Course guide
240034 - 240034 - Extended Computer Science

Last modified: 13/03/2025

Unit in charge: Barcelona School of Industrial Engineering
Teaching unit: 723 - CS - Department of Computer Science.

Degree: BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Compulsory subject).

Academic year: 2025 **ECTS Credits:** 4.5 **Languages:** Catalan

LECTURER

Coordinating lecturer: MARC VIGO ANGLADA

Others:

TEACHING METHODOLOGY

LEARNING OBJECTIVES OF THE SUBJECT

1. This subject proposes a broad approach to computer science. Assuming the basic concepts of programming are assumed, delves into design topics and, through the use of modules, introduces key computer science topics using the language of programming chosen as binder.
2. Achieve the ability to analyze problems of certain complexity, and applying structured analysis and design techniques, perform with dexterity correct algorithms, readable, efficient, and easy to maintain.
3. Know how to structure information and evaluate the various possible representations in a computer environment.
4. Be able to use abstract models to solve real problems.
5. Design numerical calculation applications.
6. Carry out a medium-sized IT project.

STUDY LOAD

Type	Hours	Percentage
Self study	67,5	60.00
Hours medium group	45,0	40.00

Total learning time: 112.5 h

CONTENTS

1. Iterators

Description:
Iterators and iterables in programming

* Generator functions
* Iterable classes
* Introduction to functional programming through iterators

Full-or-part-time: 20h
Practical classes: 6h
Self study : 14h

2. Object oriented design

Description:
Introduction and use of object-oriented design.
· Inheritance, polymorphism.
· Abstract data types.
· Basic design patterns

Full-or-part-time: 26h 30m
Theory classes: 4h
Practical classes: 8h
Self study : 14h 30m

3. Data structures

Description:
Introduction and use of some data structures.
· Some data structures will be presented and examples of their application will be seen.
· The main data structures that will be presented are graphs.

Full-or-part-time: 20h
Theory classes: 3h
Practical classes: 6h
Self study : 11h

4. Recursion

Description:
Introduction and use of recursive design.

* Recursive design, completion and correctness

Full-or-part-time: 24h
Theory classes: 3h
Practical classes: 6h
Self study : 15h

5. Utility modules

Description:
Introduction and use of some of the external Python modules, such as:
· Data analysis (pandas)
· Math software (numpy)
· Interactive applications and games (pygame)
· Services and web applications (flask)

Full-or-part-time: 20h
Theory classes: 3h
Practical classes: 6h
Self study : 11h

GRADING SYSTEM

BIBLIOGRAPHY

Basic:
- Downey, Allen; Elkner, Jeffrey; Meyers, Chris. How to think like a computer scientist : learning with Python. 5th ed. Wellesley, Massachusetts: Soho Books, 2002. ISBN 0971677506.

Complementary:
- Chun, Wesley J.. Core Python programming. 2nd ed. Upper Saddle River: Prentice Hall, cop. 2007. ISBN 0132269937.
- Guzdial, Mark; Ericson, Barbara. Introduction to computing and programming in Python : a multimedia approach [on line]. 4th ed. Boston: Pearsom, 2016 [Consultation: 01/10/2025]. Available on: https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=5185706. ISBN 9781292109862.
- Langtangen, Hans Petter. Python scripting for computational science [on line]. 3rd ed. Berlin: Springer, cop. 2008 [Consultation: 01/10/2025]. Available on: https://link-springer-com.recursos.biblioteca.upc.edu/book/10.1007/978-3-540-73916-6. ISBN 9783540739159.
- Pilgrim, M. Dive into Python 3 [on line]. 2nd ed. Nova York: Apress, 2009 [Consultation: 01/10/2025]. Available on: https://diveintopython3.net/. ISBN 9781430224150.

RESOURCES

Other resources:
Subject's open repository material: https://inf2.etseib.upc.edu/