1. BASIC INFORMATION

Course	Calculus II
Degree program	Aerospace and Aircraft Engineering
School	Arquitectura, Ingeniería y Diseño
Year	First year
ECTS	6
Credit type	Basic
Language(s)	English
Delivery mode	Face to fase
Semester	Second semester
Academic year	2023-2024
Coordinating professor	David García Nieto

2. PRESENTATION

Calculus is one of the parts of Mathematics that study the movement and has to do with variation of functions. Since the time of Newton and Leibniz, Calculus has been the appropriate mathematical instrument to provide skills and abilities in the approach an solution of such problems. Calculus is used to test scientific theories on issues such as: the pressure of a liquid, the movement of fluids, the circulation and flow of vector fields, mechanical vibrations, engineering problems, etc.

3. COMPETENCIES AND LEARNING OUTCOMES

Core competencies:

- CB2: Students must know how to apply their knowledge to their work or vocation in a professional way and possess the competencies that are usually demonstrated through the development and defense of arguments and problem-solving within their area of study.
- CB4: Students must be able to convey information, ideas, problems and solutions to both specialist and non-specialist audiences.

Cross-curricular competencies:

- CT12: Students must show knowledge of basic subjects and technologies, which will enable them to learn new methods, theories and technologies, as well as provide them with great versatility to adapt to new situations (autonomous learning).
- CT16: Students must communicate and share information, ideas, skills and abilities in the field of their specialization, in writing or orally, both to a specialized and non-specialized audience (communication skills).
- CT18: They must show commitment to perform the assigned tasks (responsibilities).
- CT19: Working in interdisciplinary teams, providing the most efficient based on cooperation, assuming their role within the team, establishing good relationships and exchanging information (teamwork).

Specific competencies:

- CE1: Ability to solve mathematical problems that may arise in engineering. Ability to apply knowledge about: linear algebra, geometry, differential geometry, differential and integral calculus, differential equations and partial derivatives, numerical methods, numerical algorithms, statistics and optimization.

Learning outcomes:

- LO1: To be able to solve applied mathematical problems.
- LO2: Produce structured and rigorous engineering reports (base don labs).

The following table shows the relationship between the competencias developed during the course and the learning outcomes pursued:

Competencies	Learning outcomes
CB2, CT12, CT18, CT19, CE1	LO1
CB4, CT12, CT16, CT18	LO2

4. CONTENT

Unit 1: Differential equations

a) Differential equations: separable equations, linear equations, Bernoulli's equation, etc…
b) Partial differential equations

Unit 2: Vector calculus

a) Introduction to vectorial calculus
b) Line integrals
c) Green's Theorem

Unit 3: Complex functions

a) Analytical functions
b) Harmonic functions

Unit 4: Introduction to the numerical analysis

5. TEACHING-LEARNING METHODOLOGIES

The types of teaching-learning methodologies used are indicated below:

- Face to face sessions
- Cases studies
- Cooperative Learning
- Mentoring, academic monitoring and assessment
- Self-study

6. LEARNING ACTIVITIES

Listed below are the types of learning activities and the number of hours the student will spend on each one:

Campus-based mode:

Learning activity	Number of hours
Resolution of exercises, problems , tests and practical work.	20
Expositions and presentations by the teacher (master classes).	25
Individual or group tutorials.	12.5
Preparation of real or simulated projects (through project-based learning methodologies).	50
Search for information and/or preparation of written assignments and reports	12.5
Autonomous study	25
Assessment test	5
TOTAL	**150**

7. ASSESSMENT

Listed below are the assessment systems used and the weight each one carries towards the final course grade:

Campus-based mode:

Assessment system	Weight
Exams and tests	30-35%
Preparation of articles, reports or memoirs	15-30%
Alternative assessment techniques	15-30%
Field experiences, conferences and visits	10%
Transversal competences (rubrics)	10-15%

When you access the course on the Campus Virtual, you will find a description of the assessment activities you have to complete, as well as the delivery deadline and assessment procedure for each one.

7.1. First exam period

To pass the course in the first exam period, you must obtain a final course grade of at least 5 out of 10 (weighted average).

In any case, you will need to get the following conditions:

- At least 5 points in the final exam
- At least 5 points in the group project
- At least 5 points in the average of the individual assignments
- At least 50% of attendance

Remark: when the requirements to perform the weighted average of the evaluable activities are not satisfied (the required grade is not reached in any of the previous points), the final grade will be:

- The weighted average if its value is less than or equal to 4
- Just a 4 if the value of the weighted average is greater than 4

7.2. Second exam period

To pass the course in the second exam period, you must obtain a final grade of at least 5 out of 10 (weighted average).

In any case, you will need to meet the following requirements:

- At least 5 points in the final exam
- At least 5 points in the group project
- At least 5 points in the average of the individual assignments

The student must deliver the activities not successfully completed in the first exam period after having received the corresponding corrections from the teacher, or those that were not delivered in the first place.

Remark: when the requirements to perform the weighted average of the evaluable activities are not satisfied (the required grade is not reached in any of the previous points), the final grade will be:

- The weighted average if its value is less than or equal to 4
- Just a 4 if the value of the weighted average is greater than 4

8. SCHEDULE

This table shows the delivery deadline for each assessable activity.

Assessable activities	Deadline
Individual/collaborative session	2-3 week
Individual/collaborative session	5-6 week
Individual/collaborative sesión	7-8 week
Individual/collaborative sesión	9-10 week
Midterm	11-12 week
Individual/collaborative sesión	13-14 week
Group Project	15-17 week
Final exam	18 week

This schedule may be subject to changes for logistical reasons related to the activities. The student will be notified of any change as and when appropriate.

9. BIBLIOGRAPHY

The main reference work for this subject is:

- JERROLD E. MARSDEN, ANTHONY J. TROMBA, "Vector Calculus". Addison Wesley Longman, 1998.
- GERALD TESCHL, "Ordinary Differential Equations and Dynamical Systems". Graduate Studies in Mathematics, Volume 140, American Mathematical Society.
- ROBERT B. ASH, W.P. NOVINGER, "Complex variables". Dover Publications Inc. 2nd Edition (2007).

10. DIVERSITY MANAGEMENT UNIT

From the Educational Guidance and Diversity Unit we offer support to our students throughout their university life to help them reach their academic achievements. Other main actions are the students inclusions with specific educational needs, universal accessibility on the different campuses of the university and equal opportunities.

From this unit we offer to our students:

1. Accompaniment and follow-up by means of counselling and personalized plans for students who need to improve their academic performance.
2. In terms of attention to diversity, non-significant curricular adjustments are made in terms of methodology and assessment for those students with specific educational needs, pursuing an equal opportunities for all students.
3. We offer students different extracurricular resources to develop different competences that will encourage their personal and professional development.
4. Vocational guidance through the provision of tools and counselling to students with vocational doubts or who believe they have made a mistake in their choice of degree.

Students in need of educational support can write to us at:

orientacioneducativa@universidadeuropea.es

11. ONLINE SURVEYS

Your opinion matters!

The Universidad Europea encourages you to participate in several surveys which help identify the strengths and areas we need to improve regarding professors, degree programs and the teaching-learning process.

The surveys will be made available in the “surveys” section in virtual campus or via e-mail.

Your assessment is necessary for us to improve.

Thank you very much for your participation.