

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	Analog Microelectronics		
Lecturer (for lectures)	Prijić D. Zoran, Vračar M. Ljubomir		
Lecturer/associate (for exercises)	Stojković S. Aleksandra		
Lecturer/associate (for OFE)	Stojković S. Aleksandra		
Number of ECTS	6	Course status (obligatory/elective)	Obligatory
Prerequisites			
Course objectives	<p>Learning objectives are defined so that the student will:</p> <ul style="list-style-type: none"> - Learn the basic configuration of linear and switching power sources; - Learn about the basic architecture of the operational amplifier and the technology in which it is implemented; - Understand the purpose and principle of applying negative and positive feedback in the operating amplifier circuit as well as basic configurations; - Understand the difference between an ideal and a real operational amplifier; - Understand the meaning of parameters from the technical specification (datasheet) of the operational amplifier; - Learn applications of the operational amplifier; - Understand the influence of other components in the circuit on the operation of the operational amplifier and the function of the circuit itself; - Understand the principle and method of realization of analog / digital signal conversion. 		
Course outcomes	<p>Learning outcomes are defined so that the student will:</p> <ul style="list-style-type: none"> - Distinguish the types of power supplies and DC/DC converters, their advantages and disadvantages for various applications; - Distinguish the types of operating amplifiers, using data from their technical specification; - Explain the concepts of using operational amplifiers for different applications; - Formulate the electrical specification of the electronic circuit with the selected operating amplifiers, for the given type of application; - Design and simulate a circuit with models of real operational amplifiers and other microelectronic components, using SPICE simulators; - Practically realize the designed circuit on a breadboard; - Examine the operation of the circuit, using laboratory instruments (power supply, signal generator, oscilloscope); - Diagnose and repair faults within the circuit; - Design an improved version of the circuit. 		
Course outline			
Theoretical teaching	DC power supplies: linear, switching. Operational amplifiers, ideal and real. Frequency response of operational amplifiers. Basic configurations: Inverting, non-inverting, voltage follower. Applications of operational amplifiers: summing, integrator, differentiator, logarithmic and antilogarithmic, differential and instrumentation amplifiers, precision rectifiers, comparators, oscillators, multivibrators, transconductance amplifiers (OTA), attenuators, A / D converters.		
Practical teaching (exercises, OFE, study and research)	Computer simulation of circuits with analog microelectronic components. Selection of operational amplifiers and other microelectronic components based on the data from technical specifications. Practical realization of the circuit with discrete components and integrated circuits, using breadboards. Checking the operation of the circuit and remedying the defects in the realization.		
Textbooks/references			
1	S. Franco, "Design with Operational Amplifiers and Analog Integrated Circuits", 4th Ed., McGraw-Hill, 2015.		
2	"Op Amp Applications Handbook", Analog Devices, 2005. https://www.analog.com/en/education/education-library/op-amp-applications-handbook.html		
3	"Op Amps for Everyone", ed by. R. Mancini, Texas Instruments 2002. http://web.mit.edu/6.101/www/reference/op_amps_everyone.pdf		

4				
5				
Number of classes of active education per week during semester/trimester/year				
Lectures	Exercises	OFE	Study and research work	Other classes
2	2	1	0	0
Teaching methods	Lectures; Exercises on the computer; Exercises in the laboratory; Consultations.			
Grade (maximum number of points 100)				
Pre-exam duties		Points	Final exam	Points
Activity during lectures		10	Written exam	
Exercises		40	Oral exam	50
Colloquia				
Projects				