

66421 - Design and optimization of Manufacturing Systems

Syllabus Information

Academic year: 2023/24

Subject: 66421 - Design and optimization of Manufacturing Systems

Faculty / School: 110 - Escuela de Ingeniería y Arquitectura

Degree: 330 - Complementos de formación Máster/Doctorado
536 - Master's in Mechanical Engineering

ECTS: 6.0

Year: 536 - Master's in Mechanical Engineering: 1

330 - Complementos de formación Máster/Doctorado: XX

Semester: First semester

Subject type: 536 - Compulsory

330 - ENG/Complementos de Formación

Module:

1. General information

Objectives of the subject

To learn about aspects related to the modelling and optimization of manufacturing systems, as well as the associated experimental and computational methods. The subject addresses the complete cycle: modelling, data capture, parameter identification and optimization according to the criteria and techniques suitable for each case.

Sustainable Development Goals of the 2030 Agenda (<https://www.un.org/sustainabledevelopment/es/>) : Goal 9: Objectives 9.4 and 9.5

2. Learning results

1. To acquire skills for the optimal design and modelling of different production systems.
2. To acquire the practical skills for the application of experimental techniques for the control and verification of manufacturing systems.
3. Acquire practical skills for the application of computational techniques in the optimization of manufacturing and measurement processes and systems.

3. Syllabus

Topics

1. Introduction to manufacturing systems design.
2. Design and modelling of systems
3. Experimental techniques for control and verification of manufacturing systems.
4. Computational optimization methods in manufacturing engineering.

Laboratory practices

1. Management of programming tools.
2. Modelling and identification (I). Kinematic modelling of an articulated arm for coordinate measurement
3. Modelling and identification (II). Data capture and analysis procedures for parameter identification.
4. Modelling and identification (III). Identification of parameters and calibration of an articulated arm for coordinate measurement.
5. Adaptation of optimization algorithms to system design (I): identification of variables, objective function and coding.
6. Adaptation of optimization algorithms to system design (II): development of algorithms and parameter adjustment.

4. Academic activities

- Master class and problem solving: 22 hours
- Practical sessions: 18 hours (6 sessions of 3 hours each)
- Tutored work: 10 hours
- Personal work: 97 hours
- Assessment: 3 hours

5. Assessment system

The subject is preferably evaluated with a **continuous assessment** that consists of three blocks:

Block 1 : Evaluation of the practical sessions. (30% of the final grade, minimum grade on each report 4/10)

After the practical sessions, students will prepare a set of reports, solving the cases presented based on the tools learned, with a maximum deadline of 2 weeks after the case presentation. The assessment criteria for these works will be: appropriate content, good approach, interesting conclusions and good presentation.

In the event of non-delivery of the report and/or if the grade obtained is below 4, the student must take a practical exam corresponding to that part in the global evaluation. It is mandatory to pass this exam in order to pass the subject.

Block 2 : Control of the first three blocks of the syllabus (20% of the final grade, minimum grade 5/10)

Evaluation of theoretical-practical knowledge with a test that is carried out during the term. The date will be set at the beginning of the term.

Block 3 : Group work on computational methods. (50% of the final grade, minimum grade 5/10)

Each group, preferably of 4/5 students, will design, model, calculate, and verify a manufacturing or mechanical engineering system, using the techniques and tools learned in this subject, under the teacher's supervision and tutoring. They must prepare a report, deliver calculation files and perform a final presentation. The evaluation will have a fixed group part and an individual part. The last one will be assigned based on the answers in the presentation session and the opinion of the members of the work team. The deadline for submitting the work will be set at the beginning of this thematic block.

Alternatively, the student has the possibility of passing the subject by means of the **global evaluation** in the official calls for exams. The evaluation will be carried out through a theoretical-practical test on the dates established by the centre.