

Nanostructured Materials for Nanotechnology Applications NANOMAT

Master Presentation

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- <https://inma.unizar-csic.es/formacion/master-nanomat/>
- <https://ciencias.unizar.es/master-en-materiales-nanoestructurados-para-aplicaciones-nanotecnologicas-2014-15>
- https://estudios.unizar.es/estudio/ver?id=637&anyo_academico=2022



MASTERS DEGREE IN

Nanostructured Materials for Nanotechnology Applications

OBJECTIVE

The objective of this master is to provide **high-quality University Multidisciplinary Education** in the **synthesis, assembly, fabrication and characterization** of nanostructured materials as well as **practical experience and skills** in the fabrication of micro and nanodevices.



MASTERS DEGREE IN

**Nanostructured Materials
for Nanotechnology Applications**

INTERNATIONAL

MULTIDISCIPLINARY

PRACTICAL

**Admission: 25
Students**

1 Year Long

60 ECTS

**1 ECTS= 25 hours
student work**

**Nanostructured Materials
for Nanotechnology Applications**

Academic Requirements

- ✓ Bachelor Degree in Sciences (physics, chemistry, biotechnology, biochemistry, materials science) or Engineering (chemical engineering, biochemical engineering, materials engineering and related)
- ✓ Particular Cases: academic contents revision by Unizar Post-Graduate Office and Master Coordinator
- ✓ English Level B1 (recommended B2)
- ✓ Personal Interview

Nanostructured Materials for Nanotechnology Applications

Available Grants

✓ <https://catedrasamcananotec.unizar.es/>

Nanomat Registration Fees (75% total costs)



Cátedra **SAMCA**
de Nanotecnología
Universidad Zaragoza



✓ <https://inma.unizar-csic.es/formacion/practicas/practicas-pi2/>



Programa de Iniciación a la Investigación PI² – PEX Universa
(2400 €)

MASTERS DEGREE IN

Nanostructured Materials for Nanotechnology Applications

Universidad de Zaragoza

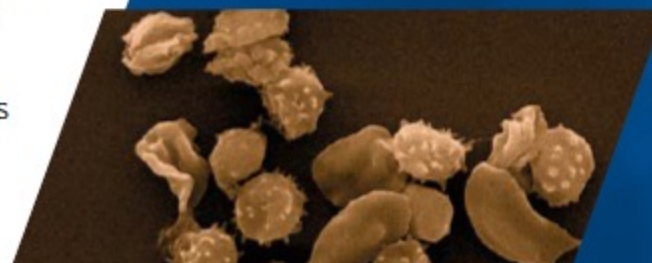
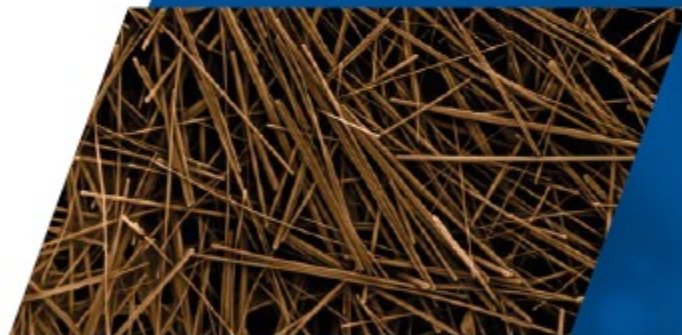
This official Master from Zaragoza University (Spain) has a duration of one academic year and comprises 60 ECTS credits. The course is suitable for graduates with science, engineering, medicine or related degrees keen to develop careers at the forefront of Nanoscience and Nanotechnology.

