

**MASTERS DEGREE IN**

**Nanostructured Materials  
for Nanotechnology Applications**

**NANOMAT**

**Master's Sessions @ Science Faculty**

Dr. Maria Pilar Pina

(mapina@unizar.es)

<https://ciencias.unizar.es/master-en-materiales-nanoestructurados-para-aplicaciones-nanotecnologicas-2014-15>

[https://estudios.unizar.es/estudio/ver?id=637&anyo\\_academico=2020](https://estudios.unizar.es/estudio/ver?id=637&anyo_academico=2020)

<https://inma.unizar-csic.es/formacion/estudiantes-master/estudios-master-unizar/nanociencia-materiales/>



**Universidad  
Zaragoza**



MASTERS DEGREE IN

# Nanostructured Materials for Nanotechnology Applications

Universidad de Zaragoza

This official Master from Zaragoza University (Spain) has a duration of one academic year and comprises 60 ECTS credits. The course is suitable for graduates with science, engineering, medicine or related degrees keen to develop careers at the forefront of Nanoscience and Nanotechnology.

The course is multidisciplinary and aims to provide students with fundamental knowledge, practical experience, and skills to become a practitioner in Nanotechnology, whether in industry, research or academia.

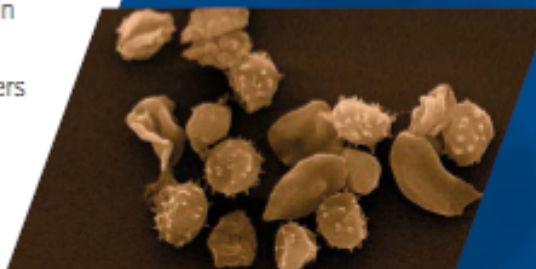
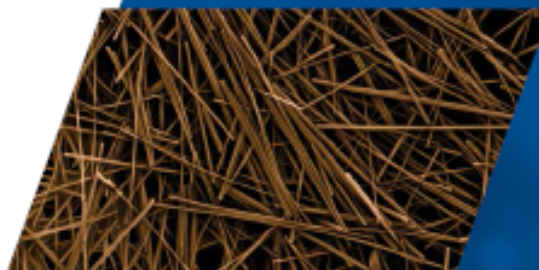
**International,  
Multidisciplinary, and  
Postgraduate unique  
environment.**

The University of Zaragoza and the Institutes of Nanoscience and Materials Science of Aragón (INA and ICMA) have exceptional materials preparation and characterization equipment, including some unique instruments in Spain and Europe.

The course is completely taught in English by highly qualified members of research and academic staff within the INA, ICMA, and the Faculty of Science of Zaragoza University as well as by other national and international departments and industrial representatives.

The master consists of the following units:

- Lectures on fabrication, assembly and characterization of nanostructured materials
- Training in advanced tools for Nanotechnology through laboratory practical work
- Communication and management skills
- Training projects: external industrial involvement, multidisciplinary joint educational project, individual research project working in interdisciplinary research groups





**MASTERS DEGREE IN**

**Nanostructured Materials  
for Nanotechnology Applications**

**INTERNATIONAL**

**MULTIDISCIPLINARY**

**PRACTICAL**

**MASTERS DEGREE IN**

**Nanostructured Materials  
for Nanotechnology Applications**

**INTERNATIONAL**

**Completely taught in English**

**Erasmus Mundus Master EM3E4SW**

**Movility Programme Erasmus**

**Post-graduate Programme: Fundación Carolina**

**Collaboration Agreement with Nanjing Tech University**





# MASTERS DEGREE IN

## Nanostructured Materials for Nanotechnology Applications

### MULTIDISCIPLINARY



### Departments Involved from Unizar

1. Biochemistry & Molecular Biology
2. Materials Science
3. Physics of Condensed Matter
4. Chemical & Environmental Engineering
5. Analytical Chemistry
6. Organic Chemistry
7. Physical Chemistry
8. Inorganic Chemistry

**INMA**  
INSTITUTO DE NANOCIENCIA  
Y MATERIALES DE ARAGÓN

**LMA**  
LABORATORIO  
DE MICROSCOPIAS  
AVANZADAS

**Fundamental Knowledge - Practical Experience - Technical Skills**

## MASTERS DEGREE IN

# Nanostructured Materials for Nanotechnology Applications

## MULTIDISCIPLINARY

Departments from Unizar

Speakers from companies

Invited lecturers from other Institutions (UCM, IMB-CNM-CSIC, EOP, U.Liverpool...)

