

60830 - Laser technologies in industrial applications

Información del Plan Docente

Academic Year	2016/17
Academic center	110 - Escuela de Ingeniería y Arquitectura
Degree	532 - Master's in Industrial Engineering
ECTS	6.0
Course	2
Period	Second semester
Subject Type	Optional
Module	---

1.Basic info

1.1.Recommendations to take this course

1.2.Activities and key dates for the course

2.Initiation

2.1.Learning outcomes that define the subject

2.2.Introduction

3.Context and competences

3.1.Goals

3.2.Context and meaning of the subject in the degree

3.3.Competences

3.4.Importance of learning outcomes

4.Evaluation

5.Activities and resources

5.1.General methodological presentation

The structure of the course is designed to provide graduate students sufficient training on the basics of laser technologies to understand the laser applications in different industrial fields. The program also includes visits to laboratories and companies involved in laser material processing.

For this course the learning process is based on:

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- Cooperative classroom techniques.
- Case studies and problem-based learning
- Practical classes and laboratory experiences

5.2.Learning activities

- Classroom activities and active learning laboratory
- Laboratory experiences:
 - Properties of a laser beam. Safety issues.
 - Fusion processes and laser assisted ablation applied to material processing.

5.3.Program

The contents of the course are:

1. Fundamentals 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

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- * 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. Study of cases of interest, including other sectors such as communication, defense, analysis and characterization, medicine, nanotechnology.

The laboratory practices include:

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

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- Laser spectroscopic techniques.

5.4.Planning and scheduling

Evaluation Test (3 hours) at the end of the semester. Personal work studying the contents of the course and applying them to solve exercises. This activity is essential in the process of student learning and to pass evaluation activities . The expected duration is 90 hours, distributed as follows :

40 hours of personal study, 15 hours of problems resolution, exercises and cases, 15 hours for questionnaires control and mandatory readings and 20 hours for work in groups (2 or 3 students).

5.5.Bibliography and recommended resources

[1] O. Svelto, Principles of Lasers, Plenum Press.

[2] W. M. Steen, Laser Material Processing, Springer.

[3] J. Ion, Laser Processing of Engineering Materials: Principles, Procedure and Industrial Application, Elsevier.

[4] J. F. Ready, LIA Handbook of Laser Materials Processing, Laser Institute of America.