Universidad Zaragoza

Academic Year/course: 2022/23

29518 - Programming

Syllabus Information

Academic Year: 2022/23
Subject: 29518 - Programming
Faculty / School: 175 - Escuela Universitaria Politécnica de La Almunia
Degree: 625 - Bachelor's Degree in Industrial Processes' Data Engineering
ECTS: 6.0
Year: 1
Semester: Second semester
Subject Type: Compulsory
Module:

1. General information

1.1. Aims of the course

After having taken a first programming course in which they have learned to design small programs (Fundamentals of Computer Science, 1st semester), in this course the student will learn the technology and the methodologies to be applied through the paradigm of programming oriented to objects, ensuring that the designs made are correct, robust and efficient.

The subject has a marked applied character. The student will learn the advanced concepts of object-oriented programming from a set of problems present in current software development.

These approaches and objectives are aligned with the following Sustainable Development Goals (SDGs) of the United Nations 2030 Agenda (https://www.un.org/sustainabledevelopment/es/), in such a way that the acquisition of the results of Learning the subject provides training and competence to contribute to some extent to its achievement:

- Goal 7: Affordable and clean energy.
    - Target 7.3 By 2030, double the global rate of improvement in energy efficiency.
- Goal 8: Decent work and economic growth.
    - Target 8.2 Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including by focusing on high value-added and labor-intensive sectors.
    - Target 8.4. Progressively improve, by 2030, the efficient production and consumption of global resources and seek to decouple economic growth from environmental degradation, in accordance with the 10-Year Framework of Programs on Sustainable Consumption and Production Patterns, starting with developed countries .
- Objective 9: Industry, innovation and infrastructures.
    - Target 9.1: Develop reliable, sustainable, resilient and quality infrastructure, including regional and cross-border infrastructure, to support economic development and human well-being, with particular emphasis on affordable and equitable access for all.
    - Target 9.5 Increase scientific research and improve the technological capacity of the industrial sectors.
    - Target 9.c Significantly increase access to information and communications technology.

1.2. Context and importance of this course in the degree

Programming is a subject that appears after the subject **"Fundamentos de Informática"**.

It is a compulsory subject that is within the Data Processing module, in the subject "Algorithms and Data", together with the subjects of **"Estructura de Datos y Algoritmos"** y **"Programación Paralela"**.

1.3. Recommendations to take this course

The student who takes this course must have basic training in programming, and it is highly recommended to have passed the **"Fundamentos de Informática"** course.

2. Learning goals

2.1. Competences

Upon passing the subject, the student will have acquired the following skills:

- CB2 - That students know how to apply their knowledge to their work or vocation in a professional way and possess the competencies that are usually demonstrated through the development and defense of arguments and problem solving within their area of study.
- CG03 - Apply techniques for the acquisition, management and treatment of data in Engineering.
- CG05 - Solve technological problems that may arise in data engineering.
- CT01 - Work cooperatively, assuming and respecting the role of the different team members.
- CT05 - Communication of results effectively.
- CT07 - Analyze and solve problems autonomously, adapt to unforeseen situations and make decisions.
- CE01 - Design and implement algorithms in high-level programming languages, using current methodologies.
- CE14 - Build the most appropriate data types and structures to solve a problem.

2.2. Learning goals

To pass this subject, the student must demonstrate the following results:

- Analyze problems, and design and implement algorithmic solutions to those problems.
- Solve problems in a disciplined way, obtaining a correct, effective and efficient implementation.
- It uses the computer at the user level, managing operating systems and programming environments.
- Know the computer equipment both physically and logically.
- Identify information needs to solve problems, retrieve it, interpret it and apply it to resolution.

2.3. Importance of learning goals

This subject is the first contact with object-oriented programming. If we attend to problem solving, Informatics deals with the knowledge, design and exploitation of computing and computer technology, constituting a discipline that:

- Develops the ability to express solutions as algorithms, and their role in approaching areas such as system design, problem solving, simulation, and modeling.
- It requires a disciplined approach to problem solving, from which quality solutions are expected.
- Control the complexity of problems, first through abstraction and simplification, then design solutions by integrating components.
- It facilitates the understanding of the opportunities offered by the automation of processes, 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 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 40%.
- **Assessment tests:** There are three throughout the course. The percentage with respect to the global mark of each evaluation test will be 20%.

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. (50% of the final grade).
- The assignments, practical exercises, solution to proposed problems, questionnaires, etc., that have not been carried out during the course, and can be delivered in a new version on the day of the call. (50% of the final grade).

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

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, 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.

The approach, methodology and assessment of this guide are intended to be the same for any teaching scenarios. They will be adapted to the social-health situation at any particular time, as well as to the instructions given by the authorities concerned.

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

4.2. Learning tasks

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:** Problemas 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.

4.3. Syllabus

The course program is structured around two components of complementary content:

- Theorists.
- Practical

Theoretical contents:

- Object-oriented programming languages:
    - Introduction to the paradigm of object-oriented programming.
    - Classes and objects.
- Objects, classes, methods:
    - Class definition: attributes and methods.
    - Object creation: constructors.
    - Method overload.
- Concept of inheritance:
    - Inheritance and attributes.
    - Inheritance and methods.
    - Abstract methods and abstract classes.
- Polymorphism and packages:
    - Concept and implementation.
    - Definition of interface, implementation and use.
    - Interfaces extension.
    - Exceptions: concept and mode of use.
    - Definition of packages.
    - Access protection.
    - Serialization and persistence:
- Serialization and persistence:
    - Introduction to data persistence.
    - Serialization of objects.
- Graphic interfaces.
- Files.
    - Storage and reading of data in text files.
        - CSV files.
        - XML files.

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.

4.4. Course planning and calendar

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:

- 15 hours of lectures.
- 41 hours of laboratoy workshop.
- 4 hours of wirtten assessment tests, two hours 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.

4.5. Bibliography and recommended resources

http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=29518