

Specification for the book of courses

Study program		Electrical Engineering and Computer Science		
Module		Electron Devices and Microsystems		
Type and level of studies		Undergraduate Academic Studies		
The name of the course		Design of Programmable Components		
Lecturer (for lectures)		Danković M. Danijel		
Lecturer/associate (for exercises)		Danković M. Danijel		
Lecturer/associate (for OFE)		Marjanović B. Miloš		
Number of ECTS	5	Course status (obligatory/elective)	Elective	
Prerequisites				
Course objectives	Extending the knowledge of basic digital microelectronic components and circuits and their practical implementation. Introduction to VHDL programming, software packages for programming of FPGA circuits and FPGA development boards.			
Course outcomes	Extensive theoretical knowledge of digital microelectronic components and circuits. Mastering the basis of the VHDL programming language and the ability to implement hardware design on a FPGA chip by using software packages.			
Course outline				
Theoretical teaching	Basic concepts of hardware description languages. An introduction to VHDL. Organization of VHDL code: declaration of libraries and packages; entity declaration; architecture description. Language constructions of VHDL code. Signal assignments in VHDL: When and Select. Process and Wait statements. If statements, Case statements and Loops. VHDL code examples of combinational and sequential circuits. Creating a project in one of the software packages, entering of VHDL code, simulation and functional verification. Use of development kits for implementing hardware design on FPGA chip. Checking the functionality of programmed circuits using development kits.			
Practical teaching (exercises, OFE, study and research)	Practical lectures take place in the laboratory. Description of digital devices and circuits using VHDL. Simulation of digital devices and circuits. Creating a project in one of the software packages, entering of VHDL code, simulation and functional verification of digital devices and circuits.			
Textbooks/references				
1	Andrew Rushton, „VHDL for Logic Synthesis“, 3rd Edition, A John Wiley and Sons, 2011, ISBN 978-4709787972.			
2	William Kleitz, „Digital Electronics a Practical Approach with VHDL“, 9th Edition, Pearson Education, 2012, ISBN 978-0138146467.			
3	Stephen Brown, Zvonko Vranesic, „Fundamentals of Digital Logic with VHDL Design“, 3rd Edition, McGraw-Hill, 2009, 978-0-07-352953-0. □			
4	Volnei A. Pedroni, „Digital Electronics and Design with VHDL“, Elsevier, 2008, ISBN 978-0-12-374270-4.			
5	William Kleitz, „Digital Electronics a Practical Approach with VHDL“, 9th Edition, Pearson Education, 2012, ISBN 978-0138146467.			
Number of classes of active education per week during semester/trimester/year				
Lectures	Exercises	OFE	Study and research work	Other classes
2	1	2	0	0
Teaching methods	Lectures; Computer simulations; Practical laboratory work; Consultation.			
Grade (maximum number of points 100)				
Pre-exam duties	Points	Final exam	Points	
Activity during lectures		Written exam	30	
Exercises	20	Oral exam	30	
Colloquia				
Projects	20			