1. BASIC INFORMATION

Course	Mechanics
Degree program	Grado en Ingeniería Aeroespacial en Aeronaves
School	Architecture, Engineering and Design
Year	2
ECTS	6 ECTS
Credit type	Compulsory
Language(s)	English and Spanish
Delivery mode	Campus Based
Semester	1
Academic year	2024 – 2025
Coordinating professor	José Manuel López López, PhD

2. PRESENTATION

This is a self-contained course about statics and dynamics for engineers. Nevertheless, many concepts discussed in the first-year courses of “Physical Foundations of Engineering I & II” are applied and extended here. The course is a suitable starting point for incoming subjects within the degree, such as "Aeronautical Structures" and "Flight Mechanics". The contents are also related with “Resistance and Elasticity of Material”, although in that case they are arranged in such a way that both courses can be taken at the same time.

"Mechanics" will be also useful for the student in a company environment; it will provide them a wide range of tools to develop design and engineering problems in an autonomous manner.

3. COMPETENCIES AND LEARNING OUTCOMES

Core competencies:

- **CB1:** That students have demonstrated knowledge and understanding in a field of study that part of the basis of general secondary education, and is usually found at a level that, while supported by advanced textbooks, includes some aspects that will knowledge of the forefront of their field of study.
- **CB2:** That students can apply their knowledge to their work or vocation in a professional manner and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study.
- **CB3:** That students have the ability to gather and interpret relevant data (usually within their field of study) to make judgments that include reflection on relevant social, scientific or ethical.
- **CB4:** To allow students to communicate information, ideas, problems and solutions both to a specialized and non-specialized audience.

- **CB5:** That students have developed those learning skills necessary to undertake further studies with a high degree of autonomy.

Cross-curricular competencies:

- **CT13:** Ability to use tools to search for library resources or information (information retrieval).
- **CT16:** To communicate and convey information, ideas and skills in the student's field of specialization, either in writing or orally, both to skilled and unskilled audiences (communication skills).
- **CT21:** Self-acknowledgement for achieving high levels of performance in one's work, with a positive influence in substantially improving the results (Self Confidence).

Specific competencies:

- **CE15:** Adequate knowledge and applied to engineering: The principles of continuum medium mechanics and techniques for calculating its response.
- **CE19:** Applied knowledge of: the science and technology of materials, mechanics and thermodynamics, fluid mechanics, aerodynamics and flight mechanics, navigation and air traffic, aerospace technology, theory of structures, air transport, economy and production projects; impact on environment.

Learning outcomes:

- **RA01** – Starting with some requirements and previous knowledge, to analyse a problem in engineering, to plan and perform a solving procedure, and to optimize the solution.
- **RA02** – To transfer some parts of an engineering problem to the laboratory (including computer laboratory), and to use it as a resource to solve the problem.

The following table shows the relationship between the competencies developed during the course and the learning outcomes pursued:

Competencies	Learning outcomes
CB01, CB02, CB04, CT13, CT21, CE15, CE19	**RA01**
CB02, CB03, CB04, CB05, CT13, CT16, CT21, CE19	**RA02**

4. CONTENT

The contents are grouped into three parts for convenience. Parts I and II comprise the core of the course: these are the contents covered by tests, exams and problem-solving sessions. Part III, on the other hand, deals with applications and additional topics which are more suitable to be covered mainly in projects, masterclasses and seminars, reinforcing the autonomous work of students.

Part I: Statics

a. Introduction: Postulates and Statics of a Point Particle
b. Equivalent Systems of Forces
c. Equilibrium of Rigid Solids: reactions at connections and supports

Part II: Dynamics

a. Kinematics of a Point Particle
b. Kinetics of a Point Particle
c. Plane Kinematics of Solids
d. Plane Kinetics of Solids

Part III: Applications

a. Lagrangian Dynamics
b. Distributed Forces
c. Introduction to Orbital Mechanics
d. Mechanical Vibrations

5. TEACHING-LEARNING METHODOLOGIES

The types of teaching-learning methodologies used are indicated below:

- Survey of objectives and interests
- Master class
- Laboratory practices / computer simulations
- Group research or group problem solving
- Field experiences, conferences, visits to companies and institutions

6. LEARNING ACTIVITIES

Listed below are the types of learning activities and the time the student will spend on each one:

Learning activity	Number of hours
Lectures / masterclasses	20 hours
Working sessions	60 hours
Self-study	50 hours
Tutorials, discussions and evaluation	20 hours
TOTAL	**150 hours**

7. ASSESSMENT

Listed below are the assessment systems used and the weight each one carries towards the final course grade:

Assessment system	Weight
SE01 – Exams and objective tests	35%
SE02 – Articles, essays and reports	25%

SE03 – Pair-evaluation, auto-evaluation, portfolio production and other alternative assessment procedures	20%
SE04 – Off-class events, conferences and seminars (*)	10%
SE05 – Core/cross-curricular competences (performance)	10%

(*) If these activities could not be carried out, the corresponding weight would split evenly between systems SE02 and SE03.

