

## 29749 - Manufacturing Systems

### Syllabus Information

**Academic year:** 2023/24

**Subject:** 29749 - Manufacturing Systems

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

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

**ECTS:** 6.0

**Year:** 4

**Semester:** First semester

**Subject type:** Optional

**Module:**

### 1. General information

The objective of the subject is to deepen the knowledge of the design of manufacturing cells focusing on the application of basic knowledge of the degree to configure flexible or dedicated manufacturing lines

The subject has an eminently practical approach, applying CAD/CAE technologies to the design of manufacturing cells, applying simulation techniques and robot simulation techniques for their programming and validation, and addressing the documentation of mechanical assemblies

These approaches and objectives are aligned with the Sustainable Development Goals (SDGs) of the United Nations Agenda 2030 (<https://www.un.org/sustainabledevelopment/es/>) specifically, the learning activities planned in this subject will contribute to the achievement of Objective 9.4 of Goal 9 and Objectives 12.2, 12.4, 12.5 and 12.8 of Goal 12.

It is recommended to have taken the core subjects of Industrial Drawing, Automatic Systems and Manufacturing Technologies I and II

### 2. Learning results

- Assimilates the scientific, technological and economic criteria to develop manufacturing systems and tooling.
- Configures different types of manufacturing systems (flexible, dedicated) for various types of forming and measuring processes, highlighting the importance of inter- and intra-cell material handling
- Defines specifications, designs and calculates the components that make up forming and measuring workstations: structural elements, kinematics, actuators, monitoring and control, with a special focus on the design of tooling in assembly processes (welding and mechanical joining).
- Knows the different types of production processes and can select the production process according to different parameters
- Acquires practical skills in the design and calculation of components and tooling through the use of computer applications characteristic of mechanical manufacturing engineering
- Acquires practical skills to program and control mechanical manufacturing systems by means of flexible automation.

### 3. Syllabus

#### **Theoretical-practical syllabus:**

- 1) Cellular manufacturing systems.
- 2) Material handling.
- 3) Adhesive bonding systems
- 4) Work stations and cells for assembly processes.
- 5) Industrial robots: selection, control and programming.
- 6) Monitoring and control systems.
- 7) Design for Assembly (DFA).

#### **Laboratory practices:**

- 1) Mechanical design of manufacturing systems: mechanical assemblies, tooling, structures, piping, wiring.
- 2) CAE validation of manufacturing systems.
- 3) Programming and control by means of PLC/PC of automatisms based on electro-pneumatic circuits.
- 4) Robot Control and Programming.

### 4. Academic activities

6 ECTS: 150 hours/student distributed as follows:

26 h. of master class (theoretical) and 12 h. of technical cases and problem solving

18 h. of practical sessions in small groups

4 h. company visit

15 h. of theoretical study

60 h. of practical work

15 h. of theoretical tests and practical reports

The dates for the test and delivery of the practical report/s will be established at the beginning of the term and will be done after the end of the syllabus and the corresponding practical sessions.

## **5. Assessment system**

It is highly recommended to follow the subject and to carry out the continuous evaluation activities.

1) Evaluation of skills related to practical sessions (15%): This will be done through direct observation of the results achieved during the practical sessions, which in some cases must be completed with personal work and formalized in a report.

2) Evaluation of the theoretical-practical knowledge related to the contents and technical cases of the subject (15%): This evaluation will be carried out continuously with tests during the term.

3) Evaluation of the practical application of the knowledge through a pre-project of design and development of a mechanical component assembly cell (not very complex) or through the analysis and improvement of a manufacturing system (70%).

The student is entitled to a global evaluation by means of theoretical-practical and skill tests in the handling of the computer applications used for the development of the practices and the subject work. In the case of failing any of the gradual evaluation activities (a minimum grade of 4.0 is required in each one), the global evaluation tests must be taken, which will be carried out in the period provided by the center.