



## Subject card

Subject name and code	Process Diagnostics, PG_00048461						
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			Polish		
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		The student understands the methods and techniques of design and operation of automatic control systems and control and robotics, as well as the use of computers in the control and monitoring of dynamic objects		[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation		
	[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 degree of construction and operating principles of components and systems, including theories, methods and relationships between them, as well as other selected specific issues		[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation		
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 Robotics is sufficient.						

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Application report methods	50.0%	100.0%
Recommended reading	Basic literature	<p>J.M. Kościelny: <i>Diagnostyka Zautomatyzowanych Procesów Przemysłowych</i>, Akademicka Oficyna Wydawnicza EXIT, Warszawa 2001</p> <p>J. Korbicz, J.M. Kościelny, Z. Kowalczyk, W. Cholewa: <i>Fault Diagnosis: Models, Artificial Intelligence, Applications, Springer</i>, Berlin 2004</p>	
	Supplementary literature	<p>B.D.O. Andersson, J.B. Moore: <i>Optimal Filtering</i>, Prentice-Hall, Englewood Cliffs 1979</p> <p>B.C. Kuo: <i>Automatic Control Systems</i>. Prentice-Hall, Englewood Cliffs 1987</p>	
	eResources addresses	<p>Adresy na platformie eNauczenie:  Diagnostyka Procesów - 2024 - Moodle ID: 38508  <a href="https://enauczenie.pg.edu.pl/moodle/course/view.php?id=38508">https://enauczenie.pg.edu.pl/moodle/course/view.php?id=38508</a></p>	
Example issues/ example questions/ tasks being completed	<p>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).</p>		
Work placement	Not applicable		