



## 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 2023		Academic year of realisation of subject		2023/2024		
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	Department of Control Systems Engineering -> 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: <a href="https://enauczenie.pg.edu.pl/moodle/course/view.php?id=11783">https://enauczenie.pg.edu.pl/moodle/course/view.php?id=11783</a>						
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	Introduction to Internet of Things (IoT) systems, getting to know typical architectures, concepts of designing hardware and software for IoT. Introduction to the design aspects of IoT edge devices. Acquisition of basic programming skills in a selected environment dedicated to IoT.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	K7_W06		He knows the basic architectures of IoT systems		[SW1] Assessment of factual knowledge		
	K7_U03		Can prepare an raport		[SU1] Assessment of task fulfilment		
	K7_U04		Analyzes the technical data contained in the documentation of the electronic module		[SU2] Assessment of ability to analyse information		
	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		
Subject contents	Basic concepts of IoT (internet of things), application examples. What features does a smart device have? Principles of building IoT systems. Layered structure of the IoT system.Examples of selected IoT architectures. Basics of communication in the structure of IoT. Principles of communication programming in the layers of the IoT system (inter-system communication protocols (I2C, SPI, USART etc.), between modular (Bluetooth, ZigBee) and inter-layer (Ethernet, Wifi)). Inter-process programming. Elements of OS / RTOS in IoT. Basics of the IoT cloud, data analysis, visualization. IoT security basics. Managing energy consumption in IoT edge devices.						
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
	final project	60.0%	50.0%
	exercises	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, <a href="https://os.mbed.com/">https://os.mbed.com/</a>	
	eResources addresses	Adresy na platformie eNauczenie: WPROWADZENIE DO INTERNETU RZECZY [2023/24] - Moodle ID: 36049 <a href="https://enauczenie.pg.edu.pl/moodle/course/view.php?id=36049">https://enauczenie.pg.edu.pl/moodle/course/view.php?id=36049</a>	
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		