COURSE DATA

Data Subject	
Code	34870
Name	Mathematics I
Cycle	Grade
ECTS Credits	6.0
Academic year	2023 - 2024

Study (s)

Degree	Center	Acad. year	Period
1403 - Degree in Telematics Engineering	School of Engineering	1	First term

Subject-matter

Degree	Subject-matter	Character
1403 - Degree in Telematics Engineering	1 - Mathematics	Basic Training

Coordination

Name	Department
ARNALTE MUR, PABLO	16 - Astronomy and Astrophysics

SUMMARY

The course Mathematics I is part of the scientific background to be acquired by all students of engineering before entering fully into the specifics of the degree. The course must, in the first instance, fill gaps in the mathematical knowledge of many students who enter University without studying mathematics in the last year of high school (2º Bachillerato). On the other hand, the course serves as a foundation for more advanced mathematical concepts studied in Mathematics II and III.

Given the extent of the material and the very limited number of hours, the course will be mainly practical: the aim is that the students will be able to apply the methods discussed to solve problems.

The course contents are: **Linear Algebra, Geometry, Differential and integral calculus of one real variable and Statistics**, which are divided into thematic units as listed in Section 6.

The general objectives of the course are:

- To manage with ease the elementary techniques of matrix algebra. In particular, to solve systems of linear equations and to know how to reduce a problem to a system of linear equations.
- To use geometric intuition to enrich mathematical knowledge, and vice versa, to take advantage of the vocabulary of mathematics to raise geometric vision.
- To acquire a basic understanding of the concepts and terminology of functions of one real variable (relating properties of a function and the shape of its graph, understanding what is the derivative and how it is used and similar questions regarding the integration) and the corresponding calculation skills.
- To understand the basic statistical definitions and apply them in simple situations.
- To perform some simple applications of interest in engineering, building on the basic content of the course.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

We assume that the student has mastered a mathematical content equivalent to the Mathematics in First year of the Spanish Bachillerato.

While successful completion of the Mathematics in second year would be desirable, it is not strictly necessary. All technical units start with the indicated level and cover the skills of the second year before proceeding any further.

Nevertheless, we arrive to a much higher level so the pace is strong and the student who has not completed high school mathematics in se

OUTCOMES

1403 - Degree in Telematics Engineering

- G3 - Acquisition of the knowledge of the basic and technological subjects that allows students to learn new methods and theories and endows them with the versatility to adapt to new situations.
- G4 - Ability to solve problems with initiative, decision-making and creativity, and to communicate and transmit knowledge, abilities and skills, understanding the ethical and professional responsibility of the activity of a telecommunications technical engineer.
- B1 - Ability to solve any mathematical problems that may arise in engineering. Ability to apply knowledge of: linear algebra, geometry, differential geometry, differential and integral calculus, differential equations and partial derivatives, numerical methods, numerical algorithms, statistics and optimization.

LEARNING OUTCOMES

Learning outcomes: (G3, G4, B1)

- To understand well and use fluently basic math concepts
- To solve engineering problems using advanced mathematical concepts
- To understand the mathematical formalisms that may arise in engineering
- To structure the way of solving engineering problems in mathematical form
- To model physical phenomena using mathematical tools
- To interpret the mathematical results when applied to the physical world

Skills to be acquired: (G3, G4, B1)

- To be able to perform basic operations with numbers (real and complex) and matrices, and to simplify mathematical expressions (rational, irrational, trigonometric, exponential, logarithmic).
- To know how to discuss the existence of solutions of a system of linear equations and how to compute them.
- Ability to use logical-mathematical thinking. Use confidently mathematical language and develop geometric intuition.
- To differentiate the properties of several types of basic mathematical functions.
- To know how to graph the basic mathematical functions.
- To understand the concept of derivative and its use to determine the intervals where a function increases or decreases.
- To understand the concept of integral of a function and its relation to the area under its graph.
- To recognize several practical situations that require the handling or resolution by statistical methods.
- To become familiar with the most common statistics (means, deviations, etc.) and be able to compute them.
- To be able to distinguish which mathematical techniques may be used in a particular engineering situation and apply it.

In addition to the specific objectives mentioned above, the course will encourage the development of several technical and social abilities, among which are included:

- Correct and clear statement (oral or written) of questions which have scientific content.
- Logical reasoning and critical ability.
- Promptness to ask what is not understood, or perhaps it is not clear enough, in an exposition by an expert.
- Being able to find connections with other disciplines of particular interest to him/her.

DESCRIPTION OF CONTENTS

1. Differential Calculus

Elementary functions, continuity. Derivatives of the elementary functions. The Chain Rule. Successive derivatives. Taylor formula. Study of the graph of a function.

2. Integral Calculus

Primitives. Integration by parts. Change of variable. Definite integral. Computation of areas and averages.

3. Linear equations and Matrices

Systems of linear equations. Matrices and the Gauss-Jordan diagonalisation process. Determinants of matrices.

4. Basic Geometry

Vectors. Linear dependence and independence. Bases, linear applications. Straight lines and planes. Diagonalization. Scalar product. Angle between vectors. Orthogonal projection. Complex numbers.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	30,00	100
Classroom practices	30,00	100
Study and independent work	20,00	0
Preparation of evaluation activities	15,00	0
Preparing lectures	20,00	0
Preparation of practical classes and problem	35,00	0
TOTAL	**150,00**	

TEACHING METHODOLOGY

In the theoretical classes, the lecturer will gradually introduce mathematical concepts and their use mainly through examples. They will also explain the standard procedures for solving problems related to the topic. **(G3, G4, B1)**

Practical classes will be aimed at the student, through his work, internalize explained in lectures. The way to achieve the active participation of students may vary according to the size of groups, ranging from exercises in small groups, when the number permitted, the execution of periodic inspections, when the number is excessive. **(G3, G4, B1)**

EVALUATION

The exam will be of a problem-solving kind and will carry up to 70% of the final grade. It will be split into two partial exams. The first partial exam will take place upon completion of the first part of the subject (Calculus), while the second part (Algebra) will take place after the end of the lectures. In the second call, there will be a single exam covering the full content of the subject.

In any case, it will be necessary to get a minimum mark of 4 over 10 in the exam in order to pass the subject.

The rest of the grade will be calculated using the continuous evaluation. The students' work will be graded using the Virtual Classroom.

In case the student could not participate in the continuous evaluation (for a justifiable reason), its weight will proportionally decrease and the grade will be calculated using a final exam. Its weight will not exceed the maximum of 70%, as set by the School.

In any case the evaluation system is guided by the rules of the University regarding found on this address: https://webges.uv.es/uvTaeWeb/MuestraInformacionEdictoPublicoFrontAction.do?idEdictoSeleccionado=5639

REFERENCES

Basic

- Anthony Croft, Robert Davison, Mathematics for engineers: a modern interactive approach, Addison-Wesley, 1999
- C. Neuhauser, Matemáticas para ciencias, Prentice-Hall, Madrid, 2004

Additional

- Alan Jeffrey, Mathematics for Engineers and Scientists, Chapman Hall, 2005.
- A.D. Polyanin, A.V. Manzhirov, Handbook of Mathematics for Engineers and Scientists, Chapman Hall, 2007.