1. OVERVIEW

Subject area	Mathematical Analysis I
Degree	Bachelor's Degree in Physics
School/Faculty	School of architecture, Engineering and Design
Year	First
ECTS	6
Type	Core
Language(s)	Spanish
Delivery mode	On campus
Semester	First semester

2. INTRODUCTION

Since the time of Newton and Leibniz, mathematics has been the language of physics.

Mathematical Analysis is a core subject area for training in mathematics and, as such, a fundamental tool for solving physics problems and understanding the different models of physics theories.

Students must be able to understand the concepts, procedures and strategies of mathematical analysis that will allow them to explore topics such as real-valued functions of a real variable, differentiation and numerical series, which can then be applied in problem solving.

The subject area Analysis I allows students to build the skills and abilities needed to properly engage in other subject areas, such as Analysis II, Complex Variables, Fundamentals of Physics I and II, Differential Equations, Statistics and others, where they will need to apply the knowledge acquired in this subject area.

3. SKILLS AND LEARNING OUTCOMES

Key skills (CB, by the acronym in Spanish):

- CB3 - Students have the ability to gather and interpret relevant data (usually within their study area) to form opinions which include reflecting on relevant social, scientific or ethical matters.

Transversal skills (CT, by the acronym in Spanish):

- CT4 - Written communication/Oral communication: Ability to communicate and gather information, ideas, opinions and viewpoints in order to understand and be able to act upon them, whether they are through spoken word and gestures, or through written word and/or visual aids.
- CT5 - Problem solving: Be able to critically evaluate information, separate complex situations into their constituent parts, recognise patterns, and consider alternatives, different approaches and perspectives in order to find optimal solutions and negotiate efficiently.

Specific skills (CE, by the acronym in Spanish):

- CE04 - To understand the laws and principles of physics, to identify their logical and mathematical structure, their experimental basis and the phenomena described through them.
- CE05 - To understand and know how to use the mathematical and numerical methods used in physics and in handling experimental data.

Learning outcomes (RA, by the acronym in Spanish):

- To use suitable algebraic techniques to resolve indeterminate limits.
- To analyse the behaviour in the plane of real-valued functions of a real variable, establishing, in particular, the location of their local and global extrema.
- To understand the different integration techniques needed for the calculation of areas and primitives.
- To characterise and calculate number and power series, and the Taylor series in particular.
- To classify and solve, using the right techniques, different types of first-order ordinary differential equations.

The following table shows how the skills developed in the subject area match up with the intended learning outcomes:

Skills	Learning outcomes
CB3, CT4, CE04	**To use suitable algebraic techniques to resolve indeterminate limits.**
CB3, CT4, CT5, CE04	**To analyse the behaviour in the plane of real-valued functions of a real variable, establishing, in particular, the location of their local and global extrema.**
CB3, CT4, CE04	**To understand the different integration techniques needed for the calculation of areas and primitives.**
CB3, CT4, CE04	**To characterise and calculate number and power series, and the Taylor series in particular.**
CB3, CT4, CT5, CE04, CE05	**To classify and solve, using the right techniques, different types of first-order ordinary differential equations.**

4. CONTENTS

1. Real-valued functions of a real variable.

2. Limits and continuity.
3. Differentiation.
4. Number series.
5. Power series.
7. Integration.

5. TEACHING/LEARNING METHODS

The types of teaching/learning methods are as follows:

- Collaborative learning: Students learn to collaborate with other people (classmates and professors) in order to find creative, comprehensive and constructive solutions to questions and problems that arise from the given case studies, using all relevant knowledge and material resources available.
- Problem-based learning: Students are given problems and asked to solve them, working individually or in groups.
- Lectures: Presentations by the professor with the necessary technological tools to maximise comprehension of the learning content.
- Workshop-based learning: Students acquire knowledge through learning to use the tools and equipment needed in their profession. In other words, "learning by doing".
- Guided academic activities: Individual and group work that is more independent, including information searches, written summaries, debates and the public defence of projects.

6. LEARNING ACTIVITIES

The types of learning activities, plus the amount of time spent on each activity, are as follows:

Type of learning activity (AF, by the acronym in Spanish)	Number of hours
Lectures	50
Oral presentations of projects and debates	6
Report writing	20
Assessment	6
Practical activities (problems, written work, projects, workshops and/or lab work)	20
Tutorials	16
Independent working	32h
TOTAL	**150**

7. ASSESSMENT

The assessment systems, plus their weighting in the final grade for the subject area, are as follows:

Assessment system	Weighting
Individual on-campus knowledge tests (theory and/or practice).	50%
Submission of group and/or individual reports, written work, projects or exercises	40%
Oral defence	5%
Performance observation	5%

On the Virtual Campus, when you open the subject area, you'll find details of your assessable tasks, including the submission dates and assessment procedures for each task.

8. BIBLIOGRAPHY

The recommended reading for the subject area is listed below. All publications are available in the Dulce Chacón University Library for reference or loan.

- J. STEWART, Cálculo de una variable, Thomson Learning, 2002.
- J. DE BURGOS, Cálculo infinitesimal de una variable, McGraw-Hill, 1994.
- J. DE BURGOS, Cálculo infinitesimal de varias variables, McGraw-Hill, 1994.
- B. P. DEMIDOVICH, Problemas de análisis matemático, Madrid, Paraninfo.
- F. BOMBAL, Problemas de análisis matemático. Tomo I, AC.
- SALAS, HILLE, Calculus, Reverte, Barcelona, 2003