



Subject card

Subject name and code	Real-time Operating Microsystems, PG_00048672						
Field of study	Electronics and Telecommunications						
Date of commencement of studies	February 2027	Academic year of realisation of subject			2027/2028		
Education level	second-cycle studies	Subject group			Optional subject group Specialty subject group Subject group related to scientific research in the field of study		
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	2	Language of instruction			Polish		
Semester of study	3	ECTS credits			2.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Metrology and Electronic Systems Department -> Faculty of Electronics Telecommunications and Informatics -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Grzegorz Lentka					
	Teachers	mgr inż. Dariusz Palmowski dr hab. inż. Grzegorz Lentka					
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0	0.0	30
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours		Self-study	SUM	
	Number of study hours	30	4.0		16.0	50	
Subject objectives	Getting familiar with application, construction, scalability and portability of real-time operating microsystems.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K7_U07] can apply advanced methods of process and function support, specific to the field of study	Analyses time constrains and selects system kernel type and configuration.			[SU4] Assessment of ability to use methods and tools		
	[K7_W03] knows and understands, to an increased extent, the construction and operating principles of components and systems related to the field of study, including theories, methods and complex relationships between them and selected specific issues - appropriate for the curriculum	Student defines terminology: operating system, realtime system, system kernel, multitasking, task, process, thread . Identifies operating microsystems specificity (small hardware resources, application area, task severity, reliability). Explains mutual exclusion and intertask communication techniques.			[SW1] Assessment of factual knowledge		
	[K7_U03] can design, according to required specifications, and make a complex device, facility, system or carry out a process, specific to the field of study, using suitable methods, techniques, tools and materials, following engineering standards and norms, applying technologies specific to the field of study and experience gained in the professional engineering environment	Uses non-preemptive operating system for co-operative multitasking. Realizes preemptive operating system with intertask communication based on messages and kernel services.			[SU1] Assessment of task fulfilment		

Subject contents	<p>Course content – lecture</p> <p>1. Introduction: course outline, course grading, references 2. Basic terminology: operating system, realtime system, system kernel, multitasking, task, process, thread 3. Operating microsystems specificity (small hardware resources, applica-tion area, task severity, reliability). 4. Simultaneous vs. concurrent processing. Getting operating microsystem requirements. 5. System resources (memory, CPU time, interrupts, DMA, I/O ports). Efficient memory management techniques. 6. Problems and methods of resource reservation. Shared resource. Shared resource exclusive access. 7. Task management and scheduling. Scheduler. Examples of realization. 8. Methods of inter-task communication and synchronization. 9. Message usage and servicing: mailboxes and queues. 10. Time dependencies realization: task-level response, calling of task periodically, delaying, external events synchronization, timeouts. 11. Configurability and aided debugging. 12. System scalability and resource usage. 13. Portability of operating microsystems. 14. Source code documenting and portability. 15. Example of simple operating microsystem: RTXtiny, FreeRTOS, eCOS. 16. Example of advanced operating microsystem: uC/OS-II, QNX embed-ded, uClinux.</p>														
Prerequisites and co-requisites	No requirements														
Assessment methods and criteria	<table border="1" data-bbox="451 465 1487 600"> <thead> <tr> <th data-bbox="451 465 794 499">Subject passing criteria</th> <th data-bbox="794 465 1137 499">Passing threshold</th> <th data-bbox="1137 465 1487 499">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="451 499 794 533">Exam</td> <td data-bbox="794 499 1137 533">50.0%</td> <td data-bbox="1137 499 1487 533">60.0%</td> </tr> <tr> <td data-bbox="451 533 794 566">Lab exercises</td> <td data-bbox="794 533 1137 566">0.0%</td> <td data-bbox="1137 533 1487 566">30.0%</td> </tr> <tr> <td data-bbox="451 566 794 600">Activity/homeworks</td> <td data-bbox="794 566 1137 600">0.0%</td> <td data-bbox="1137 566 1487 600">10.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Exam	50.0%	60.0%	Lab exercises	0.0%	30.0%	Activity/homeworks	0.0%	10.0%
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Recommended reading	Basic literature	1. J. J. Labrosse: MicroC OS II: The Real Time Kernel, Newnes 2002 2. J. J. Labrosse: Embedded Systems Building Blocks, Second Edition: Complete and Ready-to-Use Modules in C, CMP 1999													
	Supplementary literature	1. Ed Sutter: Embedded Systems Firmware Demystified, CMP 2002													
	eResources addresses														
Example issues/ example questions/ tasks being completed	<p>Starting and testing of an example of application based on FreeRTOS</p> <p>Scaling of real-time operating microsystem to application requirements</p>														
Practical activites within the subject	Not applicable														

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