The syllabus of the discipline

Algorithms and data structures (in English)

№	Field name	Detailed content, comments
1.	Name of the faculty	Computer Science Faculty
2.	The level of higher education	Bachelor
3.	Code and title of specialty	121 Software engineering
4.	The type and title of the educational program	EPP «Software engineering»
5.	Title of the discipline	Algorithms and data structures
6.	Number of ECTS credits	5
7.	The structure of the course (distribution by type and hours of training)	13 lectures – 26 hours, 3 practical works – 6 hours, 10 laboratory classes – 20 hours; independent work – 88 hours
8.	Schedule (terms) of study of the subject	1st year, 2st semester
9.	Prerequisites for learning the discipline	Discrete mathematics, software programming basics
10.	Abstract (content) of the discipline	The compulsory discipline of the professional and practical training. It has the next content modules: **Module 1. Fundamental data structures and algorithms** **Topic 1.** Introduction, list. **Topic 2.** Linked lists. **Topic 3.** Stacks. **Topic 4.** Queues. **Topic 5.** Recursion. **Topic 6.** Binary trees. **Topic 7.** Binary search trees, balancing **Module 2. Searching and sorting algorithms, graphs.** **Topic 8.** Searching lists. **Topic 9.** Hashing. **Topic 10.** Simple sorting algorithms. **Topic 11.** Fast sorting algorithms. **Topic 12.** Graphs: shortest paths. **Topic 13.** Review of algorithm design methods, conclusion
11.	Competencies, knowledge, skills, understanding that a higher education acquirer has in the learning process	**General competencies:** 1. Ability to abstract thinking, analysis and synthesis. 2. Ability to use knowledge in practical situations. 3. Ability to use and learn new knowledge**.** **Professional competences:** Ability to develop software application for storage, access and

		processing of the data; Ability of algorithmic and logical thinking Design, develop and analyze algorithms for solving problems related to software application development
12.	Learning outcomes of a Higher Education applicant	**Students completing this course will be able to:** - know the methods of designing algorithms; fundamental algorithms (sorting, search, graph algorithms); methods of evaluation and comparison of algorithms; limitations of the algorithmic approach regarding the existence of the algorithm and its computer implementation; basic data structures, abstract data structures; The role of data structure in algorithm design. - have skills to design algorithms using such methods as top-down, divide and conquer, dynamic programming, greedy method; - know and determine the asymptotic performance characteristics of algorithms and compare different algorithms that solve the same problem in order to choose the best algorithm for the existing computing situation; evaluate the possibility of computer implementation of the algorithm depending on the volume of output and given resource limitations; use data structures that optimize the resource requirements of the algorithm. - implement an algorithmic solution to a problem using some object-oriented language.
13.	Grading system according to each task for passing the test/exam	1. Pass a control test in practical classes. 2. Complete tasks in practical classes and labs. 3. Get at least 60 points per semester. 4. Get credit on exam and calculate final grade.
14.	The quality of the educational process	In accordance with the policy of academic integrity, plagiarism, as an act of fraud in student works, fabrication, and falsification of the results of calculations and research during the course of study are not allowed. When recording the fact of non-honesty on the part of students of higher education during their studies, their work is not taken into account and is evaluated by the teacher at zero. The content of the discipline is updated in accordance with international trends, development priorities of the industry and taking into account the needs of related disciplines.
15.	Created by	Andrii Babii, Ph.D