

Academic Year/course: 2022/23

## 25870 - Mathematics II

### Syllabus Information

**Academic Year:** 2022/23

**Subject:** 25870 - Mathematics II

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

**Degree:** 558 - Bachelor's Degree in Industrial Design and Product Development Engineering

**ECTS:** 6.0

**Year:** 1

**Semester:** 107-Second semester

558-First semester o Second semester

**Subject Type:** Basic Education

**Module:**

## 1. General information

## 2. Learning goals

### 2.1. Competences

**BC01.** Students have demonstrated knowledge and understanding in a field of study that is part of the general secondary education curricular, and is typically at a level which, although it is supported by advanced textbooks, includes some aspects that involve knowledge of the forefront of their field of study.

**BC02.** Students can apply their knowledge to their work or vocation in a professional manner and have competences typically demonstrated through devising and defending arguments and solving problems within their field of study.

**BC03.** Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include an important reflection on social, scientific or ethical issues.

**BC04.** Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences.

**BC05.** Students have developed those skills needed to undertake further studies with a high degree of autonomy.

**GC04.** Ability to organize time effectively and coordinate activities to acquire new knowledge quickly and perform under pressure.

**GC05.** Capacity to collect, manage, analyze and synthesize information from various sources for the development of design projects and product development. Capacity to use this documentation to obtain conclusions aimed at solving problems and making decisions with initiative, creativity and critical thinking, in order to generate new product concepts, new ideas and solutions.

**GC06.** Ability to generate the necessary documentation for the proper transmission of ideas through graphics, reports and technical documents, models and prototypes, oral presentations in Spanish and other languages.

**GC07.** Ability to use and master techniques, skills, tools and techniques and communication and others specific of design engineering needed for design practice.

**GC08.** Ability to learn continuously, to develop autonomous learning strategies and to work in multidisciplinary groups with motivation and determination to achieve goals.

**SC01.** Ability to solve mathematical problems that may arise in Engineering in Industrial Design and Product Development. Ability to apply knowledge of linear algebra; geometry; differential geometry; differential and integral calculus; differential equations and partial differential equations; numerical methods; numerical algorithmic; statistical and optimization.

### 3. Assessment (1st and 2nd call)

## 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. It favors the acquisition of knowledge related to linear algebra, its applications and an introduction to differential geometry. A wide range of teaching and learning tasks are implemented, such as lectures, theory sessions, guided assignments, computer lab sessions, group work, autonomous work, and tutorials.

Students are expected to participate actively in the class throughout the semester.

Classroom materials will be available via Moodle. These include a repository of the lecture notes used in class, the course syllabus, as well as other course-specific learning materials.

Further information regarding the course will be provided on the first day of class.

### 4.2. Learning tasks

The course includes the following learning tasks:

- **Lectures and theory sessions** (40 hours). Theory sessions will take place three hours a week, until the complete 40 hours. Topics will be presented using blackboard and computer presentations. Theoretical content and illustrative examples will be combined during the theory sessions. Lecture notes and a set of examples will be available for the students.
- **Computer lab sessions** (12 hours). In the practices of the course, mathematical algorithms are analyzed and programmed by means of symbolic and numerical programming software in the computer laboratories of EINA. Sessions will take place every 2 weeks (6 sessions in total) and last 2 hours each. The problems are designed to force the student to engage in critical, analytic, and interpretive thinking beyond rote manipulation of calculus formulas. Students are provided in advance with task guidelines for each session.
- **Guided assignments** (8 hours). Students will work individually and in teams and they will complete assignments, problems, and exercises related to concepts seen in laboratory sessions and theory sessions.
- **Group work** (14 hours). Students work in a group to carry out a project for the complete development of a product. The work may be proposed with some or all of the subjects of the second semester. Group work will be guided by regular meetings, where the teacher will provide help and feedback.
- **Autonomous work, study and tutorials** (73 hours).
- **Exams** (3 hours). Written exams.

The activities described here may be modified to adapt to the necessary health security measures throughout the course.

### 4.3. Syllabus

The course will address the following topics:

- Matrix Algebra: Matrices, determinants and linear systems of equations.
- Vector spaces.
- Euclidean spaces.
- Linear transformations.
- Diagonalization of matrices.
- Iterative methods for linear systems.
- Differential Geometry: an introduction of curves.

### 4.4. Course planning and calendar

For further details 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 'Escuela de Ingeniería y Arquitectura de la Universidad de Zaragoza', website, <https://eina.unizar.es/>.

Other activities will be scheduled according to the number of students and will be announced in advance (<https://moodle.unizar.es7add/>).

#### **4.5. Bibliography and recommended resources**

<https://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=25870>