

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		Real Time Systems		
Lecturer (for lectures)		Petrović D. Branislav		
Lecturer/associate (for exercises)		Nikolić S. Goran		
Lecturer/associate (for OFE)		Nikolić S. Goran		
Number of ECTS	5	Course status (obligatory/elective)	Elective	
Prerequisites				
Introducing students to areas of computer application in systems that need to respond to events in real time. Such events require understanding of asynchronous and synchronous events, methods for capturing data before they disappear, and performing tasks within given time intervals.				
Course objectives				
The concept of understanding and development of the system for work in real time and its implementation. System model and temperature control program.				
Course outcomes				
The concept of understanding and development of the system for work in real time and its implementation. System model and temperature control program.				
Course outline				
Definition, basic characteristics and examples of real-time systems (RT systems). Basic principles of design of RT system - specification of requirements. Methods of programming - syntax languages, style, data types, control structures, subroutines. Modular programming, abstract data types, object-oriented programming. High reliability, definitions, failure models, redundancy. Multitasking, overlapping tasks, scheduling tasks. Synchronization and communication of tasks, mutual exclusivity, traffic lights, waiting queues, buffers and protected objects. Atomic actions. Kernel - architecture, hardware model, memory folders, peripherals, allocation and interrupt processing. Distributed systems. Definition, programming languages. Low-level programming.				
Theoretical teaching				
Definition, basic characteristics and examples of real-time systems (RT systems). Basic principles of design of RT system - specification of requirements. Methods of programming - syntax languages, style, data types, control structures, subroutines. Modular programming, abstract data types, object-oriented programming. High reliability, definitions, failure models, redundancy. Multitasking, overlapping tasks, scheduling tasks. Synchronization and communication of tasks, mutual exclusivity, traffic lights, waiting queues, buffers and protected objects. Atomic actions. Kernel - architecture, hardware model, memory folders, peripherals, allocation and interrupt processing. Distributed systems. Definition, programming languages. Low-level programming.				
Practical teaching (exercises, OFE, study and research)				
Embedded system. Flickering a contact. Temperature measurement. Operating system for embedded microcomputers of the MCS51 family, RTX Tiny. Loop control. Overlapping tasks.				
Textbooks/references				
1	"Real time systems", auxiliary teacher textbook (in Serbian).			
2	Selected Articles. Silabs documentation, Keil documentation.			
3				
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				
Auditory instruction using computers and projectors. Basic examples of system simulation. Practical demonstration of real-time real-time embedded systems. Lectures. Practical exercises. Laboratory exercises. Homework. Colloquiums. Seminary work. Consultations.				
Grade (maximum number of points 100)				
Pre-exam duties	Points	Final exam		Points
Activity during lectures	10	Written exam		20
Exercises	15	Oral exam		20
Colloquia	20			
Projects	15			