

COURSE DESCRIPTION CARD – SPECIMEN

Faculty of Electrical Engineering									
Field of study	Electrical and Electronics Engineering						Degree level and programme type	bachelor's degree	
Specialization/ diploma path	-						Study profile	-	
Course name	Internet of Things						Course code	IS-FEE-10051S	
							Course type	elective	
Forms and number of hours of tuition	L	C	LC	P	SW	FW	S	Semester	summer
	15		15	15				No. of ECTS credits	4
Entry requirements	Fundamentals of Digital Technique								
Course objectives	The course is designed to teach students about the Internet of Things (IoT), which relates to the study of sensors, serial data buses, actuators, cloud computing, MQTT protocol and controllers, IoT applications, system security and examples overview (building automation, transportation, healthcare, industry). After completing the course a student will explain principles of operation of a variety of IoT digital subsystems and will be able to design a simple IoT application.								
Course content	<p>Lecture: Topics address main concepts behind the Internet of Things (the IoT paradigm, smart objects, convergence of technologies, security, protocols), technologies related to the Internet of Things, single board microcomputer IoT nodes, microcontroller based IoT nodes, sensors and serial interfaces.</p> <p>Laboratory class: Practical exercises in programming and designing IoT systems elements based on microcontrollers, single board microcomputers, FPGA and softcore processors and digital sensors.</p> <p>Project: Can encompass a broad field but should be relevant and related with the Internet of Things type of applications. (eg. microprocessor based control of an exemplary system, scheme, calculations, software, peripheral devices, cloud computing / database, web browser based data presentation and control). Dependant on how many participants of the course, a specialization can be made within the project but an understanding of the full design flow is vital for all participants.</p>								
Teaching methods	lecture, laboratory class, project								
Assessment method	lecture – written exam + oral exam, laboratory classes – evaluation of reports, verification of preparation for classes, project – project completion, presentation and discussion.								
Symbol of learning outcome	Learning outcomes						Reference to the learning outcomes for the field of study		
	<i>After completing this subject student is able to:</i>								
LO1	Recognise and understand wiring diagrams related to IoT nodes.								
LO2	Identify various data buses and interfaces from the wiring diagrams.								
LO3	Determine the function and operation of the various modules and sensors and have a good knowledge of how they are used in the management of the IoT devices.								

LO4	Use suitable programming tools.	
LO5	Use application notes and data sheets	
Symbol of learning outcome	Methods of assessing the learning outcomes	Type of tuition during which the outcome is assessed
LO1	written test on lecture content	L
LO2	written test on lecture content	L
LO3	written test on lecture content	L
LO4	evaluating the student's reports and projects	LC, P
LO5	evaluating the student's reports and projects	LC, P
Student workload (in hours)		No. of hours
Calculation	Lecture attendance	15
	participation in laboratory classes and project sessions	30
	preparation for laboratory classes and projects	15
	working on projects, reports, implementation of project tasks	15
		20
	preparation for and participation in exams/tests	5
TOTAL:		100
Quantitative indicators		HOURS
		No. of ECTS credits
Student workload – activities that require direct teacher participation		45
Student workload – practical activities		80
Basic references	<ol style="list-style-type: none"> 1. Rao M., 'Internet of Things with Raspberry Pi 3: Leverage the power of Raspberry Pi 3 and JavaScript to build exciting IoT projects', Packt Publishing Ltd., 2018. 2. Girardin G., Bonnabel A., Mounier E., 'Technologies & Sensors for the Internet of Things Businesses & Market Trends 2014 - 2024', Yole Développement, 2014. 3. Waher P., 'Learning Internet of Things', Packt Publishing, 2015. 4. Bahga A., Madiseti V., 'Internet of Things (A Hands-on-Approach)', Published by authors 2014. 5. Ida N., 'Sensors, Actuators and Their Interfaces', Scitech Publishers, 2014. 	
Supplementary references	<ol style="list-style-type: none"> 1. Frenzel L. E., Handbook of Serial Communications Interfaces: A Comprehensive Compendium of Serial Digital Input/Output (I/O) Standards', Elsevier, 2015. 2. Papazoglou P. M., 'An Educational Guide to the AVR Microcontroller Programming: AVR Programming::Demystified (Assembly Language)', Kessariani, 2018. 3. Barnett R. H., Cox S., O'Cull L., 'Embedded C Programming and the Atmel AVR', 2nd Edition, Delmar Cengage Learning, 2006. 4. Geddes M., 'Arduino Project Handbook: 25 Practical Projects to Get You Started', 2016. 	
Organisational unit conducting the course	Department of Automatic Control and Robotics	Date of issuing the programme
Author of the programme	Ph.D., Eng. Wojciech Wojtkowski	28-02-2021

L – lecture, C – classes, LC – laboratory classes, P – project, SW – specialization workshop, FW - field work, S – seminar