



Subject card

Subject name and code	Fundamentals of Optical Fibers, PG_00048078						
Field of study	Electronics and Telecommunications						
Date of commencement of studies	October 2026	Academic year of realisation of subject				2028/2029	
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	3	Language of instruction				Polish	
Semester of study	5	ECTS credits				5.0	
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		prof. dr hab. inż. Małgorzata Szczerska				
	Teachers		prof. dr hab. inż. Małgorzata Szczerska				
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	30.0	0.0	0.0	60
	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	60		5.0		60.0	125
Subject objectives	The aim of this subject is to introduce the fiber optic technology to the students.						
Learning outcomes	Course outcome		Subject outcome			Method of verification	
	[K6_U03] can design, according to required specifications, and make a simple 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					[SU1] Assessment of task fulfilment	
	[K6_W02] knows and understands, to an advanced extent, selected laws of physics and physical phenomena as well as methods and theories explaining the complex relationships between them, constituting the basic general knowledge in the field of technical sciences related to the field of study					[SW1] Assessment of factual knowledge	
	[K6_W03] knows and understands, to an advanced 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					[SW1] Assessment of factual knowledge	

Subject contents	<p>Course content – lecture</p> <p>1. Principles of electromagnetic, wave and geometric optics 2. Classification of optical waveguides: planar and optical fibers 3. Geometrical theory of planar waveguide 4. Mode structure of radiation in optical fibers 5. Wave equation of step-index optical fiber 6. Modes HH_mn, EH_mn, LP_mn and their properties 7. Gradient-index optical fibers. Optimization of refractive index profile. 8. Mode coupling and its influence on transmission properties 9. Single-mode optical fiber and its properties 10. Chromatic dispersion of optical fibers. 11. Polarization dispersion of optical fibers. 12. Optical and electrical band of optical fiber. Transfer function of single mode optical fiber. 13. Types of single-mode fibers: SF, DSF, NZDSF. 14. Compensation of chromatic dispersion in optical fiber systems 15. Multiplexing methods of fiber transmission: OTDM, DWDM. 16. Regeneration of optical signals. Block diagram of regenerator. 17. Optical fiber amplifiers for L and C band. 18. Basic configuration of optical fiber telecommunication systems. 19. Design of fiberoptic systems. Power budget, transmission range. 20. Non-linear phenomena in optical fibers. Elastic and non-elastic scattering. 21. Optical solitons types and conditions of their formation. 22. Passive components used in fiberoptic systems. 23. Connection of optical waveguides. 24. Reflectometric measurements of fiberoptic systems. 25. Mode coupling in periodical structures. 26. Optical fiber Bragg gratings types, characteristics, applications. 27. Construction of optical cables. Dark fibers. 28. Installation of optical cables technical requirements. 29. Measurements of optical cables. Documentation of optical links. 30. Recent trends in optical fiber systems.</p>		
Prerequisites and co-requisites	No requirements		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written exam	50.0%	60.0%
	Practical exercise	50.0%	40.0%
Recommended reading	Basic literature		<p>J.C. Palais, "Fiber optic communications", Prentice Hall, New York, 2005 K. Perlicki, "Pomiary w optycznych systemach telekomunikacyjnych", WKiŁ Warszawa 2002 G. Einarsson, "Podstawy telekomunikacji światłowodowej", WKiŁ Warszawa 1998 J.C. Palais, "Zarys telekomunikacji światłowodowej", WKiŁ, Warszawa, 1998 J.E. Midwinter, Y.L. Guo, "Optoelectronic and Lightwave Technology", John Wiley & Sons 1992 M. Marciniak, "Łączność światłowodowa", WKiŁ Warszawa 1998 B.E.A. Saleh, M.C. Teich, "Fundamentals of Photonics", 2nd Edition, John Wiley & Sons, New York, 2007 J.E. Midwinter, "Światłowody telekomunikacyjne", WNT Warszawa 1983 A. Majewski, "Teoria i projektowanie światłowodów", WNT Warszawa 1991 J. Siuzdak, "Wstęp do współczesnej telekomunikacji światłowodowej", WKiŁ Warszawa 1997 W. van Etten, J. van der Plaats, "Fundamentals of Optical Fiber Communications", Prentice Hall 1991 J.E. Midwinter, Y.L. Guo, "Optoelektronika i technika światłowodowa", WKiŁ Warszawa 1995 J. Wilson, J.F.B. Hawkes, "Optoelectronics. An Introduction", Prentice Hall International 1983</p>
	Supplementary literature		No requirements
	eResources addresses		
Example issues/ example questions/ tasks being completed			
Practical activities within the subject	Not applicable		

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