

Subject card

Subject name and code	Concurrent Programming, PG_00179332						
Field of study	Informatics						
Date of commencement of studies	October 2023		Academic year of realisation of subject		2025/2026		
Education level	Bachelor's studies		Subject group		Obligatory subject group in the field of study Optional 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	3		Language of instruction		Polish		
Semester of study	6		ECTS credits		6.0		
Learning profile	academic		Assessment form		exam		
Conducting unit							
Name and surname of lecturer (lecturers)	Subject supervisor		dr Paweł Pączkowski				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	30.0	0.0	0.0	60
	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	60		0.0		0.0	60
Subject objectives	Familiarizing students with the design and creation of multiprocess and multithreaded programs, as well as analyzing their behaviour.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[INFL3_U03] can design and analyze algorithms for their correctness and computational complexity using appropriate algorithmic techniques and data structures		Using the documentation, the student is able to use the mechanisms for creating processes and concurrent threads in programs, as well as methods for their communication (pipes, IPC, sockets) and synchronization (semaphores, mutexes). The student can explain the communication and synchronization mechanisms used in the programs.		[SU5] implementation of a problem task		
	[INFL3_W07] is familiar with the most important elements of computer systems architecture and the principles of operating systems with particular emphasis on concurrency, task serialization and memory and process management		The student knows the classical problems of concurrent programming (mutual exclusion, producer-consumer, readers and writers problems, the dining philosophers problem). The student knows the concepts of deadlock and starvation. The student knows methods of creation of concurrent processes and threads as well as selected methods of their communication (pipes, IPC, sockets) and synchronization (semaphores, mutexes).		[SW4] test/exam - oral or written		

Subject contents	• Classical problems of concurrent programming: mutual exclusion, producer-consumer, the dining philosophers, readers and writers • Synchronization of processes, the notions of deadlock and starvation • Inference about behaviour of concurrent processes, including elements of temporal logic • Communication and synchronization mechanisms for processes: pipes, queues, semaphores, shared memory, sockets • Creation of concurrent threads and mechanisms of coordination thereof • High-level thread mechanisms for concurrent programming in an abstract perspective - monitors and in functioning libraries (e.g., OpenMP). • Terminology in the English language.		
Prerequisites and co-requisites	programming skills in C or C++		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	written and discussed computer programs	51.0%	50.0%
	written exam	51.0%	50.0%
Recommended reading	Basic literature	1. M. Ben-Ari, <i>Principles of Concurrent and Distributed Programming</i>, Pearson Education, 2006 2. J.S. Gray, <i>Interprocess communications in Linux</i>, Prentice Hall, 2003 3. Z.J. Czech, <i>Wprowadzenie do obliczeń równoległych</i>, Wydawnictwo Naukowe PWN, 2013. 4. K. Barteczko, <i>JAVA Uniwersalne techniki programowania</i>, PWN, 2015	
	Supplementary literature	no recommendations	
	eResources addresses	Basic https://docs.python.org/3/library/ - Python Library Documentation https://www.man7.org/linux/man-pages/ - Linux manual	
Example issues/ example questions/ tasks being completed	• Explain the concepts of deadlock and starvation in concurrent programming. • Using sockets for communication, write and test client-server programs that allow playing the game rock-paper-scissors.		
Work placement	Not applicable		

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