

COURSE DESCRIPTION CARD

Faculty of Electrical Engineering									
Field of study	Electrical and Electronic Engineering							Degree level and programme type	Bachelor's degree
Specialization/ diploma path	-							Study profile	-
Course name	Field Programmable Gate Arrays							Course code	IS-FEE-10031S
								Course type	elective
Forms and number of hours of tuition	L	C	LC	P	SW	FW	S	Semester	summer
	15		30					No. of ECTS credits	5
Entry requirements									
Course objectives	The target of this course is to introduce the students to the structural design of FPGAs in the way, which is appropriate for both programmers and hardware engineers.								
Course content	Internal FPGAs architecture, clock signal frequency synthesis, signal I/O standards. CAD software for designing FPGAs - Intel Quartus II software. Design flow of FPGAs. VHDL: fundamental units, library declarations, entity, architecture. Concurrent code. Sequential code. State machines. Packages and components. Functions and procedures. IEEE standard packages. Techniques description of the project, simulation, implementation and programming of FPGAs. Constructing a digital circuit using FPGAs. Synthesis of complex hierarchical designs. Synthesis of digital systems using standard prototype modules. Support for external devices via FPGA: PWM signal modulation, I2C and SPI bus control.								
Teaching methods	describes the basic features and properties of FPGAs,								
Assessment method	lecture – test, laboratory classes – evaluation of reports								
Symbol of learning outcome	Learning outcomes							Reference to the learning outcomes for the field of study	
LO1	describes the basic features and properties of FPGAs,								
LO2	recognizes the syntax of the VHDL statements,								
LO3	uses the features of the CAD FPGA platform,								
LO4	designs simple digital systems in programmable structures,								
LO5	uses VHDL to describe the system and designs new components,								
LO6	combines various description techniques to design complex systems,								
LO7	can run a simple digital system using conventional prototype modules.								
LO8									
Symbol of learning outcome	Methods of assessing the learning outcomes							Type of tuition during which the outcome is assessed	
LO1	evaluating the student's test							L	

L02	evaluating the student's test	L	
L03	evaluating the student's reports	LC	
L04	evaluating the student's reports	LC	
L05	evaluating the student's reports	LC	
L06	evaluating the student's reports	LC	
L07	evaluating the student's reports	LC	
L08			
Student workload (in hours)		No. of hours	
Calculation	lecture attendance	15	
	participation in laboratory classes	30	
	preparation for laboratory classes	30	
	working on reports	25	
	participation in student-teacher sessions related to the classes and laboratory classes	5	
	preparation for and participation in test	20	
		TOTAL:	125
Quantitative indicators		HOURS	No. of ECTS credits
Student workload – activities that require direct teacher participation		47	1,5
Student workload – practical activities		102	4
Basic references	1. Floyd L. T.: Digital Fundamentals with PLD Programming, Prentice Hall, 2005 2. Volnei A. Pedroni: Circuit Design with VHDL, MIT, Cambridge, London, 2004 3. Jha N.K., Gupta S.: Testing of Digital Systems, Cambridge University Press, 2003 4. IEEE Standard 1076-2008 VHDL-200X 5. Hamblen J., Hall T., Furman M.: Rapid Prototyping of Digital Systems, Springer, 2008		
Supplementary references	1. Terasic Inc.: DE2-115 User Manual, www.terasic.com, 2010 2. My First FPGA for Altera DE2-115 Board, www.terasic.com, 2010 3. My First Nios II for Altera DE2-115 Board, www.terasic.com, 2010 4. Pedroni V.: Circuit Design with VHDL, MIT Press, 2004 5. Hwang E. - ELECTRONiX: Digital Logic and Microprocessor Design with VHDL, La Sierra University, 2005		
Organisational unit conducting the course	Department of Automatic Control and Robotics	Date of issuing the programme	
Author of the programme	Marian Gilewski, Ph.D. Eng.	31.01.2020	

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