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 COURSE MODULES ARE:

CORE MODULES

- 1 *Fundamental Properties of Nanostructured Materials (6 ECTS credits)*
- 2 *Preparation of Nanostructured Materials (6 ECTS credits)*
- 3 *Assembly and fabrication of Nanostructures (6 ECTS credits)*
- 4 *Characterization I: Physical-chemical techniques (6 ECTS credits)*
- 5 *Characterization II: Advanced Microscopies (6 ECTS credits)*
- 6 *Case studies of industrial applications (6 ECTS credits)*

OPTIONAL MODULES

- 7.a *Introduction to Research in Nanoscience and Nanotechnologies (5 ECTS credits)*
- 7.b *Fabrication of Micro and Nanodevices (5 ECTS credits)*
- 7.c *Multidisciplinary Joint Educational Project (5 ECTS credits)*
- 7.d *Practical work in a Nanotechnology-related company (5 ECTS credits)*

MANDATORY INDIVIDUAL RESEARCH PROJECT

- 8 *Final Master Project (14 ECTS credits)*



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Section	Course Module	ECTS Credits Coordinator	Semester	Mandatory /Optional
Fundamentals	1. Fundamental properties of nanostructured materials	6 M.P. Pina	First Semester	Mandatory
	7.a. Introduction to Research in Nanoscience/Nanotechnology	5 G. Goya	First Semester	Optional
Fabrication	2. Preparation of Nanostructured Materials	6 (4+2) Irene Lucas	First Semester	Mandatory
	3. Assembly and Fabrication of Nanostructures	6 (4+2) F. Balas	First Semester	Mandatory
	7.b. Fabrication of Micro and Nanodevices	5 M.P. Pina	Second Semester	Optional
Characterization	4. Characterization I: Physical Chemical Techniques	6 (2+4) C. Marquina	Second Semester	Mandatory
	5. Characterization II: Advanced Microscopies	6 (3+3) J.I. Arnaudas	Second Semester	Mandatory
Applications	6. Industrial Applications	6 J. Santamaría	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- S2	Optional
Project	Final Master Project	14 (M.P. Pina)	Yearlong	Mandatory

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Nanostructured Materials for Nanotechnology Applications

MULTIDISCIPLINARY

Departments Involved from Unizar

1. Biochemistry & Molecular Biology
2. Science & Technology of Materials & Fluids
3. Physics of Condensed Matter
4. Chemical & Environmental Engineering
5. Analytical Chemistry
6. Organic Chemistry
7. Physical Chemistry
8. Inorganic Chemistry
9. Marketing Direction & Market Research
10. Documentation Sciences & History of Science

Fundamental Knowledge - Practical Experience - Soft Skills



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MULTIDISCIPLINARY

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

Invited Speakers from companies: EXPERTIA, Catedra SAMCA

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

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Thursday's NanoSpin-off TALKS



Cátedra **SAMCA**
de Nanotecnología
Universidad Zaragoza



INMA
INSTITUTO DE NANCIENCIA
Y MATERIALES DE ARAGÓN

TALKS

Emprendiendo ciencia, aprendiendo innovación.

RUBYnanomed (Portugal)

Carbon Nanomembranes 2D-Materials beyond Graphene

CNM Technologies GmbH (Germany)

Bridging the gap between Academy to Business (A2B)

Nanoenergy, SPin-off of Porto University

NANOVEL BIOTECHNOLOGIES: A GLOBAL BORN COMPANY

NANOVEL BIOTECHNOLOGIES SL (Spain)

VLC Photonics: pioneering services for the development of photonic integrated circuits

VLC Photonics (Spain)

TECNAN: Innovative nanotechnological protectors for industry

TECNOLOGIA NAVARRA DE NANOPRODUCTOS S.L. TECNAN (Spain)

Lessons learned from my experience in nanotech company OXOLUTIA

OXOLUTIA SL (Spain)

Immaterial. Materials discovery and molecular engineering of MOFs

Immaterial (U.K)

BIVO, Centro de Investigación en Tejidos Orgánicos, Bioestructuras y Biomateriales.

