

Academic Year/course: 2021/22

30105 - Fundamentals of computer studies

Syllabus Information

Academic Year: 2021/22

Subject: 30105 - Fundamentals of computer studies

Faculty / School: 175 - Escuela Universitaria Politécnica de La Almunia

179 - Centro Universitario de la Defensa - Zaragoza

Degree: 425 - Bachelor's Degree in Industrial Organisational Engineering

563 - Bachelor's Degree in Industrial Organisational Engineering

ECTS: 6.0

Year: 563 - Bachelor's Degree in Industrial Organisational Engineering: 2

425 - Bachelor's Degree in Industrial Organisational Engineering: 1

Semester: Second semester

Subject Type: Basic Education

Module:

1. General information

1.1. Aims of the course

1. Solving a problem by creating small programs. The main course concern is programming. It includes problem specification, exploring diverse algorithmic solutions, better solution selection, and translation to an executable computer program.
2. Knowing fundamental parts of a computer. Understanding their internal structure, searching information and applying it to solving problems.

Specialization in Defence: These approaches and objectives are in line with the following Sustainable Development Goals (SDGs) of the United Nations 2030 Agenda (<https://www.un.org/sustainabledevelopment/>), in such a way that the acquisition of the course learning outcomes provides training and competence to contribute to their achievement to some degree.

- Goal 9: Industry, innovation and infrastructure

1.2. Context and importance of this course in the degree

Fundamentals of computer studies is a basic education subject. This subject is located at second course. This particular location in the early stages of the degree allows students to apply in the rest of the subjects of the degree the acquired knowledge, which to a greater or lesser extent need to rely on computer tools for the resolution of problems.

1.3. Recommendations to take this course

The same recommendations as for an engineering course apply here.

No previous programming knowledge is necessary.

2. Learning goals

2.1. Competences

Upon passing the subject, the student will be more competent to:

C04 - Solve problems and take decisions with initiative, creativity and critical reasoning.

C05 - Apply Information and Communication Technologies (ICTs) within the field of engineering.

C14 - Basic knowledge about computer use and programming, operative systems, databases and computer programs for engineering.

2.2. Learning goals

The student, to pass this subject, must demonstrate the following results:

Ability to analyze problems, and design and implement algorithmic solutions to these problems.

Ability to solve problems in a disciplined way, obtaining a correct, efficient and efficient implementation.

Ability to use computers at the user level, as well as using operating systems and programming environments.

Knowledge about the computer equipment, both at the physical and logical levels.

Ability to identify information needed to solve problems, to retrieve it, to interpret it and to apply it to the resolution.

2.3. Importance of learning goals

This subject is the first contact with the concepts and abilities that constitute the "engineer's way of thinking", and that allow to put it into practice with real problems from the beginning. If we attend to problem resolution, Computing deals with the knowledge, design and use of computing and computer technology, constituting a discipline that:

- Develops the ability to express solutions such as algorithms, and their role in related areas such as system design, problem solving, simulation and modeling.

- It requires a disciplined approach to solving problems, from which quality solutions are expected.

- Control the problem complexity, first through abstraction and simplification, then to design solutions by integration of components (divide-and-conquer approach).

- It facilitates the understanding of the opportunities offered by process automation, and how people interact with computers.

- It facilitates the learning, through experimentation, of basic principles such as conciseness and elegance, as well as the recognition of bad practices.

3. Assessment (1st and 2nd call)

3.1. Assessment tasks (description of tasks, marking system and assessment criteria)

The student must demonstrate that they have achieved the expected learning outcomes through the following assessment activities

Business profile

The evaluation process will include two types of action:

- **A continuous evaluation system**, which will be carried out throughout the learning period.
- **A global assessment test**, reflecting the achievement of learning results, at the end of the teaching period.

1-Continuous evaluation system.

