Óbuda University John von Neumann Faculty of Informatics	Institute of Software Engineering
Name and code: Parallel Programming (NIXPEREMNE)	**Credits:** 5
Computer Science MSc	*Daytime 2020/21 year I. semester*

Subject lecturers: Dr. Gábor Kertész, Dr. habil. Miklós Kozlovszky				
Prerequisites: (with code)				
Weekly hours:	Lecture: 2	Seminar: 0	Lab. hours: 2	Consultation: 0
Way of assessment:	Examination			

Course description

Goal: The aim of the lecture 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 lecture will give an additional overview on 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. Mutual Exclusion.
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	Producer-consumer problem. Concurrent data structures. ABA problem.
11	*Break*
12	Master-worker pattern. Concurrent bag of jobs.
13	Theoretical exam.
14	Retake of the theoretical exam.

Midterm requirements

According to the Joint Instruction of the Rector and Chancellor *17/2020. (VII. 15.)*, the lectures in the first semester of the 2020/2021 academic year will be held online. The weekly lecture materials will be published online in the Moodle system of the University.

For every week a test is announced together with the given weekly materials in the Moodle system, where solving and passing the test is obligatory. If the student does not pass the given test within 7 days (during which time multiple attempts can be made), the missing test is considered as an absence. As defined in the Study and Examination Regulations, if the number of absences exceeds 30% of the total number of hours, the student cannot obtain a signature.

For the signature the midterm exam must be successfully completed ($\leq 50\%$).
A signature can only be obtained if the student has not been blocked due to the absence defined above. If a signature is refused, a signature can only be obtained in a signature replacement exam. The condition for applying for the final exam is the presence of a signature.
If the grade calculated from the midterm exam is at least good (4), then this grade will be offered.

Midterm Test Scheduling

Education week	Topic
13	Theoretical test
14	Retake

Midterm grade calculation methods

The midterm grade is calculated from the result of the theoretical test held on week nr. 13.

Method of replacement

In case of a missed theoretical exam, a retake test is available on the 14th week. If the necessary 50% is not reached, the exam can be retaken as part of the signature exam.

Type of exam

Written.

Exam grade calculation methods

If the grade calculated from the midterm exam is at least good (4), then this grade will be offered.

In other cases, the grade of the final exam is used to calculate the grade.

0-49%	failed (1)
50-62%	satisfactory (2)
63-74%	average (3)
75-86%	good (4)
87-100%	excellent (5)

References

Obligatory:

Lecture materials, presentations

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

Others:

University Moodle System: https://elearning.uni-obuda.hu/main/