1. BASIC INFORMATION

Course	Calculus II
Degree program	Degree in Industrial Systems Engineering (English)
School	Architecture, Engineering, Science and Computing
Year	First
ECTS	6 ECTS
Credit type	Basic
Language(s)	English
Delivery mode	On-site
Semester	Second
Academic year	2025-2026
Coordinating professor	Niurka Barrios Bermúdez
Professor	David García Nieto

2. PRESENTATION

Calculus is the branch of Mathematics concerned with change and motion. Wherever there is movement or growth, Calculus—since the time of Newton and Leibniz—has been the appropriate mathematical tool for developing skills in formulating and solving such problems. Calculus is used to verify scientific theories in areas such as liquid pressure, fluid dynamics, circulation and flow of vector fields, mechanical vibrations, and engineering problems.

3. LEARNING OUTCOMES

Skills:

- **SK01**: Ability to solve mathematical problems that may arise in engineering. Aptitude for applying knowledge in: linear algebra; geometry; differential geometry; differential and integral calculus; differential and partial differential equations; numerical methods; numerical algorithms; statistics; and optimization.

Specific Subject Skills:

- Master basic techniques and results of complex analysis.
- Solve ordinary differential equations and interpret their solutions.
- Compute line and surface integrals of vector fields.
- Solve applied engineering problems involving differential equations.
- Apply numerical methods to problem-solving.
- Analyze solutions to solved problems.

Competences

CP14: Integrate analysis with critical thinking to evaluate professional ideas or possibilities and their potential for error, based on objective evidence leading to effective decision-making.

4. CONTENT

- Functions of complex variables
- Ordinary differential equations
- Partial differential equations
- Systems of differential equations
- Line and surface integrals
- Introduction to numerical analysis

5. TEACHING-LEARNING METHODOLOGIES

The following methodologies will be applied:

- Lectures
- Problem-based learning

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
Lectures	10
Practical seminars	20
Problem-solving	50
Autonomous work	60
Debates and discussions	5
On-campus assessments	5
TOTAL	**150**

Further details on AI usage policies will be published on the virtual campus platform once the course begins.

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
On-campus assessments	50-70%
Case studies/problems	20-50%
Performance evaluation	5%

Detailed evaluation activities, deadlines, and procedures will be available on the Virtual Campus.

8. SCHEDULE

This table shows the tentative delivery deadline for each assessable activity in the course:

Assessable activities	Deadline
Weekly Class Tests	Every week
Group Project	Weeks 7 to 16
Midterm Exam	Week 11
Final Exam	Week 18

This schedule may be subject to changes for logistical reasons relating 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:

Complex Variables:

- Churchill, Ruel V. *Complex Variables and Applications*. McGraw-Hill.
- Spiegel, Murray R. *Complex Variables*. McGraw-Hill.

Differential Equations:

- Zill, Dennis G. *Differential Equations with Applications*. Iberoamericana.
- Simmons, George F. *Differential Equations with Applications and Historical Notes*. McGraw-Hill.
- Castro Figueroa, Abel. *Basic Course in Partial Differential Equations*. Addison-Wesley.

Numerical Methods:

- Chapra, Steven C., and Raymond P. Canale. *Numerical Methods for Engineers*. McGraw-Hill.
- Iserles, Arieh. *A First Course in the Numerical Analysis of Differential Equations*. Cambridge UP.

Vector Calculus:

- Marsden, Jerrold E., and Anthony J. Tromba. *Vector Calculus*. 4th ed., Addison-Wesley, 1998.

Supplementary:

- Kreyszig, Erwin. *Advanced Engineering Mathematics*. Wiley.
- Burden, Richard L. *Numerical Analysis*. Thomson.

10. EDUCATIONAL GUIDANCE AND DIVERSITY UNIT

The Educational Guidance and Diversity Unit (ODI) provides support to students with specific needs, including:

1. Personalized academic advising.
2. Curriculum adjustments (non-substantive).
3. Extracurricular skill-building resources.
4. Career guidance.

Contact: orientacioneducativa@universidadeuropea.es.

11. ONLINE SURVEYS

Your feedback matters! Participate in surveys to improve teaching quality. Surveys are available on the Virtual Campus or via email.