GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Introduction to Internet of Things, PG_00054484		
Field of study	Automation, Robotics and Control Systems		
Date of commencement of studies	February 2024	Academic year of realisation of subject	2024/2025
Education level	second-cycle studies	Subject group	
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	2	Language of instruction	Polish
Semester of study	3	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Faculty of Electrical and Control Engineering		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Robert Smyk	
	Teachers	dr inż. Robert Smyk	

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

Address on the e-learning platform: https://enauczanie.pg.edu.pl/moodle/course/view.php?id=11783

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	8.0	12.0	50

Subject objectives

The objective of this course is to introduce students to the fundamental concepts of **Internet of Things (IoT) systems**, including **typical architectures, hardware and software design principles**, and the structural aspects of **edge devices**. Students will gain foundational knowledge of **IoT system design and operation** and acquire basic programming skills in a **dedicated IoT development environment**.

Specific Objectives:

1. Understanding the concept of the **Internet of Things** and its applications.
2. Learning about **typical IoT system architectures** and their components.
3. Getting familiar with **hardware design techniques** used in IoT.
4. Introduction to **software development and communication** in IoT systems.
5. Understanding the **construction and functionality of edge devices**.
6. Acquiring practical **programming skills in a dedicated IoT environment**.
7. Introduction to **security and data management** in IoT systems.

Learning outcomes

Course outcome	Subject outcome	Method of verification
K7_U07	He knows the basics of working in the IDE programming environment	[SU4] Assessment of ability to use methods and tools
K7_W11	He can program the elementary method of data transfer using the selected protocol	[SW3] Assessment of knowledge contained in written work and projects
K7_W06	He knows the basic architectures of IoT systems	[SW1] Assessment of factual knowledge
K7_U04	Analyzes the technical data contained in the documentation of the electronic module	[SU2] Assessment of ability to analyse information
K7_U03	Can prepare an raport	[SU1] Assessment of task fulfilment

Subject contents	**Fundamental Concepts of IoT** • Definition and significance of the Internet of Things. • Examples of IoT applications in various fields (industry, healthcare, smart cities). • Characteristics and key features of smart devices. **Principles of IoT System Design** • Layered structure of IoT systems. • Key components of IoT systems: edge devices, communication networks, data processing platforms. **IoT System Architectures** • Overview of selected IoT architectures. • Communication models and their applications in distributed systems. **Communication in IoT Systems** • Basic methods of data exchange between IoT devices. • Overview of communication technologies used in IoT. **IoT System Programming** • Basics of inter-process programming. • Introduction to real-time operating systems (OS/RTOS) in IoT. • Code optimization for performance and resource efficiency. **Cloud Computing and Data Analysis in IoT** • Fundamentals of cloud-based data processing in IoT. • Data analysis and visualization in IoT systems. • Integration with IoT platforms. **Security in IoT Systems** • Key security threats in IoT. • Methods for securing communication and data storage. • Encryption and authentication of IoT devices. **IoT System Optimization** • Efficient resource and performance management in IoT systems. • Strategies for improving reliability and energy efficiency. • Use of modern technologies to enhance IoT effectiveness.
Prerequisites and co-requisites	Basics of microprocessor technology, operating systems, basics of programming, computer networks

Assessment methods and criteria

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

Recommended reading

Basic literature	1. Giacomo Veneri , Antonio Capasso , Hands-On Industrial Internet of Things: Create a powerful Industrial IoT infrastructure using Industry 4.0, Packt Publishing; 1st edition (November 29, 2018) 2. Dr Kamlesh Lakhwani , Dr Hemant Kumar Gianey , Joseph Kofi Wireko, Internet of Things (IoT): Principles, Paradigms and Applications of IoT, BPB Publications; 1st edition (February 27, 2020) 3. Samuel Greengard, The Internet of Things (The MIT Press Essential Knowledge series), The MIT Press (March 20, 2015) 4. John Rossman, The Amazon Way on IoT: 10 Principles for Every Leader from the World's Leading Internet of Things Strategies, December 20, 2016
Supplementary literature	1. Bruce Sinclair , IoT Inc: How Your Company Can Use the Internet of Things to Win in the Outcome Economy Hardcover May 29, 2017 2. Dokumentacja bibliotek Mbed OS, https://os.mbed.com/
eResources addresses	Adresy na platformie eNauczanie: WPROWADZENIE DO INTERNETU RZECZY [ARiSS][2024/25] - Moodle ID: 43446 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=43446

Example issues/ example questions/ tasks being completed	List the basic features of an intelligent device in the IoT structure. List and discuss the layers of the IoT system. List the protocols and discuss the methods of communication in the various layers of the IoT. Provide an interprocess management method in an edge device IoT application.
Work placement	Not applicable

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