Weinheim, 2007, chapter 11.</li> </ol>		Supplementary literature	<ol style="list-style-type: none"> <li>1. Jan Kalinowski, Organic light-emitting diodes, Marcel Dekker, New York 2005.</li> </ol>		eResources addresses	Adresy na platformie eNauczanie:	
Basic literature	<ol style="list-style-type: none"> <li>1. E.Fred Schubert, Light emitting diodes, Cambridge University Press, Cambridge 2006.</li> <li>2. M. Schwoerer and H.C. Wolf, Organic Molecular Solids, Wiley VCH, Weinheim, 2007, chapter 11.</li> </ol>											
Supplementary literature	<ol style="list-style-type: none"> <li>1. Jan Kalinowski, Organic light-emitting diodes, Marcel Dekker, New York 2005.</li> </ol>											
eResources addresses	Adresy na platformie eNauczanie:											
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> <li>1. (e-h) pair recombination mechanisms in EL diodes.</li> <li>2. Parameters which determine quantum EL efficiency.</li> <li>3. Types of white light generation in EL diodes.</li> </ol>											
Work placement	Not applicable											