BIVO S.COOP (Spain)

Fotoglass where life and light meet

Fotoglass (Spain)





MASTERS DEGREE IN

**Nanostructured Materials
for Nanotechnology Applications**

INTERNATIONAL

Completely taught in English

Movility Programme Erasmus⁺

Post-graduate Programme: Fundación Carolina

Collaboration Agreement with Nanjing Tech University

**Erasmus Mundus Master on Membrane Engineering for
Sustainable Development:**

<https://mesd.edu.umontpellier.fr/>

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PRACTICAL

More than 50 % of the credits are practical

Training in advanced tools for Nanotechnology (LMA)

Communication and management skills

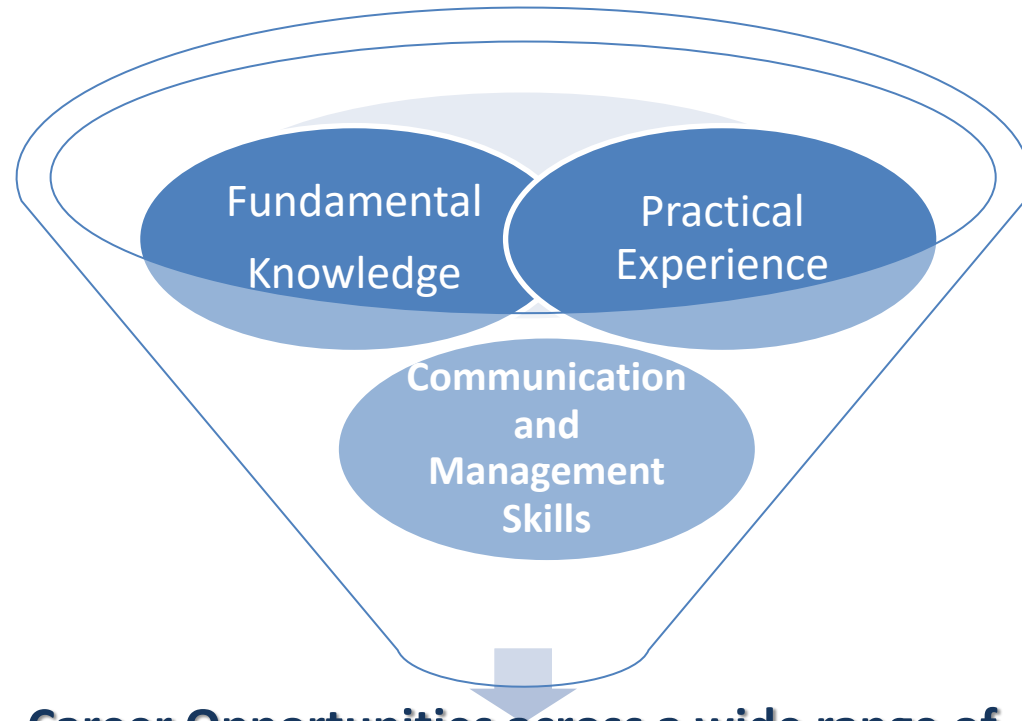
INTERSHIPS-UNIVERSA (BeONChip, NanoScale
Biomagnetics, BSH, SAMCA, SAICA, ICUs...)



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Academic Activities ... to Achieve



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

Nanostructured Materials for Nanotechnology Applications

Missing skills

But HR professionals report difficulty recruiting candidates who have the necessary soft skills for an automating world.

