Universidad Zaragoza

Year : 2018/19

60833 - Precision engineering and additive manufacturing

Syllabus Information

Academic Year:	2018/19
Subject:	60833 - Precision engineering and additive manufacturing
Faculty / School:	110 -
Degree:	532 - Master's in Industrial Engineering
ECTS:	6.0
Year:	2
Semester:	First semester
Subject Type:	Optional
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 is based on the application of computational and experimental techniques in different areas of design and product development of special features, manufacturing and measurement systems and from the principles of precision engineering and additive manufacturing.

A wide range of teaching and learning tasks are implemented, such as industrial case studies, assignments, projects, lectures, problem-solving, tutorials, and complementary activities (such as visits to companies, and seminars by external guests).

Learning tasks

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

- **Lectures** (15 hours). Whole group sessions where the teacher explains the main concepts of the course. Its aim is to present the knowledge and skills to be acquired by the student and to facilitate their assimilation, so that their monitoring is essential for the achievement of the learning outcomes.
- **Practice sessions** (15 hours). Whole group sessions where students do exercises and technical cases aimed at enhancing the acquisition and assimilation of the lectures' contents. Students also learn how to manage tools and techniques for their projects.
- **Computer lab sessions** (18 hours). 6 sessions of 3 hours each with small groups of students in the manufacturing engineering laboratory and metrology laboratory. Student work on those concepts which need specific equipment or computer software for complex calculation. Students have direct experience with machines and manufacturing systems. At the end of each session, students complete a small test or task. In some cases, the session enables to gather data for a more elaborate work and better assimilation of knowledge.
- **Supervised project** (15 hours). The tutorial time is distributed in 5 sessions of 3 hours each. This time will be used for evaluation, correction and clarification of aspects of the project, in order to analyze the possible shortcomings and answer questions to improve it.
- **Autonomous work and study** (85 hours).
- **Assessment** (2 hours). Computer lab session's tasks and tests, and the final exam are required for the continuous assessment system.

Syllabus

The course will address the following topics:

1. Design, development and optimization of manufacturing and measurement systems according to principles of precision engineering.
2. Design, manufacture and measurement of products with special characteristics.
3. Verification of manufacturing and measurement systems.
4. Additive manufacturing and rapid prototyping. Prototyping phases, workflow and integration into the product development cycle.
5. Fast prototyping Technologies and system selection. Software and file formats.
6. Prototyping applications in industrial, medical, artistic and heritage conservation.

Computer lab sessions

1. Analytical calculation and finite element simulation of machine elements.
2. Modeling and verification of machine tool.
3. Modeling and analysis of measurement systems.
4. 3D printing photopolymerizable resin. Software file management and printing. Principle of operation, operation and maintenance
5. Generic CAD design of parts. Data collection and analysis files. Printing, cleaning and finishing prototypes.
6. Digitization of parts with laser triangulation sensor and articulated arm by coordinate measuring. Coordinate measuring machines and laser tracker.

Case studies

1. Design of a precision instrument.
2. Manufacturing and measurement products large and / or complex geometries.
3. Modeling, identification and verification of volumetric machine tool.
4. Development of mechanism by additive manufacturing.
5. Reverse Engineering, CAD reconstruction from point clouds and prototype development.
6. Modeling and precision improvement of 3D printer.

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