

Specification for the book of courses

Study program		Electrical Engineering and Computer Science		
Module		Electronics - Electronic Circuits and Embedded Systems		
Type and level of studies		Undergraduate Academic Studies		
The name of the course		Medical Electronics		
Lecturer (for lectures)		Milić Lj. Miljana		
Lecturer/associate (for exercises)		Jovanović D. Borisav		
Lecturer/associate (for OFE)		Jovanović D. Borisav		
Number of ECTS	5	Course status (obligatory/elective)	Elective	
Prerequisites	Basics of Electronics			
Course objectives	Adoption of knowledge related to the electronics in medicine, the usage of electrical signals in medicine and the main characteristics of medical devices: the reliability and safety.			
Course outcomes	Acquiring knowledge related to the application of electrical signals in medicine and gaining competence for designing the basic electronic circuits as part of various medical devices.			
Course outline				
Theoretical teaching	The biopotential sources. The electrical conduction system the heart. Standard ECG leads. The EEG, EMG and ECG devices. Bio-potential amplifiers. Instrumentational biopotential amplifier. The band pass of frequency characteristic of biopotential amplifiers. The process of filtering of biopotential signals (the design of high pass filters, active and passive band-pass filters, higher harmonic attenuation circuits). Detection of pacemaker circuits. Slew rate limiting circuits. Hardware for biomedical signal processing. The digital filter design for biomedical signals. The reliability and safety of medical electronic devices. The analog and digital signal isolation using optocouplers. The medical supply design.			
Practical teaching (exercises, OFE, study and research work)	Laboratory exercises and practical student's project implementation. The knowledge gained during the lectures, is developed during laboratory exercises and during the implementation of practical student's project. The exercises include the simulation of analog electronic circuits for amplification of EEG, EMNG and ECG signals, and practical examples of microcontroller programming used for processing of biomedical ECG, EEG and EMG signals. The basics of programming, dedicated to ANDROID mobile phones application development, used for acquiring, processing and transmitting the biomedical signals, as a part of state-of-the art medical devices. The implementation of one-channel ECG monitor based on PIC microcontrollers and mobile phones, the implementation of ECG holter device and ECG telemetry devices.			
Textbooks/references				
1	M. Damjanovic, B. Jovanovic, The medical electronics (in Serbian), script			
2	D. Prutchi, M. Norris, Design and Development of Medical Electronic Instrumentation, John Willey and Sons, Inc. 2005			
3	D. Radenkovic, The electromedical instrumentation, The Faculty of Electronic Engineering Nis, 2007			
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 supported by usage of projectors, auditory exercises, laboratory exercises on computer, consultations, individual projects.			
Grade (maximum number of points 100)				
Pre-exam duties	Points	Final exam		Points
Activity during lectures	10	Written exam		
Exercises	20	Oral exam		30
Colloquia	20			
Projects	20			