



Subject card

Subject name and code	Concurrent and parallel programming, PG_00037344						
Field of study	Technical Physics						
Date of commencement of studies	October 2021	Academic year of realisation of subject			2023/2024		
Education level	first-cycle studies	Subject group			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 Część wykładów i laboratoriów będzie prowadzona w języku angielskim.		
Semester of study	5	ECTS credits			4.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Instytut Fizyki i Informatyki Stosowanej -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Jan Franz				
	Teachers		dr hab. Jan Franz				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	30.0	0.0	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		10.0		45.0	100
Subject objectives	The goal of the course is to introduce students into the area of design and programming concurrent and parallel programs. In particular will be shown how to design, implement and evaluate the quality of programs.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	K6_U03		The student practices Java programming		[SU1] Assessment of task fulfilment		
	K6_W05		The student learns how to solve the classical concurrency problems		[SW1] Assessment of factual knowledge		
	K6_K01		The student knows the scenarios where the use of concurrent or parallel programming is necessary to solve the problem		[SK5] Assessment of ability to solve problems that arise in practice		
Subject contents	<ol style="list-style-type: none">1. Basic Concepts<ol style="list-style-type: none">1.1 Basic Introduction1.2 Thread Concept in Java1.3 Elementary Mechanisms for Synchronization1.4 Basic Control of Threads2. Advanced Concepts<ol style="list-style-type: none">2.1 Measures for Parallelization2.2 Thread Pools2.3 Lock Objects2.4 Thread-safe Collections2.5 Additional Mechanisms for Synchronization3. Frameworks for Parallelization<ol style="list-style-type: none">3.1 Divide-And-Conquer / Fork-Join3.2 Parallel Arrays and Streams4. Example Applications<ol style="list-style-type: none">4.1 Monte Carlo Simulation4.2 Machine Learning Application						
Prerequisites and co-requisites	The fundamentals of Java and/or python programming.						

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written test (10 points) and laboratory (30 points). Total 40 points.	0.0%	25.0%
	Lab (30 points)	0.0%	75.0%
Recommended reading	Basic literature	<p>1. T. Rauber, G. Runger, Parallel Programming: for Multicore and Cluster Systems, 2nd edition, Springer, Berlin, 2013</p> <p>2. M. Ben-Ari, Principles of Concurrent and Distributed Programming, 2nd edition, Addison-Wesley, Upper Saddle River, NJ, 2005.</p> <p>3. R.-G. Urma, M. Fusco, A. Mycroft, Modern Java in Action, Manning Publications, 2018</p> <p>4. B. Goetz, T. Peierls, J. Bloch, J. Bowbeer, D. Holmes, D. Lea, Java Concurrency in Practice. Addison-Wesley, Upper Saddle River, NJ, 2006</p>	
	Supplementary literature	<p>1. P. Butcher, Seven Concurrency Models in Seven Weeks, The Pragmatic Bookshelf, Dallas, 2014</p> <p>2. B. J. Evans, J. Clark, M. Verburg, The Well-Grounded Java Developer, Second Edition, Manning Publications, 2023 5.</p>	
	eResources addresses	<p>Podstawowe https://docs.oracle.com/javase/tutorial/essential/concurrency/index.html - Tutorials about concurrent programming in Java. Adresy na platformie eNauczanie: Programowanie wspolbieżne i równoległe - laboratorium - 2023/24 - Moodle ID: 30988 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=30988</p>	
Example issues/ example questions/ tasks being completed	<p>1. Calculate the Speedup of a concurrent program.</p> <p>2. Convert a sequential program in a concurrent program.</p>		
Work placement	Not applicable		