

## Programming

Academic Year: ( 2019 / 2020 )

Review date: 03-05-2019

Department assigned to the subject: Computer Science and Engineering Department

Coordinating teacher: IGLESIAS MARTINEZ, JOSE ANTONIO

Type: Basic Core ECTS Credits : 6.0

Year : 1 Semester : 1

Branch of knowledge: Engineering and Architecture

## REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

(None)

## OBJECTIVES

Competencias genéricas:

- Synthesis and analysis
- Organization and planning
- Application of theoretical knowledge to practical problems
- Use of computers
- Proactivity, creativity and reasoning for problem resolution
- Team work

Specific Competences:

- Cognitive:
  - o To understand the role of Computer Science and Programming in the context of Industrial Engineering
  - o To solve engineering problems by designing algorithms and developing computer programs
  - o To understand the fundamentals of structured and modular programming
  - o To apply theoretical knowledge to solve practical problems by implementing computer programs in the C programming language
  - o To understand the role of Computer Science and Programming in the context of Industrial Engineering
- Procedural:
  - o To use a personal computer
  - o To solve engineering problems by designing and implementing computer programs in the C language
  - o To acquire a good programming style, resulting in efficient, well-organized, and well-documented programs
  - o To acquire the ability to understand and use third-party programs
  - o To learn how to use an integrated development environment (IDE) for program coding, compiling, and debugging
  - o To learn how to use common C programming libraries.

## DESCRIPTION OF CONTENTS: PROGRAMME

Topic 1. Introduction to computer science and programming.

- Computer science and computers. A historical perspective.
- Information representation in computers
- Algorithms and programs. Tools for algorithm design

Topic 2. Software and Hardware

- Programs and programming languages. Classification. Translators, compilers and interpreters. Operating systems.
- Functional structure of a computer. Internal architecture. Instruction execution by the processor. Data storage. Peripherals. Computer networks and the Internet

### Topic 3. Basic elements of the C programming language.

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- General structure of a program
- Variables and constants
- Types of operators: arithmetic, relational, logic and assignment operators.
- Operators, expressions and instructions
- Pointer type.
- Input and output instructions

### Topic 4. Control Flow and Loops

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- Selection structures: if-else, switch
- Repetition structures (loops): for, while, do-while
- Nested control structures

### Topic 5. Functions

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- Modular programming
- Function definition
- Calling a function
- Types of arguments: input, output, input / output
- Passing Arguments by Value or by Reference -Scope of Function Variables. Visibility
- Arrays and structures as parameters
- Library functions and standard C libraries

### Topic 6. Complex Data Types

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- Introduction: structured vs simple data types
- Definition and use of arrays
- Pointers and arrays
- Character strings
- User defined data structures: records
- Arrays of records

### Topic 7. Search, sort and merge algorithms

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- Search algorithms
- Sort algorithms
- Merge algorithms

### Topic 8. Advanced Topics

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- External data structures: files and databases
- Dynamic memory allocation
- Computer programs commonly used in engineering.

## LEARNING ACTIVITIES AND METHODOLOGY

### Theory classes:

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Basic theoretical knowledge and skills will be presented in large groups.

### Resolution of Exercises:

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Resolution of exercises by the student that will serve as self-evaluation and to acquire the procedural and cognitive competences.

### Laboratory sessions:

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Small groups classes, in which problems proposed to the students are discussed and developed using the computer.

### Tutorials

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The student will ask for a tutorial always that it is needed.

Final Practice.

Project groups will be formed for this activity which is divided in 3 parts taking into account the students knowledge.

## ASSESSMENT SYSTEM

Continuous Evaluation Exams:

Two continuous evaluation exams. Date to be confirmed 15 days before the exam.

These two exams will consist of a problem, writing a C program

Value: 20% of the final course mark (10% each exam).

Theoretical lessons Test:

At the end of all the theoretical lessons, there will be a test about the different concepts taught.

Value: 10% of the final course mark.

Practical assignment (final project):

To be delivered in the last week of the course. There will be also four (evolving) previous deliveries related to some parts of the final project. In addition, there will be a practical exam about this final project.

Total value: 30% of the final course mark (10% related to the final project delivery + 20% related to the final project exam - with the computer)

Final exam:

Value: 40% of the final course mark

Two parts:

\* Test, covering all topics of the course. Multiple choice test, four answers, only one correct. Penalty for wrong answers is one third. 30% of the exam mark.

\* Two problems, where the student will be asked to design a C program. Each problem will account for 35% of the exam mark.

If the mark in the end-of-term exam is below 4.0, the student will not pass the course.

Extraordinary Exam:

The exam will have the same structure as the regular exam. The mark assigned to the continuous evaluation will be taken into account if it improves the final mark.

**% end-of-term-examination:** 50

**% of continuous assessment (assignments, laboratory, practicals...):** 50

## BASIC BIBLIOGRAPHY

- Al Kelley and Ira Pohl A book on C : programming in C , Addison-Wesley, 1998
- Brian W. Kernighan, Dennis M. Ritchie C Programming Language, Prentice Hall, 1988
- Deitel, Harvey M. C : how to program, Prentice-Hall International, 1994
- Greg Perry, Dean Miller C Programming Absolute Beginner's Guide., Que, 2013
- K. N. King C Programming: A Modern Approach, W.W. Norton & Company, 2008
- King, K.K. C programming: a modern approach, W.W. Norton & Company, 2008
- Paul J. Deitel, Harvey M. Deitel C: How to Program, Prentice Hall, 2009

## ADDITIONAL BIBLIOGRAPHY

- Doris Appleby, Julius J. Vandekopple Lenguajes de Programación: Paradigma y práctica, McGraw-Hill, 1998
- Yung-Hsiang Lu Intermediate C Programming, CRC Press, 2015