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HR EXCELLENCE IN RESEARCH

Universidad Politécnica de Madrid

# Research, Innovation and Doctoral Studies at UPM

## Doctoral Studies @ UPM

**Prof. Asunción Gómez-Pérez**  
*Vice-Rector for Research, Innovation and  
Doctoral Studies*



1. *Universidad Politécnica de Madrid (UPM)*
2. International Doctorate School
3. Doctoral Areas and Doctoral Programs
4. Doctorate at UPM
5. Transversal training activities for PhD candidates
6. *Programa Propio de Investigación*





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# 1. *Universidad Politécnica de Madrid (UPM)*

# Why UPM?

## Main Technological University in Spain

## Specialized in engineering and architecture

nº 58 Ranking QS (2022)

nº 94 employability in QS ranking (2022)

## Source of high impact knowledge in Spain

nº 1 in university patent applications

nº 1 university in attracting R&D European funds  
(+116 M€ in H2020)

nº 1 in attracting R&D contracts with industry

nº 1 in new technology ventures creation

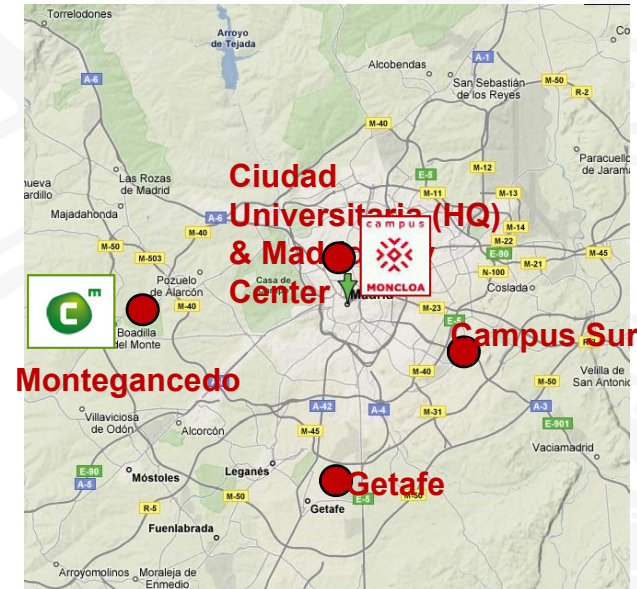
## International Excellence Campus

CEI Moncloa (UPM-UCM)

Information Technology Campus-I2Tech (UPM)



# UPM on the Map



**Rectorate in Madrid**

**5 Campuses in Madrid area**

**2 International Excellence Campus** awarded by the  
Ministry of Education (MEC-MINECO)



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# UPM Structure

- 15 Schools
- 1 Faculty (Sports)
- 1 Fashion Design Center
- 5 R&D&I Institutes
- 16 R&D&I Centers
- 2 Innovation Centers
- 218 Research Groups
- 61 Departments

**Budget (2023)**

**410 M€ Total funds**



Aeronautical and Space Engineering



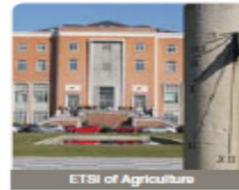
Forestry and Natural Environment



ETS of Architecture



ETS of Aeronautical Engineering



ETS of Agriculture



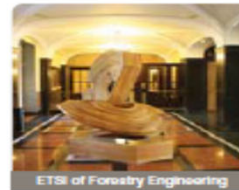
ETS of Civil Engineering



ETS of Industrial Engineering



ETS of Mining Engineering



ETS of Forestry Engineering



ETS of Naval Engineering



ETS of Telecommunications Engineering



ETS in Topography, Geodesy and Cartography



Faculty of Sciences for Physical Activity and Sport (INEF)



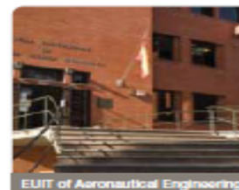
Faculty of Computer Sciences



EU of Technical Architecture



EU of Computer Sciences



EUIT of Aeronautical Engineering



EUIT of Agriculture



EUIT of Forestry Engineering



EUIT of Industrial Engineering



EUIT of Civil Works

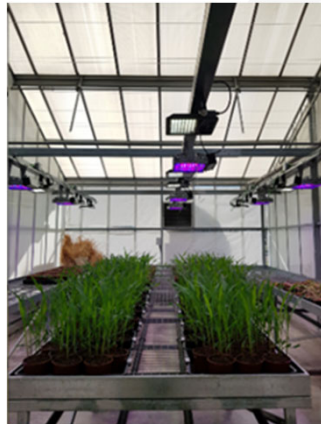


EUIT of Telecommunications Engineering



## Research in 2021 – ca. 138 M€

- 119.80 M€ in financed projects
  - ✓ 24.45 M€ National & Regional projects
  - ✓ 15.73 M€ International projects
  - ✓ 17.88 M€ Private projects (companies and foundations)
  - ✓ 61.74 M€ PRTR
- 18,41 M€ in HR competitive contracts
- +2,300 indexed publications



