

29751 - Integrated Manufacturing

Syllabus Information

Academic year: 2023/24

Subject: 29751 - Integrated Manufacturing

Faculty / School: 110 - Escuela de Ingeniería y Arquitectura

Degree: 434 - Bachelor's Degree in Mechanical Engineering

ECTS: 6.0

Year: 4

Semester: Second semester

Subject type: Optional

Module:

1. General information

Objectives of the subject

The objective of the subject is to assimilate the application methodologies of specialized CAD/CAM/CAE and rapid prototyping technologies involved in the planning of forming processes, as well as PLM technologies that enhance the integration of design and manufacturing within the framework of Concurrent Engineering applied to the production of mechanical components. The subject has an eminently practical approach, applying CAD/CAE technologies to mechanical forming processes (3D design of tooling with generic and specific CAD, validation with specialized CAE); 3D CAM applied to the designed tooling; reverse engineering and rapid prototyping in tooling.

Sustainable Development Goals of the 2030 Agenda (<https://www.un.org/sustainabledevelopment/es/>): Goal 8: Objective 8.2; Goal 9: Objective 9.4; Goal 12: Objective 12.5.

Recommendations for taking the subject

It is advisable to have a computer equipment, preferably a laptop, in order to install the CAD/CAM applications that will be used in class and at home (Solid Edge, NX, Inspire Form).

2. Learning results

1. Knows and applies properly the different Computer Integrated Manufacturing (CIM) technologies for the planning of manufacturing processes within the framework of Concurrent Engineering
2. Assimilates the technological and economic criteria for the selection and application of CIM and PLM technologies (product life cycle management) that integrate design and mechanical manufacturing.
3. Acquires practical skills in the design and calculation of components and tooling by means of the use of computer applications characteristic of mechanical manufacturing engineering CAD/CAE; especially in the design of moulds and dies.
4. Acquires practical skills to program and control mechanical manufacturing systems by means of CNC and CAD/CAM.
5. Knows and properly applies modelling and simulation tools for mechanical manufacturing processes.

3. Syllabus

Agenda

1. Mechanical design in process planning: Mechanical 3D CAD modelling systems and rules for structural and aesthetic part design.
2. Planning of mechanical forming processes: Sequencing rules, design of tools for moulding and deformation and validation by CAE simulation techniques.
3. Process planning CAM systems for machining: Machining systems. Machining strategies in systems.
4. Rapid prototyping and reverse engineering.

Laboratory practices

1. Mechanical design of mechanical components: volumetric parts.
2. Mechanical design of moulding and volumetric forming tools. Specialized applications.
3. Mechanical design of mechanical components: sheet metal. Mechanical design of conventional dies using generic 3D CAD.
4. Mechanical design of progressive dies by means of specialized 3D CAD.
5. Feasibility analysis of conformation processes using specialized CAE.
6. 3D CAD reconstruction through reverse engineering techniques.

4. Academic activities

The methodology tries to encourage the student's continuous work and focuses on methodological aspects and practical skills with commercial CAD/CAM/CAE applications, through the use of technical cases. It is recommended to bring laptops to class. Recorded videos are available to help develop the subject using CAD/CAM/CAE applications and to follow up the classes in case they are unable to attend.

- master class, technical case sessions (42 hours)
- practical sessions in small groups (18 hours)
- theoretical study and practical work (80 hours)
- tests and practical reports (10 hours) The dates of the tests and delivery of work will be established at the beginning of the term in the ADD. They are carried out on an individual basis.

5. Assessment system

It is highly recommended to follow the subject and to carry out the continuous evaluation activities. In case of not passing any of the continuous evaluation activities (minimum grade of 4.0 in each one), the global evaluation tests must be taken.

1. Practical sessions (20%): It is carried out by developing two simple technical cases: one of design of the progressive die band and part of the die components, by means of generic and Specialized; and the other of CAD reconstruction in reverse engineering.
2. Theoretical-practical knowledge related to the contents and technical cases of the subject through the term (20%).
3. Practical application of knowledge through pre-projects that apply CAD/CAM/CAE technologies to integrated design and development of mechanical components (not too complex) developed by new tools, the validation of the manufacturing process (CAE) and the development of its means of production (CAM applied to 3D CAD-designed tools). (60%).
 - Design of a bottle or a decanter and the traces of the moulds for its conformation by means of blowing. Design based on a real market model, freely adapted. (20% of the total amount of the subject).
 - Planning and validation, by means of specialized CAE, of the forming stages by means of stamping of a sheet metal component of medium complexity. (20% of the total of the subject).
 - Planning the machining of one of the moulds or dies by means of 3D CAM. (20% of the total of the subject).

The student is entitled to a global evaluation by means of theoretical-practical and skill tests in the use of the computer applications used in the practices and subject work, which are carried out on the dates established by the centre.