Top three areas of missing soft skills,
% of respondents

Problem solving, critical thinking,
innovation and creativity

37

Ability to deal with complexity
and ambiguity

32

Communication

31

[Dive deeper](#)

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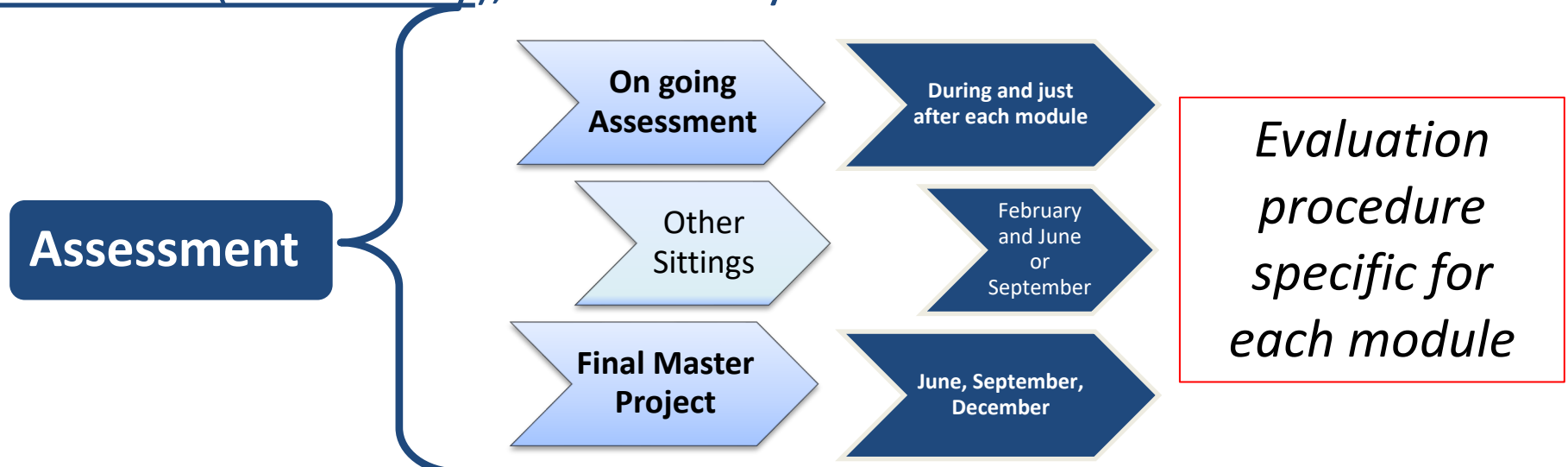
Nanostructured Materials for Nanotechnology Applications

TIMING, SCHEDULE, ASSESMENT

Lectures: from September 2023 to May 2024

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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CHRONOGRAM 1st Semester

**Module 1: Fundamental
Properties of Nanostructured
Materials**

Mid-September
to
Mid-October

**Module 2: Preparation of
Nanostructured Materials**

Mid-October
To
Mid-November

**Module 3: Assembly and
Fabrication of Nanostructured
Materials**

Mid of November
To
Mid-December

Module 6: Case Studies

Mid of November
To
Mid-January

Mid-October

Module 7.a:

**Introduction to
Research in
Nanoscience
and
Nanotechnology**

Mid of December

*INNOVATION PROJECT: INTRA – INTER MODULAR UNITY

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CHRONOGRAM 2nd Semester

Module 4:
Characterization
Techniques

February

Module 5: Advances
Microscopies

Feb-March

Module 7.b:

Fabrication of
Micro & Nano
Devices

March_April

**MOBILITY
ACTION
ERASMUS+
TOTAL
14+10 ECTS**

Module 7.c:

Multidisciplinary
Joint Educational
Project

To be presented
in June or September

Module 7.d:
Practical
work
in a Nano
Related
Company

To be presented
in June or September

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How to choose your Final Master Project

Choose from a wide choice at

<https://inma.unizar-csic.es/formacion/master-nanomat/>

Contact the supervisor/s of the project you are interested in.
General Session for Topics Exposition –October 2023 (fridays).