## Technological Innovation

- 567 patents in force to date
- 45 priority patents filed in 2021
- 72 University-business chairs in 2021
- 313 spin-offs created and coached from 1998 to date
- 11 exploitation contracts in 2021
- 62% spin-off Survival rate (3<sup>rd</sup> year)
- + 155 M€ from investors (2005-2022)

# Fields of teaching and programmes

Higher education, research and innovation in all Engineering fields:

**Aeronautics**

**Agronomy**

**Architecture**

**Biomedicine**

**Civil Engineering**

**Energy**

**Forestry**

**Industrial**

**Mining**

**Naval**

**Informatics**

**Telecommunication**

**Topography**

**+ Sports and Fashion Design**

- ✓ 53 accredited bachelor degrees
- ✓ 95 accredited master degrees
- ✓ 17 accredited combined bachelor and master degrees
- ✓ 44 accredited doctoral programmes
- ✓ 74 double degree programme agreements with international universities
- ✓ 248 UPM academic programmes (executive master, expert specialization and lifelong training programmes)

*High potential for increasing participation in multidisciplinary engineering areas*



## DIGITAL

1. Information Processing and Telecommunications Center (IPTC)
2. Center for Supercomputation & Simulation (CCS)
3. Integral Domotics Center (CeDInt)
4. Centre on Software Technologies and Multimedia Systems for Sustainability (CITSEM)
5. Artificial Intelligence Center (*AI.nnovation Space*)

## MOBILITY

6. Transport Research Center (TRANSyT)
7. Institute for Automobile Research (INSIA)

## MATERIALS

8. Institute for Optoelectronic Systems and Microtechnology (ISOM) (*Micronanofabs, ICTS*)
9. Structural Material Research Center (CIME)
10. Center for Advanced Materials and Devices for ICT (CEMDATIC)

## ENERGY

11. Institute for Solar Energy (IES)
12. Institute for Nuclear Fusion (IFN)

## SUSTAINABILITY, BIOTECHNOLOGY and HEALTH

13. Research Center for Biotechnology and Plant Genomics (CBGP-INIA) (*Severo Ochoa award*)
14. Biomedical Technology Center (CTB)
15. Research Center for the Management of Agricultural and Environmental Risks (CEIGRAM)
16. R&D&I Center for Biodiversity Conservation and Sustainable Development (CBDS)

## INDUSTRIAL ENGINEERING

17. Center for Automation and Robotics (CAR, UPM-CSIC)
18. Laser Center
19. Center of Electronics for the Industry (CEI)
20. Institute for Microgravity “Ignacio da Riva” (IDR)
21. Technological Center for Safety and Quality in Energy Industries and Mines (TECMINERGY)

## INNOVATION

22. Innovation and Technology for Development Centre (itdUPM)
23. Centre for Support for Technological Innovation (CAIT)

# Human Resources & Students

## Human Resources

- **2,891 Faculty academics**  
375 Full professors
- **1,742 Administration and Service Staff**
- **503 competitive contracts in 2021**  
323 predoctoral researchers  
107 postdoctoral researchers  
73 technicians and managers



## Students

- Over 30,000 undergraduate students (2021/2022)
- 6,500 master students (2021/2022)
- Over 2,000 PhD Students (2022/2023)
- +250 PhD Theses defended (2021/2022)
- + 1,300 International mobility (incoming)
- + 1,800 International mobility (outcoming)
- + 6,700 Internships (2020/2021)
- 48 associations (19 cooperation development, 17 sports, 12 drama)
- 107 Medals obtained in official competitions



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# Connected to Research & Innovation networks



