esade

TEACHING GUIDE - 2024-2025

Computing Foundations

UGRA_015720

Departments	Dept. of Operations, Innovation & Data Sciences
Teaching Languages	English
ECTS	8
Teacher responsible	Macià Sorrosal Sandra - sandra.macia@esade.edu

Course Goals

This course aims to present the basic principles and elements of computers as well as to give a first approach to their user-level use.

In particular, this course will cover:

(1) Basic principles of computation:
- Fundamental ideas of computing
- Mathematical concepts supporting computation
- Information processes: information/data representation and manipulation

(2) Computer constituent elements:
- Fundamentals of digital computing and Boolean logic
- Design and function of digital
- Introduction to computer architecture, including high-level components

(3) Computation abstraction and user interaction:
- Basics of modern computer hardware and software
- Overview of operating systems

(4) Introduction to programming
- Definition, understanding, and analysis of algorithms
- Fundamentals of the Python programming language

By the end of the course, students will know how computers work and will be able to use them to create simple programs.

Previous knowledge

No prior knowledge is required for this course. It is a self-contained course on computing foundations for all participants, regardless of their previous computing experiences.

Prerequisits

This course does not require having previously taken any other courses.

The course will be managed through a dedicated eCampus website where students will find all the necessary materials. Students should familiarize themselves with this environment before the start of the course and check for updates regularly.

Teaching methodology

This course has a study load of 8 ECTS, which is equivalent to 200 working hours. To achieve the learning objectives of the course, the distribution, contents and organization of these hours will be approximately as follows:

- **25% Lesson hours.** The lecture classes will consist of a total of 20 sessions, each lasting 2 hours and 30 minutes, with a short break around the midpoint of the class. This amounts to approximately 50 hours of lectures. These hours will be dedicated to theoretical lessons using the expository method or lecture approach, where the concepts for each topic will be introduced. After covering the theory, lesson hours will move to a participatory expository approach where students will actively participate through questions, discussions, exercises resolution, and assignments reviews.
- **6,5% Practical sessions.** The practices will consist of a total of 5 sessions, each lasting 2 hours and 30 minutes. This amounts to 12.5 hours of hands-on experience.

The practical sessions provide students with the opportunity to apply their knowledge within a close, collaborative context. These sessions will be conducted in small class sizes, ensuring a high student-to-teacher ratio. Some of these sessions will be dedicated to project work, emphasizing the collaborative learning approach among group members.

- **25% Independent student work.** Including class preparation, revision, reading, and exam preparation, the estimated autonomous work for each student amounts to approximately 50 hours.
- **20% Assignments dedication.** This portion should be dedicated to completing the weekly course assignments. It is estimated to require approximately 40 hours of autonomous work to reach the course learning objectives through a problem-based learning approach.
- **23,5% Project dedication.** The project dedication should account for approximately 47 hours per student, excluding the practical project sessions, which involve collaborative work among project group members. By promoting cooperative and autonomous student efforts, the project-based learning approach will offer students a firsthand comprehension of the learning objectives.

Most lecture classes will include theory, followed by the midpoint class break, and then discussions, exercises, and assignments reviews.

Each week, an assignment will be scheduled for the following week, requiring approximately 2 to 3 hours of individual work. The submission will remain open until the beginning of the first week class.

Independent student work is expected to require one hour for every hour of class. I recommend dedication of 2 hours and 30 minutes daily, from Monday to Friday, taking into account class hours (excluding project-related time).

Practical sessions will involve a post-work submission, which includes the work done during the practical class and requires finalization afterward.

This course will be managed through a dedicated Moodle website. Students will find there all the necessary materials, including study guides for every session, class materials and further references. Students should familiarize themselves with this environment before the start of the course and check for updates regularly.

For some sessions, the use of laptops is required. For those, each student should bring a laptop to class. Students who don't own a personal computer or who have issues working with it can request one on lease from CAU.
For the rest of the sessions, laptops, tablets and phones are not allowed.

Description

Course contribution to program

Computers are powerful tools that span everywhere from homes to workplaces, assisting in almost any activity. Despite their broad applicability and ubiquitous underlying technologies, they all arise from the same basic principles. As we transition into the Artificial Intelligence Era, humanity is achieving disruptive advances through the use of computers. However, the fundamental principles of computation have not changed.

This course will cover essential concepts and methods in data science and programming, focusing on the main elements related to computers. It also encourage students to describe basic algorithmic techniques and their primary characteristics while examining different parts of a problem to design effective solutions. Moreover, the course emphasizes facilitating cooperation to achieve team objectives, fostering a collaborative learning environment that is crucial for future professionals in artificial intelligence.

Short description

The Computing Foundations course is designed to cover the fundamental principles, concepts, and skills forming the basis of computer science and serving as the building blocks of technological education. Specifically, we will explore the mathematical underpinnings of computer science, the foundations of information processing, and how they relate to computing. Students will learn what a computer is, what it is made of, and how to interact with it, gaining an understanding of computer hardware and software, its components, methods, and abstractions for user interaction.

Throughout the course, students will be introduced to algorithms and taught to think logically and systematically to solve problems conceptually. This knowledge will culminate in the ability to write programs and make use of computers as powerful computational tools. The course combines both theoretical understanding and practical application, providing a comprehensive foundation for further studies in artificial intelligence.

Bibliography

William Stallings, Computer Organization and Architecture, Tenth Edition 2016. ISBN-10: 0134101618 (Book Chapter)

, Foundations of Computer Science/Introduction (E-book)

Jeffrey Elkner, Peter Wentworth, Allen B. Downey, Chris Meyers, and Dario Mitchell, How to Think Like a Computer Scientist: Interactive Edition (E-book)

Brad Miller, David Ranum, Foundations of Python Programming: Interactive Edition (E-book)

, The Python Tutorial (E-book)

Content

#	Topic
1	Computation principles
2	Hardware basics
3	Software basics
4	Programming

Assessment

Tool	Assessment tool	Category	Weight %
Attendance and punctuality	Attendance. In accordance with ESADE regulations, attendance is mandatory for this course. Students who fail to attend 80% of the course will not be allowed to pass and will be required to sit the retake exam.	Ordinary round	0.00%
In-class analysis and discussion of issues	Active contribution to learning	Ordinary round	10.00%
Individual or team exercises	Weekly assignments	Ordinary round	20.00%
Group project	Group project	Ordinary round	20.00%
Quizzes/tests	Practical assessment	Ordinary round	20.00%
Written and/or oral exams	Hand-written exams	Retake and ordinary round	30.00%

PROGRAMS

DBAI23-Double Degree in Business Administration and Artificial Intelligence for Business (Undergraduates: Business)

DBAI23 Year 1 (Basic)