

Specification for the book of courses

Study program		Electronics and Microsystems		
Module		Electronics and Microsystems		
Type and level of studies		Master studies		
The name of the course		Real Time Operating 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				
Course objectives	Knowledge of the basic concepts and principles of modern operating systems, as well as their structure, functions and components. Getting to know the importance of time warranties in executing programs in real-time systems.			
Course outcomes	Theoretical and practical knowledge of concepts, internal design and implementation of modern operating systems that are applied in embeded applications. Practical application of the Real Time Linux operating system API functions. Detailed knowledge of the Linux kernel and its upgrade capabilities.			
Course outline				
Theoretical teaching	History of embeded Linux, Embeded Linux distribution. Architecture embeded Linux, Linux kernel architecture, User space, Start-up sequences, Boot loader interface, Mapping memory, interrupt management. Timers, UART, power management. Embeded storage memory: Flash memory card, Memory device technologies. File systems: Ramdisk, JFFS, NFS, PROC file system. Optimize the memory space. Optimize kernel memory. Embeded drivers: serial port driver, ethernet driver, I2C, USB. Porting applications: Programming threads, operating system porting level, kernel API drivers. Real-Time Linux as an operating system for real-time operation: interruption delay, delay and duration of panners. Planning process, memory lock, POSIX memory sharing, waiting queues, traffic lights, signals, clock and timer, asynchronous I / O. Building and Debuging: building kernel, building applications, root file system. IDE: Eclipse, Kdevelop, CodeBlocks. Example of design: Design and development of board computer cars using mirror and RT Linux.			
Practical teaching (exercises, OFE, study and research)	Working with files from the command line, Command Interpreter (shell). Copy, move, and delete files. Work with directories. Working with text files. Shell programming. Basics of shell programming. Structures in shell programming. Network environment. Introduction to TCP / IP Linux as a network server. Process administration. Basic techniques of process and thread management. Process synchronization. Synchronizing threads. Booting (boot). Configuring the Linux system core. Work with modules. Translation of the kernel.			
Textbooks/references				
1	Stalling William, "Operating Systems 6th Edition, Pearson Education, ISBN 978-81-317-2528-3.			
2	Andrew S. Tanenbaum ,Modern Operating Systems, 3/E, ISBN-13: 9780136006633.			
3	Christopher Hallinan, "Embedded Linux Primer: A Practical Real-World Approach (2nd Edition)", Prentice Hall, 2010, ISBN-13: 978-0-137-01783-6.			
4	Teacher's handwriting (in Serbian) : Linux in embeded systems			
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		
Teaching methods	Auditory instruction using computers and projectors. 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			