Students from different backgrounds: Physics, Chemistry, Biotechnology, Chemical Eng., Veterinary, Industrial Eng...)



**MASTERS DEGREE IN**

# **Nanostructured Materials for Nanotechnology Applications**

**PRACTICAL**

**More than 50 % of the credits are practical**

**Training in advanced tools for Nanotechnology (LMA)**

**Communication and management skills**

**External Practicum (BeONChip, NanoScale  
Biomagnetics, Argenol, BSH, SAMCA, SAICA, IUIs...)**



# MASTERS DEGREE IN

## Nanostructured Materials for Nanotechnology Applications

Section	Module	ECTS Credits Coordinator	Semester	Mandatory /Optional
Fundamentals	<b>1. Fundamental properties of nanostructured materials</b>	6 M.P. Pina	First Semester	Mandatory
	7.a. Introduction to Research in Nanoscience/Nanotechnology	5 G. Goya	First Semester	Optional
Fabrication	<b>2. Preparation of Nanostructured Materials</b>	6 (4+2) Irene Lucas	First Semester	Mandatory
	<b>3. Assembly and Fabrication of Nanostructures</b>	6 (4+2) R. Mallada	First Semester	Mandatory
	7.b. Fabrication of Micro and Nanodevices	5 M.P. Pina	Second Semester	Optional
Characterization	<b>4. Characterization I: Physical Chemical Techniques</b>	6 (2+4) C. Marquina	Second Semester	Mandatory
	<b>5. Characterization II: Advanced Microscopies</b>	6 (3+3) J.I. Arnaudas	Second Semester	Mandatory
Applications	<b>6. Industrial Applications</b>	6 Santamaría/Urbiztondo	First Semester	Mandatory
	7.c. Joint Multidisciplinary Ac. Pr.	5 (M.P. Pina)	Second Semester	Optional
	7.d. Practicals in a company	5 (M.P. Pina)	Yearlong	Optional
Project	<b>Final Master Project</b>	<b>14 (M.P. Pina)</b>	<b>Yearlong</b>	<b>Mandatory</b>



# Nanostructured Materials for Nanotechnology Applications

## How to choose your Final Master Project

Choose from a wide choice at

➔ <https://inma.unizar-csic.es/formacion/estudiantes-master/estudios-master-unizar/nanociencia-materiales/>

Contact the supervisor/s of the project you are interested in.

**General Session for Topics Exposition – First of October.**

First Official list available in First-November (Annex I) at:

<https://ciencias.unizar.es/master-en-materiales-nanoestructurados-para-aplicaciones-nanotecnologicas-2014-15>

Sign the FMP Custody/Learning Agreement (Annex II)

[https://ciencias.unizar.es/sites/ciencias.unizar.es/files/users/fmlou/pdf/Asuntos\\_academicos/annex\\_ii\\_englishnanomat.pdf](https://ciencias.unizar.es/sites/ciencias.unizar.es/files/users/fmlou/pdf/Asuntos_academicos/annex_ii_englishnanomat.pdf)

## Final Master Projects offered

NanoMat Master. Proposed TFM's (course 2020-2021, updates coming):

**Topic:** Dye-sensitized titanium dioxide anode for photoelectrochemical water splitting **Supervisors:** Maria J. Blesa & Alejandro Ansón.

**Topic:** Application of halide perovskite thin-films in Surface Enhanced Raman Spectroscopy (SERS) **Supervisors:** Pilar Pina, Emilio J. Juárez.

**Topic:** Exploring the Surface Enhanced Raman Spectroscopy (SERS) properties of perovskite nanocrystals. **Supervisors:** Pilar Pina, Emilio J. Juárez.

**Topic:** Development of solar cells based on perovskite-nanocrystal heterojunctions. **Supervisors:** María Bernechea & Emilio J. Juárez.

**Topic:** Development of thin film photocatalysts active under solar light for pollutant removal in wastewater. **Supervisor:** María Bernechea.

**Topic:** Characterization of Supramolecular Systems by NMR Spectroscopy. **Supervisors:** Pilar Romero Soria & Jesús del Barrio Lasheras.

**Topic:** Low-dimensional carbon and related materials: In-situ microscopy studies. **Supervisor:** Raúl Arenal.

**Topic:** Atomic configuration studies of misfit-layered compounds in the form of nanotubes. **Supervisors:** Raúl Arenal & Simon Hettler.

