Course Syllabus

I. General Information

Course name	Algorithms and data structures
Programme	Informatics
Level of studies (BA, BSc, MA, MSc, long-cycle MA)	BA (1st level)
Form of studies (full-time, part-time)	full-time
Discipline	Informatics
Language of instruction	English

Course coordinator	Michał Horodelski

Type of class *(use only the types mentioned below)*	Number of teaching hours	Semester	ECTS Points
lecture	30	IV	5
tutorial			
classes			
laboratory classes	30	IV	
workshops			
seminar			
introductory seminar			
foreign language classes			
practical placement			
field work			
diploma laboratory			
translation classes			
study visit			

Course pre-requisites	1. Programming skills 2. Object-oriented programming, 3. Basics of programming in C++

II. Course Objectives

1 Presentation of the basic abstract data types and operations on them
2 Own implementation of abstract data types
3. Improving skills in programming and analytical thinking
4. Abstract data types in C++ standard library

III. Course learning outcomes with reference to programme learning outcomes

Symbol	Description of course learning outcome	Reference to programme learning outcome

KNOWLEDGE		
W_01	The student can recognize the basic data structures and indicate the differences between the learned data structures.	K_W01, K_W03, K_W06
W_02	The student knows basic methods that manipulates abstract data structures and their implementation.	K_W03
SKILLS		
U_01	The student can use technical language related to the ADS concepts and can choose the appropriate abstract data structures and to a specific problem.	K_U06, K_U10
U_02	The student can use abstract data structures in application, implement own version of ADS and use frameworks or libraries with prepared implementation.	K_U08, K_U10, K_U11
U_03	The student can solve problems from various areas of sciences and real life using algorithms based on abstract data structures	K_U10, K_U11, K_U12
U_04	The student can work individually and in a team, understands the need for systematic work on long-term projects. The student Can properly define the priorities within the implemented IT project.	K_U17
SOCIAL COMPETENCIES		
K_01	The student is ready to assess the level of his knowledge and skills and critically evaluates the received content.	K_K01
K_02	The student shows initiative and efficiency during the project.	K_K02

IV. Course Content

Pointers.
Files and I/O operations
Function and class templates.
Stack and reverse Polish notation.
Queue and examples of its use.
Forward lists and lists with sorting options.
Trees, binary search trees (BST).
Tree operations. Balancing trees. The use of trees.
Heap - priority queues.
Sorting and search algorithms.
Hash table.
Pointers to functions.

V. Didactic methods used and forms of assessment of learning outcomes

Symbol	Didactic methods *(choose from the list)*	Forms of assessment *(choose from the list)*	Documentation type *(choose from the list)*
KNOWLEDGE			
W_01	- Conventional lecture - Conversational lecture - Guided practice - implementations in laboratory and in homework,	- Exam/Written test - Preparation / implementation of the project - homework programs	- written work, - set of files, - report

	- using a projector - group work		
W_02	- Conventional lecture - Conversational lecture - Guided practice - implementations in laboratory and in homework, - using a projector - group work	- Exam/Written test - Preparation / implementation of the project - homework programs	- written work, - set of files, - report
	SKILLS		
U_01	- Practical classes - Project-based Learning - implementations in laboratory and in homework, - using a projector - design thinking - group work	- Exam/Written test - Preparation / implementation of the project - homework programs - activity during the laboratory	- written work, - set of files, - report
U_02	- Practical classes - Project-based Learning - implementations in laboratory and in homework, - using a projector - design thinking - group work	- Exam/Written test - Preparation / implementation of the project - homework programs - activity during the laboratory	- written work, - set of files, - report
U_03	- Practical classes - Project-based Learning - implementations in laboratory and in homework, - using a projector - design thinking - group work	- Exam/Written test - Preparation / implementation of the project - homework programs - activity during the laboratory	- written work, - set of files, - report
U_04	- Practical classes - Group work - Project-based Learning - implementations in laboratory and in homework, - using a projector - design thinking - group work	- Exam/Written test - Preparation / implementation of the project - homework programs - activity during the laboratory	- set of files, - report
	SOCIAL COMPETENCIES		
K_01	- Discussion - Conventional lecture	- Exam/Written test - Preparation /	- written work, - set of files,

	- Conversational lecture - group work - Project-based - design thinking Learning	implementation of the project - homework programs - activity during the laboratory	- report
K_02	- Discussion - Conventional lecture - Conversational lecture - group work - Project-based - design thinking Learning	- Exam/Written test - Preparation / implementation of the project - homework programs - activity during the laboratory	- set of files, - report

VI. Grading criteria, weighting factors.....

Passing laboratory: verification by written tests (20% of the final mark), activity in laboratories (10% of the final mark), homework covering particular topics of data structures (20% of the final mark) and a test (50% of the final mark).

Passing the lecture: written and oral exam (for people who have passed the laboratory), knowledge provided during the lecture.

Grading scale:

less than 50% insufficient (2.0)

Detailed rules of assessment are given to students with each edition of the subject.

VII. Student workload

Form of activity	Number of hours
Number of contact hours (with the teacher)	Lecture 30 Laboratory 30 Consultations 30
Number of hours of individual student work	Preparation for classes and home projects 30 Studying Literature 10 Preparation for tests and exam 20

VIII. Literature

Basic literature
1. M. A. Weiss, Data Structures Algorithm Analysis in C++, 4th edition, Pearson, 2014 2. Clifford A. Shaffer, Data Structures and Algorithm Analysis Edition 3.2 (C++ Version), published by Dover Publications, 2013 3. C++ Language Tutorials on the website cplusplus.com, site: http://www.cplusplus.com/doc/tutorial/, 2021
Additional literature
1. Cormen T.H., Leiserson C.E., Rivest R.L., Introduction to Algorithms, Wyd. Massachusetts Institute of Technology, 2009 2. Knuth D E. The art of computer programming. Volume 1, Volume 2, Volume 3 3. C++ language Tutorials on the website cppreference.com, site: https://en.cppreference.com/w/cpp/language, 2021