

COURSE DESCRIPTION – ACADEMIC YEAR 2024/2025

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| Course title | Algorithms and Programming |
| Course code | 42407 |
| Scientific sector | ING-INF/05 |
| Degree | Bachelor in Electronics and Cyberphysical Systems (L-8) |
| Semester | 1 |
| Year | 2 |
| Credits | 6 |
| Modular | No |

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| 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 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.</p> |
| Prerequisites | <ul style="list-style-type: none"> • C programming skills at an introductory level • Basic mathematical knowledge about sets, functions, and elementary calculus |
| Course page | Teams and OLE |

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| Specific educational objectives | <p>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.</p> <p>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> |
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| Lecturer | Ivan Donadello |
| Contact | Piazza Domenicani 3, ivan.donadello@unibz.it |
| Scientific sector of lecturer | ING-INF/05 |
| Teaching language | Italian |
| Office hours | On appointment (arrange beforehand by email). |
| Lecturing assistant (if any) | Oswald Lanz |
| Contact LA | POS 1.08, lanz@inf.unibz.it |

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| Office hours LA | On appointment (arrange beforehand by email). |
| List of topics | <ul style="list-style-type: none"> • Searching and sorting • Divide and conquer, recurrences • Analysis of algorithms: correctness and complexity • Abstract data types: stacks, queues, priority queues, maps • Pointers, dynamic data structures, linked lists • Binary trees, red-black trees |
| Teaching format | Frontal lectures and labs |
| Learning outcomes | <p>Knowledge and understanding</p> <ul style="list-style-type: none"> • Have a solid knowledge of the most important data structures and programming techniques; • Know the concepts of complexity of algorithms and data structures; • Have a solid knowledge of the most important algorithms for sorting and searching and their complexity. <p>Applying knowledge and understanding</p> <ul style="list-style-type: none"> • Be able to implement algorithms and data structures in procedural programming languages such as C; • Be able to analyze and measure size, complexity and critical aspects of algorithms and data structures. <p>Making judgements</p> <ul style="list-style-type: none"> • Be able to collect useful data about the performance of algorithms and to judge which algorithm is most suitable for a given task. <p>Learning skills</p> <p>Have developed learning capabilities to pursue further studies with a high degree of autonomy.</p> |
| 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 small exercises. |
| Assessment language | Italian |
| Assessment Typology | Monocratic |
| Evaluation criteria and criteria for awarding marks | <p>There are no requirements for attending the final exam.</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</p> |

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| | <p>their correctness, the suitability of the algorithms developed, and the validity and clarity of the analysis.</p> |
| <p>Required readings</p> | <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</p> <p>Subject Librarian: David Gebhardi, David.Gebhardi@unibz.it</p> |
| <p>Supplementary readings</p> | <p>Algorithms and Data Structures - The Basic Toolbox, K. Mehlhorn and P. Sanders, free download from</p> <p>http://www.mpi-inf.mpg.de/~mehlhorn/ftp/Mehlhorn-SandersToolbox.pdf</p> |
| <p>Software used</p> | <p>C compiler and debugger</p> |