Module/Course Syllabus
Program: COMPUTER SCIENCE
Full-time master degree program

Course:	Internet of Things
Type of the course:	directional
Course code:	I2S1.0A
Year:	I
Semester:	1
Form of the degree program:	full-time
Form of classes and number of hours per semester:	60
Lecture	30
Laboratory	30
Number of ECTS credits:	3
Form of assessment:	course completion assessment
Course language:	English

Course objective (CO)	
CO1	Familiarizing students with the elements of the Internet of Things (IoT) and communication interfaces.
CO2	Acquisition of skills allowing for independent and proper programming of IoT devices using sensors, data processing and transmission systems.

Prerequisites in terms of knowledge, skills and other competencies	
1	Ability to program C/C++
2	Knowledge of the basics of algorithms and data structures

Learning outcomes (LO)	
	In terms of knowledge:
LO 1	He knows the characteristics and application of microcontrollers used in IoT devices.
LO 2	He has knowledge in the field of construction, operation, electrical parameters of interfaces and peripheral devices in modern IoT designs.
LO 3	He knows the communication protocols used in IoT constructions.
	In terms of skills:
LO 4	He can independently create, test and run applications for IoT systems in C/C++.
LO 5	He can independently design and build an IoT device and program it using sensors and known communication protocols.
	In terms of social competence:
LO 6	Is aware of the recognition of expert knowledge as a result of a critical assessment of his knowledge.

Course content	
Form of classes – lectures (L)	
	Course content
L1	Internet of Things - main assumptions and perspectives.
L2	Systems used in IoT. Basic characteristics and classes of systems. Overview of available hardware architectures.
L3	ESP platform. Discussion of the internal structure. Version overview and hardware resources.

L4	Specificity of ESP module programming in C/C++ language.
L5	Communication protocols and interfaces in IoT systems.
L6	Transmission of information in IoT systems.
L7	Sensors in IoT systems.
Form of classes – laboratories (Lab)	
	Course content
Lab1	Arduino IDE as an environment for ESP32. Communication with peripheral devices, use of GPIO.
Lab2	Using interrupts in microcontroller programming.
Lab3	The use of reduced power consumption modes in the microcontroller software.
Lab4	Communication with peripheral devices: SPI.
Lab5	Communication with peripheral devices: I2C.
Lab6	Communication with peripheral devices: 1-Wire.
Lab7	Communication with peripheral devices: CAN.
Lab8	Communication with peripheral devices: ModBus.
Lab9	The ESP32 module as an independent data collection and acquisition system.

Didactic methods	
1	Lecture with multimedia presentation.
2	Laboratory exercises: performing exercises.

Assessment methods and criteria		
Assessment method symbol	**Assessment method description**	**Passing threshold**
A1	Test with closed, multiple choice and open questions.	**51%**
A2	Laboratory credit: evaluation of laboratory results	**51%**
A3	Completion of the laboratory - attendance and creativity in class.	**81%**

Required textbooks and other course materials	
1	Evans, B. , Beginning Arduino Programming: Writing Code for the Most Popular Microcontroller Board in the World, Technology In Action tia, Apress, New York, 2011.
3	Kolban, N.,Kolbon's Book on ESP32 & ESP8266, 2016.
4	Vasseur, J. P., Dunkels, A. Interconnecting smart objects with ip: The next internet, Morgan Kaufmann, 2010.
Recommended textbooks and other course materials	
1	Documentation ESP32, https://docs.espressif.com/
2	Documentation platformy Arduino, http://www.arduino.cc/
3	The Internet of Things with ESP32, http://esp32.net/

Student workload	
Form of activity	**Average number of hours to complete the activity**
Contact hours with the lecturer, including:	60
participation in lectures	30
participation in laboratories	30
Student's own work, including:	15
preparation for the exam	5

preparation for the laboratory	10
Total student workload	75
Total number of ECTS credits	3

Learning outcomes matrix					
Learning outcome	**Reference to learning outcomes defined for the master's program**	**Course objectives**	**Course content**	**Didactic methods**	**Assessment methods**
LO 1	I2A_W01+	CO1	L1,L2	1	A1
LO 2	I2A_W04+++, I2A_W06++, I2A_W08+++	CO1, CO2	L3-L7	1,2	A1
LO 3	I2A_W06++, I2A_W07+, I2A_W08+++	CO1, CO2	L5-L6	1,2	A1
LO 4	I2A_U01+, I2A_U15+++	CO2	Lab1-Lab8	2	A2, A3
LO 5	I2A_U01+, I2A_U07++, I2A_U15+++	CO2	Lab2-Lab9	2	A2, A3
LO 6	I2A_K01+, I2A_K02++,	CO1, CO2	L1-L7, Lab1-Lab9	1,2	A1, A3

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