

Study program: Communication Technologies			
Course title: Integrated Circuit Design			
Professor/assistant: Miloš B. Stojanović, PhD			
Type of course: compulsory			
ECTS credits: 6			
Pre-requisites: Introduction to electronics, Fundamentals of computer science, Programming languages 1			
Aims of the course: The aim of the course is to introduce and teach the students about the basic principles of design and synthesis of integrated circuits, by using computers. The students are instructed on how to use program packages for design, simulation, synthesis and testing. They will learn how to use the basics of the hardware description language VHDL. Instruction is also provided on the design and synthesis of a system of low and mid-level complexity in VHDL, implemented in FPGA.			
Learning outcomes: Once the student has passed the exam, he/she will be able to independently design integrated circuits, by using a computer.			
Syllabus			
<u>Theoretical part</u> Integrated circuit design. Design domains (functional, structural, physical). Levels of modelling and abstraction. Design process. Program packages used for designing. Languages used to describe hardware. VHDL code organization and design styles. Simulation and synthesis of the VHDL code and the role it plays in the design process. Components, packages, libraries. Language structures. Concurrent and sequential code. Parametric design. Hierarchical design. RTL design.			
<u>Practical part</u> Designing a new project using the Xilinx ISE Design Suite program package, selection of an integrated circuit for synthesis. The design of a source (VHDL) design file, selection of the type of design file. Defining the interface (ports) of the model being designed. Defining the architecture of the module and the time limitation. Test-bench, and generation of the test-bench. Functional simulation. Timing simulation. Designing a testing circuit. Circuit synthesis. Generating a report on the synthesis – the RTL diagram. Implementation and generation of a report on implementation. Report on the pins. Defining the limitations. Generating a configuration file. Connecting a PC to the development system. Configuration of the FPGA circuit. Testing of the FPGA circuit.			
Literature			
1. Milivojević. Z., <i>Projektovanje pomoću računara</i> , Punta, Niš, 2003. 2. Volnei A. P., <i>Circuit Design and Simulation with VHDL</i> , the MIT Press, Cambridge, 2010. 3. Đorđević. G., <i>Arhitecture mikrosistema</i> , Elektronski fakultet Niš, 2009.			
Number of active classes			Other forms of teaching:
Lectures: 30	Practical classes: 15	Research work:	
Teaching methods Combined, interactive classes with solutions offered from practice.			
Grading system (maximum 100 points), grading scale from 5 to 10: below 51 points grade 5, grade 6 from 51-60 points, grade 7 from 61-70 points, grade 8 from 71-80 points, grade 9 from 81-90 points, grade 10 from 91-100 points.			
Pre-exam obligations	points	Final exam	points
activity during theoretical lectures	10	written exam	30
practical training	10+10	oral exam	
colloquium(s)/seminar papers	20+20		
Sum	70	Sum	30