GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Optical Sensors and Advanced Measurement Methods II, PG_00048687		
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	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	0.0	0.0	15.0	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	4.0	16.0	50

Subject objectives	Provision of knowledge and abilities in the field of analysis, use and design of selected types of optical fiber sensors, networks of these sensors and distributed optical fiber sensors.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[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	can analyse operation of sensors and networks of sensors using fiber Bragg gratings and distributed polarimetric sensors using polarization mode coupling; performs analysis of operation of phase-sensitive detection circuits and circuits using spectral analysis techniques; measures parameters and characteristics of circuits using phase-sensitive detection and spectral analysis;	[SU1] Assessment of task fulfilment
[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.	knows and understands coupled-mode theory, description methods of the state of polarization, operation of fiber Bragg gratings and polarization-maintaining and polarizing fibers;	[SW3] Assessment of knowledge contained in written work and projects
[K7_U03] can design, according to required specifications, and make a complex device, facility, system or carry out a process, specific to the field of study, using suitable methods, techniques, tools and materials, following engineering standards and norms, applying technologies specific to the field of study and experience gained in the professional engineering environment	Designs optical fiber sensors and sensor networks using fiber Bragg gratings; Designs distributed polarimetric optical fiber sensors using polarization mode coupling; Designs measurement circuits using phase-sensitive detection and spectal analysis detection techniques;	[SU1] Assessment of task fulfilment
[K7_W06] Knows and understands, to an increased extent, the basic processes taking place in the life cycle of devices, facilities and technical systems.	knows and understands propagation of polarization modes in optical fibers; knows and understands propagation of optical radiation in fiber Bragg gratings; knows and understands factors influencing accuracy, resolution and drift of optical fiber sensors and measurement setup using phase-sensitive detection;	[SW3] Assessment of knowledge contained in written work and projects
[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	knows and understands coupled-mode theory, description methods of the state of polarization;	[SW3] Assessment of knowledge contained in written work and projects

Subject contents

1. Interferometric sensors of selected physical quantities using advanced detection methods.
2. Optical fibre sensors using Fibre Bragg Gratings.
3. Optical fibre sensors using optical fibre DFB lasers.
4. Polarimetric sensors.
5. Light propagation in intensity sensors.
6. Light propagation in microbending sensors.
7. Sensors using polarization mode coupling.
8. Disturbances in optical sensors.

Prerequisites and co-requisites

Pass grade from Optical Sensors and Advanced Measurement Methodas

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
reports	51.0%	40.0%
design of a sensor/network of sensors	51.0%	60.0%

Recommended reading

Basic literature	1. T. Pustelny: Physical and technical aspects of optoelectronic sensors, Wyd. Polit. Śląskiej, Gliwice 2005 2. Z. Kaczmarek: Światłowodowe czujniki i przetworniki pomiarowe, Agenda Wydawnicza PAK, Warszawa 2006 3. P. Rastogi, Optical Measurement Techniques and Applications, Artech House, London, 1997 4. R. B. Dyot, Elliptical Fiber Waveguides, Artech House, London, 1995
Supplementary literature	No requirements

	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	Design a network of N fiber Bragg grating sensors for temperature measurement Design a network of N fiber Bragg grating sensors for temperature measurement	
Work placement	Not applicable	