Universidad de Alcalá

TEACHING GUIDE

Computer Science

Degree in
Industrial Electronics and Automatics Engineering

Universidad de Alcalá

Academic Year 2026/2027

1st Year - 1st Semester

Approved by the EPS School Board on June 15th, 2026

TEACHING GUIDE

Course Name:	**Computer Science**
Code:	**600005**
Degree in:	**Industrial Electronics and Automatics Engineering**
Department and area:	**Automática** **Computer Engineering**
Type:	**Basic**
ECTS Credits:	**6.0**
Year and semester:	**1st Year, 1st Semester**
Teachers:	Por definir
Tutoring schedule:	Consultar al comienzo de la asignatura
Language:	English

1. COURSE SUMMARY

Computer Science is a basic training subject taught in the first semester, first year, of the Bachelor's Degree on Electronics and Industrial Automation Engineering. It is the first subject related to computing in the degree, and will be followed by the obligatory subject Industrial Computing in the second year.

In this course students will be introduced to the basic concepts related to the structure of current general purpose computers. Each element in this structure will be described from the point of view of the functionality it provides.

The subject will deal with the problems relating to the representation of information in digital systems, from the most elementary forms to some complex data structures, and also with representing actions and procedures in an algorithmic way, so they can be executed by a microprocessor.

The student will learn how to build programs using the basic tools provided by a programming language of general purpose.

2. SKILLS

Basic, Generic and Cross Curricular Skills.

This course contributes to acquire the following generic skills, which are defined in the Section 3 of the Annex to the Orden CIN/351/2009:

en_TR2 - Knowledge in basic and technological subjects, which enables them to learn new methods and theories, and gives them versatility to adapt to new situations.

en_TR3 - Ability to solve problems with initiative, decision making, creativity, critical reasoning and to communicate and transmit knowledge, skills and abilities in the field of Industrial Engineering.

en_TR4 - Knowledge to carry out measurements, calculations, assessments, appraisals, appraisals, studies, reports, work plans and other similar works.

en_TR9 - Ability to work in a multilingual and multidisciplinary environment.

en_TRU1 - Capacity of analysis and synthesis.

en_TRU2 - Oral and written competencies.

en_TRU3 - Ability to manage information.

en_TRU4 - Autonomous learning skills.

en_TRU5 - Team work.

Professional Skills

This course contributes to acquire the following professional skills, which are defined in the Section 5 of the Annex to the Orden CIN/351/2009:

en_CB3 - Basic knowledge on using and programming computers, operating systems, databases and software with application in engineering.

Learning Outcomes

After succeeding in this subject the students will be able:

- RAI1: To describe the structure of a current general-purpose computer and how its different

elements interact with each other.

- RAI2. To express procedures for problems resolution in an algorithmic way.
- RAI3. To represent information to be stored and processed by a computer, from basic representations to complex data structures.
- RAI4. To handle different programming paradigms.
- RAI5. To use basic design techniques and software engineering.
- RAI6. To build programs using a programming language.
- RAI7. To justify the need for concurrent processes, the problems they cause and the available solutions.

3. CONTENTS

Unit 1. Introduction to computer science
Basic definitions. Functional structure. von Neumann machine. Machine and assembler languages. Compilers. Programs.

Unit 2. Information representation
Instructions, data, character codification, integers and floating point numbers. Rounding.

Unit 3. Introduction to operating systems
Processes. Memory, paging, virtual memory, file systems, Unix/Linux systems. Applications. Program execution in an OS.

Unit 4. Introduction to C programming language
Introduction to programming. Compilation and linking in C, variables, arithmetical expressions, control flow, Input/Output, constants, vectors and functions.

Unit 5. Types, operators and expressions
Variable names, data types, declarations, arithmetical operators, relational operators, increment and decrement operators, bitwise operators, assignment operators and expressions, conditional expressions, precedence and order of evaluation

Unit 6. Control flow
If-Else, Switch, For, While, Do-while, Break and Continue

Unit 7. Functions and program structure
Basics of functions, scope rules, function declaration and definition, variable types, argument passing by value and by reference.

Unit 8. Structures.
Basics of structures, structures and functions, arrays of structures, pointers to structures, unions.

Unit 9. Pointers and arrays.
Pointers and addresses, pointers and function arguments, pointers and arrays, pointer arrays, multi-dimensional arrays.

Unit 10. Dynamic memory
Dynamic memory allocation. Functions for dynamic memory allocation. Dynamically allocated arrays. Pointers to structures. Pointers as arguments in functions.

Contents Blocks	Total number of hours or credits
Introduction to Computer Science, Information representation and Introduction to operating systems	6T + 6P
C language programming	24T + 20P

4. TEACHING - LEARNING METHODOLOGIES. FORMATIVE ACTIVITIES.

4.1. Credits Distribution

Number of on-site hours:	58 hours (56 hours on-site +2 exams hours)
Number of hours of student work:	92
Total hours	150

4.2. Methodological strategies, teaching materials and resources

Theoretical classes (big groups)	Oral presentations conducted by the lecturer. Problem solving. Computer demonstrations.
Practical classes (small groups)	Brief oral presentations by the lecturer about practical issues in C programming, Practical laboratory sessions: Programming exercises in C language. Program creation, compilation, linking, debugging.
Tutorship (individual/groups)	Solving doubts Support to autonomous learning

5. ASSESSMENT: procedures, evaluation and grading criteria

Preferably, students will be offered a continuous assessment model that has characteristics of formative assessment in a way that serves as feedback in the teaching-learning process.

