

COURSE DESCRIPTION – ACADEMIC YEAR 2021/2022

Course title	Data Structures and Algorithms
Course code	76410
Scientific sector	INF/01
Degree	Bachelor in Informatics and Management of Digital Business (L-31)
Semester	1
Year	2
Credits	6
Modular	No
Total lecturing hours	40
Total lab hours	20
Attendance	<p>Attendance is not compulsory, but strongly recommended. The lectures consist of presentations, interspersed by small exercises, and discussions with the students. The goal of the course is to enable students to develop and analyze algorithms, which is a skill that can only be acquired by training.</p> <p>All the material used in the lectures and labs as well as the assignments will be published on the OLE pages of the course.</p> <p>Students who are unable to follow all lectures and labs are encouraged to attend at least some of them. They are also encouraged to work out all the exercises given during the lectures and the labs and to submit the coursework, for which they will receive feedback and marks.</p>
Prerequisites	<ul style="list-style-type: none"> • Java programming skills at an introductory level • Basic mathematical knowledge about sets, functions, and elementary calculus
Course page	https://ole.unibz.it/
Specific educational objectives	<p>The course belongs to the type "attività formative di base – informatica di base".</p> <p>By following this course, students will be able to formulate algorithmic problems and to recognize algorithmic problems underlying an application.</p> <p>They will also acquire an in-depth understanding of the standard data structures and the corresponding algorithmic techniques to solve such problems. They will recognize how certain algorithmic approaches depend on the choice of a suitable data structure and vice versa. Moreover, students will learn how to analyze whether an algorithm is correct and which time and space resources it needs. Finally, students will learn how to compare different algorithms with respect to their suitability for a given application.</p>
Lecturer	Elisa Marengo
Contact	Piazza Domenicani 3, Office 2.02, elisa.marengo@unibz.it , +39 0471 016171
Scientific sector of lecturer	INF/01

Teaching language	English
Office hours	On appointment (arrange beforehand by email).
Lecturing Assistant (if any)	Ivan Donadello
Contact LA	Piazza Domenicani 3, ivan.donadello@unibz.it
Office hours LA	On appointment (arrange beforehand by email).
List of topics	<ul style="list-style-type: none"> • Searching and sorting • Divide and conquer algorithms • Analysis of algorithms: correctness and complexity • Abstract data types: stacks, queues, priority queues, maps • Dynamic data structures and associated algorithms: linked lists and trees • Graphs and elementary graph algorithms
Teaching format	Frontal lectures and labs

Learning outcomes	<p>Knowledge and understanding:</p> <ul style="list-style-type: none"> • D1.3 - Know the basic principles of programming. • D1.6 - Know the most important data structures and their use in programming languages. <p>Applying knowledge and understanding:</p> <ul style="list-style-type: none"> • D2.2 - Ability to solve algorithmic problems using programming methods. <p>Learning skills</p> <ul style="list-style-type: none"> • D5.1 - Learning ability to undertake further studies with a high degree of autonomy.
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Assessment	<p>The assessment is based on a written final exam and coursework assignments. The written exam consists of questions to verify knowledge, questions that assess the ability to apply knowledge acquired in the course, and small exercises. The assignments consist of exercises to apply knowledge acquired in the lectures and experiments, on which the students have to report.</p> <p>Passing the written exam is mandatory. The coursework assignments are optional. The marks are valid during the three exam sessions following the teaching of the course.</p>
Assessment language	English
Assessment Typology	Monocratic
Evaluation criteria and criteria for awarding marks	<p>There are no requirements for attending the final exam.</p> <p>To pass the course, the written exam has to be passed.</p> <p>In the written exam, students have to apply techniques taught in the course in a defined setting and have to develop algorithms for new problems. The algorithms developed have to be analyzed with respect to correctness and efficiency. The answers are marked according to their correctness, the suitability of the algorithms developed, and the validity and clarity of the analysis.</p> <p>In the coursework assignments, students have to develop solutions for algorithmic problems and analyze their solutions with respect to</p>

	<p>correctness and running time. The exercises are assessed according to correctness and efficiency and validity of the analysis.</p> <p>Students who do not submit all assignments will be assessed on the written exam taken and the submitted parts of the coursework. The final course mark is computed from the mark of the written exam plus the mark of the assignments if handed in by the student.</p>
Required readings	<p>Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein (CLRS), 2nd or 3rd edition University Library: ST 134 C811</p> <p>Subject Librarian: David Gebhardi, David.Gebhardi@unibz.it</p>
Supplementary readings	<p>Algorithms and Data Structures - The Basic Toolbox, K. Mehlhorn and P. Sanders, free download from http://www.mpi-inf.mpg.de/~mehlhorn/ftp/Mehlhorn-Sanders-Toolbox.pdf</p>
Software used	<p>Java</p>