

## 29719 - Mechanism and Machine Theory

### Syllabus Information

**Academic year:** 2024/25

**Subject:** 29719 - Mechanism and Machine Theory

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

**Degree:** 434 - Bachelor's Degree in Mechanical Engineering

**ECTS:** 6.0

**Year:** 2

**Semester:** Second semester

**Subject type:** Compulsory

**Module:**

### 1. General information

The objective is to present the principles of the Theory of Mechanisms and Machines, as a continuation of Mechanics. The student must be able to analyze the operation of mechanisms (articulated/cams/gears), as well as to define and interpret the requirements of a machine (actions, balancing, cyclic operation, exchanged power).

Knowledge of Physics (units, magnitudes), Mathematics (algebra, trigonometry and differential calculus) is required, Graphic Expression (spatial vision, interpretation of diagrams) and, in particular, third semester topics in Mechanics (rigid body dynamics).

### 2. Learning results

- Know methods of synthesis and kinematic analysis of mechanisms
- Know methods of dynamic analysis of machines such as rigid solids
- Be able to schematize a machine and/or a mechanism
- Formulate the transmission of actions in a mechanism and/or machine
- Draw the bar diagrams of a machine and/or mechanism and the connectivity between components
- Obtain the kinematic and dynamic resolution of mechanisms and machines by energetic and Newtonian methods, and compare these methods
- Know how to analyze kinematically mechanisms of special interest such as cam mechanisms and gearwheel mechanisms.
- Understand and know how to analyze special dynamic problems of machines such as balancing and cyclic operation
- Use numerical simulation programs suitable for the synthesis and analysis of mechanisms and machines

### 3. Syllabus

The program of the subject is structured in two blocks:

Kinematics

- Mechanisms: nomenclature, typologies, mobility. Introduction to mechanism synthesis.
- Kinematic analysis of articulated mechanisms. Position, velocity and acceleration problems.
- Analysis and design of mechanisms of special interest: cams and gear trains.

Dynamics

- Actions in machines and mechanisms.
- Methods of dynamic analysis in machines: vector dynamics, energy, virtual power theorem.
- Balanced. Application to rotors and mechanisms.
- Study of the cyclic operation of machines.

### 4. Academic activities

- **Theoretical class** (30 hours): The theoretical basis of mechanisms and machines will be presented and illustrated with examples.
- **Problem classes and case resolution** (15 hours): Problems and cases will be developed, coordinated with the theoretical contents, encouraging the participation and curiosity of the students for mechanical systems.
- **Laboratory practices** (15 hours): in small groups, where the student will handle different mechanisms and machines, performing analyses by means of numerical methods and computer programs.
- **Teaching assignments** (30 hours): Work will be proposed to deepen in the different concepts seen in the subject.
- **Study** (55 hours).
- **Assessment tests** (5 hours)

## 5. Assessment system

The **assessment of learning** is carried out through the conjunction of:

- Subject work (10%): It will be developed in small groups. Its assessment will be based on the reports submitted.
- Practices (15%): Sessions with delivery of a report of each session to be evaluated.
- Intermediate knowledge test (up to 15%): Written test, open answers, voluntary, composed of kinematics questions. If it is not passed, it will be possible to demonstrate the learning process.
- Knowledge test, open answers, in the global test (between 60% and 75% depending on the grade of the intermediate test): The entire subject will be evaluated by means of kinematics and dynamics questions. It will be held on the dates determined by the EINA calendar.

The **global evaluation** assessment of the subject, in the official calls, will be carried out by means of the following tests (if the practices and/or the assignment have been passed, only the knowledge test must be taken):

- Knowledge test (75%): The complete content of the course will be evaluated by means of written theoretical-practical questions and open-ended problems.
- Practical exam (15%): questions related to the activities of the practical sessions.
- Questions on the activities developed in the subject work (10%).

## 6. Sustainable Development Goals

9 - Industry, Innovation and Infrastructure  
12 - Responsible Production and Consumption