DOCTORAL SCHOOL OF WROCŁAW UNIVERSITY OF SCIENCE AND TECHNOLOGY

SUPERVISOR/TEAM/ DECLARING/CONDUCTING COURSE: Wojciech Bożejko
DEPARTMENT: Faculty of Electronics W4
SCIENTIFIC DISCIPLINE: Automation, Electronics and Electrical Engineering

COURSE CARD

Course name in Polish: Programowanie równoległe
Course name in English: Parallel programming
Course language Polish
The course is intended for all PhD students: YES / NO
1) BASIC COURSE
2) SPECIALIST COURSE
3) SEMINAR
4) HUMANISTIC COURSE
5) LANGUAGE

Subject code: AEQ004101W

* delete as applicable

	Lecture	Foreign language course	Seminar	Mixed forms
Number of hours of organized classes in university (ZZU)	30			
Grading	Exam	Exam	Oral presentation	Exam, inspection, evaluation classes
Number of ECTS points	0			

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Basic knowledge of programming in a high-level language

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COURSE OBJECTIVES
C1. Acquisition of knowledge regarding parallel programming with the use of multiprocessor architectures
C2. Acquisition of knowledge in the field of implementation of concurrent sorting algorithms
C3. Acquisition of knowledge in the field of implementation of concurrent graph algorithms
C4 Acquisition of knowledge in the field of implementation of concurrent algorithms for solving linear equations
C5. Acquisition of knowledge in the field of implementation of concurrent optimization algorithms,
C6. To acquire the ability to design parallel metaheuristics for solving NP-hard problems

PROGRAM CONTENTS

	Form of classes – lecture (Lec)	Number of hours
Lec1	Architecture of multiprocessor systems - from multi-core processors, through GPUs to clusters and supercomputers. The PRAM model.	2
Lec2	Parallel programming languages and libraries.	2
Lec3	Programming in a cluster - the MPI library.	2
Lec4	Programming of GPU devices - CUDA.	2
Lec5	MIC programming - OpenMP.	2
Lec6	Environments with shared and distributed memory - differences in programming.	2
Lec7	Quality measures of concurrent algorithms (acceleration, efficiency, cost).	2
Lec8	Limits of parallel calculations - anomaly of the superelevation acceleration.	2
Lec9	Parallel graph algorithms. Determining the shortest / longest paths in networks.	2
Lec10	Parallel sorting algorithms. Sort "even-odd".	2
Lec11	Parallel sorting algorithms. Parallel quicksort algorithm.	2
Lec12	Parallel solving systems of linear equations. Matrix algorithms.	2
Lec13	Selected parallel algorithms. Parallel metaheuristics.	2
Lec14	Parallel and distributed algorithm for taboo search and simulated annealing	2
Lec15	Parallel genetic algorithms and their models. Parallel scatter search.	2
	Total hours:	30

TEACHING TOOLS USED

N1. Lecture with presentations in the supercomputer system online.
N2. consultations
N3. Own work - independent studies

ACHIEVED SUBJECT LEARNING OUTCOMES

Type of learning outcome	Code of learning outcome	Assessment of learning outcome
Knowledge	P8S_WG	Lecture
Skills	P8S_WG	Exan
Skills	P8S_UW	Exan

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PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Grama A., Gupta A., Karypis D., Kumar V., Introduction to Parallel Computing (2nd ed.), Pearson Addison Wesley (2003).
[2] Cormen T.H., Leiserson C.E., Rivest R.L. : Introduction to algorithms, chapter 30 Parallel algorithms, WNT, Warsaw (1997).

SECONDARY LITERATURE:

[1] Bożejko W., A new class of parallel scheduling algorithms, Wroclaw University of Technology Publishing House, (2010), 1-280.
[2] Bożejko W., Parallel algorithms of discrete optimization in manufacturing, EXIT Academic Publishing House, Warsaw 2018, 1-192, ISBN 978-83-7837-076-5.

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

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