Syllabus

Course Description

Course Title	Algorithms and Programming
Course Code	42407
Course Title Additional	
Scientific-Disciplinary Sector	IINF-05/A
Language	Italian
Degree Course	Bachelor in Electronics and Cyber-Physical Systems Engineering
Other Degree Courses (Loaned)	
Lecturers	Dr. Sergio Tessaris, Sergio.Tessaris@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/2315 dr. Ivan Donadello, Ivan.Donadello@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/45237
Teaching Assistant	
Semester	First semester
Course Year/s	2
CP	6
Teaching Hours	40
Lab Hours	20
Individual Study Hours	90
Planned Office Hours	18
Contents Summary	• Searching and sorting • Analysis of algorithms: correctness and complexity • Divide and conquer, recurrences • Pointers, dynamic data structures, linked lists • Abstract data types: stacks, queues, priority queues, maps • Elementary graph and tree algorithms

Course Topics	• Ricerca e ordinamento • Analysis of algorithms: correctness and complexity • Divide and conquer, recurrences • Pointers, dynamic data structures, linked lists • Abstract data types: stacks, queues, priority queues, maps • Elementary graph and tree algorithms
Keywords	Ricerca e ordinamento; Data structures and algorithms; Analysis of algorithms; Recurrences; Algoritmi su grafi
Recommended Prerequisites	• Java/C programming skills at an introductory level • Basic mathematical knowledge about sets, relations, discrete mathematics, mathematical functions (logs and exponentials), series and and differential calculus.
Propaedeutic Courses	
Teaching Format	Frontal lectures and labs
Mandatory Attendance	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. All the material used in the lectures and labs will be published on the OLE pages of the course. Attendance to lectures and labs is strongly recommended.
Specific Educational Objectives and Learning Outcomes	Knowledge and understanding: • D1.3 - Know the basic principles of programming. • D1.6 - Know the most important data structures and their use in programming languages. Applying knowledge and understanding: • D2.2 - Ability to solve algorithmic problems using programming methods. Learning skills • D5.1 - Learning ability to undertake further studies with a high degree of autonomy.
Specific Educational Objectives and Learning Outcomes (additional info.)	The course belongs to the type "attività formative di base – informatica di base". By following this course, students will be able to formulate algorithmic problems and to recognize algorithmic problems underlying an application. 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.
Assessment	The assessment is based on a written final exam. The written exam consists of questions to verify knowledge, questions that assess the ability to apply knowledge acquired in the course, and exercises
Evaluation Criteria	There are no requirements for attending the final exam. 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.
Required Readings	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
Supplementary Readings	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
Further Information	Subject Librarian: David Gebhardi, David.Gebhardi@unibz.it Software used: Java/C compiler and debugger
Sustainable Development Goals (SDGs)	Quality education