

。 GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Optical systems for automatic diagnostics and process monitoring, PG_00062774							
Technologies for Industry 5.0							
October 2024		Academic year of realisation of subject			2026/2027		
first-cycle studies		Subject group			Obligatory subject group in the field of study		
					Subject group related to scientific research in the field of study		
Full-time studies		Mode of delivery			at the university		
3		Language of instruction			Polish		
6		ECTS credits			4.0		
general academic profile		Assessment form			exam		
Department of Metrology and Optoelectronics -> Faculty of Electronics, Telecommunications and Informatic						and Informatics	
Subject supervisor		dr hab. inż. Ro	obert Bogdano	wicz			
Teachers							
					t		SUM 45
hours	10.0	0.0	10.0	10.0		0.0	
E-learning hours included: 0.0							
Learning activity					Self-study		SUM
Number of study hours	45		5.0		50.0		100
The aim of the course is to acquire basic knowledge of optical monitoring and diagnostic methods in industrial systems. Students will learn to use optical methods to build diagnostic systems. In addition, the aim is to acquire the ability to correctly use the learned methods to design and implement basic diagnostic systems adapted to industry.							
Course out	come	Subj	ect outcome			Method of ve	erification
processes, utilized devices and systems, has knowledge regarding selected processes monitoring tools		Student is able to deal with measurement errors and implement calibration and validation techniques. Communicates effectively, clearly and unambiguously, describes activities and communicates the results and opinions of the specialist engineer, using appropriate communication methods and tools, taking into account the specificities of optical solutions.			[SW1] Assessment of factual knowledge		
unambiguously conveys information, describes activities and communicates their results and opinions of a specialist engineer using appropriate communication methods and tools [K6_U02] identifies and solves problems related to signal processing and transmission, integrates measurement and control systems, manages		phenomena occurring during optical diagnostics of a technological process and processes taking place in the life cycle of optical devices and systems, critically evaluates the functioning of existing solutions in the field of optical systems for automatic diagnostics and monitoring of industrial processes. The student has a working knowledge of technological processes and monitoring tools using optical techniques.			[SK3] Assessment of ability to organize work [SU4] Assessment of ability to use methods and tools		
	Technologies for Indu October 2024 first-cycle studies Full-time studies 3 6 general academic pro Department of Metrol Subject supervisor Teachers Lesson type Number of study hours E-learning hours inclu Learning activity Number of study hours The aim of the course industrial systems. St aim is to acquire the systems adapted to in <u>Course out</u> [K6_W05] demonstra knowledge related to processes, utilized d systems, has knowle regarding selected p monitoring tools [K6_K03] effectively, unambiguously conv information, describe and communicates th and opinions of a spe engineer using appre communication meth [K6_U02] identifies a processing and trans integrates measurem control systems, mar electronic systems in	Technologies for Industry 5.0 October 2024 first-cycle studies first-cycle studies 3 6 general academic profile Department of Metrology and Optoe Subject supervisor Teachers Lesson type Lecture Number of study hours 15.0 E-learning hours included: 0.0 Learning activity Participation in classes includ plan Number of study hours 45 The aim of the course is to acquire to industrial systems. Students will lear aim is to acquire the ability to correc systems adapted to industry. Course outcome [K6_W05] demonstrates practical knowledge related to technological processes, utilized devices and systems, has knowledge regarding selected processes monitoring tools [K6_K03] effectively, clearly and unambiguously conveys information, describes activities and communicates their results and opinions of a specialist engineer using appropriate communication methods and tools [K6_U02] identifies and solves problems related to signal processing and transmission, integrates measurement and	Technologies for Industry 5.0 October 2024 Academic y realisation first-cycle studies Subject grownelling Full-time studies Mode of determine studies Full-time studies Mode of determine studies G ECTS cred general academic profile Assessmer Department of Metrology and Optoelectronics -> Fa Subject supervisor dr hab. inz. R Teachers Image: Studies included: 0.0 Learning hours included: 0.0 Learning hours included: 0.0 Learning nours included: 0.0 Image: Students will learn to use optica aim is to acquire the ability to correctly use the lear systems adapted to industry. Course outcome Subj Information, describes activities and systems, has knowledge regarding selected processes monitoring tools Student is ability and oprices and validation technological processes monitoring tools IK6_K03] effectively, clearly and unambig activities and oprices and transmission, inclearches activities and oprices and transmission, inclearches activities and oprices and transmission, inclearches activities and oprices are and communicate the inclear or systems in the context	Technologies for Industry 5.0 October 2024 Academic year of realisation of subject first-cycle studies Subject group Full-time studies Mode of delivery 3 Language of instruction 6 ECTS credits general academic profile Assessment form Department of Metrology and Optoelectronics -> Faculty of Electr Subject supervisor dr hab. inž. Robert Bogdano Teachers Elearning hours included: 0.0 Lesrning activity Participation in didactic classes included in study plan Number of study hours Participation in didactic classes included in study plan Number of study hours 45 5.0 The aim of the course is to acquire basic knowledge of optical motindustrial systems. Students will learn to use optical methods to b aim is to acquire the ability to corrective use the learned methods to systems adapted to industry. Course outcome Student is able to deal with measurement errors and processes utilized devices and systems, has knowledge regarding selected processes monitoring tools The student interprets the phenomena occurring during appropriate communication and validation techniques. (K6_U02] identifies and solves processes and pointions of a specialit engineer, using appropriate communication methods and tools, taking in acount the special devices and systems, riti	Technologies for Industry 5.0 October 2024 Academic year of realisation of subject first-cycle studies Subject group Full-time studies Mode of delivery 3 Language of instruction 6 ECTS credits general academic profile Assessment form Department of Metrology and Optoelectronics -> Faculty of Electronics, T Subject supervisor dr hab. in2. Robert Bogdanowicz Teachers Elesson type Lesson type Lecture Lesson type Lecture Participation in didactic plan Consultation hours Filearning activity Participation in didactic consultation hours plan Number of study hours 45 Number of study plan 5.0 The aim of the course is to acquire basic knowledge of optical monitoring industrial systems. Students will learn to use optical methods to build diagam is to acquire the ability to correctly use the learned methods to design systems adapted to industry. Course outcome Student is able to deal with knowledge related to technological processes monitoring tools K6_W03] effectively, clearly and unambiguously, describes activities and communicates the results and opinions of a specialist engineer, using appropriate communication methods and tools, taking into account the specificities o	Technologies for Industry 5.0 Academic year of realisation of subject 2026/ October 2024 Academic year of realisation of subject 2026/ first-cycle studies Subject group Oblig, field of Subject first-cycle studies Mode of delivery at the 3 Language of instruction Polish 6 ECTS credits 4.0 general academic profile Assessment form exam Department of Metrology and Optoelectronics -> Faculty of Electronics, Telecom Subject supervisor dr hab. inz. Robert Bogdanowicz Teachers Its.0 0.0 15.0 15.0 Lesson type Lecture Tutorial Laboratory Project Number of study 15.0 0.0 15.0 50.0 hours Students will learn to use optical methods to build diagnostic aim is to acquire basic knowledge of optical monitoring and dia industrial systems. Students will learn to use optical methods to build diagnostic am is to acquire the ability to correctly use the learned methods to design and in systems adapted to industry. 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Robert Bogdanowicz Teachers Iso 0.0 15.0 0.0 Learning nours included: 0.0 Learning nours included: 0.0 E-learning nours included: 0.0 Self-study Learning activity Participation in didactic classes included in study plan Portical monitoring and diagnostic methods to build diagnostic methods to usid diagnostic systems. In a final striat systems. Students will learn to use optical methods to build diagnostic systems in a admis to acquire basic knowledge of optical monitoring and diagnostic methods to design and implement bas systems adapted to industry. Student is able to deal with knowledge (K6_K03) effectively, clearly and numarbiguously. describes and systems, has knowledge regarding selected processes utilized devices and systems, ortically evaluates the firctives; and systems, ortically evaluates the firctives and sy

