Specification for the book of courses

Study program	Communications and Information Technologies		
Module	System Engineering and Radio-Communications		
Type and level of studies	Master studies		
The name of the course	IoT services		
Lecturer (for lectures)	Maleš-Ilić P. Nataša, Pronić-Rančić R. Olivera		
Lecturer/associate (for exercises)	Atanasković S. Aleksandar, Dimitrijević Ž. Tijana		
Lecturer/associate (for OFE)	Atanasković S. Aleksandar, Dimitrijević Ž. Tijana		
Number of ECTS	4	**Course status (obligatory/elective)**	Elective
Prerequisites			
Course objectives	Introducing students with architecture and operation principles of IoT-platforms, as well as with technologies for their networking, security and principles of data processing. Training students to develop software for different applications of IoT (smart grid, e-health, smart houses, smart cities).		
Course outcomes	Understanding the architecture and way of functioning of the Internet of Things. Knowledge of network technologies and communication protocols necessary for IoT applications. Application of acquired knowledge for the development of IoT solutions for different application areas: smart grid, e-health, smart homes, smart cities.		
Course outline			
Theoretical teaching	Internet of Things: basic concepts, architecture and application. Circuits and devices in the IoT environment: sensors, actuators, gateway, M2M communication. RFID, NFC, EPC architecture. Device communication protocols: IEEE 802.15.4, 802.11ah, ZigBee. LoRaWAN, LTE-M, NB-IoT. Network layer optimization protocols: 6LoWPAN, 6TiSCH. Application layer: MQTT, CoAP, HTTP. Security aspects. Standards. IoT-platforms. Localization algorithms. Indoor localization. Low power and Lossy network-LLN. Embedded apps for working in cloud. Application of IoT: smart grid, e-health, smart home, smart cities.		
Practical teaching (exercises, OFE, study and research	Solving selected problems in auditory exercises. Practical work in the laboratory. Work on project and presentation of results.		
Textbooks/references			
1	D. Hanes, G. Salgueiro, P. Grossetete, R. Barton, and J. Henry, IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, Cisco Press, 2017.		
2	O. Hersent, D. Boswarthick, and O. Elloumi, The Internet of Things: Key Applications and Protocols, John Wiley & Sons Ltd., 2011.		
3	D. Drajić, Introduction to IoT (Internet of Things), Akademic mind, Belgrade, 2017.		
4	S. C. Mukhopadhyay, Internet of Things: Challenges and Opporunities, Springer, 2014.		
5	F. Behmann, and K. Wu, Collaborative Internet of Things (C-IoT): For Future Smart Connected Life and Bussines, John Wiley & Sons Ltd., 2015.		

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, practical laboratory work, consultations			

Grade (maximum number of points 100)			
Pre-exam duties	**Points**	**Final exam**	**Points**
Activity during lectures	10	**Written exam**	
Exercises	30	**Oral exam**	40
Colloquia			
Projects	20		