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

Master Topics & INMA RESEARCH

Transversal Research Areas

A5. SYNTHESIS, PROCESSING & SCALING OF FUNCTIONAL MATERIALS (SPE)	A6. SINGULAR EXPERIMENTAL TECHNOLOGIES (TES)
L5.1: Design and synthesis of functional organic materials	L6.1: Nanofabrication and Advanced Microscopy
L5.2: Manufacture and processing of nano and microstructures	L6.2: Analysis of materials in singular international scientific and technical infrastructures
L5.3: Laser material processing and surface modification	L6.3: Micro- and nano-sensors "on-chip"
L5.4: Continuous production of nanomaterials	L6.4: New technologies for the purification and liquefaction of Helium
	L6.5: Chemical microsensors and contactors based on nanostructured materials

Oriented Research Areas

A1. MATERIALS FOR ENERGY AND ENVIRONMENT (MEM)	A2. MATERIALS FOR BIOMEDICINE (BIO)	A3. MATERIALS FOR INFORMATION TECHNOLOGIES (MTI)	A4. NEW PHENOMENA AT THE NANOSCALE (NFN)
L1.1: Nanoporous materials and membranes for molecular separations	L2.1: Nanodiagnostic tools for health and nutrition	L3.1: Magnetic materials for spintronics and energy-saving electronics	L4.1: Physics of nanosystems
L1.2: Fuel cells and batteries	L2.2: Advanced therapies based on nanoconjugates: hyperthermia and delivery of bioactive molecules	L3.2: Organic and molecular electronics	L4.2: Nanostructure, magnetism and hyperthermia of magnetic nanoparticles
L1.3: Magnetocaloric materials and magnetic cooling	L2.3: Antimicrobial materials and in vivo models of bacterial infection	L3.3: Nanosystems and nanodevices for electronics and spintronics	L4.3: Atomic and molecular scale physics and surface engineering
L1.4: State-of-the-art solar cells processed in solution	L2.4: Nanocatalysis for biomedical and biotechnological applications	L3.4: Hybrid quantum technologies	L4.4: Nanophotonics
L1.5: Catalytic materials that can be activated by electromagnetic radiation for intensification processes	L2.5: Tissue regeneration and tissue engineering		
L1.6: Carbon nanomaterials and catalysts for energy and environment	L2.6: Nanotoxicology and Nanosafety		

Final Master Projects offered (course 2022-2023)

Topic: Preventing microbially-influenced corrosion using polyoxometale-ionic liquids. **Supervisors:** Scott Mitchell & Rafael Martín.

Topic: Development of solar cells based on perovskite as light absorber. **Supervisors:** Emilio Juárez, María Bernechea & Cristina Momblona.

Topic: Development of solar cells combining perovskite and semiconductor nanocrystals. **Supervisors:** Emilio Juárez, María Bernechea & Cristina Momblona.

Topic: Nanoparticles based on dendrimers for cancer diagnosis based on fluorescence liquid biopsy. **Supervisors:** Teresa Sierra & Olga Abián.

Topic: Analysis of flavoenzymes by fluid atomic force microscopy. **Supervisors:** Anabel Gracia Lostao & Carlos Marcuello Anglés.

Topic: Integration of molecules on devices by dip-pen nanolithography. **Supervisors:** Anabel Gracia Lostao & Carlos Marcuello Anglés.

Topic: Polymer-coated DNA nanostructures for nucleic acid delivery. **Supervisors:** Silvia Hernández & Jesús del Barrio.

Topic: Nanocrystalline chitin as a sustainable adjuvant towards green hydrogen production through water splitting. **Supervisors:** José Miguel González Domínguez & Alejandro Ansón Casaos.

Topic: Novel approaches for the development of bacterial nanocellulose. **Supervisors:** José Miguel González Domínguez & Ana M. Benito Moraleja.

Topic: New MOF-inorganic porous material hybrid applied to gas separation membranes. **Supervisor:** Joaquín Coronas.

Topic: Control of the aspect ratio of metal organic frameworks by microfluidic synthesis. Application to gas separation membranes. **Supervisor:** Joaquín Coronas.

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OPPORTUNITIES

