

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 Microelectronics Devices		
Lecturer (for lectures)		Pantić S. Dragan		
Lecturer/associate (for exercises)		Pantić S. Dragan		
Lecturer/associate (for OFE)		Marjanović B. Miloš		
Number of ECTS		5	Course status (obligatory/elective)	Obligatory
Prerequisites				
Basic knowledge about methods and procedures of simulation and optimization of technological processes for the production of semiconductor devices and integrated circuits and procedures for designing and optimizing microelectronic components and simulating their electrical characteristics.				
Course objectives				
The student is introduced to the most important technological processes for the production of semiconductor devices and integrated circuits and is able to independently use commercial software tool (Silvaco) for the design, simulation and optimization of technological processes and electrical characteristics of microelectronic components.				
Course outcomes				
The student is introduced to the most important technological processes for the production of semiconductor devices and integrated circuits and is able to independently use commercial software tool (Silvaco) for the design, simulation and optimization of technological processes and electrical characteristics of microelectronic components.				
Course outline				
Introduction. Simulation and modeling of technological processes. CMOS technology flow. Modeling the process of ion implantation. Analytical 1D and 2D models. BTE. Monte Carlo. Modeling of thermal processes. Diffusion equations. Diffusion of impurities and point defects. Segregation of the substance. An analytical model of the oxidation process. Deal-Groove model. Numeric models. Modeling of lithographic processes. Modeling deposition and corrosion. Simulation and modeling of electrical characteristics of components. System of basic semiconductor equations. Mobility. Generation and recombination. Scaling. Domain simulation and boundary conditions. Discretization. Solving PDE system TCAD software packages. Silvaco and ISE TCAD packages. Design of the numerical experiment (DOE).				
Theoretical teaching				
Introduction. Simulation and modeling of technological processes. CMOS technology flow. Modeling the process of ion implantation. Analytical 1D and 2D models. BTE. Monte Carlo. Modeling of thermal processes. Diffusion equations. Diffusion of impurities and point defects. Segregation of the substance. An analytical model of the oxidation process. Deal-Groove model. Numeric models. Modeling of lithographic processes. Modeling deposition and corrosion. Simulation and modeling of electrical characteristics of components. System of basic semiconductor equations. Mobility. Generation and recombination. Scaling. Domain simulation and boundary conditions. Discretization. Solving PDE system TCAD software packages. Silvaco and ISE TCAD packages. Design of the numerical experiment (DOE).				
Practical teaching (exercises, OFE, study and research)				
In the framework of computational exercises, one independent project (seminar work) and 4 planned exercises carried out on a computer, the student is able to independently use commercial software tools for designing and simulating technological processes and electrical characteristics of semiconductor components.				
Textbooks/references				
1	Dragan Pantić, Tatjana Pešić, Elva Jovanović, Modeling and Eimulation in microelectronics (in serbian), Faculty of Electronic Enginnering, Niš, 2005.			
2	J.D. Plummer, M.D. Deal, P.B. Griffin, Silicon VLSI Technology, Prentice Hall, 2000.			
3	Lectures in the form of PowerPoint presentations, materials for computational exercises, computer exercises and homework on the web site of the Faculty of Electronic Engineering www.elfak.ni.ac.rs			
4				
5				
Number of classes of active education per week during semester/trimester/year				
Lectures	Exercises	OFE	Study and research work	Other classes
2	1	1	0	0
Teaching methods				
Lectures, consultations, exercises, computer exercises, seminar work, homework assignments.				
Grade (maximum number of points 100)				
Pre-exam duties		Points	Final exam	Points
Activity during lectures		5	Written exam	
Exercises		15	Oral exam	40
Colloquia		20		
Projects		20		