COURSE DATA

Data Subject	
Code	34786
Name	Mathematics I
Cycle	Grade
ECTS Credits	6.0
Academic year	2021 - 2022

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

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 mathematics in second year must make a sustained extra daily effort to acquire the lacking skills quickly.

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

The teacher will gradually introduce the mathematical concepts and their use, mainly through examples (CG3). Likewise, the teacher will explain the standard procedures for solving problems related to the topic (CG12, CG4). The aim of the Exercises Sessions will be that the students, through their work, internalize what has been explained in the Lessons. The way to achieve the active participation of students can vary according to the size of the practice groups, but will emphasize the balance between (a) individual work and (b) discussion and reasoned analysis of the exercises proposed by the teacher (CG12, CG4).

EVALUATION

The evaluation will be carried out following the following model:

50% of the final grade will be obtained by continuous assessment in which the work of the student will be valued through a series of midterm tests throughout the course, and other assignments (CG12, CG4) indicated by the teacher.

The remaining 50% of the grade will be obtained from a final exam (CG12, CG4). It will be necessary to pass a minimum grade of 3.5.

In any case, the evaluation system will be governed by the provisions of the Evaluation Regulation

(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

Contents:
The contents initially collected in the teaching guide are maintained.

Volume of work and planning of teaching:
Regarding the workload: The different activities described in the Teaching Guide are maintained with the planned dedication.

Regarding the planning of teaching: The material for the follow-up of the theory classes allows to continue with the teaching planning, both if the teaching is classroom-based or not, although the student has freedom to follow the teaching sessions according to his own planning.

Teaching methodology
In theory and practical classes there will be as much attendance as possible, always respecting the sanitary restrictions that limit the capacity of the classrooms to 50% of their usual occupation. Depending on the capacity of the classroom and the number of students enrolled, it may be necessary to distribute the students into two groups. If this situation arises, each group will attend classroom theory and practical sessions with a physical presence in the classroom by rotating shifts, thus ensuring compliance with the criteria for occupying spaces. The rotation system will be established once the actual enrollment data is known, guaranteeing, in any case, that the attendance percentage of all the students enrolled in the subject is the same. For non-classroom sessions, there will be a preferably synchronous online teaching model, as long as compatibility with other scheduled activities allows it. Online teaching will be carried out by synchronous videoconference respecting the schedule, or, if not possible, asynchronous.
With respect to laboratory practices, attendance at sessions scheduled in the schedule will be entirely in person.

Once the actual enrollment data is available and the availability of spaces is known, the Academic Committee of the Degree will approve the Teaching Model of the Degree and its adaptation to each subject, establishing in said model the specific conditions in which it will be developed teaching the subject.

If there is a closure of the facilities for sanitary reasons that totally or partially affects the classes of the subject, these will be replaced by distance sessions following the established schedules.

Evaluation:
The evaluation system described in the Teaching Guide of the subject in which the different evaluable activities have been specified as well as their contribution to the final grade of the subject is maintained. If there is a closure of the facilities for health reasons that affect the development of any face-to-face evaluable activity of the subject, it will be replaced by a test of a similar nature that will be carried out in virtual mode using the computer tools licensed by the University of Valencia. The contribution of each evaluable activity to the final grade for the course will remain unchanged, as established in this guide.

Bibliography
The bibliography recommended in the Teaching Guide is kept as it is accessible and is complemented with notes, slides and problems uploaded to the Virtual Classroom as subject material.