GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Concurrent programming and real time systems, PG_00057026
Field of study	Mechatronics

Date of commencement of studies	February 2023	Academic year of realisation of subject	2022/2023
Education level	second-cycle studies	Subject group	Obligatory subject group in the field of study
			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	1	Language of instruction	Polish
Semester of study	1	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment

Conducting unit	Department of Marine Electronic Systems -> Faculty of Electronics, Telecommunications and Informatics

Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Iwona Kochańska
	Teachers	mgr inż. Mariusz Rudnicki
		dr inż. Piotr Grall
		dr hab. inż. Iwona Kochańska

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	15.0	0.0	45
	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	45	2.0	28.0	75

Subject objectives	The aim of the course is to familiarize the student with the techniques of programming the real-time systems and issues related to software development in multi-process and multi-thread systems. Students learn about the mechanisms of resource sharing in real-time systems the specificity of programming systems based on computers of industrial standards VMEBus, cPCI, PC104, PC104-PLUS.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_W04] has detailed, supported by the theory knowledge in terms of electronic circuits, microelectronics and optoelectronics	The student knows the basic architectures of embedded systems, in particular multi-processor systems, and understands the basic problems related to the software of such systems and how to solve them.	[SW1] Assessment of factual knowledge
	[K7_U06] is able to evaluate feasibility and possibility of application of new achievements (technical and technological) in terms of mechatronics	The student is able to use at an intermediate level the techniques of programming multi-process and multi-thread real-time systems	[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment
	[K7_W05] has detailed, supported by the theory knowledge in terms of control theory, identification methods, concurrent and real time programing, signal and image processing and Artificial Intelligence	The student knows the techniques of concurrent programming of embedded systems working with various operating systems, in particular real-time systems	[SW1] Assessment of factual knowledge

Subject contents	1. Review of real-time operating systems 2. Concepts and elements of real-time systems 3. Kernel and its environment in RT operating systems 4. Process manager, resource manager, namespace management 5. Memory management in RT systems. 6. Processes and threads. 7. Thread scheduling in RT systems. 8. Thread synchronization methods in RT systems. 9. Implementation of thread and process support in POSIX standard 10. Implementation of thread support in the C ++ 11 language standard 11. Basic problems of concurrent programming and ways of solving them		
Prerequisites and co-requisites	Basics of programming in C or C ++		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
		50.0%	50.0%
		50.0%	50.0%
Recommended reading	Basic literature	1. M. Ben-Ari, Principles of Concurrent and Distributed Programming, Addison Wessley, 2005 2. Andrew S. Tanenbaum, Herbert Bos, Modern Operating Systems (4th Edition), Pearson Prentice Hall, 2016	
	Supplementary literature	• R. Love, Linux system programming", O'Reilly Media, 2013 • J. Corbet, A. Rubini, G. Kroah-Hartman, Linux Device Drivers, Third Edition, OReilly	
	eResources addresses	Adresy na platformie eNauczanie: Programowanie współbieżne i systemy czasu rzeczywistego 2023 - Moodle ID: 31107 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=31107	
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		