

DOCTORAL SCHOOL OF WROCLAW UNIVERSITY OF SCIENCE AND TECHNOLOGY

SUPERVISOR DECLARING/CONDUCTING COURSE: *Michał Przewoźniczek*
DEPARTMENT: *Faculty Computer Science and Communication Technology*
SCIENTIFIC DISCIPLINE: *Computer Science and Communication Technology*

COURSE CARD

Course name in Polish: *Nowoczesne Obliczenia Ewolucyjne*
Course name in English: *Modern Evolutionary Computation*
Course language: *english*
The course is intended for all PhD students: *YES*
2) SPECIALIST COURSE

Subject code: **ITQ100275W**

* 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	evaluation classes

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Programming skill in C++, C#, or Java
2. The working knowledge and understanding of objective-oriented programming

COURSE OBJECTIVES

- C1 Getting the knowledge on the main state-of-the-art trends in the field of Evolutionary Computation
 C2 Getting the ability to choose the appropriate optimizer for the optimization problem at hand
 C3 Getting the ability to implement chosen metaheuristics efficiently
 C4 Getting the ability of critical analysis of the obtained results

PROGRAM CONTENTS

Form of classes		Number of hours
	Organization classes. Basic optimization methods (lecture)	2
	Continuous domains – problem features, optimizers features (lecture+lab)	2
	Continuous domains – how to be effective? Automated optimizer step choice (lecture+lab)	2
	Statistical analysis in continuous domains (lecture+lab)	4
	Genetic Algorithms – basics, parameter influence (lecture+lab)	2
	Gray-box optimization, problem-dedicated techniques (lecture+lab)	4

**DOCTORAL SCHOOL OF WROCLAW UNIVERSITY OF SCIENCE AND
TECHNOLOGY**

	Population diversity – influence, classical and modern diversity preservation techniques (lecture+lab)	4
	Problem decomposition (lecture+lab)	6
	The basics of multi-objective optimization (lecture+lab)	2
	Differential Evolution (lecture+lab)	2
	Total hours	30

TEACHING TOOLS USED
N1. Multimedia presentations (for the lecture part of classes)
N2. Documentation for the programming tasks (the laboratory part of classes)
N3. The e-learning system for publishing the educational materials

ACHIEVED SUBJECT LEARNING OUTCOMES		
Type of learning outcome	Code of learning outcome	Assessment of learning outcome
SzD_W3 the main trends in the development of the scientific or artistic disciplines covered in the curricula;	P8S_WG	The ability to use state-of-the-art evolutionary methods will be verified during the classes.
SzD_W4 research methodology	P8S_WG	During the laboratory part of the classes, the participants will run their research. The quality of this research will be verified during the classes.
SzD_U2 use knowledge from different fields of science or art to creatively identify, formulate and innovatively solve complex problems or perform research tasks (...)	P8S_UW	During the classes, students will have to improve the already known evolutionary methods and their basic form. The quality of these modifications will be discussed during the classes.
SzD_U5 initiate debates and participate in a scientific discourse;	P8S_UW	During the classes, students will discuss various subjects of Evolutionary Optimization. The activity during these classes will be verified and rated.

PRIMARY AND SECONDARY LITERATURE
<u>PRIMARY LITERATURE:</u>
[1] <i>Classes notes</i>
[2] Arabas J. <i>Wykłady z algorytmów ewolucyjnych</i>
[3] Michalewicz Z. <i>Genetic Algorithms + Data Structures = Evolution Programs</i>
[4] Michalewicz Z., Fogel D.B. <i>How to Solve It: Modern Heuristics</i> , WNT 2006
Goldberg D. <i>Genetic algorithms in search, optimization, and machine learning</i>
SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

**DOCTORAL SCHOOL OF WROCLAW UNIVERSITY OF SCIENCE AND
TECHNOLOGY**

Michał Przewoźniczek (michal.przewozniczek@pwr.edu.pl)