

Specification for the book of courses

Study program		Electrical Engineering and Computer Science		
Module		Computing and Informatics		
Type and level of studies		Undergraduate Academic Studies		
The name of the course		Internet of Things		
Lecturer (for lectures)		Dimitrijević M. Aleksandar		
Lecturer/associate (for exercises)		Dimitrijević M. Aleksandar		
Lecturer/associate (for OFE)		Simić S. Vladimir		
Number of ECTS	5	Course status (obligatory/elective)	Elective	
Prerequisites				
Course objectives	Introduction to IoT technologies and acquiring knowledge necessary for the design and implementation of microcontroller based IoT devices and their organization into IoT systems.			
Course outcomes	Acquired theoretical and practical knowledge necessary for the design, development, programming and testing of microcontroller-based IoT devices (embedded devices that can interact with the outside world), as well as the planning and design of the IoT system.			
Course outline				
Theoretical teaching	Introduction to the Internet of Things (IoT). IoT Ecosystem. IoT Architecture. Microcomputer System Architecture. Microcontrollers. Introduction to the Microcontroller Programming. I/O Devices, Sensors and Actuators. Communications and Information. Non-IP Based WPAN Communication. IP-Based WPAN and WLAN Communication. Long-Range Communication Systems. Infrastructural Devices. IoT Protocols. Cloud and Fog Technologies. Data Analysis and Machine Learning in the Cloud and in the Fog. IoT Security and Privacy. Designing the IoT system. IoT Applications. Philosophy of Information and Ethics of IoT Technologies.			
Practical teaching (exercises, OFE, study and research work)	Practical implementation of a simple IoT device based on a microcontroller. Introduction to development environments and the basics of microcontroller programming. Interaction with simple sensors and actuators. Digital input, output and pulse width modulation. Reading analog sensors. USB and serial communication. Shift registers. Communication interface (I2C and SPI bus). Connecting the LCD display. Wired and wireless communication (communication via Ethernet and Wireless module). Downloading content from the web site. Sending data to the cloud. Data protection. Sensors monitoring in the cloud via the dashboard. Monitor and manage a large number of IoT devices. Error detection in cloud data monitoring. Interaction with Web Services. Mutual interaction of two IoT devices (M2M). Examples of the IoT system.			
Textbooks/references				
1	Perry Lea, "Internet of Things for Architects", Packt Publishing, ISBN-13: 978-1788470599, 524 str. 2018.			
2	Abhik Chaudhuri, "Internet of Things, for Things, and by Things", CRC Press, ISBN-13: 978-1-138-71044-3, 285 str. 2019.			
3	Simone Cirani, Gianluigi Ferrari, Marco Picone and Luca Veltri, "Internet of Things: Architectures, Protocols and Standards", Wiley, ISBN-13: 978-1119359678, 408 str. 2018.			
4	Jeremy Blum, "Exploring Arduino", Wiley, ISBN-13: 978-1118549360, 384 str. 2013.			
5	Marco Schwartz, "Internet of Things with Arduino Cookbook", Packt Publishing, ISBN-13: 978-1785286582, 198 str. 2016.			
Number of classes of active education per week during semester/trimester/year				
Lectures	Exercises	OFE	Study and research work	Other classes
2	2	1	0	0
Teaching methods	Lectures, auditory and laboratory exercises			
Grade (maximum number of points 100)				
Pre-exam duties	Points	Final exam		Points
Activity during lectures		Written exam		
Exercises	20	Oral exam		40
Colloquia	40			
Projects				