Universidad Zaragoza

Year : 2018/19

60801 - Design and testing of machines and Integrated manufacturing systems

Syllabus Information

Academic Year:	2018/19
Subject:	60801 - Design and testing of machines and Integrated manufacturing systems
Faculty / School:	110 -
Degree:	532 - Master's in Industrial Engineering
ECTS:	6.0
Year:	1
Semester:	Half-yearly
Subject Type:	Compulsory
Module:	---

General information

Aims of the course

Context and importance of this course in the degree

Recommendations to take this course

Learning goals

Competences

Learning goals

Importance of learning goals

Assessment (1st and 2nd call)

Assessment tasks (description of tasks, marking system and assessment criteria)

Methodology, learning tasks, syllabus and resources

Methodological overview

The methodology followed in this course is oriented towards achievement of the learning objectives. It seeks to promote continuous work and focuses on the practical aspects related to design and testing of machines. A wide range of teaching and learning tasks are implemented, such as

- Lectures, where the main contents of the course are explained.

- Practice sessions where students solve problems related to lectures.
- Laboratory sessions where students, in small groups, work on tasks related to the lectures and practice sessions.
- Tutorials.
- Complementary activities such as exercises, oral presentations, company visits, seminars by experts,etc. to achieve the learning objectives.

Students are expected to participate actively in the class throughout the semester.

Learning tasks

The course (6 ECTS: 150 hours) includes the following learning tasks:

- **Lectures** (42 hours, 3 weekly hours). Its aim is to present the knowledge and skills that must be acquired by the student and facilitate their assimilation, so that their monitoring is essential for the consolidation and development of the syllabus. Problem-solving tasks and technical case studies are part of the lectures to facilitate learning and provide a practical perspective.
- **Laboratory sessions** (18 hours). 6 sessions of 3 hours with small groups of students to work with mechanical engineering equipment, and manufacturing and metrology laboratory. They complement those concepts which need specific equipment or complex computer calculation. Attendance is recommended because students can gain direct experience with the machines and manufacturing systems. At the end of each session, there will be some assessment tasks (small tests or assignments) required for the continuous assessment system.
- **Autonomous work and study** (85 hours).
- **Assessment tests** (5 hours).
- **Tutorials** (about 5 hours).

Syllabus

The course will address the following topics:

Topic 1. Introduction to Machine Dimensioning

- Materials.
- Technical specifications.
- Notebook loads.
- Specifications.

Topic 2. Dimensioning Unions

- Mechanical joints: hooping, crimps, screws and rivets.
- No mechanical joints: Welding and adhesive.

Topic 3. Dimensioning of transmission elements.

- Dimensioning of shafts, pins and bearings.
- Dimensioning of couplings, belts and chains.
- Dimensioning of gear transmissions.

Topic 4. Flexible manufacturing systems: machine tools, material handling, monitoring and control systems.

- Principles for designing machine tools from components.
- Drives and motion transmission. Structures, interfaces and assembly.
- Diagnosis and control of manufacturing systems. Dynamics and vibrations

Topic 5. Geometric and Functional verification of production systems.

- Standardization. Modeling of production systems.
- Direct verification.
- Indirect verification.

Topic 6. Development of manufacturing cells.

- Lean Manufacturing.
- Clustering methods for cell formation.
- Design of plant layout for cell manufacturing.

Practice sessions

1. Dimensioning of a load cell, theoretical and practical analysis, experimental strain gauge application.
2. Analysis of photoelasticity stress concentrators and theoretical comparison by methods FEM.
3. Dimensioning of components using computer tools.
4. Experimental techniques for manufacturing systems verification.
5. Modeling and verification of machine tool.
6. Lean Manufacturing: VSM and manufacturing cells formation.

Course planning and calendar

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course, will be provided on the first day of class or please refer to the EINA website.

Bibliography and recommended resources