GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Fundamentals of Optical Fibers, PG_00048078						
Field of study	Electronics and Telecommunications						
Date of commencement of studies	October 2024		Academic year of realisation of subject	2026/2027			
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	Department of Metrology and Optoelectronics -> Faculty of Electronics, Telecommunications and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. inż. Małgorzata Szczerska				
	Teachers		prof. dr hab. inż. Małgorzata Szczerska				
Lesson types and methods of instruction	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_U06] can analyse the operation of components, circuits and systems related to the field of study, measure their parameters and examine technical specifications		[SU1] Assessment of task fulfilment
[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

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 HHmn, EHmn, LPmn 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.

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	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 wspólczesnej 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
Supplementary literature	No requirements

	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	