



## Subject card

Subject name and code	Selected Topics in Applied Optics, PG_00048690						
Field of study	Electronics and Telecommunications						
Date of commencement of studies	February 2027	Academic year of realisation of subject			2027/2028		
Education level	second-cycle studies	Subject group			Optional subject group Specialty 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			exam		
Conducting unit	Metrology and Electronic Systems Department -> Faculty of Electronics Telecommunications and Informatics -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Jerzy Pluciński					
	Teachers	dr hab. inż. Jerzy Pluciński					
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	15.0	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	The aim of the course is to provide knowledge on applied optics with emphases in the wave nature of light, the phenomenon of polarization of light and the ability to apply that knowledge to the analysis of the optical beam propagation through selected optical elements.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_U12] is able, to an increased extent, to analyze the operation of components and systems related to the field of study, as well as to measure their parameters and study their technical characteristics, and to plan and carry out experiments related to the field of study, including computer simulations, interpret the obtained results and draw conclusions	He analyzes the effect of optical parameters of lenses on Gaussian beam transmission through optical elements. He analyzes the impact of the rotation of polarizers and retarders on the state of polarization of light after passing through the polarizing and depolarizing elements.	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools
	[K7_U02] can perform tasks related to the field of study as well as formulate and solve problems applying recent knowledge of physics and other areas of science	He finds the parameters of the Gaussian beam after passing through the optical elements. He calculates the state of polarization of light after passing through polarizing and depolarizing elements.	[SU1] Assessment of task fulfilment
	[K7_W02] knows and understands, to an increased extent, selected laws of physics and physical phenomena, as well as methods and theories explaining the complex relationships between them, constituting advanced general knowledge in the field of technical sciences related to the field of study	He knows the definition of wave optics, the concept of analytical signal, the relationship between rays and wave fronts, knows when it is used, knows the Gaussian beam concept and its properties, the concept of confocal parameter and Rayleigh range, narrowing point, beam diameter and Gaussian beam constraint diameter. He knows the Guoy effect. He knows the concepts of non-polarized, fully polarized and partially polarized light and methods for describing the state of polarization.	[SW1] Assessment of factual knowledge
[K7_W03] knows and understands, to an increased extent, the construction and operating principles of components and systems related to the field of study, including theories, methods and complex relationships between them and selected specific issues - appropriate for the curriculum	He knows the effects and influence of optical elements on the Gaussian parameters changes. He knows the methods of analysis of changes in the polarization state of optical radiation after passing through optical elements.	[SW1] Assessment of factual knowledge	
Subject contents	<p>Course content – lecture</p> <ol style="list-style-type: none"> <li>1. Wave optics postulates, relationships between rays and wavefronts, complex amplitude, complex wavefunction, intensity, analytic signal.</li> <li>2. Paraxial Helmholtz equation.</li> <li>3. Gaussian beam and its properties.</li> <li>4. Parameters of Gaussian beam intensity, beam radius, waist radius, beam divergence, Rayleigh range, phase retardation, radius of curvature of the wavefront.</li> <li>5. Guoy phase effect and its consequences.</li> <li>6. Propagation of Gaussian beam through optical elements.</li> <li>7. Polarization optics polarized, nonpolarized, and partial polarized light, linearly polarized light, circularly polarized light.</li> <li>8. Description of polarized light by Jones vector.</li> <li>9. Matrix representation of polarization devices by the Jones matrix.</li> <li>10. Description of partially polarized light by Stokes vector.</li> <li>11. Matrix representation of polarization devices by the Mueller matrix.</li> <li>12. Description of partially polarized light using the Poincare sphere.</li> <li>13. Description of partially polarized light by coherency matrix.</li> </ol>		
Prerequisites and co-requisites	No requirements		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written exam	50.0%	50.0%
	Midterm colloquium	50.0%	50.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. J. K. Jabczyński: Podstawy optyki stosowanej. WAT, Warszawa, 2006.</li> <li>2. F. Ratajczyk: Dwójtomność i polaryzacja optyczna. Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław, 2000.</li> <li>3. B. E. A. Saleh, M. C. Teich: Fundamentals of Photonics, 2nd Edition. John Wiley &amp; Sons, New York, 2007.</li> <li>4. F. L. Pedrotti, L. S. Pedrotti: Introduction to Optics. Prentice-Hall International, Inc., New York, 1997.</li> <li>5. E. Hecht: Optics, 4th Edition. Addison Wesley, New York, 2001.</li> </ol>	
	Supplementary literature	No requirements	

	eResources addresses	
Example issues/ example questions/ tasks being completed		
Practical activities within the subject	Not applicable	

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