

## Specification for the book of courses

<b>Study program</b>		Electrical Engineering and Computer Science		
<b>Module</b>		Control Systems		
<b>Type and level of studies</b>		Undergraduate Academic Studies		
<b>The name of the course</b>		Digital Electronics		
<b>Lecturer (for lectures)</b>		Đorđević Lj. Goran, Đošić M. Sandra		
<b>Lecturer/associate (for exercises)</b>		Jovanović D. Milica, Stojanović Z. Igor		
<b>Lecturer/associate (for OFE)</b>		Jovanović D. Milica, Stojanović Z. Igor		
<b>Number of ECTS</b>	6	<b>Course status (obligatory/elective)</b>	Obligatory	
<b>Prerequisites</b>				
The course objectives are: a) to teach students with fundamentals of digital system design with emphasis on techniques and methods for analysis and synthesis of combinational and sequential digital circuits, b) to introduce students with basics of memory circuits, programmable logic devices, and data converters..				
At the end of this course, students should be able to: a) analyse and design combinational and sequential digital circuits by using formal method and basic principles of digital design, and b) implement simple digital systems in FPGA technology.				
<b>Course outline</b>				
Logic gates and combinational logic networks: logic levels and digital signals, basic logic gates, logic expressions and combinational networks, Boolean algebra, and algebraic manipulation of Boolean expressions. Implementation technologies: MOSFET as switch, CMOS inverter, CMOS logic gates, programmable logic devices (PLA, PAL, and ROM). Combinational building blocks: decoder, multiplexer, encoder, priority encoder, demultiplexer. Arithmetic circuits: half-adder, full-adder, ripple-carry adder, carry look-ahead adder, ripple carry multiplier, array multiplier. Latches and flip-flops: SR and D latch, master-slave flip-flops, edge triggered flip-flops. Registers: storage register, shift registers, asynchronous and synchronous counters. Sequential circuits: analysis and synthesis of sequential circuits, algorithmic state machine. Memory components: RAM (SRAM and DRAM), and ROM. Data conversion: characteristics of data converters, basic architectures of D/A and A/D converters.				
Practical lectures includes eight laboratory assignments. Each assignment involves: a) the design, modelling and simulation of a module or feature of a digital component, and b) implementation of the module in FPGA by using schematic editor.				
<b>Textbooks/references</b>				
1	R.J. Tocci, N. S.Widmer, G. L. Moss, Digital Systems: Principles and Applications, 11th ed., Pearson, July 17, 2010.			
2	S.Brown, Z.Vranesic, Fundamentals of Digital Logic with VHDL Design, 3th ed.,McGraw-Hill Education, April 14, 2008.			
3	Digital electronics - supplementary nodes, available at course web site.			
4				
5				
<b>Number of classes of active education per week during semester/trimester/year</b>				
<b>Lectures</b>	<b>Exercises</b>	<b>OFE</b>	<b>Study and research work</b>	<b>Other classes</b>
2	2	1	0	0
<b>Teaching methods</b>	Lectures, exercises, laboratory exercises, homework, consultations			
<b>Grade (maximum number of points 100)</b>				
<b>Pre-exam duties</b>	<b>Points</b>	<b>Final exam</b>		<b>Points</b>
<b>Activity during lectures</b>		<b>Written exam</b>		30
<b>Exercises</b>	10	<b>Oral exam</b>		30
<b>Colloquia</b>	30			
<b>Projects</b>				