**Topic:** Physical phase plates for transmission electron microscopy analysis of nanomaterials. **Supervisors:** Raúl Arenal & Simon Hettler.

**Topic:** Nanostructured electrodes based on carbon nitride materials for electrochemical energy storage. **Supervisors:** Emilio J. Juárez-Pérez & Marta Haro-Remón.

**Topic:** Thin films of dense magnetic MOFs particles for local cryogenic magnetic refrigeration. **Supervisors:** Ignacio Gascón & Olivier Rubeau.

**Topic:** Nanofabrication methodologies and surface characterization in molecular electronic devices. **Supervisors:** Pilar Cea & Santiago Martín-Solans.

**Topic:** Mimic cell membranes. Thermodynamic and atomic force microscopy studies. **Supervisors:** Pilar Cea & Santiago Martín-Solans.

**Topic:** Nanofabrication of chemically modified surfaces with applications in molecular electronics. **Supervisors:** Pilar Cea & Santiago Martín-Solans.

**Topic:** Inks and electrodes based on nano cellulose for the photoelectrochemical water splitting. **Supervisors:** José M. González-Domínguez & Ana M. Benito-Moraleja.

**Topic:** Functional materials based on assembled nano cellulose for environmental applications. **Supervisors:** José M. González-Domínguez & Enrique García-Bordejé.

**Topic:** Nanocarriers base don ortogonal clickable block copolycarbonates. **Supervisors:** Milagros Piñol & Luis Oriol.

**Topic:** Electrode optimization through nano-catalysts for green fuel production in solid oxide cells. **Supervisors:** Alodia Orera & Miguel Á. Laguna.

**Topic:** Sizing metallic nanoparticles at trace levels. **Supervisors:** Martin Resano-Ezcaray.

**Topic:** Electroanalytical techniques for the detection and quantification of micro and nanoplastics in natural waters. **Supervisor:** Juan C. Vidal.

**Topic:** Nanomaterials for photocatalytic reduction of CO<sub>2</sub>: Nanolayered MoS<sub>2</sub>-based catalysts. **Supervisors:** Francisco Balas & Jesús Santamaría.

**Topic:** Nanomaterials for photocatalytic reduction of CO<sub>2</sub>: Development of efficient solid-gas reactors. **Supervisors:** Francisco Balas & Jesús Santamaría.

**Topic:** SERS platforms based on silicon nanopillars for ultrasensitive detection of chemical warfare agents in gas phase. **Supervisors:** M. Pilar Pina & Marta Lafuente.

**Topic:** AFM induced pattern formation in compliant surfaces. **Supervisors:** David Serrate & Juan J. Mazo.

**Topic:** Design and «dry» synthesis of 2D nanographenes with atomic scale precision. **Supervisors:** David Serrate & Jorge Lobo.

**Topic:** Interaction of Cooper pairs with magnetic impurities in type-II superconductor nano-deposit. **Supervisors:** David Serrate & José M<sup>a</sup> de Teresa.

**Topic:** Nanomaterials for cultural heritage conservation. **Supervisors:** Andrés Seral & Scott Mitchell.

**Topic:** Interaction of Cooper pairs with magnetic impurities in type-II superconductor nano-deposits. **Supervisors:** David Serrate & José M. de Teresa.

**Topic:** Design and "dry" synthesis of 2D nanographenes with atomic scale precision. **Supervisors:** David Serrate & Jorge Lobo.

**Topic:** Development of enzyme-like catalysts to cause metabolic alterations in tumors. **Supervisors:** José L. Hueso, Javier Calzada & Jesús Santamaría.

**Topic:** Development of carbon-based nanocatalysts with enzyme-like response for biomedical applications. **Supervisors:** José L. Hueso, Javier Calzada & Jesús Santamaría.

**Topic:** Electron microscopic atomic analysis of porous catalysts. **Supervisors:** Álvaro Mayoral & César Magén.

**Topic:** Evaluating the synergistic antimicrobial properties of polyoxometalate-peptide hybrids as biofilm prevention materials. **Supervisors:** Elena Atrián & Scott Mitchell.

**Topic:** Correlations between crystal symmetry and magnetic properties of spintronic epitaxial LaCo<sub>3</sub> thin films by aberration-corrected STEM. **Supervisors:** Álvaro Mayoral & César Magén.

**Topic:** Laser-induced crystallization of binary oxide films deposited on different substrates. **Supervisors:** Luis Angurel & José Á. Pardo.

**Topic:** Study of the dimensional influence and structural damping on the vortex movement in superconducting YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> quasi-monodimensional microwires. **Supervisors:** Antonio Badía & Irene Lucas.

