



Academic Year 11/12	24376	<b>NEW PERSPECTIVES ON MATERIAL SCIENCE AND TECHNOLOGY</b>	
Department:	702 Materials Science and Metallurgical Engineering		
Coordinator:	Luis M. Llanes		
Typology:	Block 1. Engineering Courses	Language: English	
ECTS: 5	Offered in other degrees: Industrial Engineering	Year 1; Semester 2 Spring Semester	

## OBJECTIVES

### General objective

Materials Science and Engineering is a multidisciplinary field. After more than thirty years since it was implemented as an specific degree in universities all over the world, it has become an established discipline. However, it should be kept in mind that the success of Materials Science and Technology comes from its interdisciplinarity. Chemistry (organic and inorganic), Physics, Mechanics, Electronics, Economics and many other disciplines are some of the most relevant disciplines that make up the field of Materials Science and Engineering. This is the reason why in a Materials Engineering degree, most of the matters deal with the structure, the properties and the processing of engineering materials, taken from a multidisciplinary point of view. However, it seems that a targeted approach, looking at the industry needs and the scientific knowledge generated in basic disciplines, can offer a new point of view in terms of the challenges and the new perspectives that are appearing in Materials Science and Technology, precisely because it is a multidisciplinary field. The main objective of the present course is then to show the industrial and societal demands put on Materials Science and Technology and how this multidisciplinary field can respond to them. The students of this course acquire knowledge about the technological challenges and industrial opportunities of the field in the next ten to twenty years.

### Specific objectives

This course does not aim to provide specific information necessary for developing new skills or to provide a specific skill. In fact the direct objective is to relate some of the present scientific knowledge to the main ideas that collaborate to the creation of new materials and processes out of them. These are the new perspectives. This is some kind of training with the scientific risk. In order that the students can grasp this approach, they will have to present in public one of such packages of ideas and knowledge that may lead to a new material or materials, applications and industrial products. In this sense all their work will be concentrated on preparing a project and defending it.

## COURSE DESCRIPTION

### LECTURES

1.- Introduction: 1 hour

2.- Revision to some aspects of the structure of matter: 8 hours

Basic elements. Two states of matter: order and disorder. The perfect gas. Crystals. Crystalline solids. Liquids. Non-crystalline solids. Between order and disorder. Composite materials, suspensions and colloidal solutions.

3.- Challenges and perspectives : 21 hours

Photonic Materials (2 hours). Materials for Information Storage (2 hours). Smart Materials (1 hour). Biological Materials and Biomimetics (3 hours). Biomedical Materials (2 hours). Materials for Clean Energy (2 hours). Porous Materials (2 hours). Diamond and Hard Materials (2 hours). The New Polymers (2 hours). Surfaces, Interfaces and Nanotechnology (3 hours).

### INVITED SPEAKERS (15 hours)

This part of the course will consist in attending specific talks, given by specialists and experts in the different fields of interest of the course, that will present relevant aspects related to the different materials and their characterisation. These talks are meant to provide a deeper insight into particular aspects of the challenging areas that are presented in the lectures.

### PROJECT AND PUBLIC PRESENTATION (15 hours)

In this part of the course it is expected that the students prepare a project about a specific application, the development of a device or the current investigation in one of the areas presented in the Lectures. They will

have to work in small groups and after choosing a specific subject, they will have to collect information, analyse the state of the art from a technological point of view and elaborate a report that will have to be presented and debated in public with the other students in the class.

## **METHODOLOGY**

All the activities will take place in a conventional lecture room. Both the lectures and the invited talks will take place in a conventional way in a lecture room. The presentations are meant to include discussion and the students will be asked to participate in it. The invited lectures will be more formal and it is expected that discussion with every speaker will take place after the presentation. This is a great opportunity for the students to grasp aspects such as development and innovation in the field of Materials Science and Technology.

The practical aspect of the course looks for the work in group of the students around the preparation of a subject, the writing of a report and its presentation and defense. In fact what is being looked for is their ability to choose and defend a new technology and its application in industry, including the economical, social and environmental assessment.

## **COURSE EVALUATION**

The students will be evaluated by means of a written exam, the report that they will write and the evaluation of their public presentation.

## **FACULTY**

Luis M. Llanes

<http://directori.upc.edu/directori/dadesPersona.jsp?id=1002332>

## **ADDITIONAL INFORMATION**