1.	Course Title	IoT
2.	Code	F18L3W108
3.	Study program	Software engineering and information systems
4.	Study Program Organizer	Faculty of Computer Science and Engineering
5.	Degree (first, second, third cycle)	first cycle
6.	Academic year / semester 4 / winter / optional	7. ECTS credits 6
8.	Teacher	associate professor Igor Mishkovski, assistant professor Biljana Stojkoska
9.	Course enrollment prerequisites	Вградливи микропроцесорски системи и (Компјутерски мрежи или Компјутерски мрежи и безбедност)

10.	Course program goals (competencies):
	Students will obtain knowledge about the main development steps and challenges when designing Internet of Things based solutions. At the end of the course students can model, design and implement IoT systems in different application domains.

11.	Course program content:
	(1) Introduction to Internet of Things. Evolution from wireless sensor and personal area networks to Internet of Things. Hardware abstractions. (1) Building the IoT Architecture (dew, fog, edge, cloud). (1) IoT electronics, sensors and IoT platforms. (1) IoT wireless connectivity. LoRaWAN, ZigBee and Bluetooth Low Energy technology. RFID and NFC technology. Interoperability of different wireless IoT protocols. (1) 6LowPAN. Architecture. 6LowPAN headers and addressing. 6LowPAN compression. Fragmentation and routing. (1) Application level protocols. MQTT and COAP. (1) Localization algorithms, routing, self-organizing, aggregation, data fusion and classification in IoT (1) Data acquisition systems for sensor data. (1) Processing sensor IoT data. Data analysis using different Python packages and data visualization. (1) Design guidelines/possibilities/risks. Security, privacy and data confidentiality in IoT systems. (1) Wireless energy transport and energy harvesting in IoT. (1) Survey of popular application IoT domains: smart home, smart grid, smart city, smart city, UAV, smart eco-systems, smart health, monitoring systems, biological and security systems.

12.	Learning methods:
	Lectures using presentations, interactive lectures, exercises (using equipment and software packages), teamwork, case studies, invited guest lecturers, independent preparation and defense of a project assignment and seminar work.

13.	Total available time	6 ECTS x 30 hours = 180 hours

14.	Distribution of the available time		30 + 45 + 15 + 15 + 75 = 180 hours	
15.	Teaching activity forms	15.1.	Lectures – theoretical teaching	30 hours
		15.2.	Exercises (laboratory, auditory), seminar papers, teamwork	45 hours
16.	Other activity forms	16.1.	Project Tasks	15 hours
		16.2.	Independent Learning Tasks	15 hours
		16.3.	Home learning	75 hours
17.	Assessment methodology			
	17.1.	Tests		10 points
	17.2.	Seminar paper/project (presentation: written and oral)		10 points
	17.3.	Activity and learning		10 points
	17.4.	Final exam		70 points
18.	Assessment criteria (points/grade)	up to 50 points	5 (five) (F)	
		51 to 60 points	6 (six) (E)	
		61 to 70 points	7 (seven) (D)	
		71 to 80 points	8 (eight) (C)	
		81 to 90 points	9 (nine) (B)	
		91 to 100 points	10 (ten) (A)	
19.	Course completion and final exam requirements	Realized activities 15.1 and 15.2		
20.	Teaching Language	Macedonian and English		
21.	Teaching quality evaluation method	Internal evaluation mechanisms and questionnaires		
22.	Course Material			
	22.1.	Mandatory course material		

No.	Author	Title	Publisher	Year
1	Ovidiu Vermesa, Peter Friess	Internet of Things – From Research and Innovation to Market Deployment	River Publishers Series in Communication	2014
2	Samuel Greengard	The Internet of Things (The MIT Press Essential Knowledge series)	The MIT Press Essential Knowledge series	2015
3	Timothy Chou	Precision: Principles, Practices and Solutions for the Internet of Things	lulu.com	2016
4	Kazem Sohraby, Daniel Minoli, Taieb Znati	Wireless Sensor Networks: Technology, Protocols, and Applications	Wiley	2007
5	Yang, Shuang-Hua	Wireless Sensor Networks Principles, Design and Applications	Sprnger	2014

22.2.	Additional course material			
No.	Author	Title	Publisher	Year