



Subject card

Subject name and code	Monitoring and Diagnosis in Control Systems, PG_00038292						
Field of study	Automation, Robotics and Control Systems						
Date of commencement of studies	October 2026	Academic year of realisation of subject			2026/2027		
Education level	second-cycle studies	Subject group			Specialty subject group Subject group related to scientific research in the field of study		
Mode of study	Part-time studies	Mode of delivery			at the university		
Year of study	1	Language of instruction			Polish		
Semester of study	2	ECTS credits			4.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Faculty of Electrical and Control Engineering -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Michał Grochowski				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	20.0	0.0	20.0	0.0	0.0	40
	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	40	10.0		50.0	100	
Subject objectives	Gain knowledge related with data driven monitoring and diagnosis system within the area of control systems. The use of computational intelligence methods to build diagnostic models. Learn how to properly use known methods for the design and implementation of basic diagnostic systems.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K7_K06] is aware of the impact of engineering activities on the quality of applied solutions and the environment	Not related to the subject of the course.			[SK5] Assessment of ability to solve problems that arise in practice		
	[K7_U05] is able to select equipment and take electrical measurements, is able to use ICT information and communication technology to carry out engineering tasks involving devices, systems and automation and robotics systems	Selects appropriate information and communication techniques for the implementation of diagnostic systems.			[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools		
	[K7_U10] is able to apply the known mathematical tools and methods and computer techniques to analyse and evaluate automation and robotics components, devices, systems and systems	Designs and implements simple diagnostic systems. On the basis of the conducted research, the student is able to draw conclusions.			[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools		
	[K7_W05] has knowledge of artificial intelligence computing techniques, inference, learning and solution-finding methods in algorithmic terms applied to automation and robotics systems	Designs and implements simple diagnostic systems. He uses selected methods of computational intelligence in the projects. He uses the software tool: Matlab/Simulink at an advanced level. On the basis of the conducted research, he knows how to draw conclusions.			[SW3] Assessment of knowledge contained in written work and projects		

Subject contents	Course content – lecture Data acquisition systems in control systems. Data processing. Process monitoring and diagnosis. Data driven models in process diagnosis. Multivariable Processes Analysis. Computational intelligence methods. Actuators and measuring devices fault diagnosis. Early fault and anomalies detection systems. Fault tolerance control systems.		
	Course content – laboratory Development and analysis of a diagnostic system for selected industrial equipment and processes. Development and implementation of a decision support system for user detection and authorisation (face recognition system).		
Prerequisites and co-requisites	Knowledge of the following subjects: Mathematics, Numerical Methods, optimization and decision making, Methods of artificial intelligence, the Methods and basis of identification and Modeling and identification		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Laboratory	50.0%	40.0%
	Lecture test	50.0%	20.0%
	Exam	50.0%	40.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. Bishop C. M. Pattern Recognition and Machine Learning. Springer, 2006.</li> <li>2. Byrski, W. Obserwacja i sterowanie w systemach dynamicznych. Uczelniane Wydawnictwa NaukowoDydaktyczne Akademii GórniczoHutniczej w Krakowie, 2007.</li> <li>3. Jackson, J.E., A User's Guide to Principal Components, Wiley-Interscience (New York), 1991.</li> <li>4. Korbicz, J., Kościelny, J, Kowalczyk, Z., Cholewa, W. Diagnostyka procesów. Modele, metody sztucznej inteligencji, zastosowania. Wydawnictwa Naukowo Techniczne, Warszawa 2002.</li> <li>5. Korbicz J., Kościelny J.M. Modelowanie, diagnostyka i sterowanie nadrzędne procesami. Implementacja w systemie DiaSter. Wydawnictwa Naukowo Techniczne, Warszawa 2009.</li> </ol>	
	Supplementary literature	<ol style="list-style-type: none"> <li>1. Alpaydin, E. Introduction to Machine Learning. The MIT Press Cambridge, Massachusetts London, England 2010.</li> <li>2. Berthold, M. Hand, D. J. Intelligent data analysis, an intruduction. Springer, 1999.</li> <li>3. Bishop C. M. Neural Networks for Pattern Recognition. Oxford University Press, New York 1995.</li> <li>4. Haykin, S. Neural Networks. A Comprehensive Foundation, Prentice Hall, 1999.</li> <li>5. 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.</li> </ol>	
	eResources addresses		
Example issues/ example questions/ tasks being completed	<p>- Describe in detail the algorithm for building the PCA model and explain how it is used for process diagnosis.- List and describe the steps in the process of diagnosis using data-driven methods. Give any example illustrating another of these steps.- Sketch and briefly describe the essence of support vector machines (SVMs). Highlight the support vectors in the figure.- What effect(s) can we expect when we use PCA models to diagnose strongly nonlinear processes ?</p>		
Practical activites within the subject	Not applicable		

Document generated electronically. Does not require a seal or signature.