UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

# COURSE SYLLABUS

**2627-1-E4105B004-E4105B004-1**

## Learning objectives

The course contributes to consolidating the ability to apply knowledge and understanding in the field of processing through programming and the use of statistical packages/languages, in line with the Computer Science learning area of the three-year degree course in Statistical and Economic Sciences

The course is aimed at gathering skills on: fundamentals of computer architecture, definition of hardware and software, information representation, data types (basic and structured), algorithm design, software programming basics, Python coding and adoption of software libraries for operating on structured data (e.g., Numpy and Pandas Data Frame).
At the end of the course, the student will be able to design algorithms and implement them in a programming language (i.e., Python), specifically with the aim to process data for solving specific problems.

## Contents

Representation of information
Information management: the architecture of computers
Hardware and system software
The notion of algorithm
Fundamental constructs
Data structures
Procedures and functions
Write and read files
Object Oriented Programming
Examples and exercises

## Detailed program

Representation of information

- information and uncertainty
- the representation of numbers in computers: the binary, octal and hexadecimal system (representation of integers, floating point decimals, text). Basics of Boolean algebra.
  Information management: the architecture of computers
- elementary machine
- modern machine (registers and ALU)
- primary and secondary memory
- BUS
- peripheral devices
  Hardware and system software: introduction to operating systems
- processes and CPU
- memory management
- I/O management (Input / Output)
- the File System
  The notion of algorithm
- pseudocode and flow charts
- algorithm design: elementary, top-down, and bottom-up strategies
  Fundamental constructs
- variables
- conditional statements
- cycles
- recursion
- fundamental operators
  Data structures
- simple types
- array: vectors and matrices
- lists, stacks and queues
  Procedures and functions
  Write and read files
  Object Oriented Programming
- definitions of "class", "object" and "method"
- (method) "constructor" of a class
- abstract classes and interfaces
- inheritance
  Examples and exercises

## Prerequisites

None

## Teaching methods

22 hours of in-person lessons
8 hours of in-person laboratory and exercises
12 hours of remote laboratory and exercises

## Assessment methods

The final exam consists of a written test and a subsequent discussion/acceptance of the final grade. Registration through the online system is mandatory.

The written test consists of 8 "multiple-choice" questions and 2 "open-ended" questions. The time available for the exam will be 2 hours.

**Multiple choice questions**
The multiple-choice questions will concern theoretical topics or will require you to simulate the execution of an algorithm and/or piece of code, or will require you to identify the output produced by an algorithm and/or piece of code. A wrong answer will not give rise to any penalty, the correct answers will contribute to the achievement of the final grade.

**Open-ended questions**
You will be asked to summarize a specific topice and/or describe an algorithm for solving a specific problem and translate it into code (Python) that must be executable.

**Outcomes**
The exam is passed if a sufficient grade is achieved both in the multiple-choice questions and in the open-ended questions. In the event of a seriously insufficient test, there are no limitations on returning to one of the subsequent exams: however, we are confident that the student will present himself for the exams prepared or that he will ask not to correct the test if he considers that he has carried out the task in a seriously insufficient way.

## Textbooks and Reading Materials

Slides, exercises, and, in general, all the materials presented during lectures will be published on this website

Textbooks

- "Fondamenti di Informatica per l'Università". Enrico Grosso, Manuele Bicego. G. Giappichelli Editore, Torino
- "Concetti di informatica e fondamenti di Python" (seconda edizione). Cay Horstmann, Rance D. Necaise. Maggioli Editore.

## Semester

First semester, second period.

## Teaching language

Italian

## Sustainable Development Goals

QUALITY EDUCATION