Course guide
390223 - FOT - Applied Photonics

Last modified: 13/06/2023

Unit in charge: Barcelona School of Agri-Food and Biosystems Engineering
Teaching unit: 739 - TSC - Department of Signal Theory and Communications.

Degree: MASTER'S DEGREE IN ENABLING TECHNOLOGIES FOR THE FOOD AND BIOPROCESSING INDUSTRY (Syllabus 2014). (Compulsory subject).
MASTER'S DEGREE IN ENABLING TECHNOLOGIES FOR THE FOOD AND BIOPROCESSING INDUSTRY (Syllabus 2020). (Compulsory subject).

Academic year: 2023 **ECTS Credits:** 5.0 **Languages:** Catalan, Spanish, English

LECTURER

Coordinating lecturer: Artigas Garcia, David

Others: Gualda Manzano, Emilio Jose
Sepulcre Sanchez, Francisco Luis

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.

Generical:
2. Identification of the industrial techonologies 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.

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, oportunities and limitations of the application of photonics. The second part shows concrete application examples.

STUDY LOAD

Type	Hours	Percentage
Self study	90,0	72.00
Hours large group	35,0	28.00

Total learning time: 125 h

CONTENTS

Chapter 1

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.

Full-or-part-time: 17h
Theory classes: 17h

Chapter 2

Description:
2. Applications to the agri-food industry.
2.1 Spectroscopy.
2.2 Microscopy.
2.3 Other Methods.
2.3.1 Raman Spectroscopy.
2.3.2 Optical fiber-based sensors.
2.3.3 Emerging technologies: plasmonics, nanophotonics.

Full-or-part-time: 18h
Theory classes: 18h

GRADING SYSTEM

Continuous assessment
N1 = 2 Partial exams with the same weight (33%)
N2 = Presentation of research articles
Final mark = 0.70 N1 + 0.30 N2

EXAMINATION RULES.

Presentiality. Continuous monitoring. Deliveries and oral presentations.

BIBLIOGRAPHY

Basic:
- Tipler, Paul Allen; Mosca, Gene. Física para la ciencia y la tecnología (Vol. 2) [on line]. 6a ed. Barcelona [etc.]: Reverté, 2010 [Consultation: 16/07/2022]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=10373. ISBN 9788429144307.

Complementary:
- Saleh, Bahaa E. A.; Teich, Malvin Carl. Fundamentals of photonics. Third edition. Hoboken: John Wiley & Sons, 2019. ISBN 9781119506874.