



Subject card

Subject name and code	Concurrent and Distributed Processing, PG_00063888						
Field of study	Informatics						
Date of commencement of studies	October 2024	Academic year of realisation of subject			2025/2026		
Education level	first-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	2	Language of instruction			Polish		
Semester of study	4	ECTS credits			5.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Computer Architecture -> Faculty of Electronics Telecommunications and Informatics -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Mariusz Matuszek					
	Teachers	dr inż. Mariusz Matuszek					
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	30.0	15.0	0.0	60
	E-learning hours included: 0.0						
	eNauczanie source addresses: Moodle ID: 4695 Przetwarzanie współbieżne i rozproszone https://enauczanie.pg.edu.pl/2025/course/view.php?id=4695						
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		4.0		61.0	125
Subject objectives	Teaching and upskilling foundations and rules of distributed and parallel processing in networked computer systems						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_U09] can carry out a critical analysis of the functioning of existing technical solutions and assess these solutions, as well as apply experience related to the maintenance of technical systems, devices and facilities typical for the field of studies, gained in the professional engineering environment	Student: - uses system libraries in distributed processing, - designs own distributed application, - presents practical distributed programming skills.	[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment
	[K6_W04] knows and understands, to an advanced extent, the principles, methods and techniques of programming and the principles of computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study, and organisation of systems using computers or such devices	Student: - knows issues in state sharing, - knows OS processes, - analyses synchronisation issues in distributed computing, - identifies the core synchronisation methods, - can differentiate practical synchronisation issues.	[SW1] Assessment of factual knowledge
[K6_W11] knows and understands to an advanced degree the general principles of the creation and development of economic entities, forms of individual entrepreneurship and conducting enterprises and the fundamental dilemmas of modern civilization, as well as the basic economic, legal and other conditions of various types of activities related to the field of study, including the basic concepts and principles of industrial property protection and copyright law	Student: - gains knowledge about power demand generated by high performance computing and data centers and their environmental impact.	[SW1] Assessment of factual knowledge	
Subject contents	<p>Course content – lecture</p> <ol style="list-style-type: none"> 1. Introduction to the course. Completion rules 2. Abstraction of concurrent processing 3. Parallel processing in examples 4. Critical section - introduction 5. Classical problems of concurrent processing: producers - consumers, readers writers, five philosophers 6. Semaphores detailed classification with descriptions 7. Concurrent and multi-entry procedures 8. Solutions for classic topics of concurrent processing with use of semaphores 9. Binary and general semaphores in Unix system 10. Multi- thread programming 11. Access and execution synchronization for threads or processes 12. Libraries of concurrent functions for Unix systems 13. Monitor introduction and description of the mechanism 14. Monitors in solving of concurrent processing problems practical examples 15. Conditional variables in Unix systems, practical implementation of monitor procedures 16. Comparison of semaphores and monitor mechanisms - theoretical approach <p>Course content – laboratory</p> <ol style="list-style-type: none"> 1. Dynamic data structures and memory management 2. Dynamic and static libraries 3. Multithreading and multiprocessing (creating and managing threads and processes) 4. Interprocess communication 5. Threads and process synchronisation 6. Low level socket API 7. Multithreading in higher-level languages (Java, Python) 8. Monitors as synchronisation objects <p>Course content – project</p> <p><u>Small student groups design, implement and present a distributed client-server application.</u></p>		
Prerequisites and co-requisites	<p>It is advisable to have a basic C programming skills and understand arithmetic of pointers in the C programming language.</p> <p>It is helpful to know your way around in Linux console.</p>		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Midterm colloquium	50.0%	40.0%
	Term-long design	50.0%	20.0%
	Practical laboratories	50.0%	40.0%

Recommended reading	Basic literature	<ol style="list-style-type: none"> 1. Ben-Ari M.: Podstawy programowania współbieżnego, Wydawnictwa Naukowo Techniczne, Warszawa. 2. Colouris G., Dollimore J., Kindberg G.: Distributed Systems, Concepts and Design, second edition, Addison-Wesley. 3. Coulouris G., Dollimore J, Kindberg T.: Systemy rozproszone Podstawy i projektowanie, Wydawnictwa Naukowo Techniczne, Warszawa. 4. Hwang K., Briggs F.: Computer Architecture and Parallel Processing, McGraw - Hill.
	Supplementary literature	<ol style="list-style-type: none"> 1. Lister A., Eager R.: Wprowadzenie do systemów operacyjnych, Wydawnictwa Naukowo Techniczne, Warszawa. 2. Silberschatz A., Gavlin P.: Podstawy systemów operacyjnych, Wydawnictwa Naukowo Techniczne, Warszawa. 3. Stevens R.: Unix Network Programming, Prentice Hall.
	eResources addresses	
Example issues/ example questions/ tasks being completed		
Practical activities within the subject	Not applicable	

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