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 2023	Academic year of realisation of subject	2023/2024
Education level	second-cycle studies	Subject group	Optional 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	Department of Control Systems Engineering -> Faculty of Electrical and Control Engineering

Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Michał Grochowski
	Teachers	

Lesson types and methods of instruction	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						
	Adresy na platformie eNauczanie:						

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_W05	Student 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
	K7_U10	Student 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_U05	The student 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

Subject contents	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.
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
	Exam	50.0%	40.0%
	Lecture test	50.0%	20.0%
	Laboratory	50.0%	40.0%

Recommended reading	Basic literature	1. Bishop C. M. Pattern Recognition and Machine Learning. Springer, 2006. 2. Byrski, W. Obserwacja i sterowanie w systemach dynamicznych. Uczelniane Wydawnictwa Naukowo–Dydaktyczne Akademii Górniczo–Hutniczej w Krakowie, 2007. 3. Jackson, J.E., A User's Guide to Principal Components, Wiley-Interscience (New York), 1991. 4. Korbicz, J., Kościelny, J, Kowalczuk, Z., Cholewa, W. Diagnostyka procesów. Modele, metody sztucznej inteligencji, zastosowania. Wydawnictwa Naukowo Techniczne, Warszawa 2002. 5. Korbicz J., Kościelny J.M. Modelowanie, diagnostyka i sterowanie nadrzędne procesami. Implementacja w systemie DiaSter. Wydawnictwa Naukowo Techniczne, Warszawa 2009.
	Supplementary literature	1. Alpaydin, E. Introduction to Machine Learning. The MIT Press Cambridge, Massachusetts London, England 2010. 2. Berthold, M. Hand, D. J. Intelligent data analysis, an intruduction. Springer, 1999. 3. Bishop C. M. Neural Networks for Pattern Recognition. Oxford University Press, New York 1995. 4. Haykin, S. Neural Networks. A Comprehensive Foundation, Prentice Hall, 1999. 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.
	eResources addresses	
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	