1. OVERVIEW

Subject Area	Mathematics and Physics Applied to Design
Degree	Bachelor's Degree in Design
School/Faculty	Architecture, Engineering and Design
Year	First
ECTS	6 ECTS
Type	Compulsory
Language(s)	Spanish/English
Delivery Mode	On campus
Semester	First semester
Academic Year	2024-2025
Coordinating professor	

2. INTRODUCTION

This subject deals with concepts regarding the principles of geometry, algebra and calculus, regulating lines and shape optimisation, planar and spatial analysis, conic sections, matrices and determinants, physical fundamentals of light and sound, structural elements, and equilibrium. It forms part of Module 1 Representation in Design.

This course teaches students the tools used in design, from analogue to digital techniques. Students gradually learn the concepts, such as 2-D to 3-D transformations and multimedia and website content.

3. SKILLS AND LEARNING OUTCOMES

Key skills (CB, by the acronym in Spanish):

- CB1: Students have shown their knowledge and understanding of a study area that builds on general secondary school education, and are usually at the level where, with the support of more advanced textbooks, they may also demonstrate awareness of the latest developments in their field of study.
- CB2: Students can apply their knowledge to their work or vocation in a professional manner and possess the skills which are usually evident through the forming and defending of opinions and resolving problems within their study area.
- CB3: Students have the ability to gather and interpret relevant data (usually within their study area) to form opinions which include reflecting on relevant social, scientific and ethical matters.
- CB4: Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences.

- CB5: Students have developed the learning skills necessary to undertake further study in a much more independent manner.

Transversal skills (CT, as per the Spanish acronym):

- CT2: Self-confidence: ability to evaluate their own results, performance and skills with the self-determination necessary to complete tasks and meet any objectives.

- CT3: Ability to adapt to new circumstances: being able to evaluate and understand different points of view, taking different approaches to suit the situation.

- CT4: Ability to analyse and synthesize: being able to break down complex problems into manageable blocks; also evaluating alternatives and perspectives to find the ideal solution. Synthesizing to reduce the complexity and better understand the situation and/or solve problems.

- CT13: Problem solving: ability to resolve an unclear or complex issue or situation which has no established solution and requires skill to reach a conclusion.

Specific skills (CE, as per the Spanish acronym):

- CE2: Ability to apply concepts of metric and projective geometry and systems of spatial representation.

- CE5: Ability to apply knowledge of physics, dimensioning, numerical calculus, analytical geometry and basic algebra in design projects.

- CE7: Understanding of theories of shape and composition to create designs to suit user needs and requirements, ensuring they respect the relationship between shape, function and the context in which they are used.

Learning outcomes (RA, as per the Spanish acronym):

- RA12: Understand the principles of maths and physics to apply them to the dimensioning of objects.

The following table shows how the skills developed in the subject area match up with the intended learning outcomes:

Skills	Learning outcomes
CB1, CB2, CB3, CB4, CB5 CT2, CT3, CT4, CT13 CE2, CE5, CE7	RA12: Understand the principles of maths and physics to apply them to the dimensioning of objects.

4. CONTENTS

The subject matter is divided into ten teaching units::

- Unit 1. Regulating lines
- Unit 2. Geometric foundations. Trigonometry
- Unit 3. Fractals
- Unit 4. Polygons and polyhedrons
- Unit 5. Structural foundations
- Unit 6. Conic sections and surfaces

- Unit 7. Physics of light and sound
- Unit 8. Isometrics
- Unit 9. Fundamentals of algebra
- Unit 10. Fundamentals of calculus

5. TEACHING/LEARNING METHODS

The types of teaching/learning methods are as follows:

- Master lectures
- Problem-based learning (PBL).
- Project-based studies (PBS)
- Learning based on workshop teaching

6. LEARNING ACTIVITIES

The types of learning activities, plus the amount of time spent on each activity, are as follows:

Learning activity	Number of hours
Attendance and participation in activities	12.5h (on-site)
Directed learning, practical exercises and problem-solving	50h (20% on-site)
Project presentation	12.5h (on-site)
Integrated group project	12.5h (off-site)
Research work and projects	12.5h (off-site)
Self-study	25h (off-site)
Tutorials, academic follow-up and assessment	25h (on-site)
TOTAL	150 h

7. ASSESSMENT

The assessment methods, plus their weighting in the final grade for the course, are as follows:

Assessment method	Weight
Submission and/or presentation of projects	90-100%

On the Virtual Campus, when you open the course, you can see all the details of your assessment activities and the deadlines and assessment procedures for each activity.

