

(faculty stamp)

COURSE DESCRIPTION

1. Course title: ALGORITHMS AND DATA STRUCTURES		2. Course code: AaDS		
3. Validity of course description: 2017/2018				
4. Level of studies: 1st cycle of high er education				
5. Mode of studies: intramural studies				
6. Field of study: Macrofaculty				
7. Profile of studies:				
8. Programme:				
9. Semester: 6				
10. Faculty teaching the course: Faculty of Automatic Control, Electronics and Computer Science				
11. Course instructor: dr hab. Inż. Sebastian Deorowicz, dr inż. Agnieszka Debudaj-Grabysz				
12. Course classification: common courses				
13. Course status: obligatory				
14. Language of instruction: English				
15. Pre-requisite qualifications: It is assumed, that the student has an elementary knowledge of mathematics at the secondary level and logical thinking skills, including abstract thinking. An additional requirement is knowledge of English and the ability to write and understand simple programs.				
16. Course objectives: The aim of the course is to introduce students into advanced topics of algorithms and data structures. We present algorithms for sorting, searching, operating on graphs, trees. We discuss selected data structures: binary trees, heaps, priority queues. Students after this course should be able to analyze the complexity of algorithms, adapt known algorithms for new problems etc. Topics are illustrated with many examples.				
17. Description of learning outcomes:				
Nr	Learning outcomes description	Method of assessment	Teaching methods	Learning outcomes reference code
1	Analyzes computational complexity of algorithms, solves the equations expressing the complexity of recursive algorithms; analyzes the amortized cost	Lab programs, Written tests/exam	Lecture, lab classes	K1A_U11
2	Designs efficient algorithms, understands the influence of computer architecture on algorithms, is able to tune algorithms	Lab programs, Written tests/exam	Lecture, lab classes	K1A_U11
3	Uses following methods in algorithms: divide and conquer, dynamic programming, greedy methods	Lab programs, Written tests/exam	Lecture, lab classes	K1A_U11
4	Can apply known algorithms (sorting, searching, selection, graph, text, geometric number theory, algebra and linear algebra,	Lab programs, Written tests/exam	Lecture, lab classes	K1A_U11

	numerical) for a particular problem			
5	Is able to formulate opinions on the key issues of computer science, with particular emphasis on algorithmics	Lab programs, Written tests/exam	Lecture, lab classes	K1A_W7
18. Teaching modes and hours Lecture / BA /MA Seminar / Class / Project / Laboratory 30h lecture / 30h laboratory				
19. Syllabus description: Lectures: Introduction, complexity of algorithms. Simple sorting algorithms: selection sort, insertion sort. Quick sort, k-selection. Divide and conquer. Heaps and their use: heap sort, priority queues. Sorting with comparisons. Sorting of specific data: integers, bucket sort, radix sort. Binary Search Trees. Hashing: chaining, open addressing, MPHF. Exhaustive search. Greedy algorithms. Graphs, BFS, DFS. The Dijkstra algorithm, The Floyd-Warshall algorithm. Dynamic programming. Laboratory: Programs implementing selected algorithms presented during lectures.				
20. Examination: yes				
21. Primary sources: T.H. Corman, C.E. Lejseron, R.L. Rivest, Wprowadzenie do Algorytmów, WNT, Warszawa, 1997 (Original version in English)				
22. Secondary sources: E.M. Reingold, J. Nievergelt, N. Deo, Algorytmy Kombinatoryczne, PWN, Warszawa, 1985. 2. N. Wirth, Algorytmy + Struktury danych = Programy, WNT, Warszawa, 2000 (Original version in English) 3. L. Banachowski, A. Kreczmar, Elementy Analizy Algorytmów, WNT, Warszawa, 1982. 4. S. Alagić, M.A. Arbib, Projektowanie Programów Poprawnych i Dobrze Zbudowanych, WNT, Warszawa, 1982. 5. A.V. Aho, J.D. Ullman, Projektowanie i Analiza Algorytmów Komputerowych, PWN, Warszawa, 1983. 6. J. Bentley, Perełki Programowania, WNT, Warszawa, 1986. W. Lipski, Kombinatoryka dla Programistów, WNT, Warszawa, 1987. 7. L. Banachowski, A. Kreczmar, W. Rytter, Analiza Algorytmów i Struktur Danych, WNT, Warszawa, 1987. 8. D. Harel, Rzecz o Istocie Informatyki. Algorytmika, WNT, Warszawa, 1992. 9. R.L. Graham, D.E. Knuth, O. Patashnik, Matematyka Konkretna, PWN, Warszawa, 1996 (Original version in English)				
23. Total workload required to achieve learning outcomes				
Lp.	Teaching mode :	Contact hours / Student workload hours		
1	Lecture	30 / 15		
2	Classes	- / -		
3	Laboratory	30 / 15		
4	Project	- / -		
5	BA/ MA Seminar	- / -		
6	Other	- / -		
	Total number of hours	60 / 30		
24. Total hours: 90				
25. Number of ECTS credits: 3				
26. Number of ECTS credits allocated for contact hours: 1				

27. Number of ECTS credits allocated for in-practice hours (laboratory classes, projects): 2
26. Comments: –

Approved:

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(date, Instructor's signature)

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(date, the Director of the Faculty Unit signature)