When you access the course on the *Campus Virtual*, you'll find a description of the assessment activities you have to complete, as well as the delivery deadline and assessment procedure for each one.

7.1. First exam period

To pass the course in the first exam period, you must meet **all of** the following requirements:

- Obtain a final course grade of at least 5 out of 10 (weighted average).
- Obtain at least 4 out 10 in the final exam.
- Comply with the minimum attendance regulations stablished by the STEAM School, if applicable.

In the event that **any** of the above requirements were not met, the final grade may not exceed 4.0 in a scale up to 10, failure.

7.2. Second exam period

To pass the course in the second exam period, you must meet **both of** the following requirements:

- Obtain a final grade of at least 5 out of 10 (weighted average).
- Obtain at least 4 out 10 in the final exam.

In the event that **any** of the above requirements were not met, the final grade may not exceed 4.0 in a scale up to 10, failure.

The student must deliver the activities not successfully completed in the first exam period, or those that were not delivered in the first place. Further details will be given through virtual campus.

8. SCHEDULE

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

Assessable activities	Deadline
AE01 – Initial test (SE03)	1st or 2nd
AE02, AE03 – Solving problem sessions [Part I] (SE03, SE05)	3rd to 7th
AE04, AE05 – Solving problem sessions [Part II] (SE03, SE05)	8th to 15th
AE06 – Group project [Part III] (SE02, SE05)	16th to 17th
AE07 – Final exam (SE01)	17th or 18th
AE08 – Off-class events, conferences, seminars (SE04)	To be determined

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 handbooks for this subject are:

1. Beer F.P., Johnston E.R. & Mazurek D.F., "Vector Mechanics for Engineers: Statics" 12th edition (2018), Ed. McGraw-Hill.
2. Beer F.P., Johnston E.R. & Cornwell P.J., "Vector Mechanics for Engineers: Dynamics" 12th edition (2018), Ed. McGraw-Hill.
3. Meriam J.L. & Kraige L.G. "Engineering Mechanics. Statics", 9th edition (2018), Ed. Wiley.
4. Meriam J.L. & Kraige L.G. "Engineering Mechanics. Dynamics", 9th edition (2018), Ed. Wiley.

The recommended bibliography also includes:

5. Hibbeler R.C. "Engineering Mechanics. Statics", 14th edition (2015), Ed. Pearson.
6. Hibbeler R.C. "Engineering Mechanics. Dynamics", 14th edition (2015), Ed. Pearson.
7. Goldstein H., Poole C.P. & Safko J. "Classical Mechanics", 3rd edition (2011), Ed. Pearson.
8. Marion J.B. & Thornton "Classical Dynamics of Particles and Systems", 5th edition (2003), Ed. Cengage Learning.

10. EDUCATIONAL GUIDANCE AND DIVERSITY UNIT

From the Educational Guidance and Diversity Unit we offer support to our students throughout their university life to help them reach their academic achievements. Other main actions are the students inclusions with specific educational needs, universal accessibility on the different campuses of the university and equal opportunities.

From this unit we offer to our students:

1. Accompaniment and follow-up by means of counselling and personalized plans for students who need to improve their academic performance.
2. In terms of attention to diversity, non-significant curricular adjustments are made in terms of methodology and assessment for those students with specific educational needs, pursuing an equal opportunities for all students.
3. We offer students different extracurricular resources to develop different competences that will encourage their personal and professional development.
4. Vocational guidance through the provision of tools and counselling to students with vocational doubts or who believe they have made a mistake in their choice of degree.

Students in need of educational support can write to us at:
orientacioneducativa@universidadeuropea.es

11. ONLINE SURVEYS

Your opinion matters!

The Universidad Europea encourages you to participate in several surveys which help identify the strengths and areas we need to improve regarding professors, degree programs and the teaching-learning process. The surveys will be made available in the "surveys" section in virtual campus or via e-mail.
Your assessment is necessary for us to improve.

Thank you very much for your participation.