

Academic Year/course: 2022/23

29504 - Fundamentals of Mathematics I

Syllabus Information

Academic Year: 2022/23

Subject: 29504 - Fundamentals of Mathematics I

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: First semester

Subject Type: Basic Education

Module:

1. General information

1.1. Aims of the course

Mathematical methods are a basic tool in Engineering. The aims of the course are precisely the knowledge of these tools, in a way that is both theoretical and applied to real problems (using mathematical software). This knowledge and techniques will serve as the basis for other subjects.

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/es/>), 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 4. Quality Education:

4.4 By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship.

4.5 By 2030, eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples and children in vulnerable situations.

Goal 9. Industry, Innovation and Infrastructure,

9.5 Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including, by 2030, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending.

9.b Support domestic technology development, research and innovation in developing countries, including by ensuring a conducive policy environment for, inter alia, industrial diversification and value addition to commodities.

1.2. Context and importance of this course in the degree

The subject is compulsory and forms part of the basic education of the students.

It is taught in the first semester of the first course and its content is part of the basis for other subjects. The practical approach of the subject helps to achieve this objective.

The unifying character of Mathematics simplifies problems dealt with in other subjects and makes evident the similarities in apparently different problems.

1.3. Recommendations to take this course

It is recommended that the student have basic knowledge of differential and integral calculus.

2. Learning goals

2.1. Competences

When the subject is successfully passed, the student will be more competent to...

CG03 - To apply techniques for the acquisition, management and treatment of data in Engineering.

CG06 - To build solutions derived from data analysis that optimize production processes in the industry.

CB2 - The 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 elaboration and defense of arguments and the resolution of problems within their area of study.

CB4 - The students can transmit information, ideas, problems and solutions to both specialized and non-specialized audiences.

CB5 - The students have developed those learning skills necessary to undertake further studies with a high degree of autonomy.

CT03 - To search, select and manage information and knowledge responsibly.

CT04 - To develop critical thinking and reasoning.

CT05 - Communication of results effectively.

CT07 - To analyze and to solve problems autonomously, to adapt to unforeseen situations and to make decisions.

CE04 - To solve mathematical problems that may arise in engineering.

2.2. Learning goals

The student, to pass this subject, must show the following results ...

1. To learn the necessary bases to solve mathematical problems that can be posed in Linear Algebra; Graphic Theory; Differential and Integral Calculus, Numerical Methods and Optimization.
2. To know the reflective use of symbolic and numerical calculation tools.
3. To possess scientific-mathematical thinking skills, which allow them to ask and answer certain mathematical questions.
4. To have the ability to handle mathematical language; in particular, symbolic and formal language.

2.3. Importance of learning goals

The results of the learning process are important since they provide the students the necessary mathematical basis for other subjects of a scientific-technological nature of the Degree, such as, Physics, Computer Science, Statistics, Operations Research, Economics, Electronics, Resistance of materials... The ability to apply mathematical techniques to solve problems of different fields related to engineering is a fundamental ability of an engineer/officer, as well as the use of the existing resources and the interpretation of the obtained results.

3. Assessment (1st and 2nd call)

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

The student must show has achieved the expected learning goals through the following assessment tasks:

Continuous assessment:

- 2 midterm exam. Related learning goals: 1, 2, 3 and 4. Weight in the final grade: 80%.
- 4 Test: Related learning goals: 1, 2, 3 and 4. Weight in the final grade: 20%.

Global assessment:

- Final exam. Related learning goals: 1, 2, 3 and 4. Weight in the final grade: 100%.

Assessment criteria: The assessment criteria are the same for all assessment tasks:

- understanding the mathematical concepts used to solve problems;
- the use of efficient strategies and procedures in their resolution;
- clear and detailed explanations;
- the absence of mathematical errors in development and solutions;
- correct use of terminology and notation; orderly, clear and organized exhibition.

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The learning process designed for this subject is based on the following:

Strong interaction between the teacher/student. This interaction is brought into being through a division of work and responsibilities between the students and the teacher. Nevertheless, it must be taken into account that, to a certain degree, students can set their learning pace based on their own needs and availability, following the guidelines set by the teacher.

Fundamentals of Matemáticas I is conceived as a stand-alone combination of contents, yet organized into two fundamental and complementary forms, which are: the theoretical concepts of each teaching unit and the solving of problems or resolution of questions, at the same time supported by other activities.

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.

4.2. Learning tasks

The course includes the following learning tasks:

Involves the active participation of the student, in a way that the results achieved in the learning process are developed, not taking away from those already set out, the activities are the following:

- **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 cases are carried out, complementary to the theoretical concepts studied.
 - **Individual Tutorials:** Those carried out giving individual, personalized attention with a teacher from the department. Said tutorials may be in person or online.
- **Generic non-class activities:**
 - Study and understanding of the theory taught in the lectures.
 - Understanding and assimilation of the problems and practical cases solved in the practical classes.
 - Preparation of seminars, solutions to proposed problems, etc.
 - Preparation of summaries and reports.
 - Preparation of the written tests for continuous assessment and final exams.

The subject has 6 ECTS credits, which represents 150 hours of student work in the subject during the semester, in other words, 10 hours (Lectures: 4 h.; Other Activities: 6 h.) per week for 15 weeks of class.

The overall distribution is:

- 52 hours of lectures, with 50% theoretical demonstration and 50% solving type problems.
- 8 hours of written assessment tests.
- 90 hours of personal study, divided up over the 15 weeks of the semester.

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

4.3. Syllabus

The course will address the following topics:

1. Single Variable Differential Calculus.
2. Single Variable Integral Calculus.
3. First order differential equations.
4. Linear differential equations.

4.4. Course planning and calendar

A detailed schedule will be published in the Moodle page of the subject.

The dates of the final exams will be those that are officially published on the School website.

4.5. Bibliography and recommended resources

<http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=29504>