

1.	Field of study	Computer Science
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2021/2022 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

Module: Mathematical modeling of optimization problems

Module code: W4-IN-S2-20-3-MMPO

1. Number of the ECTS credits: 3

2. Learning outcomes of the module			
code	description	learning outcomes of the programme	level of competence (scale 1-5)
M_001	Is able to use selected programming libraries in order to formulate combinatorial optimization problems as a linear program (also integer program).	K_U01 K_U05 K_U08 K_U09	1 1 3 3
M_002	Is able to solve a combinatorial optimization task using modern search methods, such as Answer Set Programming and Satisfiability Modulo Theories, in a selected programming language.	K_U01 K_U05 K_U08 K_U09	1 3 3 3
M_003	Has knowledge about formulating combinatorial optimization tasks by means of the classical and modern methods of mathematical modeling.	K_W01 K_W02 K_W04 K_W09	4 3 1 1

3. Module description	
Description	This subject aims at the exact and effective solving of intractable optimization problems. The students are familiarizing with the following three approaches: (i) linear and integer programming (for example MathProg language), (ii) satisfiability modulo theories (for example based on Z3 library), and (iii) answer set programming (for example AnsProlog). Thanks to that every student should know all aspects of using classical and modern exact optimization methods.

Prerequisites	
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4. Assessment of the learning outcomes of the module			
code	type	description	learning outcomes of the module
W_001	Midterm for lecture	Executing assignments that involve all approaches described in the lecture.	M_003
W_002	Midterm for lab	Programming assignments that involve classical and modern combinatorial optimization problems, with the help of glpk and Z3 libraries as well as AnsProlog language.	M_001, M_002

5. Forms of teaching						
code	form of teaching			required hours of student's own work		assessment of the learning outcomes of the module
	type	description (including teaching methods)	number of hours	description	number of hours	
Z_001	lecture	Oral presentation with the help of prepared slides. Focusing on the hard part of the topics, giving basic examples and suggesting web pages for more advanced ones.	15	Familiarizing with the topics, appropriate software, selected web pages, and recommended literature.	30	W_001
Z_002	laboratory classes	Preparing students for executing assignments by showing the methodology and handling steps.	15	Writing computer programs and the analysis of existing solutions on the Internet.	30	W_002