

## 30706 - Mathematics 2

### Syllabus Information

**Academic Year:** 2020/21

**Subject:** 30706 - Mathematics 2

**Faculty / School:** 110 - Escuela de Ingeniería y Arquitectura

**Degree:** 470 - Bachelor's Degree in Architecture Studies

**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 methodology followed in this course is oriented towards the achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as lectures, computer sessions, problem-solving sessions, and group work.

Most of central ideas and topics are given by lecturers to the whole group of students. They break up into small groups of 15 to 20 students for computer classes. The problem classes allow students to practice under the close assistance and guideline of the teacher. In addition, there are computer sessions every two weeks which allow to emphasize numerical aspects of the course.

Students are expected to participate actively in the classes throughout the term.

Classroom materials will be available via Moodle.

#### 4.2.Learning tasks

This course is organized as follows:

- **Lectures**
- **Computer sessions**
- **Problem sessions**
- **Group work**

### 4.3.Syllabus

The course will address the following topics:

#### Linear Algebra

1. Bilinear forms. Matrix representation, change of basis. Symmetric forms and their link with quadratics forms. Diagonalization of quadratics forms. Law of inertia, classification by rank and signature.
2. Inner product spaces, orthonormal sets. Gram-Schmidt orthogonalization. QR factorization of rectangular matrices.

#### Differential and Integral Calculus in $\mathbf{R}^n$

1. Limits and continuity of real-valued functions defined on subsets of  $\mathbf{R}^n$ .
2. Partial and directional derivatives. Differentiability. The gradient. Higher-order derivatives. Local extrema. Vector-valued functions defined on subsets of  $\mathbf{R}^n$ . Differentiation, the Jacobian matrix. The chain rule.
3. Double and triple integrals. Change of variables.

#### Differential Geometry

1. Curves and smooth surfaces in  $\mathbf{R}^3$ . Parameterized curves, arc length, curvature, and torsion. Frenet-Serret frame. Parameterized surfaces in  $\mathbf{R}^3$ . Area.
2. Line integrals. Surface integrals. Integration theorems.

### 4.4.Course planning and calendar

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course will be provided on the first day of class or please refer to the College of Higher Engineering and Architecture (EINA) website (<https://eina.unizar.es/>) and Moodle.

### 4.5.Bibliography and recommended resources

- Lay, David C.: Álgebra lineal y sus aplicaciones. México : Pearson Educación, 2007
- Salas, Saturnino L.: Calculus : una y varias variables / Salas, Hille, Etgen . 4ª ed. española, reimp. / actualización de la 4ª ed. española correspondiente a la 8ª ed. en inglés y revisión de la obra, Carles Casacuberta Vergés Barcelona : Reverté, D.L. 2005-2007
- Carmo, Manfredo P. do: Geometría diferencial de curvas y superficies. Madrid : Alianza Editorial, 1990
- Marsden, Jerrold E.: Cálculo vectorial . Jerrold E. Marsden, Anthony J. Tromba ; traducción Patricio Cifuentes Muñiz ... [et al.] ; revisión técnica Eugenio Hernández Rodríguez . 5ª ed., reimp. Madrid [etc.] : Addison-Wesley, 2005