Universidad Zaragoza

Year : 2018/19

60830 - Laser technologies in industrial applications

Syllabus Information

Academic Year:	2018/19
Subject:	60830 - Laser technologies in industrial applications
Faculty / School:	110 -
Degree:	532 - Master's in Industrial Engineering
ECTS:	6.0
Year:	2
Semester:	Second 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 focuses on the basics of laser technologies to understand the laser applications in different industrial fields. A wide range of teaching and learning tasks are implemented, such as cooperative classroom techniques, case studies, problem-solving, laboratory sessions and visits to laboratories and companies involved in laser material processing.

Learning tasks

The course includes the following learning tasks:

- **Lectures**.
- **Laboratory sessions**. Students work on properties of a laser beam, safety issues, fusion processes, and laser-assisted ablation applied to material processing.
- **Autonomous work and study** (90 hours). Time distributed as follows: study of the contents of the course (40 hours),problem-solving and case studies (15 hours), questionnaires (15 hours), and compulsory readings for group assignments (20 hours). This activity is essential in the learning process and to pass the course.
- **Assessment** (3 hours). Test at the end of the semester.

Syllabus

The course will address the following topics:

1. Basic concepts of Laser
2. Types of lasers
3. Control of the optical properties of lasers
4. Radiation-matter interactions
5. Applications of lasers:
    - Cutting and marking
    - Drilling
    - Welding
    - Surface heat treatments
    - Cladding and surface alloying
    - Micromachining and microelectronic applications
    - Photoablation and photolytic processes
    - Crystal Growth
    - Rapid Prototyping. Selective sintering
    - Complementary systems
    - Application of laser in heritage restoration
6. Industrial Implementation of laser technology.
    - Safety, regulatory and practical aspects
    - Protection systems.
7. Case studies of interest, including other sectors such as communication, defense, analysis and characterization, medicine, nanotechnology.

Laboratory sessions

- Management of laser beams. Optical systems
- Laser cutting, melting, ablation
- Welding
- Marking and machining
- Surface modification. Cleaning, textured, hardening
- Crystal Growth
- Nanoparticles fabrication
- Laser spectroscopic techniques

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