



## Subject card

Subject name and code	Optical Measurement Techniques, PG_00048097						
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			3.0		
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 inż. Maciej Wróbel				
	Teachers		dr inż. Maciej Wróbel				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	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		3.0		42.0	75
Subject objectives	Provision of knowledge and abilities in the field of key optical measurement methods used in the industry and science.						
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 analyse operation of optical interferometers and optoelectronic distance measurement systems.		[SU1] Assessment of task fulfilment		
	[K6_W31] Knows the definitions of measurement error and uncertainty, measurement methods, including digital methods of time, frequency and phase measurements, transducer properties and knows digital signal processing systems.		estimates measurement uncertainty in interferometric measurement setups an optoelectronic distance measurement systems		[SW1] Assessment of factual knowledge		
Subject contents	<ol style="list-style-type: none"> <li>1. Overview of optical measurement methods</li> <li>2. Transfer function of two-beam interferometers</li> <li>3. Limitations of classic interferometers</li> <li>4. Transfer function of multiple-beam interferometers</li> <li>5. Visibility and coherence in interferometry</li> <li>6. Heterodyne detection</li> <li>7. Operation of interferometers with synthetic wavelength</li> <li>8. Interferometers using birefringent components</li> <li>9. Polarization microinterferometers Fourier-Transform Spectroscopes (FTIR)</li> <li>10. Characterization of optical setups using interferometric methods</li> <li>11. Interferometric measurement of distance</li> <li>12. Interferometric measurement of vibrations</li> <li>13. Interferometric measurement of wavelength</li> <li>14. Polarimetry and ellipsometry</li> <li>15. Time-of-flight measurement of distance and surface profiling</li> <li>16. Optoelectronic circuits for time-of-flight measurement</li> <li>17. Pulsed Time-of-Flight measurement</li> <li>18. Time-of-Flight measurement using Amplitude Modulated signal</li> <li>19. Main sources of error in Time-of-Flight measurement</li> <li>20. Low-coherence reflectometry</li> <li>21. Non-contact temperature measurement</li> </ol>						

Prerequisites and co-requisites	No requirements		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Practical exercise	51.0%	60.0%
	Midterm colloquium	51.0%	40.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. P.K. Rastogi, Optical Measurement Techniques and Applications, Artech Book House, 1998</li> <li>2. F Ratajczyk, Dwójłomność i polaryzacja optyczna, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2000</li> <li>3. M. Pluta, Mikrointerferometria w świetle spolaryzowanym, WNT Warszawa 1991</li> <li>4. M. Born, E. Wolf, Principles of Optics, np. 6th Edition, Pergamon Press, Oxford 1993</li> </ol>	
	Supplementary literature	No requirements	
	eResources addresses		
Example issues/ example questions/ tasks being completed	<p>Discuss the operation principles of a selected interferometer using wavefront division</p> <p>Discuss the operation principles of a selected interferometer using amplitude division</p> <p>Present the operation principles of Time-of -Flight setups</p>		
Work placement	Not applicable		