390223 - FOT - Applied Photonics

Coordinating unit: 390 - ESAB - Barcelona School of Agricultural Engineering
Teaching unit: 739 - TSC - Department of Signal Theory and Communications
Academic year: 2019
Degree: MASTER'S DEGREE IN ENABLING TECHNOLOGIES FOR THE FOOD AND BIOPROCESSING INDUSTRY (Syllabus 2014). (Teaching unit Compulsory)
ECTS credits: 5
Teaching languages: Spanish, English

Teaching staff
Coordinator: Artigas Garcia, David
Others: Perez Torres, Juan

Prior skills
Graduate students in science, engineering or technology disciplines with a diploma equivalent to 240 ETCS.

Requirements
Presentiality

Degree competences to which the subject contributes

Specific:
1. Identification of the opportunities and knowledge of the scientific basis of photonics in measurement techniques, treatments and communication. Selection of new technologies for the food industry.

General:
2. Identification of the industrial technologies with larger future impact and develop new applications of such technologies in the food and biotechnological industry.

Transversal:
3. SUSTAINABILITY AND SOCIAL COMMITMENT: Being aware of and understanding the complexity of the economic and social phenomena typical of a welfare society, and being able to relate social welfare to globalisation and sustainability and to use technique, technology, economics and sustainability in a balanced and compatible manner.
4. FOREIGN LANGUAGE: Achieving a level of spoken and written proficiency in a foreign language, preferably English, that meets the needs of the profession and the labour market.

Teaching methodology
We indicate here the repertoire of teaching methods to be applied in the different training activities according to the teaching plans of the subject.
Lecture or conference: presentation of knowledge by university professors or by external specialists.
Participatory classes: collective solving exercises, conducted group discussions with the lecturer and other students in the classroom; classroom presentation of an activity individually or in small groups.
Theoretical and practical works: conducted classroom activity or exercise, individually or in small groups, with the advice of the lecturer.
Project or short works: based on the realization, individually or in groups, of a work of reduced complexity or scope.
Information search: Information search by students, it allows the acquisition of knowledge, skills and attitudes related to obtaining information.
Simulation: Activity related to a case or problem, each student or each group is assigned a role under which they must intervene in the development of the situation.
Evaluation activities.
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Learning objectives of the subject

This subject aims to give an up-to-date vision of the possibilities of photonics to improve the processes in food and biotechnological industries. The first part of the course aims that students acquire the fundamentals of light behavior and light-matter interaction needed to understand the basics, opportunities and limitations of the application of photonics. The second part shows concrete application examples.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 125h</th>
<th>Hours large group: 40h</th>
<th>32.00%</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Guided activities: 5h</td>
<td>4.00%</td>
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<tr>
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<td>Self study: 80h</td>
<td>64.00%</td>
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Content

**Chapter 1**

**Learning time:** 20h

Theory classes: 20h

**Description:**
1. Introduction to photonics.
1.1 Light, the electromagnetic spectrum, types of light, light characteristics (energy, power, spatial structure, etc.)
1.2 Light-matter interaction: refraction, absorption, scattering, fluorescence, Raman, nonlinear effects.
1.3 Light sources: lasers and other light sources.
1.4 Optical systems for the transmission and manipulation of light.
1.5 Light detectors.

**Chapter 2**

**Learning time:** 20h

Theory classes: 20h

**Description:**
2. Applications to the agri-food industry.
2.1 Optical coherence tomography.
2.2 Microscopy.
2.3 Methods of fluorescence analysis.
2.4 Raman Spectroscopy.
2.5 Optical fiber-based sensors.
2.6 Emerging technologies: plasmonics, nanophotonics.

Qualification system

Ongoing assessment
Regulations for carrying out activities


Bibliography