

Software Engineering Institute			Semester 2. of the curriculum 2025-26-2			
Name of the subject:	Code of the subject:	Credits:	Weekly hours:			
				lec	sem	lab
Parallel Programming	NSXPP1EMNF	5	full-time	2		2
Responsible person for the subject: Dr. Gabor Kertesz			Classification:			
Subject lecturer(s): Kaziwa Saleh						
Prerequisites:						
Way of the assessment:		Examination				
Course description						
Goal:	The aim of the subject is to deepen the knowledge of the students regarding the design methods and questions for parallel computational systems, and the required programming skills.					
Course description:	Students will learn, and obtain practical techniques used in parallel programming, such as thread handling, communication between threads, and synchronization. The course will give an additional overview of different programming variants of distributed systems.					

Lecture schedule	
Education week	Topic
1.	Fundamentals of parallel programming. Efficiency.
2.	Parallel design. Granularity. Load balance. Processes in operating systems
3.	Designing parallel algorithms. Multithreading, thread parallelism. Race condition.
4.	Synchronization. Dekker's algorithm and Peterson's algorithm. Critical Section.
5.	MPI #1
6.	MPI #2
7.	Lamport's "bakery" algorithm. Atomic operations. Semaphore. Deadlock
8.	Classical problems I: dining philosophers, readers-writers
9.	Classical problems II: cigarette smokers, barbershop. Monitor
10.	<i>Break</i>
11.	Producer-consumer problem. Concurrent data structures. ABA problem.
12.	Master-worker pattern. Concurrent bag of jobs.
13.	Midterm exam
14.	Retake of the midterm exam
Mid-term requirements	
Conditions for obtaining a mid-term grade/signature	Attendance of the classes is obligatory. The students will write a midterm exam (week 13). The exam must be successfully completed ($\leq 50\%$). Otherwise, the student can retake the exam in the final week. In that case, the grade of the retake exam is considered. A signature will be granted to students who successfully pass the midterm exam and do not miss more than 30% of the classes. (TVSZ 23.§)
Assessment schedule	
Education week	Topic
13	Midterm exam
14	Retake

Type of the replacement											
Type of the replacement of written test/mid-term grade/signature	In case of a missed midterm exam, a retake exam is available on the 14th week. If the necessary 50% is not reached, the exam can be retaken as part of the signature (or grade replacement) exam.										
Type of the exam											
The course can be completed by successfully passing an exam. The exam is written.											
Calculation of the exam mark											
The final grade is the average of the midterm grade and the result of the written exam, provided that both parts separately reach the minimum level.											
Final grade calculation methods:											
The final grade is calculated as follows:											
	<table border="1" style="margin-left: auto; margin-right: auto;"> <tbody> <tr> <td style="text-align: center;">0-49%</td> <td style="text-align: center;">failed (1)</td> </tr> <tr> <td style="text-align: center;">50-62%</td> <td style="text-align: center;">satisfactory (2)</td> </tr> <tr> <td style="text-align: center;">63-74%</td> <td style="text-align: center;">average (3)</td> </tr> <tr> <td style="text-align: center;">75-86%</td> <td style="text-align: center;">good (4)</td> </tr> <tr> <td style="text-align: center;">87-100%</td> <td style="text-align: center;">excellent (5)</td> </tr> </tbody> </table>	0-49%	failed (1)	50-62%	satisfactory (2)	63-74%	average (3)	75-86%	good (4)	87-100%	excellent (5)
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References											
Obligatory:	Lab materials, presentations available on the course's page on Moodle										
Recommended:	Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar: Introduction to Parallel Computing, Addison Wesley, 2003 Mattson, Sanders, Massingill: Patterns for Parallel Programming, Pearson, 2005 Clay Breshears: The Art of Concurrency, O'Reilly, 2009										
Other references:											