GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Process Diagnostics, PG_00047517		
Field of study	Automatic Control, Cybernetics and Robotics		
Date of commencement of studies	February 2024	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	Full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	English
Semester of study	1	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Decision Systems and Robotics -> Faculty of Electronics, Telecommunications and Informatics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Tomasz Białaszewski	
	Teachers	dr inż. Tomasz Białaszewski	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	0.0	0.0	15.0	30

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	30	4.0	16.0	50

Subject objectives

Familiarization with modern methods of diagnostics of industrial processes

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W21] Knows and understands, to an advanced extent, methods and techniques of design and operation of automatic control systems, control and robotics systems, as well as the use of computers in the control and monitoring of dynamic objects	understands and knows the algorithmic methods of process diagnostics	[SW1] Assessment of factual knowledge
[K7_W03] Knows and understands, to an increased 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.	The student understands the structure and principles of operation of components and systems, including theories, methods and relationships between them, as well as other selected specific issues	[SW1] Assessment of factual knowledge

Subject contents

Fault detection methods: the control of process parameters, examination of limitations (credibility, alarm limits, trends), analysis of signals; control compounds (redundancy, feedback, deterministic and statistical compounds) modeling methods, quality models, fuzzy and neural; Methods and tools for fault location: elements of description of the object and diagnosing system (state of an object, process variables, diagnostic signals, relationship fault-symptoms, binary matrices, arrays of states, isolability, diagnosis), redundancy in hardware, logic, observers (diagnostic systems/banks, observation with unknown inputs, systems robustness), equations and spaces parity (residua, directivity, parity/balance equations), pattern recognition (classical methods of classification, neural classifiers), binary diagnostic matrix (expert knowledge, reasoning, serial, diagnostic trees, contradiction symptoms, parallel reasoning) , Bayesian theory (conditional probability, probabilistic inference) Information System (relationship-damaging symptoms, assessment of multivalent, distinctness, reasoning parallel and serial, reduced systems), fuzzy logic (evaluation of residues, fuzzy inference, fuzzy relationship Diagnostic, fuzzy neural networks).

Prerequisites and co-requisites

Knowledge of core and direction subjects for Automation and Robotic s is sufficient.

<table>
<tr><td>Assessment methods and criteria</td><td colspan="2"><table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>Application report methods</td><td>50.0%</td><td>100.0%</td></tr></table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>J.M. Kościelny: Diagnostyka Zautomatyzowanych Procesów Przemysłowych, Akademicka Oficyna Wydawnicza EXIT, Warszawa 2001

J. Korbicz, J.M. Kościelny, Z. Kowalczuk, W. Cholewa: Fault Diagnosis: Models, Artificial Intelligence, Applications, Springer, Berlin 2004</td></tr>
<tr><td>Supplementary literature</td><td>B.D.O. Andersson, J.B. Moore: Optimal Filtering, Prentice-Hall, Englewood Cliffs 1979</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:
Process Diagnostics - summer semester 2023/2024 - Moodle ID: 38507
https://enauczanie.pg.edu.pl/moodle/course/view.php?id=38507</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">Research within the scope of fault detection methods: the control of process parameters, examination of limitations (credibility, alarm limits, trends), analysis of signals; control compounds (redundancy, feedback, deterministic and statistical compounds) modeling methods, quality models, fuzzy and neural; Methods and tools for fault location: elements of description of the object and diagnosing system (state of an object, process variables, diagnostic signals, relationship fault-symptoms, binary matrices, arrays of states, isolability, diagnosis), redundancy in hardware, logic, observers (diagnostic systems/banks, observation with unknown inputs, systems robustness), equations and spaces parity (residua, directivity, parity/balance equations), pattern recognition (classical methods of classification, neural classifiers), binary diagnostic matrix (expert knowledge, reasoning, serial, diagnostic trees, contradiction symptoms, parallel reasoning) , Bayesian theory (conditional probability, probabilistic inference) Information System (relationship-damaging symptoms, assessment of multivalent, distinctness, reasoning parallel and serial, reduced systems), fuzzy logic (evaluation of residues, fuzzy inference, fuzzy relationship Diagnostic, fuzzy neural networks).</td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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