# COURSE DATA

| Data Subject | |
|---|---|
| **Code** | 34786 |
| **Name** | Mathematics I |
| **Cycle** | Grade |
| **ECTS Credits** | 6.0 |
| **Academic year** | 2019 - 2020 |

**Study (s)**

| Degree | Center | Acad. year | Period |
|---|---|---|---|
| 1402 - Degree in Telecommunications Electronic Engineering | School of Engineering | 1 | First term |

**Subject-matter**

| Degree | Subject-matter | Character |
|---|---|---|
| 1402 - Degree in Telecommunications Electronic Engineering | 1 - Mathematics | Basic Training |

**Coordination**

| Name | Department |
|---|---|
| MACIA JUAN, OSCAR | 205 - Geometry and Topology |
| MOYA PEREZ, JUAN ANTONIO | 363 - Mathematics |

# 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

### 1402 - Degree in Telecommunications Electronic 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.
- 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.

- Capacidad de resolver problemas con iniciativa, toma de decisiones, creatividad, razonamiento crítico y de comunicar y transmitir conocimientos, habilidades y destrezas en el campo de la Ingeniería Industrial.

## LEARNING OUTCOMES

**Learning outcomes:**

- To understand well and use fluently basic math concepts (G3)
- To solve engineering problems using advanced mathematical concepts (B1, G4)
- To understand the mathematical formalisms that may arise in engineering (G3)
- To structure the way of solving engineering problems in mathematical form (B1, G4)
- To model physical phenomena using mathematical tools (G3, B1, G4)
- To interpret the mathematical results when applied to the physical world (G3, B1, G4)

**Skills to be acquired:**

- 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 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 **social and technical skills**, 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. Linear equations and Matrices

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

### 2. Basic Geometry

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

### 3. Differential Calculus

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

### 4. Integral Calculus

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

## 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 lectures, the lecturer will gradually introduce mathematical concepts and their use mainly through examples (G3). They will also include expositions of the standard procedures for solving problems related to the topic (B1, G4).
Practical classes will be aimed so that the student, through his work, may internalize the material explained in lectures. The way to achieve the active participation of students may vary according to the size of groups, but will emphasize a balance between (a) the individual work and (b) the group discussion of the exercises proposed by the teacher (B1, G4), through presentations by the students and their

subsequent reasoned analysis (G3).

## EVALUATION

The grading will be conducted using the following model:

The final exam will be practical in nature (B1, G4) and will count 50% of the grade. Students will be required to overcome a minimum mark.

The remaining 50% will be obtained from continuous assessment on the ongoing student work through active participation in class, through presentations (G3) of a number of problems / assignments (B1, G4) given by the teacher.

If for any valid reason, continuous assessment of a student could not be completely performed, the weight given will proportionally decrease, increasing the weight of the exam respecting the agreed maximum 70%.

In any case, the evaluation system will be governed by what is established in the Evaluation and Qualification Regulations of the University of Valencia for Degrees and Masters

(https://webges.uv.es/uvTaeWeb/MuestraInformacionEdictoPublicoFrontAction.do?idEdictoSeleccionado=5639).

## REFERENCES

### Basic

- Rafael Sivera, Francisca Mascaro, "Apuntes de Matematicas I", 2012 (disponible online en el AulaVirtual)
- 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.

## ADDENDUM COVID-19

**This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council**

## English version is not available