Concurrent Programming

Course description

Basic Information

Field of study : Analytical Computer Science

Path : -

Organizational unit : Faculty of Mathematics and Computer Science

Education level : first-cycle

Form of studies : full-time studies

Study profile : general academic

Status : optional

Education cycle : 2022/23

Course code : UJ.WMIIANS.1380.03352.22

Languages of instruction : Polish

Course related to scientific research : Yes

Disciplines : Computer Science

ISCED classification : 0613 Software and applications development and analysis

USOS code : WMI.TCS.PW.S

Course coordinator

Maciej Ślusarek

Course instructors

Maciej Ślusarek, Krzysztof Turowski

Terms Semester 4, Semester 5, Semester 6	Verification method of learning outcomes exam Form of instruction and hours lecture: 30 laboratory classes: 30	Number of ECTS credits 6.0

Learning outcomes for the course

Code	Outcomes in terms of	Directional learning outcomes	Verification methods
Knowledge – Student knows and understands:			
W1	basic concepts, models and techniques of parallel computing	IAN_K1_W04, IAN_K1_W08, IAN_K1_W13	written exam, credit
Skills – Student can:			
U1	design and analyze parallel algorithms for selected problems and parallelism models	IAN_K1_U03, IAN_K1_U05, IAN_K1_U11, IAN_K1_U17, IAN_K1_U21	written exam, credit
U2	program in parallel in a graphics card environment	IAN_K1_U03, IAN_K1_U05, IAN_K1_U09, IAN_K1_U11	written exam, credit

ECTS credits balance

Form of student activity	Average number of hours* dedicated to completed activity types	
lecture	30	
laboratory classes	30	
project preparation	30	
independent solving of computer tasks	60	
exam preparation	30	
Total student workload	Number of hours 180	ECTS credits 6.0

* hour (lesson) means 45 minutes

Program content

No.	Program content	Learning outcomes for the course

No.	Program content	Learning outcomes for the course
1.	1. Basic concepts of concurrent programming 2. Algorithms in the PRAM model: model properties, complexity parameters, basic techniques: doubling, parallel prefix, Euler path technique for trees 3. Selected algorithms in the PRAM model - transitive closure, shortest paths, BFS, connected components 4. Basics of programming in the CUDA system 5. Multi-threaded algorithms in the CILK system 6. Threads in the POSIX standard 7. OpenMP 8. MPI 9. Selected parallel algorithms (parallel prefix, sorting, graph problems, matrix operations) in various concurrent computing models.	W1, U1, U2

Extended information

Teaching methods:

conventional lecture, laboratory classes

Type of classes	Credit forms	Course credit conditions
lecture	written exam	Positive grade from the exam. Admission to the exam subject to a positive grade from the laboratory. The final grade is a weighted average of the laboratory grade and the exam.
laboratory classes	credit	Laboratory credit based on credit programs and project

Prerequisites and additional requirements

Algorithms and data structures 1

Literature

Required

1. A.Grama, A.Gupta, G.Karypis, V.Kumar, Introduction to Parallel Computing (2'nd ed.), Addison-Wesley, 2003

Additional

1. T.H. Cormen, Ch.E. Leiserson, R.L. Rivest, C. Stein, Wprowadzenie do algorytmów, wydanie III, PWN, 2012
2. http://docs.nvidia.com/cuda/cuda-c-programming-guide