Following the spirit of Bologna, regarding the degree of involvement and continued work of the student throughout the course, the evaluation of the subject considers the continuous evaluation system as the most appropriate to be in line with the guidelines set by the new framework from the EHEA.

The continuous evaluation system will have the following group of qualifying activities:

- **Works:** The works will consist of practical exercises, solution to proposed problems, questionnaires, etc. The correctness and quality of the results will be assessed. These practices will be carried out in groups of a maximum of 20 students. The percentage with respect to the global mark of all these works will be 30%.
- **Assessment tests:** There are two throughout the course. The percentage with respect to the global mark of each evaluation test will be 35%.

It is necessary to pass the works and written tests separately so that they can contribute to the average of the final grade.

To opt for the Continuous Assessment system, you must attend at least 80% of the face-to-face activities (practices, technical visits, classes, etc.)

2-Global final evaluation test.

The student must opt for this modality when, due to their personal situation, they cannot adapt to the rhythm of work required in the continuous evaluation system, have suspended or want to upload a grade having participated in said evaluation methodology.

The global final evaluation test will have the following group of qualifying activities:

- **Exam:** It is carried out in the official calls. This option can always be followed even though the student has used the continuous assessment system.

Defense profile

The course will be evaluated following the activities in two lines:

- Guided practical tasks (30%): A set of laboratory practical works, guided by the teachers, where students will have to solve practical programming exercises. Correction and quality of the results will be taken in consideration.
- Theoretic and practical tests (70%), divided in two types of exercises:
 - Intermediate problems (20%), where the students face a series of short problems along the course, to evaluate mid-term acquisition of knowledge and competencies.
 - Final exam (50%), divided in two parts, that need to be passed as a whole entity:
 - A test, which will evaluate the theoretical knowledge acquired in classes, problems,...
 - Programming problems, where the student will need to demonstrate the programming skills acquired during the course.

In order to pass the course, a minimum grade of 4 is required in both activities (practical tasks and tests), and the combined grade between both parts needs to be equaly or higher 5.

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. It is based on participation and the active role of the student favors the development of computer science basics and fundamentals of programming. A wide range of teaching and learning tasks are implemented, such as lectures, assignments, computer lab sessions, autonomous work, and tutorials.

Students are expected to participate actively in the class throughout the semester.

Classroom materials will be available via Moodle. These include a repository of the lecture notes used in class, the course syllabus, as well as other course-specific learning materials, including a discussion forum.

Further information regarding the course will be provided on the first day of class.

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The subject is strongly based on practice, so it has many practical works in class.

The organization of teaching will be carried out using the following steps:

- Lectures: Theoretical activities carried out mainly through exposition by the teacher, where the theoretical supports of the subject are displayed, highlighting the fundamental, structuring them in topics and or sections, interrelating them.
- Practice Sessions: The teacher resolves practical problems or cases for demonstrative purposes. This type of teaching complements the theory shown in the lectures with practical aspects.
- Laboratory Workshop: The lecture group is divided up into various groups, according to the number of registered students, but never with more than 20 students, in order to make up smaller sized groups.
- Individual Tutorials: Those carried out giving individual, personalized attention with a teacher from the department. Said tutorials may be in person or online.

If classroom teaching were not possible due to health reasons, it would be carried out on-line.

Further information regarding the course will be provided on the first day of class.

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If classroom teaching were not possible due to health reasons, it would be carried out on-line.

All the activities that are included in the course on a daily basis are considered for the final evaluation. Therefore, the evaluation of the course is done in a continuous manner through several or all of these elements: exercises, participation, lab sessions, projects, tests and final exam.

4.2. Learning tasks

This is a 6 ECTS course organized as follows:

? **Lectures** (2 ECTS: 45 hours). Lectures run for 2/3 weekly hours. The teacher explains the course contents and solves representative applied programming problems. Regular attendance is highly recommended.

