

| CÓDE | NAME OF MODULE                     | TYPE |
|------|------------------------------------|------|
|      | FROM NANOSCIENCE TO NANOTECHNOLOGY | M    |

M = mandatory  
E = elective

**3.3.1. Learning goals of the module.**

*(List the specific learning goals that the current module should provide to the student; goals can focus on content, skills, or attitudes.)*

THE BASIC AIM OF THE MODULE IS KNOWING THE STATE OF THE ART IN SEVERAL TECHNOLOGY FIELDS, THE PERSPECTIVES AND THE IMPACT OF NANOSCIENCE IN THOSE FIELDS. IN THIS CONTEXT, THE MODULE FOCUS ON THE CONNECTION OF CURRENT RESEARCH ACTIVITIES IN NANOSCIENCE TO THEIR POTENTIAL TECHNOLOGICAL APPLICATION.

**3.3.2. Methodology: learning activities and credit value of the module (ECTS).**

**3.3.2.1. Learning activities.**

*(Time required to teach the module; links to other modules included in the MSc Program and suggested chronological sequence with the latter)*

THE TIME REQUIRED TO TEACH THE MODULE IS 32 HOURS  
THE LINK WITH OTHER MODULES IS OBVIOUS  
THE MODULE MUST BE TUGHT AFTER BASIC SCIENTIFIC SUBJECTS, SUCH AS QUANTUM PHYSICS AND MATHEMATICS

**3.3.2.2. ECTS credit value (and time)**  
*1 ECTS credit = 25 hours UPV/EHU*

| TYPE OF LECTURE <sup>(1)</sup> | Theory           |    | Practice |    |    |    |     |     |     | Evaluation       |               |
|--------------------------------|------------------|----|----------|----|----|----|-----|-----|-----|------------------|---------------|
|                                | M <sup>(2)</sup> | S  | PA       | PL | PO | TA | TAI | PCL | PCC | Periodic Grading | Final Grading |
| Classroom lectures             | 15               | 10 |          |    |    |    |     |     |     | 5                | 3             |
| Personal work <sup>(3)</sup>   | 22               | 20 |          |    |    |    |     |     |     |                  |               |
| <b>TOTAL</b>                   | 37               | 30 |          |    |    |    |     |     |     | 5                | 3             |

- (1) M (standard lecture); S (seminar); PA (practical exercises in classroom); PL (practical exercises in laboratory); PO (practical exercises with computers); TA (non-industrial workshops); TAI (industrial workshops); PCL (clinical practice); PCC (field practice); the acronyms are taken from the Spanish wording.
- (2) M = maximum allowed is 60% of the full classroom lectures
- (3) Personal work = time that the student would use to prepare and develop individual and group assignments.

**3.3.2.3. Module Program.**

*(Lectures)*

|            |   |
|------------|---|
| Lecture 1  | 1 <u>Creating small objects in a controlled way</u><br>1.1 The top down strategy: Lithography                             |
| Lecture 2  | 1.2 The bottom-up strategy: self-assembly   |
| Lecture 3  | <u>2. Introduction to the geometries of nanoscale carbon</u><br>2.1 Fullerenes  |
| Lecture 4  | 2.2 Carbon Nanotubes  |
| Lecture 5  | <u>3. Quantum dots</u>  |
| Lecture 6  | <u>4. Nanocomposites</u>  |
| Lecture 7  | 4 <u>The semiconductor industry: state of the art and challenges</u><br>4.1 CMOS: fundamentals, technology and limits     |
| Lecture 8  | 4.2 Magnetic recording: state of the art and challenges<br>4.3 State of the art Lithography and its limits                |
| Lecture 9  | 5.4 Towards molecular electronics   |
| Lecture 10 | 5 <u>Nanotechnology challenges in solar energy research</u><br>5.1 The energy challenge<br>5.2 The solar energy challenge |
| Lecture 11 | 5.2.1 Solar Photovoltaics   |
| Lecture 12 | 5.2.2 Solar fuel<br>5.2.3 Solar thermal   |

**3.3.2.4. Bibliography.**

*(Basic and specialized bibliographies, journal references, internet addresses, etc.)*

- 1.- INTRODUCTION TO NANOSCALE SCIENCE AND TECHNOLOGY EDS DI VENTRA, EVOY AN HEFLIN SPRINGER, 2004.
- 2.- NANOTECHNOLOGY, BASIS SCIENCE ADN EMERGING NANOTECHNOLOGIES. WILSON ET AL CHAPMAN, 2002
- 3.- INTERNATIONAL TECHNOLOGY ROADMAP FOR SEMICONDUCTORS ITRS-2007
- 4.- "BASIC RESEARCH NEEDS FOR SOLAR ENERGY UTILIZATION", Report on the Basic Energy Sciences Workshop on Solar Energy Utilization  
[HTTP://WWW.SC.DOE.GOV/BES/REPORTS/FILES/SEU\\_RPT.PDF](http://www.sc.doe.gov/bes/reports/files/seu_rpt.pdf)

**3.3.3. Criteria and methods for evaluation and grading**

*(Analysis of the methodology that will be used to evaluate the learning process of the student)*

THE EVALUATION IS MADE ON THE BASIS OF AN INDIVIDUAL EXERCISES AND A SEMINAR ON A RELATED SUBJECT

**3.3.4. Learning resources**

ACCESS TO LECTURE VIEGRAPH PDF'S

**3.3.5. Language and number of groups attending the module**

1

NUMBER OF GROUPS

x

LANGUAGE: ENGLISH

**3.3.6. Fields of science and technology to which the module is related**

| CODE | FIELD                       |
|------|-----------------------------|
|      | PHYSICS OF CONDENSED MATTER |
|      | APPLIED PHYSICS             |
|      |                             |
|      |                             |
|      |                             |
|      |                             |
|      |                             |
|      |                             |

**3.3.7. Department in charge of the Program**

| CODE | DEPARTMENT <sup>(1)</sup>       |
|------|---------------------------------|
|      | DEPARTMENT OF MATERIALS PHYSICS |
|      |                                 |
|      |                                 |

**3.3.8. Teachers in charge of the module**

| DNI       | Teacher UPV/EHU              | Number of credits |
|-----------|------------------------------|-------------------|
| 15960590Q | José Enrique ORTEGA CONEJERO | 2                 |
|           |                              |                   |
|           |                              |                   |
|           |                              |                   |
|           |                              |                   |

| DNI | Teacher other institutions | Number of credits |
|-----|----------------------------|-------------------|
|     | Andrés AYUELA              | 1                 |
|     |                            |                   |
|     |                            |                   |
|     |                            |                   |
|     |                            |                   |