

Specification for the book of courses

Study program		Electrical Engineering and Computer Science		
Module		Electronics - Electronic Circuits and Embedded Systems		
Type and level of studies		Undergraduate Academic Studies		
The name of the course		Internet of Things		
Lecturer (for lectures)		Petrović D. Branislav		
Lecturer/associate (for exercises)		Nikolić S. Goran		
Lecturer/associate (for OFE)		Nikolić S. Goran		
Number of ECTS	5	Course status (obligatory/elective)	Elective	
Prerequisites				
Course objectives				
The aim of this course is to understand the architecture and software solutions used to connect devices to the Internet for various applications. Students are introduced to the new Internet Item (IoT) paradigm, which includes a combination of hardware and networking technologies, use of clues and data analysis.				
Course outcomes				
Acquiring knowledge and skills necessary for the design and implementation of applications that represent Internet intelligent devices. Based on the understanding of how IoT platforms and network technologies work, students will be able to apply communication protocols for networking devices and implementation of solutions for different applications.				
Course outline				
Theoretical teaching				
The concept of Internet of things, architecture and application areas. Things and devices in the IoT environment. Physical layer of IoT: sensors, actuators, gateway, M2M communication. Internet code of IoT. Network level IoT, addressing, routing. IoT requests for protocols. IoT protocol stack and comparison with existing Internet protocol stack. Protocols for communication between devices in the data link layer: IEEE 802.15.4, 802.11ah, ZigBee, LoRaWAN, LTE-M, NB-IoT. Network layer protocols: 6LoWPAN, 6TiSCH. Application layer protocols: MQTT, CoAP, AMQP, HTTP. Fog Computer, Integrated Computing Platform, Network Services. Platform as a Service (PaaS), a suite of tools and application programming interfaces (APIs) for application development. IoT Platforms: Components, Architecture, Platform Cloud Computing examples.				
Practical teaching (exercises, OFE, study and research)				
The student works independently for laboratory exercises within which he will design and implement examples of IoT applications using sensors, communication networks and server applications with databases.				
Textbooks/references				
1	Arshdeep Bahga, Vijay Madiseti, Internet of Things: A Hands-On Approach, VPT, 2014.			
2	David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton, Jerome Henry, IoT Fundamentals, Cisco Press, 2017.			
3	Dominique Guinard, Vlad Trifa, Building the Web of Things, Manning Publications, 2016.			
4	Ammar Rayes, Samer Salam, Internet of Things From Hype to Reality, Springer, 2019.			
5				
Number of classes of active education per week during semester/trimester/year				
Lectures	Exercises	OFE	Study and research work	Other classes
2	1	1	0	0
Teaching methods				
Lectures; Practical exercises; Laboratory exercises; Homework; Colloquiums; Seminary work; Consultations.				
Grade (maximum number of points 100)				
Pre-exam duties	Points	Final exam		Points
Activity during lectures		Written exam		30
Exercises	20	Oral exam		30
Colloquia	20			
Projects				