5.1. PROCEDURES

The evaluation must be inspired by the criteria of continuous evaluation (Learning Assesment Guidelines, LAG, art 3). However, in compliance with the regulations of the University of Alcalá, an alternative process of final evaluation is made available to the student in accordance with the Learning Assesment Guidelines as indicated in Article 10, students will have a period of fifteen days from the start of the course to request in writing to the Director of the Polytechnic School their intention to take the non-continuous evaluation model adducing the reasons that they deem convenient. The evaluation of the learning process of all students who do not apply for it or are denied it will be done, by default, according to the continuous assessment model. The student has two calls to pass the subject, one ordinary and one extraordinary.

EVALUATION PROCEDURE

The current regulations (see NORMATIVA REGULADORA DE LOS PROCESOS DE EVALUACIÓN DE LOS APRENDIZAJES, aprobada en Consejo de Gobierno de 24 de marzo de 2011) propose two methods of evaluation: **Continuous Evaluation** and **Evaluation by Final Exam**. The student, unless duly justified as specified in the aforementioned regulations, will be evaluated using the first method (Continuous Evaluation).

In the first method, a continuous evaluation of the student's performance is proposed through a double system of monitoring the programmed work: a series of tests for qualification of the subject contents in the classroom and a series of tests for qualification of the subject contents in the laboratory. Until 60% of the evaluation of the subject has been completed, the student may decide to withdraw from the evaluation process. In that case, the rating will be "No Presentado". If the student continues to apply for evaluation tests after this percentage, it will no longer be possible to obtain this grade.

Those students who choose the evaluation by a Final Exam must request it at the beginning of the course as specified in the regulations. In case the student is granted this method of qualification, the exam will have two sections:

- One for **theoretical and practical content in the classroom**
- One for **specific contents of laboratory activities.**

The description of the test will be made public to the students at the beginning of the semester.

With respect to the Extraordinary Call Evaluation, its structure, contents and philosophy will be analogous to those of the Final Test

The teaching-learning methodology and the assessment process will be adapted as needed, in accordance with the guidelines of the Diversity Support Unit, to implement curricular adaptations for students with specific needs.

5.2. EVALUATION

EVALUATION CRITERIA

Evaluation criteria must address the extent of skills acquisition by the student. For this purpose, the following ones are defined:

- CE1:The student has acquired technical knowledge about the different computer components, both physical and logical.
- CE2: The student shows ability and initiative in solving practical problems associated with programming.
- CE3: The student is able to use basic software tools to support code generation.
- EC4: The student demonstrates that he or she can analyze the execution of programs created by others.

GRADING TOOLS

This section specifies which evaluation instrument will be applied to each evaluation criteria:

- The Partial Evaluation Exams (PEE) are tests about theoretical concepts and solution of simple, practical problems.
- The Laboratory Exams (PL) consist of practical programming exercises on the computer.
- The Final Exam (PEF) consists of some theoretical questions about the whole subject, and practical programming exercises with the computer.

GRADING CRITERIA:

As a general rule, a student who completes evaluation activities accounting for less than 60% of the total weight will be considered as "No Presentado". The tables for each specific case are provided below.

To pass the continuous evaluation, students must demonstrate an appropriate level of proficiency in the theoretical, practical, and experimental competencies outlined in the evaluation criteria section. To achieve this, the following conditions must be met:

Theoretical Competencies: Students must successfully pass the evaluation of competencies by theoretical tests (PEIs). This requirement is satisfied if the aggregate score of these tests reaches at least 40% of their combined total.

Laboratory Competencies: Students must successfully pass the evaluation of competencies evaluated by laboratory tests (PLs). This requirement is satisfied if the aggregate score of these tests reaches at least 40% of their combined total.

Failure to meet either of these two conditions will result in a final grade calculated as the weighted sum of all evaluations, capped at a maximum of 4.5 out of 10.

Regarding the ordinary call by final evaluation and the extraordinary call, the examination is comprised of a set of exercises mirroring the structure and weighting of the continuous evaluation. The conditions applied to the latter apply equally to the exercises in the former two.

Ordinary Call (Continuous Evaluation):

Skil	Learning Outcome	Evaluation Criteria	Evaluation Instrument	Grading Weight
CB3	RAI1, RAI3, RAI7	CE1	PEE1	15%
CB3	RAI2, RAI3, RAI4, RAI5, RAI6	CE2,CE3	PL1	10%
CB3	RAI2, RAI3, RAI4, RAI5, RAI6	CE2,CE3	PL2	40%
CB3	RAI2, RAI3, RAI4, RAI5, RAI6	CE2,CE4	PEE2	35%

Ordinary Call (Final Evaluation)

Skill	Learning Outcome	Evaluation Criteria	Evaluation Instrument	Grading weight
TR2-3, TR9, CB3	RAI1-7	CE1-4	PEF	100%

Extraordinary Call :

The criteria, instruments and grading for the extraordinary call will be the same as for the final evaluation in the ordinary call (previous table)

6. BIBLIOGRAPHY

6.1. Basic Bibliography

- *The C Programming Language.* B.W. Kernighan and D.M. Ritchie. Prentice Hall Software Series. Second Edition

6.2. Additional Bibliography

- *Computer Fundamentals and Programming in C*. P. Dey and M. Ghosh. Oxford University Press.
- Internet resources that will be indicated by the lecturer during the course

Disclosure Note

During the evaluation tests, the guidelines set out in the Regulations establishing the Rules of Coexistence of the University of Alcalá must be followed, as well as the possible implications of the irregularities committed during said tests, including the consequences for committing academic fraud according to the Regulation of Disciplinary Regime of the Students of the University of Alcalá.