

Specification for the book of courses

Study program		Control Systems		
Module		Automatic Control		
Type and level of studies		Master studies		
The name of the course		Embedded Systems		
Lecturer (for lectures)		Nikolić R. Tatjana		
Lecturer/associate (for exercises)		Nikolić R. Tatjana		
Lecturer/associate (for OFE)				
Number of ECTS	5	Course status (obligatory/elective)	Elective	
Prerequisites				
Course objectives	The aim of this course is to introduce students to the principles of designing embedded systems and the specific problems and requirements that are typical for the main fields of embedded systems application.			
Course outcomes	Gaining knowledge about the embedded systems architecture, hardware and software elements, communication mechanisms, programming techniques, embedded operating systems and development environments that are necessary for the development of practical applications.			
Course outline				
Theoretical teaching	Definition, characteristics and categories of embedded systems. Integrated hardware and software aspects of the embedded processor architecture. Designing an embedded system using formal models and methods, as a computer-based synthesis method. Architecture (based on modern 32/64-bit embedded processors) and components of embedded systems. Hardware-software interfaces, memory architectures, buses. Embedded operating systems. Concurrentness (software and hardware interrupts, timers). Real-time operation principles (multitasking, task scheduling, synchronization). Device driver development. Designing embedded software (handling exceptions, loading, changing operation mode, embedded programming), implementation and debugging. Profiling and code optimization. Designing an low power embedded system.			
Practical teaching (exercises, OFE, study and research)	It is planned that students independently do laboratory exercises using modern development environment and development tools for designing embedded systems based on ARM processor with low power and high performance.			
Textbooks/references				
1	Embedded systems, PowerPoint presentations for all lectures, available on the website of the course			
2	Christopher Hallinan, Embedded Linux Primer, Second Edition, Pearson Education, Inc., 2011.			
3	Changyi Gu, Building Embedded Systems, Programmable Hardware, Apress, 2016.			
4	Derek Molloy, Exploring Raspberry Pi, Interfacing to the Real World with Embedded Linux, John Wiley & Sons, Inc., 2016.			
5	Wayne Wolf, Computers as Components: Principles of Embedded Computing System Design, Morgan Kaufmann, 2008.			
Number of classes of active education per week during semester/trimester/year				
Lectures	Exercises	OFE	Study and research work	Other classes
2	2	0		
Teaching methods	Lectures, exercises, labs, homeworks, colloquia, projects, consultations			
Grade (maximum number of points 100)				
Pre-exam duties	Points	Final exam	Points	
Activity during lectures		Written exam	30	
Exercises	20	Oral exam	30	
Colloquia	20			
Projects				