



## IDENTIFYING DATA

### Laser technology

Subject	Laser technology			
Code	V12G320V01908			
Study programme	Grado en Ingeniería Eléctrica			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	Spanish English			
Department				
Coordinator	Pou Saracho, Juan María			
Lecturers	Barro Guizán, Óscar Boutinguiza Larosi, Mohamed Pou Saracho, Juan María			
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Web				
General description	(*)Introduction to laser technology and its applications for undergraduate students of the industrial field.			

## Training and Learning Results

Code	
B10	CG10 Ability to work in a multidisciplinary and multilingual environment.
D10	CT10 Self learning and work.

## Expected results from this subject

Expected results from this subject	Training and Learning Results	
- Know the physical principles in which it bases the operation of a laser and his parts.	B10	D10
- Know the main properties of a laser and relate them with the potential applications.		
- Know the different types of lasers differentiating his specific characteristics.		
- Know the main applications of the technology laser in the industry.		

## Contents

Topic	
Chapter 1.- INTRODUCTION	<ol style="list-style-type: none"> <li>1. Electromagnetic waves in the vacuum and in the matter.</li> <li>2. Laser radiation.</li> <li>3. Properties of the laser radiation.</li> </ol>
Chapter 2.- BASICS	<ol style="list-style-type: none"> <li>1. Photons and energy level diagrams.</li> <li>2. Spontaneous emission of electromagnetic radiation.</li> <li>3. Population inversion.</li> <li>4. Stimulated emission.</li> <li>5. Amplification.</li> </ol>
Chapter 3. COMPONENTS OF A LASER	<ol style="list-style-type: none"> <li>1. Active medium</li> <li>2. Excitation mechanisms.</li> <li>3. Feedback mechanisms.</li> <li>4. Optical cavity.</li> <li>5. Exit device.</li> </ol>
Chapter 4. TYPES OF LASER	<ol style="list-style-type: none"> <li>1. Gas lasers</li> <li>2. Solid-state lasers</li> <li>3. Diode lasers.</li> <li>4. Other lasers.</li> </ol>

- Chapter 5. OPTICAL COMPONENTS AND SYSTEMS
1. Spherical lenses.
  2. optical centre of a lens.
  3. Thin lenses. Ray tracing.
  4. Thin lenses coupling.
  5. Mirrors.
  6. Filters.
  7. Optical fibers.

- Chapter 6. INDUSTRIAL APPLICATIONS
1. Introduction to laser materials processing
  2. Introduction to laser cutting and drilling.
  3. Introduction to laser welding.
  4. Introduction to laser marking.
  5. Introduction to laser surface treatments.

### Planning

	Class hours	Hours outside the classroom	Total hours
Laboratory practical	18	30.6	48.6
Lecturing	32.5	65	97.5
Essay questions exam	1.7	0	1.7
Report of practices, practicum and external practices	1.9	0	1.9
Problem and/or exercise solving	0.3	0	0.3

\*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

### Methodologies

	Description
Laboratory practical	Activities of application of the knowledge to specific situations and of acquisition of basic and practical skills related to the matter object of study. They will be developed in the laboratories of industrial applications of the lasers of the EEI.
Lecturing	Exhibition on the part of the teacher of the contents on the matter object of study. Exhibition of real cases of application of the laser technology in the industry.

### Personalized assistance

Methodologies	Description
Laboratory practical	

### Assessment

	Description	Qualification	Training and Learning Results
Essay questions exam	Several tests consisting of development questions will be proposed, so that no test exceeds 40% of the overall grade for the subject..	70	B10 D10
Report of practices, practicum and external practices	The evaluation of the laboratory practices will be carried out by means of the qualification of the corresponding practice reports.	20	B10 D10
Problem and/or exercise solving	During the course there will be carried out a test of follow-up of the subject that will consist of two questions of equal value.	10	B10 D10

### Other comments on the Evaluation

If some student was resigning officially the continuous assessment, the final note would be calculated by the following formula:  $(0.8 \times \text{Exam qualification}) + (0.2 \times \text{Practices qualification})$ . It is mandatory to carry out the laboratory practices in order to pass the subject. It is mandatory to attend 75% of the theory lessons to pass the subject. Ethical commitment: it is expected an adequate ethical behaviour of the student. In case of detecting unethical behaviour (copying, plagiarism, unauthorized use of electronic devices, etc.) shall be deemed that the student does not meet the requirements for passing the subject. In this case, the overall rating in the current academic year will be Fail (0.0). The use of any electronic device for the assessment tests is not allowed unless explicitly authorized. The fact of introducing unauthorized electronic device in the examination room will be considered reason for not passing the subject in the current academic year and will hold overall rating (0.0).

### Sources of information

#### Basic Bibliography

Jeff Hecht, **UNDERSTANDING LASERS: AN ENTRY-LEVEL GUIDE**, IEEE, 2008  
 W.Steen, J. Mazumder, **LASER MATERIALS PROCESSING**, Springer, 2010

## **Complementary Bibliography**

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## **Recommendations**

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### **Other comments**

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Requirements: To register for this module the student must have passed or be registered for all the modules of the previous year.

In case of discrepancies, the spanish version (castellano) will prevail.

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