



Subject card

Subject name and code	Intelligent Measurement Systems, PG_00047448						
Field of study	Automatic Control, Cybernetics and Robotics						
Date of commencement of studies	February 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	Full-time studies		Mode of delivery		at the university		
Year of study	1		Language of instruction		English		
Semester of study	2		ECTS credits		2.0		
Learning profile	general academic profile		Assessment form		exam		
Conducting unit	Department of Decision Systems and Robotics -> Faculty of Electronics, Telecommunications and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Jakub Wszolek				
	Teachers		dr inż. Jakub Wszolek				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	15.0	0.0	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	The aim of the course is to acquaint students with methods of building a smart computer measuring systems. The student becomes familiar with the interfaces used widely in automation of measurement. The course design students use the acquired knowledge in practice. The projects relate to actual implementation of the measurement system.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[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.	Understanding and appropriate use of distributed processing to analyze measurement data.	[SW1] Assessment of factual knowledge
	[K7_W01] Knows and understands, to an increased extent, mathematics to the extent necessary to formulate and solve complex issues related to the field of study.	A deeper knowledge of the currently used methods of mathematical analysis of measurement data. The theory of rule-based systems. Mathematical methods of classification.	[SW2] Assessment of knowledge contained in presentation
	[K7_U03] can design, according to required specifications, and make a complex device, facility, system or carry out a process, specific to the field of study, using suitable methods, techniques, tools and materials, following engineering standards and norms, applying technologies specific to the field of study and experience gained in the professional engineering environment	Practical learning of measuring interfaces by designing and building a measuring track based on the Arduino / Raspberry Pi platform.	[SU1] Assessment of task fulfilment
	[K7_U21] can individually carry out an in-depth analysis of controlling, diagnostics and signal processing problems; and, to an advanced extent, is able to individually design, tune and operate automatic regulation, control and robotics systems; and use computers to control and monitor dynamic systems	The student is able to design a measurement data analysis system. Has knowledge of measurement interfaces used in industry and the possibilities of their mutual integration.	[SU3] Assessment of ability to use knowledge gained from the subject
	[K7_U04] can apply knowledge of programming methods and techniques as well as select and apply appropriate programming methods and tools in computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study, making assessment and critical analysis of the prepared software as well as a synthesis and creative interpretation of information presented with it	Getting a practical knowledge of algorithms for the verification of measurement data by designing and implementing an analytical system.	[SU3] Assessment of ability to use knowledge gained from the subject
Subject contents	<p>1. Introduction 2. The configuration and structure of the measuring system 3. Accuracy of measurement and dynamic measurement systems 4. Noise generated within the measuring devices 5. Interference generated in the measuring line 6. The computer measurement systems a. The architecture of the machine b. Bus and rail c. The bus Universal Serial Bus USB and IEEE-1394 7. Components measuring systems a. Structure of computerized measuring system b. Digital-to-analog and analog-to-digital c. Measurement systems interfaced. Computer measurement cards and virtual instruments 8. Scattered wired measurement systems a. The CAN interface i. General, bus, messages ii. The structure of the CAN module c. Characteristics of the system and protocol PROFIBUS-DP b. System Interface PROFIBUS c. The interface MicoLAN 9. Measuring systems in the network a. Network Ethernet b. The IEEE 802.11 wireless network 10. Measurement systems on the LAN a. Measuring systems on an Ethernet network interface converters b. Measuring systems on the LAN as an interface bus c. Measuring systems on the Internet 11. The system architecture aggregating measurement data a. Database as a reservoir for storing data and. TCP / IP stack i. The data link and physical layer network and. the relational model ii. Model nierzeczyjny iii. hierarchical model 12. Methods of measurement data mining</p>		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	lecture	50.0%	50.0%
	project	50.0%	50.0%

Recommended reading	Basic literature	<ul style="list-style-type: none"> • Eckel, B., Thinking in Java, 2010 • http://www.jboss.org/get-started/ • http://playground.arduino.cc/Code/WebClient • http://www.dropwizard.io/ • https://www.arduino.cc/en/Guide/HomePage
	Supplementary literature	<ul style="list-style-type: none"> • Automotive Industry Action Group (AIAG), Measurement Systems Analysis (MSA), 2010 • Pratap Misra, Per Enge, Global Positioning System: Signals, Measurements, and Performance • A.F.P van Putten, Electronic Measurement Systems: Theory and Practice
	eResources addresses	Adresy na platformie eNauczanie: Intelligent Measurement Systems - Moodle ID: 34860 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=34860
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	