Universidad Zaragoza

Academic Year: 2025/26

26940 - Laser and Applications

Teaching Plan Information

Academic year: 2025/26
Subject: 26940 - Laser and Applications
Faculty / School: 100 - Facultad de Ciencias
Degree: 447 - Degree in Physics
ECTS: 5.0
Year: 4 and 3
Semester: Second semester
Subject type: Optional
Module:

1. General information

As the laser is in continuous evolution and improvement and is an indispensable tool in the study of physical phenomena and in technological applications, it is important to know and understand the main physical fundamentals associated with it, the most relevant measurement techniques and the optical properties of the laser beam.

It is recommended to have previously taken the subjects Electromagnetism, Electromagnetic Waves and Optics.

2. Learning results

1. To understand the physical phenomena related to optical amplification and laser oscillation
2. To physically understand the operation of continuous laser oscillation
3. To understand the operation of pulsed lasers
4. To know the main parameters that define a laser and the basic rules of laser cavity design
5. To be familiar with the handling of lasers in the laboratory and with the measurement of their main characteristics
6. To know the main types of lasers and their most relevant scientific, technical, industrial and medical applications

3. Syllabus

1. General characteristics of lasers and their applications
2. Optical amplification
3. Resonators
4. Laser beam properties
5. Continuous laser
6. Pulsed lasers
7. Safety in laser environments
8. Some scientific, medical, technical, and industrial applications

4. Academic activities

- Master classes: 35 hours. Theoretical sessions in which the contents of the subject are explained.
- Problems and cases: 5 hours. Solving problems related to the contents of the subject.
- Laboratory practices: 10 hours. Experimental setup of lasers, analysis and measurement of laser beam properties.
- Special practices at external facilities: visit to the ultra-short lasers laboratories of the University of Salamanca.
- Teaching assignments: 20 hours. Elaboration of a group work on a laser application.
- Personal study. 50 hours
- Assessment tests. 4 hours

5. Assessment system

To pass, a final grade equal to or higher than 5 points must be obtained in a single global test, but there are 2 activities that will allow the student to obtain up to 3 points:

1. Completion of laboratory practices and a single laboratory report. Maximum grade of 1 point. Minimum grade required: 0.5 points.

2. Carrying out and correction of group work. Maximum grade of 2 points. Minimum qualification required: 1 point.

Passing the subject by means of a single global test:

The evaluation will be carried out by means of an examination test consisting of the following parts:

- Theory of the subject. Maximum grade of 3 points. Minimum grade required: 1 point.

- Problems of the subject. Maximum grade of 4 points. Minimum grade required: 1.5 points.

- Practical laboratory test. Maximum grade of 1 point. Minimum grade required: 0.5 points. It is not necessary to do this test if the student has passed activity 1.

- Presentation of a written work. Maximum grade of 2 points. Minimum grade required: 1 point. It is not necessary to do this test if the student has passed activity 2.

6. Sustainable Development Goals

4 - Quality Education
8 - Decent Work and Economic Growth
9 - Industry, Innovation and Infrastructure