DOCTORAL SCHOOL OF WROCŁAW UNIVERSITY OF SCIENCE AND TECHNOLOGY

SUPERVISOR DECLARING/CONDUCTING COURSE: dr hab inż. Adam Kasperski, prof. uczelni
DEPARTMENT: Faculty of Computer Science and Management
SCIENTIFIC DISCIPLINE: Information and Communication Technology

COURSE CARD

Course name in Polish: Złożoność Obliczeniowa
Course name in English: Computational Complexity
Course language: Polish
The course is intended for all PhD students: YES
1) BASIC COURSE
~~**2) SPECIALIST COURSE**~~
~~**3) SEMINAR**~~
~~**4) HUMANISTIC COURSE**~~
~~**5) LANGUAGE**~~
~~**6) RESEARCH SKILLS**~~

Subject code: ITQ100245W

* delete as applicable

	Lecture	Foreign language course	Seminar	Mixed forms
Number of hours of organized classes in university (ZZU)	30			
Grading	Written test			

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Fundamentals of logic and probability calculus
2. Fundamentals of computer programming

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COURSE OBJECTIVES

C1 Showing students various computational problems and models of computations.
C2 Presentation of the most important complexity classes
C3 Indication of theoretical limitations on the computing capabilities of modern computers

PROGRAM CONTENTS

Form of classes		Number of hours
Le1	Introduction to the theory of computations	2
Le2	Finite automata. Regular languages	2
Le3	Pushdown automata. Context-free grammars	2
Le4	Turing machines. Church – Turing thesis	2
Le5	Decidable, recursively enumerable and undecidable languages	2

Le6	Time complexity. Classes P, NP, EXP, NEXP	2
Le7	NP-complete problems. The hypothesis P<>NP.	4
Le8	Space complexity. Classes L, NL, PSPACE, NPSPACE	2
Le9	Optimization problems. Classes NPO, PO and NP-hard problems.	2
Le10	Approximability of optimization problems. Classes APX, PTAS, FPTAS	4
Le11	Randomized computations. Monte Carlo and Las Vegas algorithms	2
Le12	Randomized complexity classes BPP, RP, ZPP	2
Le13	Written test	2
	Total hours	**30**

TEACHING TOOLS USED
N1. Presentation N2. Computer software N3. Solving sample problems

ACHIEVED SUBJECT LEARNING OUTCOMES		
Type of learning outcome	Code of learning outcome	Assessment of learning outcome
Knowledge	P8S_WG	Written test
Skills	P8S_UW	Written test

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] M. Sipser. Wprowadzenie do teorii obliczeń. WNT, Warszawa 2009.
[2] J. E. Hopcroft, J. D. Ullman. Wprowadzenie do teorii automatów, języków i obliczeń. PWN, Warszawa 2003
[3] C. Papadimitriou. Złożoność obliczeniowa. WNT, Warszawa 2002

SECONDARY LITERATURE:

[1] S. Arora, B. Barak. Computational complexity: a modern approach. Cambridge University Press 2009.
[2] G. Ausiello, P. Crescenzi, G. Gambosi, V. Kann, A. Marchetti-Spaccamela, M. Protasi. Complexity and approximation. Combinatorial optimization problems and their approximability properties. Springer 2003
[3] C. Papadimitriou, K. Steiglitz. Combinatorial optimization. Algorithms and complexity, Dover Publications, Inc., New York 1998.

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

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