Cracow University of Technology

Course syllabus

binding for the doctoral students of the CUT Doctoral School commencing their studies in the academic year 2022/2023

Information on the course

Name of the course in Polish	Metaheurystyki równoległe w optymalizacji
Name of the course in English	Parallel metaheuristics for optimisation problems
Number of the ECTS points	1
Language of instruction	Polish
Category of the course	Elective
Field of education	Engineering and Technology
Discipline of education	Automatic Control, Electronics and Electrical Engineering
Person responsible for the course Contact	Zbigniew Kokosiński, *doctor habilitatus* in Engineering, prof. of CUT zk@pk.edu.pl

Type of course, number of hours in the study programme curriculum

Semester	Credit type (G / NG)*	Lecture	Practical class	Laboratory	Computer laboratory	Project class	Seminar
2, 3	G	9	0	0	0	6	0

*G – graded credit, NG – non-graded credit

Course objectives

Code	Objective description
Objective 1	Introduction to discrete and continuous optimisation problems and their computational complexity
Objective 2	Learning and applying selected modern metaheuristic methods in optimisation problems

Learning outcomes

Code	Description of the learning outcome adjusted to the specific characteristics of the discipline	Learning outcome symbol in the CUT DS	Methods of verification
OUTCOMES RELATED TO KNOWLEDGE			
EUW1	The doctoral student knows and understands discrete and continuous optimisation problems and their computational complexity	E_W01 E_W02	Attendance in class, written test
EUW2	The doctoral student knows and understands selected metaheuristic methods	E_W01 E_W02	Attendance in class, written test
OUTCOMES RELATED TO SKILLS			
EUU1	The doctoral student is able to select and implement a programmatic metaheuristic method for a given optimisation problem	E_U02 E_U08 E_U11	Project report

OUTCOMES RELATED TO SOCIAL COMPETENCES			
EUK1	The doctoral student is prepared to critically evaluate subject-related literature and to collaborate in a team execution of a project	E_K01 E_K02 E_K03 E_K07	Discussion, presentation of project results

Course outline

No.	Contents	Learning outcomes for the course	No. of hours
LECTURE			
W1	Discrete and continuous optimisation problems and their computational complexity. Selected benchmarks.	EUW1	3
W2	Selected metaheuristic methods derived from the local search method.	EUW2	3
W3	Selected population-based metaheuristics.	EUW2	3
PROJECT CLASS			
P1	Implementation of selected metaheuristics for a given optimisation problem.	EUW1, EUW2, EUU1, EUK1	6

The ECTS points statement

WORKING HOURS SETTLEMENT	
Type of activity	Average number of hours (45 min.) dedicated to the completion of an activity type
SCHEDULED CONTACT HOURS WITH THE ACADEMIC TEACHER	
Hours allotted in the syllabus	15
Consultations	1
Course credit assignment	2
HOURS WITHOUT THE PARTICIPATION OF THE ACADEMIC TEACHER	
Independent study of the course contents	6
Preparation of a paper, report, project, presentation, discussion	6
ECTS POINTS STATEMENT	
Total number of hours	30
The ECTS points number	1

Preliminary requirements

No.	Requirements
1	Knowledge of a high-level programming language, general knowledge of algorithmics

Course credit assignment conditions / method of the final grade calculation

No.	Description
COURSE CREDIT ASSIGNMENT CONDITIONS	
1	Attendance in class, passing a test on knowledge covered in the lecture, successful completion of an individual or team project

METHOD OF THE FINAL GRADE CALCULATION
The final grade is a weighted average of the grade on the test of knowledge covered in the lecture (weight 1) and the grade on the completion of the project (weight 3)

Additional information

None

The course reading list

1	Kubale M., *Łagodne wprowadzenie do analizy algorytmów*, Wyd. Politechniki Gdańskiej, Gdańsk 2017
2	Sait S.M., Youssef H., *Iterative computer algorithms with applications in engineering. Solving combinatorial optimization problems*, Los Alamitos, 1999, IEEE Computer Society Press
3	Michalewicz Z., Fogel D.B., *How to solve it? Modern heuristics*, Springer 1999
4	Ausiello G. et al., *Complexity and approximation: Combinatorial optimization problems and their approximability properties*, Springer 1999
5	Alba E., *Parallel metaheuristics. A new class of algorithms*, Wiley, 2005
6	Kokosiński Z., Ochał Ł., Chrząszcz G., *Parallel metaheuristics for robust graph coloring problem*, [in:] Fidanova S. (ed.), Recent advances in computational optimization, *Studies in Computational Intelligence*, Vol. 655, 285-302, Springer International Publishing, 2016