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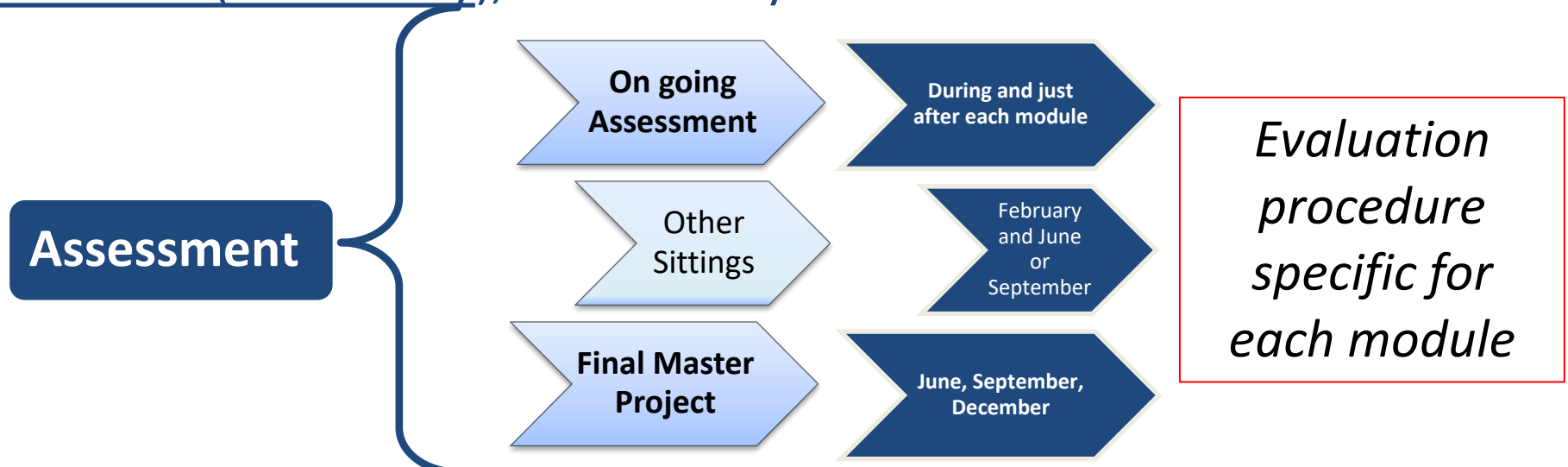
## Nanostructured Materials for Nanotechnology Applications

### TIMING, SCHEDULE, ASSESMENT

Lectures: from September 2021 to May 2022

Schedule: from Monday to Friday , from 15:00 up to 20:00 h (50´)

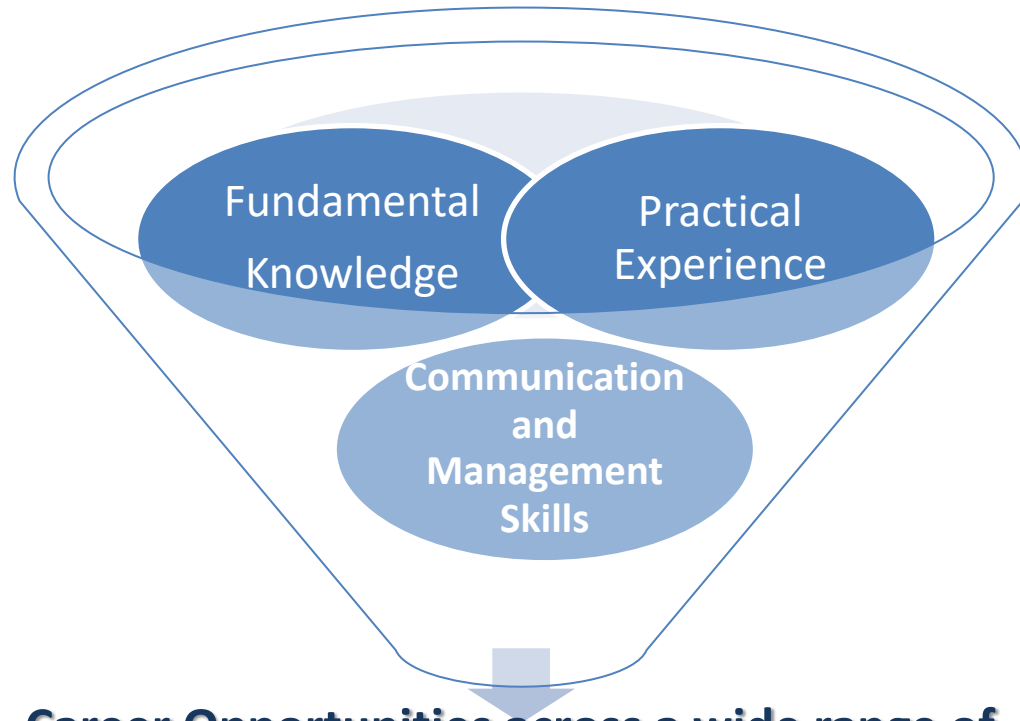
Morning Activities: experimental work-FMP, attendance to scientific seminars (mandatory), occasionally lab sessions