7.1. Ordinary examination period

To pass the subject in the ordinary examination period, students must get a 5 or above in the weighted average of all the course activities. This also includes achieving a grade of at least 4 in the knowledge test (of these 4 points, at least 2 must be awarded for the theory/practical section).

We will assess:

- The ability to organise and plan work efficiently.
- The ability to gather relevant information and then suitably analyse, synthesise and process this information.
- The choice of resources for solving problems and taking decisions in line with the final objectives.
- The ability to demonstrate critical thinking.
- The appropriate assimilation of knowledge and resources taught in class.
- Interest, work and effort in performing designated tasks.

7.2. Extraordinary examination period

To pass the subject in the extraordinary examination period, students must get a 5 or above in the weighted average of all the course activities. This also includes achieving a grade of at least 4 in the knowledge test (of these 4 points, at least 2 must be awarded for the theory/practical section).

We will assess:

- The ability to organise and plan work efficiently.
- The ability to gather relevant information and then suitably analyse, synthesise and process this information.
- The choice of resources for solving problems and taking decisions in line with the final objectives.
- The ability to demonstrate critical thinking.
- The appropriate assimilation of knowledge and resources taught in class.
- Interest, work and effort in performing designated tasks.

8. SCHEDULE

The schedule with delivery dates of assessable activities in the course is indicated in this section:

Assessable activities	Date
Activity 1.	Week 1-2
Activity 2.	Week 3
Activity 3.	Week 4-5
Activity 4. (Group Activity)	Week 6-11
Activity 5. (Group Activity)	Week 12-13
Activity 6.	Week 14
Activity 7	Week 15
Activities 8. Final knowledge tests	Week 18

The schedule may be subject to modifications for logistical reasons of the activities. Students will be informed of any changes in due time and course.

9. BIBLIOGRAPHY

The recommended bibliography is indicated below:

- Lecciones de álgebra y geometría para estudiantes de arquitectura. C. Alsina y E. Trillas. GG.
- Curso de física. Problemas de estática. F. Belmar, A. Garmendia y J. Llinares. UPValencia.
- Fundamentos del diseño bi y tri dimensional. W. Wucios. GG.
- Redes y ritmos espaciales. R. Leoz. UNAM.
- Recálculo: Enfoque de resolución de problemas. D. Prado. Pearson Educación

10. EDUCATIONAL GUIDANCE AND DIVERSITY UNIT

The Educational Guidance and Diversity Unit offers support throughout your time at university to help you with your academic achievement. One of the main pillars of our educational policy is the inclusion of students with special educational needs, universal accessibility to the different university campuses and equal opportunities.
This unit offers students:

1. Support and monitoring through personalised counselling and programmes for students who need to improve their academic performance.
2. Promotion of diversity, with curricular changes possible in terms of methodology or assessment for those students with special educational needs in order to provide equal opportunities for all our students.
3. We also offer students a range of educational extracurricular resources for developing a variety of skills to enhance their personal and professional development.
4. Career guidance by offering tools and advice to students with doubts regarding their professional careers or those who believe they have chosen the wrong line of study.

Students who need educational support can contact us at:
orientacioneducativa@universidadeuropea.es

11. SATISFACTION SURVEYS

Your opinion matters!

Universidad Europea encourages you to complete our satisfaction surveys to identify strengths and areas for improvement for staff, degree courses and the learning process.

These surveys will be available in the surveys area of your virtual campus or by email.

Your opinion is essential to improve the quality of the course.

Many thanks for taking part.