Syllabus of the educational discipline
«DATA STRUCTURES AND ALGORITHMS»

Cycle of Higher Education	*First cycle of higher education (Bachelor's degree)*
Field of Study	*F Information Technologies*
Specialty	*F7 Computer engineering*
Educational program	*Computer systems and networks*
Discipline status	*Normative*
Teaching language	*English*
Year of studies, semester	*1 year (1,2 semester)*
Number of credits ECTS	*6 credits*
Distribution by types of trainings and hours of study	*Lectures, Laboratory studies, Independent training*
Form of final assessment	*Exam*
Teacher	*Marina K. I., assistant lecturer of the department of computer systems and network*
Teacher's contacts	*kateryna.marina@uzhnu.edu.ua*
Course Schedule	*According to the timetable*

The purpose of the discipline " Data Structures and Algorithms " is to provide students with an understand of fundamental concepts of basic data structures and algorithms, and to form the skills for developing complex software by using modern structured programming techniques.

At the end of this course, students should:

know:

- basic concepts and methods of the algorithm theory;
- basic data structures and algorithms;
- basic methods of structured and modular programming and design;
- methods of the algorithm and program complexity measurement;
- algorithm writing methods.

be able to

- develop complex algorithms and data structures;
- generalize algorithms for various data structures;
- solve problems of the complexity analysis of the algorithms and programs;
- apply a selected or developed algorithm to specific problem.

Prerequisites for learning

Programming, Organization and Functioning of Computers

Content of the educational discipline

Module 1

Content module 1. Introduction to Algorithms.

Topic 1. Introduction to Algorithms. Ways of describing algorithms.

Topic 2. Fundamental Control Structures of Algorithms.

Topic 3. Complexity of Algorithms.

Content module 2. Data structures.

Topic 4. An abstract data type concept.

Topic 5. Data structure classifications.

Topic 6. Scalar data structures.

Topic 7. Combined data structures.

Content module 3. Static data structure.

Topic 8. Sets.

Topic 9. Arrays.

Content module 4. Algorithms with arrays.

Topic 10. Searching algorithms.

Topic 11. Sorting Algorithms.

Modular control work

Module 2

Content module 5. Linear Data Structures.
Topic 12. Stack.
Topic 13. Queue.
Content module 6. Dynamic data structure.
Topic 14. Linked Lists.
Content module 7. Non Linear Data Structures.
Topic 15. Tree. Binary Tree.
Topic 16. Graph. Algorithms on Graph.
Modular control work
Exam

Course page on the Moodle platform (personal training system)	*Syllabus of the educational discipline, hyperlinks to electronic publications of the discipline, recommended literature, students' attendance, lecture materials, presentations, questions for self-control, tests, tasks for checking students' knowledge.* https://moodle.uzhnu.edu.ua

Recommended literature

1. Aho, J. E., Hopcroft, J. D. Ullman, Data Structures and Algorithms. Addison-Wesley, https://doc.lagout A. V..org/Alfred%20V.%20Aho%20-%20Data%20Structures%20and%20Algorithms.pdf

2. Cormen T. H., Leiserson Ch. E., Rivest R. L., Stein C. Introduction to Algorithms. MIT Press, 2009. https://web.iiit.ac.in/~pratik.kamble/storage/Algorithms/Cormen_Algorithms_3rd.pdf

3. McConnell J. "Analysis Algorithms. An Active Learning Approach". 2001. 383 p.

4. Knut D. Art of Computer Programming, Volume 2: Seminumerical Algorithms, Moscow, "Vilyams", 2004.

5. Knut D. Art of Computer Programming, Volume 3: Sorting and searching, Moscow, "Vilyams", 2005.

6. Mehlhorn K. Data structures and algorithms 1: Sorting and searching. Vol. 1. Springer Science & Business Media, 2007. https://people.mpi-inf.mpg.de/~mehlhorn/ftp/Mehlhorn-Sanders-Toolbox.pdf

Assessment system of learning outcomes

Current control carried out the semester and evaluated by the amount of points (max is 100 points). A minimum amount, that allows a student to get credit is 35 (max is 100 points).

The student's rating (R_s) in the course consists of points that he/she receives for defended laboratory exercises (R_1) and the modular control work(R_2):

$$R_s=R_1+R_2=100 \text{ points.}$$

As a result, the maximum average weight score is equal to: 3 laboratory exercises x 15 points = 45 points, modular control work = 55 points

Each module is rated at a maximum of 100 points. At the end of the discipline displayed rating score, which is defined as the arithmetic mean of two modules.

The students whose overall points at the end of the semester are more or equal to 60 points can:

– get their final grade according to the rating system;

– pass an exam in order to increase the grade.

Final (semester) control is carried out in the form of exam and evaluated in points (max is 100 points, min is 35 points).

ECTS and national grading scale

Mark scale	ECTS	Exam	Test
90 - 100	A	Excellent	Satisfied
82 - 89	B	Good	
74 - 81	C		
64 - 73	D	Satisfactory	
60 - 63	E		

35 - 59	FX	“Unsatisfactory” with possibility to pass the exam again	“Not satisfied” with possibility to pass the exam again
1 - 34	F	“Unsatisfactory” with obligatory repeated study of the discipline	“Not satisfied” with obligatory repeated study of the discipline