

Course code B.1. Course item

1. INFORMATION ABOUT THE COURSE

A. Basic information

Course title	Data Structures and Algorithms
Field of study	Computer Aided Engineering
Cycle	<i>Second</i>
Study profile	<i>Academic</i>
Study mode	<i>Full-time</i>
Specialisation	<i>Not relevant</i>
Unit responsible for the field of study	<i>Faculty of Mechanical Engineering</i>
Lecturer	<i>Dr inż. Tomasz Marciniak</i>
Introductory courses	<i>Not relevant</i>
Prerequisites	<i>Basic knowledge of computer, software installation</i>

B. Semester/ weekly timetable

Semester	Lectures	Classes	Laboratories	Project classes	Seminars	Field experience	ECTS credits
I	15	-	15	-	-	-	3

LEARNING OUTCOMES (acc. to National Qualifications Framework)

No.	Description of learning outcomes	Reference to learning outcomes for the field of study	Reference to learning outcomes for the area of study
KNOWLEDGE			
K1	On successful completion of the course student is supposed to: describe the basic sorting and searching algorithms. Will be able to define algorithm design paradigm based on multi-branched recursion: divide and conquer.	CAE_W01	T2A_W02
K2	Student will have the knowledge to the discussion of the complexity of the algorithms, will be able to explain the concept of a graph and minimum spanning tree.	CAE_W08	T2A_W04 T2A_W05
SKILLS			
S1	The student is able, using the available literature and the Internet, to obtain information to improve the functionality of the tested algorithms	CAE_U07	T2A_U01
S2	The student is able to prepare a scientific report on the studies carried out	CAE_U08	T2A_U03 T2A_U10

SOCIAL COMPETENCES			
SC1	The student is able to act and think in a creative way	CAE_K06	T2A_K06

2. TEACHING METHODS

multimedia lecture, laboratory classes

2. METHODS OF EXAMINATION

written exam, report

3. COURSE CONTENT

Specify the content separately for each type of classes in accordance with point I.B.	<p>LECTURES: Basic sorting algorithms (bubble, by inserting, fast, by choice, haystacks, merge) and searches (of maximum / minimum, binary search in the sorted collection.) Basic methods of algorithms: greedy and "divide and conquer". Understanding the complexity of certain algorithms (time, memory, computing). Discussion of the concept graph and minimum spanning tree. Presentation of algorithms: Dijkstra, Bellman-Ford, Kruskal and Prima. A revision about the basics of relational databases. Basics of SQL queries.</p> <p>LABORATORY: Implementation of the lecture discussed algorithms. The use of different data structures: one-dimensional and multidimensional arrays, vectors, and containers. Creating different queues: FIFO, LIFO cyclic and simple and use them in algorithms. Implementation of structures such as list, stack, heap, tree and graph. The syntax of SQL queries. Create a query to an existing database. The use of sorting and searching algorithms in an existing database.</p>
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4. VALIDATION OF LEARNING OUTCOMES

(Each learning outcome from the list requires validation methods to ensure that it was achieved by a student.)

Learning outcome	Form of assessment (for example:)					
	Oral examination	Written examination	Colloquium	Project	Report	Test
K1		x			x	
K2		x			x	
S1		x			x	
S2		x			x	
SC1					x	

5. LITERATURE

Basic literature	<p>Niklaus Wirth, Algorytmy + struktury danych = programy, WNT, 2000. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman , Algorytmy i struktury danych, Helion, 2003 Robert Sedgewick , Algorytmy w C++ : grafy, Wydaw. RM, 2003 Donald E. Knuth, Sztuka programowania. T. 1, Algorytmy podstawowe , WNT, 2002 Donald E. Knuth, Sztuka programowania. T. 3, Sortowanie i wyszukiwanie,</p>
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	WNT, 2002
Supplementary literature	Bruce Eckel, Thinking in java. Edycja polska. Wydanie IV, Wydawnictwo Helion. Bruce Eckel, Thinking in C++. Edycja polska. Wydawnictwo Helion.

6. TOTAL STUDENT WORKLOAD REQUIRED TO ACHIEVE EXPECTED LEARNING OUTCOMES EXPRESSED IN TIME AND ECTS CREDITS

Student's activity	Student workload– number of hours (for example:)
Participation in classes indicated in point 2.2	30
Preparation for classes	20
Reading assignments	15
Other (preparation for exams, tests, carrying out a project etc)	20
Total student workload	85
Number of ECTS credits allocated by the lecturer	3
Final number of ECTS credits (determined by the Programme Council for the Field of Study)	3