

Course guide

330219 - TP - Programming Technology

Last modified: 26/06/2026

Unit in charge: Manresa School of Engineering
Teaching unit: 750 - EMIT - Department of Mining, Industrial and ICT Engineering.

Degree: BACHELOR'S DEGREE IN ICT SYSTEMS ENGINEERING (Syllabus 2010). (Compulsory subject).

Academic year: 2026 **ECTS Credits:** 6.0 **Languages:** Catalan

LECTURER

Coordinating lecturer: MARTA ISABEL TARRÉS PUERTAS

Others:

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

1. Ability to understand and master the basic concepts of discrete mathematics, logic, algorithms and computational complexity as well as its application to the automatic processing of information through computer systems and the application to solving problems of engineering
2. (ENG) El coneixement de les estructures de dades més habituals i la capacitat d'usar-les de forma escaient en problemes reals. La capacitat de dissenyar estructures de dades específiques quan els problemes així ho requereixin.
3. The ability to analyze, design and maintain computer applications as well as knowledge of the principles and tools of software engineering and its application.
4. Knowledge and ability to use existing tools and instrumentation for the analysis, design, development and verification of electronic, computer and communications systems.

Transversal:

5. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 1. Planning oral communication, answering questions properly and writing straightforward texts that are spelt correctly and are grammatically coherent.
7. SELF-DIRECTED LEARNING - Level 1. Completing set tasks within established deadlines. Working with recommended information sources according to the guidelines set by lecturers.

TEACHING METHODOLOGY

The subject is structured in two classes of two hours per week. Of these four weekly contact hours, one is dedicated to presenting the main contents in an expository way, the second to solving problems on demand from the student body and the remaining two to solving practical problems in the computer laboratory.

The student is told weekly the study and problem solving tasks that are necessary for him to do. It is advisable to do these jobs, at least partially, working as a team. Periodically, the progress of each individual student is evaluated.

The subject also incorporates a program development project of a medium size that has to be worked on as a team.

LEARNING OBJECTIVES OF THE SUBJECT

After passing this subject the student must:

1. Know how to plan oral communication, respond appropriately to the questions asked and write basic level texts with spelling and grammar correction.
2. Know how to identify one's own information needs and use the collections, spaces and services available to design and execute simple searches appropriate to the thematic field.
3. To be able to carry out the tasks entrusted in the scheduled time, working with the indicated sources of information, in accordance with the guidelines set by the teaching staff.
4. To be able to apply the fundamental algorithmic procedures to solve problems using high-level languages.
5. Know the most common data structures and be able to use them as necessary in real problems of moderate complexity.
6. Be able to design specific data structures of medium complexity.
7. Know the concept of computational complexity and be able to calculate the complexity in time and space for the worst case of simple algorithms.
8. Know the principles and some tools for verification and validation of software and be able to apply them to real problems.
9. Be able to write simple technical reports, also in a third language, and present them orally.

STUDY LOAD

Type	Hours	Percentage
Self study	90,0	60.00
Hours small group	30,0	20.00
Hours large group	30,0	20.00

Total learning time: 150 h

CONTENTS

(ENG) TEMA 1: Classes d'objectes

Description:

Classes and Objects

Full-or-part-time: 45h

Theory classes: 10h

Laboratory classes: 10h

Self study : 25h

(ENG) TEMA 2: Recursivitat

Description:

Recursivity

Specific objectives:

Recursivity

Full-or-part-time: 23h

Theory classes: 4h

Laboratory classes: 4h

Self study : 15h



(ENG) TEMA 3: Estructures de dades

Description:

Stack and BST

Specific objectives:

Stack and BST

Full-or-part-time: 45h

Theory classes: 10h

Laboratory classes: 10h

Self study : 25h

(ENG) TEMA 4: Introducció a l'enginyeria del software

Description:

UML

Full-or-part-time: 23h

Theory classes: 4h

Laboratory classes: 4h

Self study : 15h

(ENG) TEMA 5: Complexitat algorítmica

Description:

