GDAŃSK UNIVERSITY OF TECHNOLOGY

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 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	exam			
Conducting unit	Department of Metrology and Optoelectronics -> Faculty of Electronics, Telecommunications and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Jerzy Pluciński				
	Teachers		dr hab. inż. Jerzy Pluciński				
Lesson types and methods of instruction	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_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
[K7_U06] can analyse the operation of components, circuits and systems related to the field of study; measure their parameters; examine technical specifications; interpret 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.	[SU4] Assessment of ability to use methods and tools [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_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

Subject contents

1. Wave optics postulates, relationships between rays and wavefronts, complex amplitude, complex wavefunction, intensity, analytic signal.
2. Paraxial Helmholtz equation.
3. Gaussian beam and its properties.
4. Parameters of Gaussian beam intensity, beam radius, waist radius, beam divergence, Rayleigh range, phase retardation, radius of curvature of the wavefront.
5. Guoy phase effect and its consequences.
6. Propagation of Gaussian beam through optical elements.
7. Polarization optics polarized, nonpolarized, and partial polarized light, linearly polarized light, circularly polarized light.
8. Description of polarized light by Jones vector.
9. Matrix representation of polarization devices by the Jones matrix.
10. Description of partially polarized light by Stokes vector.
11. Matrix representation of polarization devices by the Mueller matrix.
12. Description of partially polarized light using the Poincare sphere.
13. Description of partially polarized light by coherency matrix.

Prerequisites and co-requisites

No requirements

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Midterm colloquium	50.0%	50.0%
Written exam	50.0%	50.0%

Recommended reading

Basic literature	1. J. K. Jabczyński: Podstawy optyki stosowanej. WAT, Warszawa, 2006. 2. F. Ratajczyk: Dwójłomność i polaryzacja optyczna. Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław, 2000. 3. B. E. A. Saleh, M. C. Teich: Fundamentals of Photonics, 2nd Edition. John Wiley & Sons, New York, 2007. 4. F. L. Pedrotti, L. S. Pedrotti: Introduction to Optics. Prentice-Hall International, Inc., New York, 1997. 5. E. Hecht: Optics, 4th Edition. Addison Wesley, New York, 2001.
Supplementary literature	No requirements
eResources addresses	Adresy na platformie eNauczanie:

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