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### Academic Activities ... to Achieve



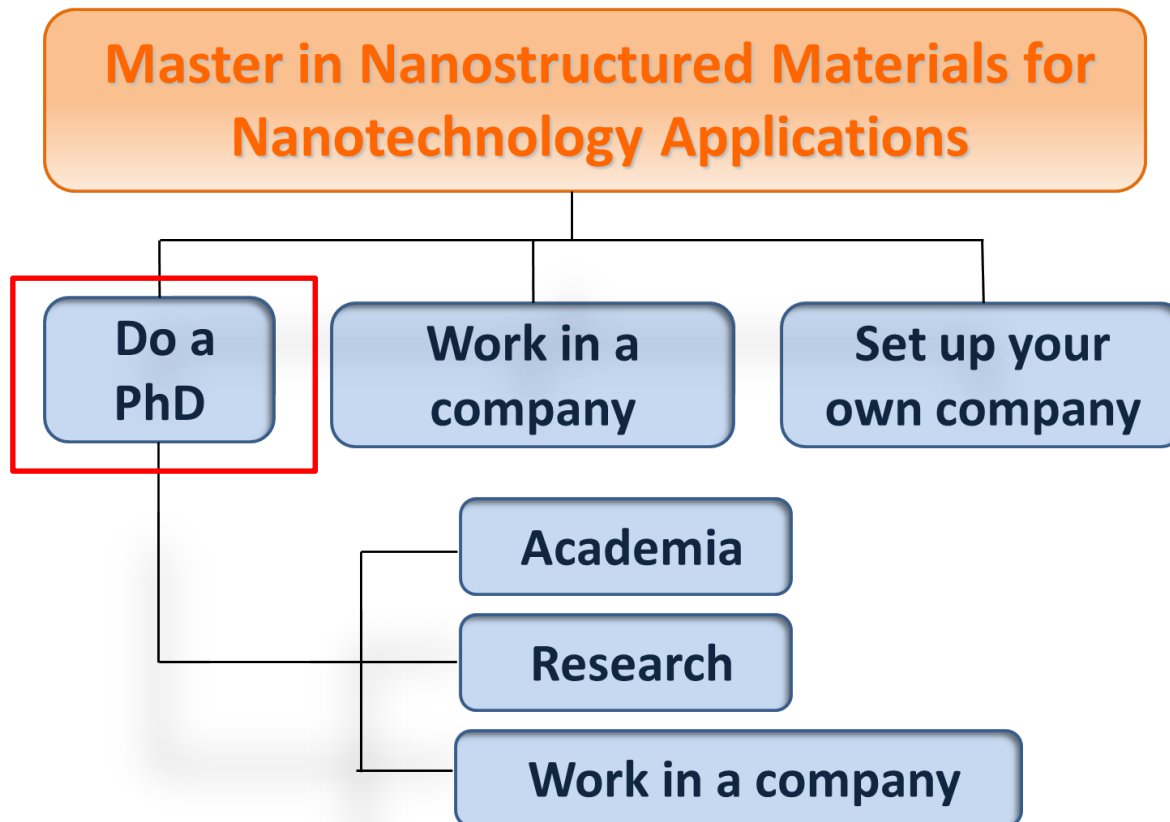
**Career Opportunities across a wide range of  
industry sectors as well as in academia and  
research**



# MASTERS DEGREE IN

## Nanostructured Materials for Nanotechnology Applications

# OPPORTUNITIES



**MASTERS DEGREE IN**

# **Nanostructured Materials for Nanotechnology Applications**

**Nanomat Graduates on 2019-2020: “On field” Experience**

Sergio Aina (sergioaina7@gmail.com)

Jose María Bonastre (bonastrec97@gmail.com)