28705 - Mathematics applied to engineering II

Información del Plan Docente

Academic Year	2018/19
Subject	28705 - Mathematics applied to engineering II
Faculty / School	175 - Escuela Universitaria Politécnica de La Almunia
Degree	423 - Bachelor's Degree in Civil Engineering
ECTS	6.0
Year	1
Semester	Second semester
Subject Type	Basic Education
Module	

1.General information

1.1.Aims of the course

1.2.Context and importance of this course in the degree

1.3.Recommendations to take this course

2.Learning goals

2.1.Competences

2.2.Learning goals

2.3.Importance of learning goals

3.Assessment (1st and 2nd call)

3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The learning process designed for this subject is based on the following:

Strong interaction between the teacher/student. This interaction is brought into being through a division of work and responsibilities between the students and the teacher. Nevertheless, it must be taken into account that, to a certain degree, students can set their learning pace based on their own needs and availability, following the guidelines set by the teacher.

28705 - Mathematics applied to engineering II

The current subject, *Matemática Aplicada a la Ingenería II*, is conceived as a stand-alone combination of contents, yet organized into three fundamental and complementary forms, which are: the theoretical concepts of each teaching unit, the solving of problems or resolution of questions, at the same time supported by other activities.

The organization of teaching will be carried out using the following steps:

Theory Classes: Theoretical activities carried out mainly through exposition by the teacher, where the theoretical supports of the subject are displayed, highlighting the fundamental, structuring them in topics and or sections, interrelating them. **Practical Classes**: The teacher resolves practical problems or cases for demonstrative purposes. This type of teaching complements the theory shown in the lectures with practical aspects. **Individual Tutorials**: Those carried out giving individual, personalized attention with a teacher from the department. Said tutorials may be in person or online.

4.2.Learning tasks

The programme offered to the student to help them achieve their target results is made up of the following activities...

Involves the active participation of the student, in a way that the results achieved in the learning process are developed, not taking away from those already set out, the activities are the following:

- Face-to-face generic activities:
  - Theory Classes: The theoretical concepts of the subject are explained and illustrative examples are developed as support to the theory when necessary.
  - Practical Classes: Problems and practical cases are carried out, complementary to the theoretical concepts studied.
- Generic non-class activities:
  - Study and understanding of the theory taught in the lectures.
  - Understanding and assimilation of the problems and practical cases solved in the practical classes.
  - Preparation of seminars, solutions to proposed problems, etc.
  - Preparation of the written tests for continuous assessment and final exams.

The subject has 6 ECTS credits, which represents 150 hours of student work in the subject during the trimester, in other words, 10 hours per week for 15 weeks of class.

4.3.Syllabus

Matemática Aplicada a la Ingeniería II programme:

1. Planar and spatial curves: Frenet frame; curvature and torsion.
2. Functions of several variables. Limits and continuity.
3. Partial derivatives and differential; the chain rule.
4. Extrema. Constrained extrema: the method of Lagrange multipliers.
5. Double integral; change of variables.
6. Triple integrals.
7. Line integral. Work and energy. Green's Theorem.
8. Surfaces. Surface integrals; Stokes and Gauss Theorems.
9. Ordinary Differential Equations: basic concepts, existence and uniqueness.
10. Analytic solvability.

28705 - Mathematics applied to engineering II

11. Qualitative aspects: fixed points and linear stability.
12. Numerical methods: Euler, Runge-Kutta.
13. Higher orden ODE: Oscillators; resonance. Beam stability.
14. Higher order numerical methods (FDM y FEM).
15. Introduction to Partial Differential Equations: separation of variables; vibrations.

4.4.Course planning and calendar

The dates of the final exams will be those that are officially published at

https://eupla.unizar.es/asuntos-academicos/examenes.

1	1	Curves			
2	2	Continuity			
3	3	Differentiability			
4		Extrema	1st test	5	Dif./Cont.
5	4	Multiple Integrals	2nd test	5	Integrals
6	5	Line Integrals			
7	6	Surface Integrals	1st Exam	40	Several V.
8	7	ODE: Introduction, 1st order			
9		Linear equations	3rd test	5	1st order ODE
10	8	Linear stability			
11	9	Numerical Methods			
12	10	Oscillators, resonance	4th test	5	ODE
13	11	Beam Stability			
14	12	PDE: Introduction			

28705 - Mathematics applied to engineering II

15		Separation of variables	2nd Exam	40	ODE, PDE	

4.5.Bibliography and recommended resources