

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		Wireless Networks and Devices		
Lecturer (for lectures)		Đošić M. Sandra		
Lecturer/associate (for exercises)		Stojanović Z. Igor		
Lecturer/associate (for OFE)		Jovanović D. Milica		
Number of ECTS	5	Course status (obligatory/elective)	Elective	
Prerequisites	Computer networks			
Course objectives	The course aims to provide students with a fundamental knowledge of: data transfer, networking, protocol and embedded programming; the design and implementation of wireless embedded devices and sensor networks; advantages and limitations of various wireless technologies used in designing and implementing practical wireless embedded systems.			
Course outcomes	By the end of the course a student should be able to: a) understand the wireless data transmission, b) adopt the basic knowledge of communication and computer concepts and techniques related to wireless transmission, c) understand problems and limitations in designing wireless embedded systems, d) adopt the basic knowledge of wireless data transmission techniques in the field of distributed embedded systems.			
Course outline				
Theoretical teaching	Introduction to wireless transmission. Physical characteristics and limitations of wireless transmission: spreading of radio signals, frequency bands, antennas. Wireless data transmission: coding and modulation. Wireless MAC protocols. Wireless LAN. Bluetooth LE: operating modes, protocol stack, application profiles. Wireless ad hoc network. Wireless sensing networks: architectures and applications, TDMA and CSMA MAC protocols, routing protocols. Wireless devices: hardware, operating systems and programming, energy efficiency and energy collection from the environment, development platforms. Internet of Things (IoT): elements of the IoT ecosystem, architectures, applications, trends and implications, relevant communication protocols.			
Practical teaching (exercises, OFE, study and research work)	Practical classes cover work with the IoT development platforms, which includes: wireless modules based on RF MCU (Sub-1GHz / Bluetooth LE and WiFi) multi-protocol and software development environment with network programming support. Through seven laboratory exercises and small-scale projects, students create IoT system, which includes: a simple wireless sensor network, a Bluetooth application for directly configuring the operating parameters of sensor nodes and program support for distributing the collected data to end users through IoT cloud.			
Textbooks/references				
1	C. Beard, W. Stallings, Wireless Communication Networks and Systems, Pearson. Higher Education, Inc. , 2015			
2	H. Karl, A. Willig, Protocols and Architectures for Wireless Sensor Networks, Wiley, 2007.			
3	Wireless Networks and Devices, Notes and PowerPoint presentation for all lectures, available online.			
4				
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, exercises, labs, homework, colloquia, consultations.			
Grade (maximum number of points 100)				
Pre-exam duties	Points	Final exam	Points	
Activity during lectures		Written exam	25	
Exercises	50	Oral exam	25	
Colloquia				
Projects				