GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Intelligent Measurement Systems, PG_00048473		
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	Polish
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 Wszołek	
	Teachers	dr inż. Jakub Wszołek	

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_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 has the ability to analyze the results of the project. Student is able to assess the legitimacy of choosing a specific group of algorithms.	[SU3] Assessment of ability to use knowledge gained from the subject
[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	Student designs and implements his own measurement and diagnostic system.	[SU4] Assessment of ability to use methods and tools
K7_U04	The student is introduced to available tools and development libraries. Ready-to-use cloud services (AWS, GCP) for integration with metering systems (MQTT) are also presented. Performance analysis of distributed queuing systems is performed.	[SU3] Assessment of ability to use knowledge gained from the subject
[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.	Student uses machine learning to solve prediction and classification problems in measurement systems.	[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.	Student describes problems related to the construction of distributed measurement systems. Student understands the mechanism of aggregation and analysis of measurement data. The student has knowledge of components included in the architecture of the intelligent measuring system.	[SW2] Assessment of knowledge contained in presentation

Subject contents

1. Introduction2. The configuration and structure of the measuring system3. Accuracy of measurement and dynamic measurement systems4. Noise generated within the measuring devices5. Interference generated in the measuring line6. The computer measurement systemsa. The architecture of the machineb. Bus and rail PCc. The bus Universal Serial Bus USB and IEEE-13947. Components measuring systemsa. Structure of computerized measuring systemb. Digital-to-analog and analog-to-digitalc. Measurement systems interfaced. Computer measurement cards and virtual instruments8. Scattered wired measurement systemsa. The CAN interfacei. General, bus, messagesii. The structure of the CAN moduleand. Characteristics of the system and protocol PROFIBUS-DPb. System Interface PROFBUSc. The interface MicoLAN9. Measuring systems in the networka. Network Ethernethb. The IEEE 802.11 wireless network10. Measurement systems on the LANa. Measuring systems on an Ethernet network interface convertersb. Measuring systems on the LAN as an interface busc. Measuring systems on the Internet11. The system architecture aggregating measurement dataa. Database as a reservoir for storing dataand. TCP / IP stacki. The data link and physical layer networkand. the relational modelii. Model nierelacyjnyiii. hierarchical model12. Methods of measurement data mining

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
lecture	50.0%	60.0%
project	50.0%	40.0%

Recommended reading

Basic literature

- Measurement Systems, Ernest Doebelin, 2019

	Supplementary literature	• http://www.jboss.org/get-started/ • http://playground.arduino.cc/Code/WebClient • http://www.dropwizard.io/ • https://www.arduino.cc/en/Guide/HomePage
	eResources addresses	Adresy na platformie eNauczanie: Inteligentne Systemy Pomiarowe - Moodle ID: 34861 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=34861
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	