

Study program: Information Technology			
Course title: COMPUTER ENGINEERING FUNDAMENTALS			
Teacher(s): Vanja V. Luković, Marina M. Milošević			
Course status: mandatory			
Number of ECTS credits: 6			
Prerequisite courses: none			
Course objectives			
Acquisition of basic engineering knowledge on the way of functioning and design principles of combinational and sequential digital circuits, as integral components of all modern digital devices and systems.			
Learning outcomes			
The student should be able to represent digital functions with a set of decimal indices, tabularly, in perfect and imperfect normal forms and to perform their minimization using Karnaugh maps in different bases of logic circuits; to analyze and synthesize combinational digital circuits; laws of functioning of memory elements (flip-flops); to analyze and synthesize sequential digital circuits; to design combination modules (multiplexers, encoders, decoders, and demultiplexers); to design standard combination digital circuits (incrementors, decrementors, adders, subtractors, and comparators); uses the software tool LogiSim for the analysis and synthesis of combinational and sequential digital circuits and the simulation of their functioning; uses FPGA integrated circuit programming software tools in designing, simulating and testing digital digital circuits.			
Content of the course			
<i>Theoretical teaching</i>			
Boolean algebra - basic axioms and theorems; Boolean functions and ways of defining them: table, set of decimal indices, perfect and imperfect normal forms, and Karnaugh maps; minimization of Boolean functions; logical elements and basic parameters; procedures of analysis and synthesis (logical design) of combinational digital circuits in different bases of logical elements; procedures of analysis and synthesis (logical design) of sequential digital circuits; procedures for the logical design of combinational modules and standard combinational digital circuits: incrementors, decrementors, adders, subtractors, and comparators.			
<i>Practical teaching</i>			
Solving computational examples for defining and minimizing Boolean functions and their design in different bases of logic circuits. Analysis and synthesis of combinational and sequential digital circuits, using computational examples. Logic design of combinational and sequential digital circuits using LogiSim simulation software tool and FPGA integrated circuit programming software tool, using remote experiment.			
Literature			
[1] Borivoj Lazić, Osnovi računarske tehnike, Akademska misao, Beograd, 2006, ISBN 978-86-7466-234			
[2] Jovan Đorđević, Zaharije Radivojević, Marija Punt, Jelica Protić, Dragan Milićev, Aleksandar Milenković, Boško Nikolić, Osnovi računarske tehnike: Projektovanje uređaja, zbirka rešenih zadataka, Zbirka rešenih ispitnih zadataka, Akademska misao, Beograd, 2014, ISBN 978- 86-7466-508-4.			
[3] Vanja Luković, Aleksandar Peulić, Đorđe Damjanović, Radojka Krneta, Priručnik za projektovanje digitalnih korišćenjem FPGA integrisanog kola sa primerima, Univerzitetska mreža, Fakultet tehničkih nauka u Kragujevcu. str. 73, ISBN 978-86-7776-212-4, Čačak, mart 2017.			
[4] Ata Elahi, Computer Systems, Digital Design, Fundamentals of Computer Architecture and Assembly Language, Springer Cham, 2018, ISBN 978-3-319-88318-2, DOI: https://doi.org/10.1007/978-3-319-66775-1			
[5] Bindal, Ahmet, Fundamentals of Computer Architecture Organization and Design. Cham, Springer Cham, 2019, ISBN 978-3-030-00222-0, DOI https://doi.org/10.1007/978-3-030-00223-7			
[6] Sivarama P. Dandamudi, Fundamentals of Computer Organization and Design, Springer New York, NY, 2003, ISBN 978-0-387-95211-6. ISSN 1868-0941, DOI: https://doi.org/10.1007/b97279			
Number of active teaching classes: 4		Theoretical teaching: 2	Practical teaching: 2
Teaching methods Lectures, calculation exercises, computer exercises.			
Evaluation of knowledge (maximum number of points 100)			
Pre-exam obligations	Points	Final exam	Points
Activities during teaching process	5	Final exam (written):	25
Practical teaching	10	Final exam (oral):	20
Colloquium	15		
Practical teaching	25		