## COURSE DATA

| Data Subject |
| :--- | :--- |
| Code 34787 <br> Name Mathematics II <br> Cycle Grade <br> ECTS Credits 6.0 <br> Academic year $2023-2024$ |


| Study (s) | Center | Acad. Period <br> year |
| :--- | :--- | :---: |
| Degree | School of Engineering | 1 | Second term

## SUMMARY

This subject develops some usual parts of Mathematical Analysis: Differential and integral Calculus of several variables, ordinary differential equations with the Laplace transform, complex funcions and Fourier series as well as the Fourier transform for periòdic funcions.

It is addressed to engineering students, so that the contents have been carefully chosen according to the specific requirements of the corresponding subjects in which they are applied. Always keeping a coherent order in the presentation and development of the concepts to be introduced.

Course Guide 34787 Mathematics II

## PREVIOUS KNOWLEDGE

## Relationship to other subjects of the same degree

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

## Other requirements

It is convenient that the student knows the concepts explained in the subject Matemáticas I delivered in the first semester.

## 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

This subject allows the acquisition of the following learning skills:
---Comprehension and knowledge of basic Mathematics concepts
---Engineering problem solving by using advanced mathematical tools
$---B e ~ a b l e ~ t o ~ u n d e r s t a n d ~ t h e ~ m a t h e m a t i c a l ~ p r o b l e m s ~ t h a t ~ m a y ~ a r i s e ~ i n ~ e n g i n e e r i n g ~$
---Structure the resolution of engineering problems in a mathematical form
---Modelize physical phenomena by means of mathematical tasks
---Interpretation of the mathematical results when applied to Physics
As a complement of the former results, this subject also allows to acquire the following skills:
---Understand the concpet of partial derivative, as well as the use of the chain rule in order to calculate derivtives of compositions and implícit functions
---Know the concepts of double and triple integral and their appication in calculating plane areas and three-dimensional volumes
---Knowledge of the main methods of resolution of ordinary differential equations
---Know how to deal with numerical series as well as power series which can be used to expand complex functions
---Represent functions in a frequency domain by means of Fourier series and using the Fourier transform
---Correct exposition (both, written and oral) of scientific material
---Logic and critical reasoning
---Facility to ask whatever has not been understood at an expert dissertation
---Discover connections with other disciplines

## DESCRIPTION OF CONTENTS

## 1. Differential calculus of functions of several variables.

Partial derivatives, directional derivatives, derivative of a composition, implícit derivatives.

## 2. Integrals in several variables

Integrals of funcions in two and three variables, Integration by change of variables, Applications to calculus of plane areas and volumes.

## 3. Ordinary differential equations

Separable variables equations, linear equarions of the first order, linear equations of higher order with constant coeficients, applicatio of the Laplace tansform in the solving of linear equations.

## 4. Functions of a complex variable.

Functions of a complex variable, elementary complex functions, complex derivatives, power series, power series expansions of complex functions.

## 5. Fourier series and transform

Periodic functions, Fourier series in trigonometric and exponential form, representing periodic funcions by means of Fourier series, Fourier transform and its properties.

## WORKLOAD

| ACTIVITY | Hours | \% To be attended |
| :---: | :---: | :---: |
| Theory classes | 30,00 | 100 |
| Classroom practices | 20,00 | 100 |
| Laboratory practices | 10,00 | 100 |
| Study and independent work | 15,00 | 0 |
| Preparation of evaluation activities | 30,00 | 0 |
| Preparing lectures | 15,00 | 0 |
| Preparation of practical classes and problem | 30,00 | 0 |
| TOTAL | 150,00 |  |

## TEACHING METHODOLOGY

It is based upon the following learning estrategies:
a) Theory lectures
b) Interactive activities: Mostly personal learning from problema solving

Theory activities: Lecture attendance
Practical activities: Problem solving
Laboratory: Work in computer rooms

## EVALUATION

The evaluation of the subject will be carried out according to:
-- A final exam. The weight of this will be a 70 per cent of the final grade.
-- Continuous evaluation. This consists in either some tasks for the student or the realization of periodical tests. The weight of this part will be a 20 per cent.
-- The work developed at the computer lab will have a weight of a 10 per cent.

## REFERENCES

## Basic

- G. James . Matemáticas avanzadas para la ingeniería. Segunda Edición. Pearson Education. (2002) ISBN: 970-26-0209-2
- E. Kreyszig. Matemáticas avanzadas para la ingeniería. Limusa Wiley (2003) ISBN: 968-18-5310-5
- M. Molero, A. Salvador, T. Menárguez, L. Garmendia. Análisis matemático para ingeniería. Pearson Education. (2007) ISBN: 978-84-8322-346-8.


## Additional

- J.E. Marsden, A.J. Tromba. Cálculo vectorial. Cuarta Edición. Pearson Educación (1998) ISBN: 968-444-276-9
- J. Stewart. Cálculo multivariable. Thomson Learning (2003) ISBN: 970-686-123-8