Subject contents							
	1, Measuring techniquesBasic measurement parameters obtained using optical methodsImportance and application in industry.2 Spectroscopy IIntroduction to spectroscopy.Near-infrared (NIR), mid-infrared (MIR), Raman spectroscopy,Applications and significance.3 Spectroscopy IIMultiple linear regression (MLR).Fluorescence spectroscopy.UV/Vis spectroscopy.Comparison and applications.Interpretation and applications.4 Vision optical methodsVision systemsImage processing techniques.Pattern recognition in an industrial context.5 Measurement errors and uncertaintyCommon sources of error.Calibration and validation.						
Prerequisites and co-requisites							
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade				
	Project	59.0%	20.0%				
	Laboratory	50.0%	40.0%				
	Lecture	50.0%	40.0%				
Recommended reading	Basic literature	Wyd. Polit. Śląska, Gliwice 2009 czujniki i przetworniki pomiarow transducers), Publishing House Pattern Recognition and Machir Observation and control in dyna Naukowo Dydaktyczne Akadem 2007.Jackson, J.E., A User's Gr Interscience (New York), 1991. Cholewa, W. Process Diagnosti intelligence, applications. Wyda Warszawa 2002.Korbicz J., Koś master control of processes. Im Wydawnictwa Naukowo Technie	Pustelny: Physical and technical aspects of optoelectronic sensors, d. Polit. Śląska, Gliwice 2005 Z. Kaczmarek: Światłowodowe niki i przetworniki pomiarowe (Optical fibre sensors and sducers), Publishing House PAK, Warsaw 2006Bishop C. M. ern Recognition and Machine Learning. Springer, 2006.Byrski, W. iervation and control in dynamic systems. Uczelniane Wydawnictwa kowo Dydaktyczne Akademii Górniczo Hutniczej w Krakowie, 7.Jackson, J.E., A User's Guide to Principal Components, Wiley- rscience (New York), 1991.Korbicz, J., Kościelny, J, Kowalczuk, Z., lewa, W. Process Diagnostics. Models, methods of artificial lligence, applications. Wydawnictwa Naukowo Techniczne, 'szawa 2002.Korbicz J., Kościelny J.M. Modelling, diagnostics and ster control of processes. Implementation in the DiaSter system. Jawnictwa Naukowo Techniczne, Warszawa 2009.				
	eResources addresses	Cambridge, Massachusetts London, England 2010. Berthold, M. Hand, D. J. Intelligent data analysis, an intruduction. Springer, 1999. Bishop C. M. Neural Networks for Pattern Recognition. Oxford University Press, New York 1995. Haykin, S. Neural Networks. A Comprehensive Foundation, Prentice Hall, 1999. Venkatasubramanian, V., Rengaswamy, R., Kavuri, S.N. and Yin, K., A review of process fault detection and diagnosis Part I, Part II, Part I: Computers and Chemical Engineering 27, 2003. Adresy na platformie eNauczanie:					
_		Adresy na platformie eNauczar	ne:				
Example issues/ example questions/ tasks being completed	n/a						
Work placement	Not applicable						

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