Algorithm complexity

Full-or-part-time: 14h

Theory classes: 2h

Laboratory classes: 2h

Self study : 10h

ACTIVITIES

(ENG) ACTIVITAT 1: EXAMEN

Full-or-part-time: 2h

Theory classes: 2h

(ENG) ACTIVITAT 2: ESTUDI DE CONTINGUTS

Full-or-part-time: 25h

Self study: 25h

(ENG) ACTIVITAT 3: CLASSE EXPOSITIVA

Full-or-part-time: 12h

Theory classes: 12h



(ENG) ACTIVITAT 4: CLASSE DE PROBLEMES

Full-or-part-time: 12h

Theory classes: 12h

(ENG) ACTIVITAT 5: CLASSE DE LABORATORI

Full-or-part-time: 41h

Laboratory classes: 26h

Self study: 15h

(ENG) ACTIVITAT 6: RESOLUCIÓ DE PROBLEMES

Full-or-part-time: 30h

Self study: 30h

(ENG) ACTIVITAT 7: PROJECTE

Full-or-part-time: 28h

Theory classes: 4h

Laboratory classes: 4h

Self study: 20h

GRADING SYSTEM

Any academic fraud, plagiarism or use or possession of unauthorised means in an assessment activity leads to a mark of zero (0) for the affected test or assignment. Furthermore, in accordance with the University's regulations, if disciplinary proceedings are initiated the subject is recorded as "Pending Assessment" until a decision is reached. These incidents are managed in accordance with the [Action Framework for Academic Integrity in Assessment at the UPC](#).

The final grade for the course will be calculated as follows:

25% Project (PROJ)

15% Laboratory Activities (EOL)

20% Midterm Exam (EOT)

40% Final Exam (FIN)

Evaluation will be continuous.

Note 1. Given the comprehensive nature of the Final Exam (FIN), its grade will replace the grade obtained in the Midterm Exam (EOT), provided that the Final Exam grade is higher.

Note 2. If an individual's performance in assessment tasks is substantially lower than their performance in group activities, the student may be required to individually complete tasks similar to those performed in the group. The grade of the individual tasks will replace the original group-based grade.

Note 3. The completion and in-person oral defense of the Project (PROJ) are mandatory prerequisites to pass this activity. Failure to attend or pass the individual oral defense will result in a grade of 0 for the Project (PROJ).



EXAMINATION RULES.

The activities will be carried out following the uses and customs of academic work and, in particular, the following guidelines will be respected:

1. Those activities that are explicitly declared as individual, whether in person or not, will be carried out without any collaboration from other people.
2. The dates, formats and other delivery conditions that are set will be mandatory.
3. The use of the computer laboratory will be reserved exclusively for academic activities and in no case may abuse be made.

BIBLIOGRAPHY

Basic:

- Downey, A. Python for software design: how to think like a computer scientist [on line]. Cambridge: Cambridge University, 2009 [Consultation: 09/11/2020]. Available on: <http://openbookproject.net/thinkcs/python/english3e/>. ISBN 9780521725965.
- Miller, Bradley N.; Ranum, David L. Problem solving with algorithms and data structures using Python. Wilsonville, OR: Franklin, Beedle & Associates, 2006. ISBN 9781590280539.
- Neceise, Rance D. Data structures and algorithms using Python. Hoboken: Wiley, 2011. ISBN 9780470618295.

Complementary:

- Metha, D. P.; Sahni, S., ed. Handbook of data structures and applications [on line]. Boca Raton, Fla: Chapman and Hall/CRC, 2005 [Consultation: 16/09/2026]. Available on: <https://learning-oreilly-com.recursos.biblioteca.upc.edu/library/view/handbook-of-data/9781351645645/?ar=>. ISBN 1584884355.
- Sommerville, I. Software engineering [on line]. 9th ed. Boston: Pearson / Addison Wesley, 2011 [Consultation: 01/06/2022]. Available on: <https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?docID=5185655>. ISBN 9780137053469.