GDAŃSK UNIVERSITY OF TECHNOLOGY

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 2024	Academic year of realisation of subject	2024/2025
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		
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_K06] is aware of the impact of engineering activities on the quality of applied solutions and the environment		
[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	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
[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	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_W05] has knowledge of artificial intelligence computing techniques, inference, learning and solution-finding methods in algorithmic terms applied to automation and robotics systems	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

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.

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="3">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</td></tr>
<tr><td>Assessment methods and criteria</td><td colspan="3"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Laboratory</td><td>50.0%</td><td>40.0%</td></tr>
<tr><td>Lecture test</td><td>50.0%</td><td>20.0%</td></tr>
<tr><td>Exam</td><td>50.0%</td><td>40.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">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.</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">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.</td></tr>
<tr><td>eResources addresses</td><td colspan="2"></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3"></td></tr>
<tr><td>Work placement</td><td colspan="3">Not applicable</td></tr>
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