? **Computer lab sessions** (0.5 ECTS: 10 hours). Sessions will take place every 2 weeks (5 sessions in total) and they last 2 hours each. Students will work together in groups doing tasks such as practical programming problema and solve representative challenges.

? **Assignments** (1 ECTS: 20 hours). Students will complete assignments, problems and exercises related to concepts seen in laboratory sessions and lectures. Assignments will be submitted along the course so as to be discussed and analyzed.

? **Autonomous work** (1.5 ECTS: 75 hours). Students are expected to spend about 75 hours to study theory, solve problems, prepare sessions, and take exams.

? **Tutorials** (1 ECTS: 25 hours). Teacher's office hours allow students to solve questions and discuss unclear course contents. It is advisable to come with clear and specific questions.

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Face-to-face generic activities:

- Theory Classes: The theoretical concepts of the subject are explained and illustrative examples are developed as a support to the theory when necessary.
- Practical Classes: Problems and practical classes are carried out, complementary to the theoretical concepts studied.
- Laboratory Workshop: This work is tutored by a teacher, in groups of no more than 20 students.

Generic non-class activities

- Study and understanding of the theory taught in the lectures.
- Understanding and assimilation of the problems and practical classes solved in the practical classes.
- Solving proposed problems, project, etc.
- Preparation of laboratory workshops, preparation of summaries and reports.
- Preparation of the written tests for continuous assessment and final exams.

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The different activities programmed during the course (exercises, lab sessions, etc.) are used in all the parts of the program in order to achieve the specific objectives of Fundamentals of Computer Science and some general objectives of the degree.

4.3. Syllabus

The course will address the following topics:

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1-Theoretical contents

Part I

- Computer: Machine that executes algorithms. Algorithm definition. Computer architecture: digital nature, codification, hardware, software.
- Operating systems.
- Data bases
- Programming: programming styles, language hierarchy, programming elements
- Nets of computers.

Part II

- Introduction
- Function design
- Text and input/output
- Conditional branching
- Introduction to classes and objects
- Lists
- Iteration

Part III

- Other collections: sets, tuples, dictionaries
- Designing algorithms
- Search and sorting
- Files

Part IV

- Classes, objects and methods

2-Practical contents

Every part has related practices. As the concepts are shown, the practices are going to be presented, in the classroom or in

moodle platform.

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The program of the course includes the next topics:

1. Computer architecture, hardware and software.
2. Languages and programming interface.
3. Predefined data types.
4. Modular programming I (procedures).
5. Control structures (conditional sentences and loops).
6. Modular programming II (functions).
7. Error control and files.
8. Advanced data types I (records).
9. Advanced data types II (vectors and matrices).
10. Algorithms on vectors (insertion, removal, sort and search).

4.4. Course planning and calendar

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The subject has 6 ECTS credits, which represents 150 hours of student work in the subject during the trimester, in other words, 10 hours per week for 15 weeks of class.

A summary of a weekly timetable guide can be seen in the following table.

- 1 hour of lectures
- 3 hour of laboratory workshops
- 6 hours of other activities

Nevertheless, the previous table can be shown in greater detail, taking into account the following overall distribution:

- 16 hours of lectures.
- 42 hours of laboratory workshop.
- 2 hours of wirtten assessment tests, one hour per test.
- 45 hours of exercices and tutelated work, divided up the 15 weeks of the second semester.
- 45 hours of personal study, divided up the 15 weeks of the second semester.

There is a tutorial calendar timetable set by the teacher taht can be requested by the students who want a tutorial.

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During the semester there will be a series of activities like exercises, lab sessions, projects, tests, etc. After the semester, there will be an exam including theory and practice.

The projects/lab sessions will be conducted in teams of 2 persons and they will be submitted online before the due date. It will be the authors? responsibility to comply with the deadline and to include the authorship details in the files that were submitted.

4.5. Bibliography and recommended resources

Defence and Business profile

Bibliography and recommended resources are available at:

<http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=30105>