**Human Brain Project**  
Unifying our understanding of the human brain.

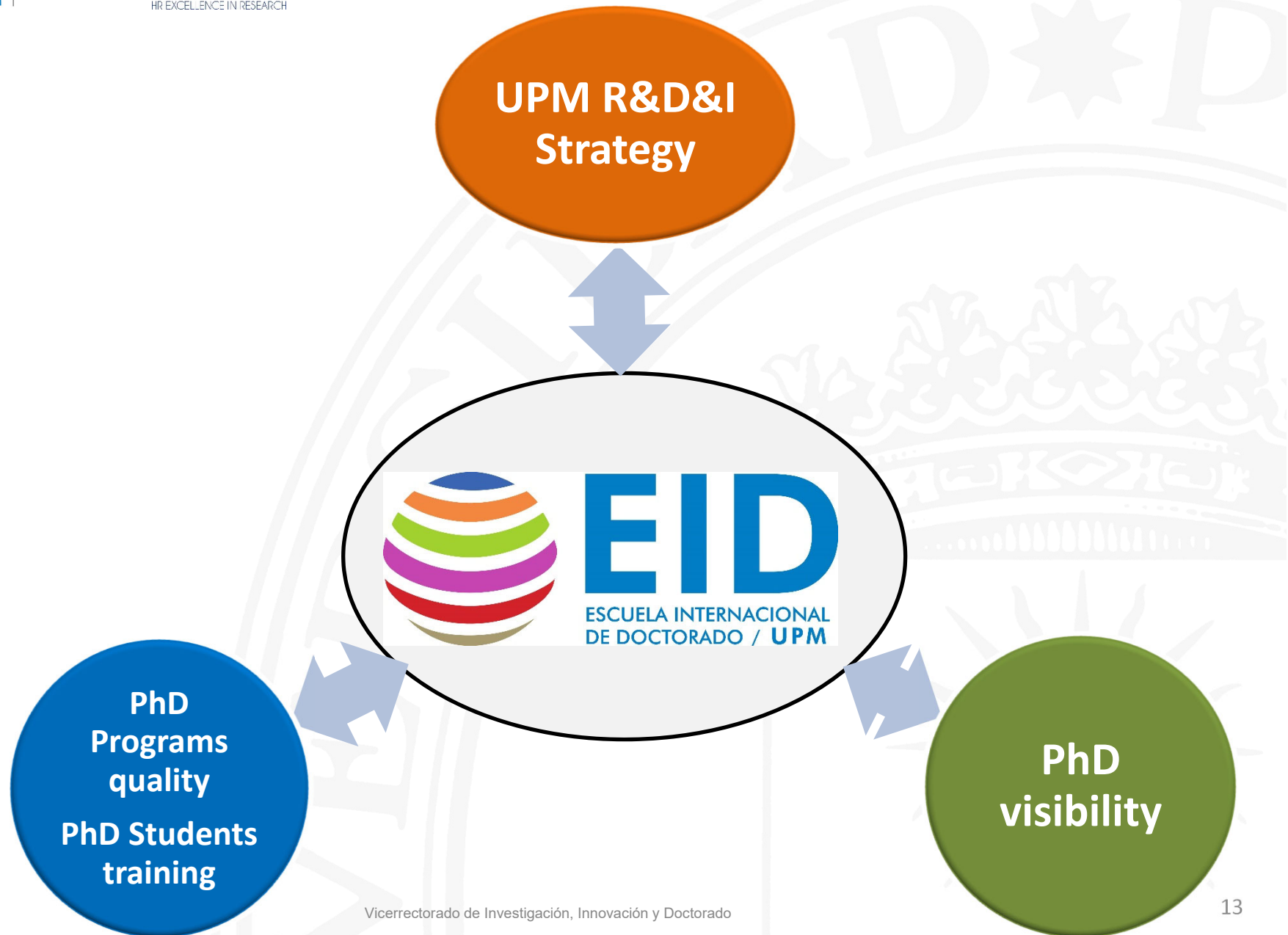




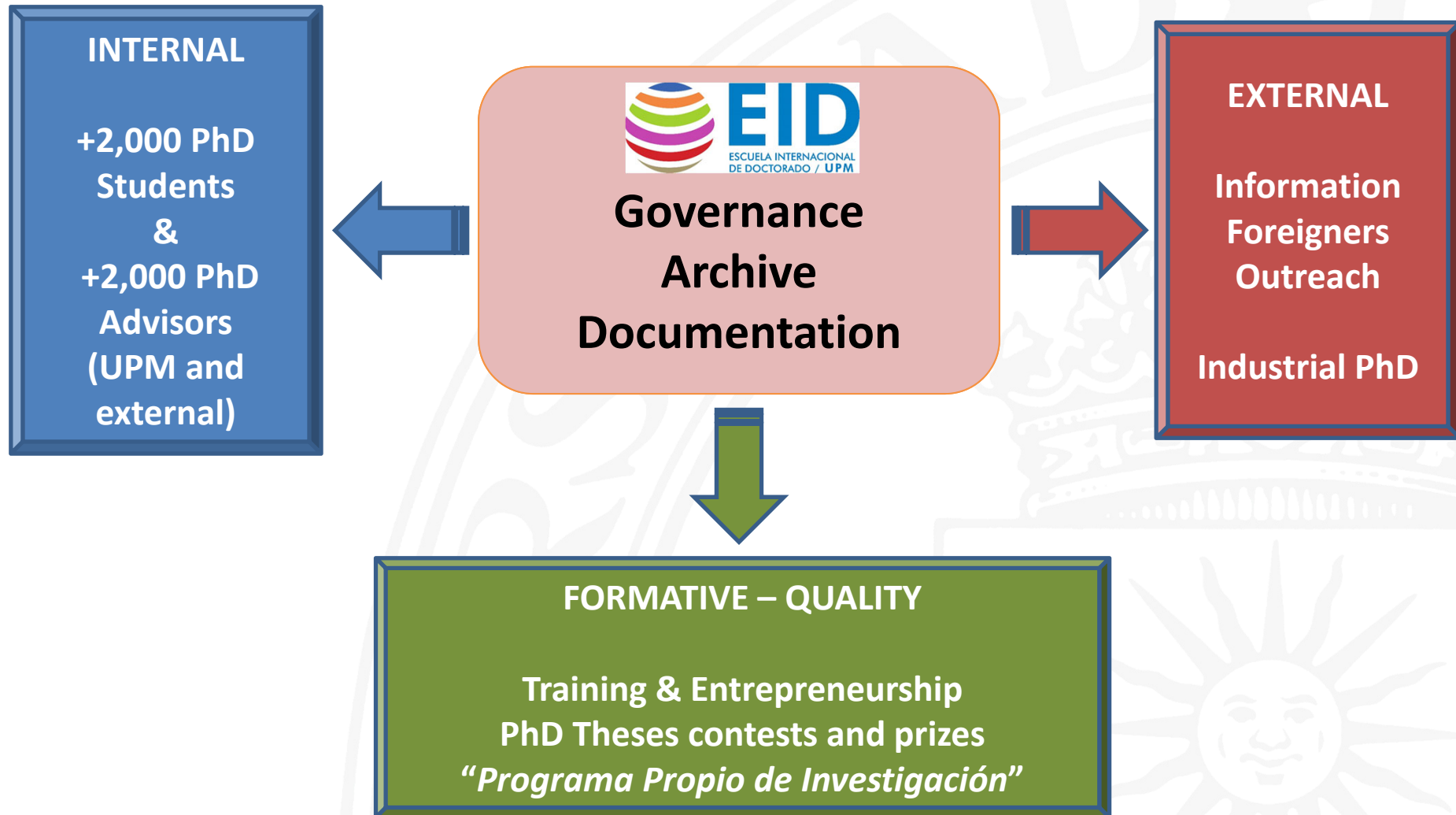
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## 2. UPM International Doctorate School



# International Doctoral School: Visibility and “School” model



# 3. Doctoral Areas and Doctoral Programs

# Doctoral Areas & Doctoral Programs



## MANUFACTURING & INDUSTRY

1. Aerospace Engineering
2. Automation and Robotics
3. Economy and Innovation Management
4. Engineering in Industrial Organization
5. Environmental, Chemical and Material Engineering
6. Electrical and Electronic Engineering
7. European Doctorate in Industrial Management
8. Fluid Mechanics
9. Mechanical Engineering
10. Production Engineering and Industrial Design
11. Research, Modeling and Risk Analysis in Environment
12. Sustainable, Nuclear and Renewable Energy

## ICTs

1. Artificial Intelligence
2. Biomedical Engineering
3. Communication Systems and Technologies
4. Computation Science and Technology for Smart Cities
5. Electronic Systems Engineering
6. Mathematical Eng., Statistics and Operations Research
7. Photovoltaic Solar Energy
8. Systems and Services Engineering for the Information Society
9. Software, Systems and Computation
10. Telematic System Engineering

## AGRONOMICS, FORESTRY & ENVIRONMENT

1. Advanced Forest Research
2. Agricultural Engineering
3. Biotechnology and Genetic Resources of Plants and Assoc. Microorganisms
4. Complex Systems
5. Engineering and Management of Environment
6. Environmental Technology for Sustainable Agriculture
7. Project Planning for Rural Development and Sustainable Management

## CIVIL ENGINEERING

1. Earth Informatics Engineering
2. Civil Engineering Systems
3. Structural, Geotechnical and Material Engineering
4. Naval Architect, Marine and Ocean Engineering
5. Technological Innovation in Building Construction

## ARCHITECTURE

1. Advanced Architectural Design
2. Architecture and Urban Planning
3. Architecture Heritage
4. Building and Architecture Technology
5. Edification Structures
6. Sustainability and Urban Regeneration

## ARTS & SOCIAL SCI.

1. Architecture Communication
2. Architecture, Design, Fashion and Society
3. Music and its Sciences and Technologies
4. Physical Activity and Sport Sciences





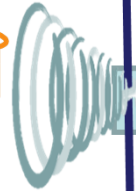
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# 4. Doctorate at UPM

Eligibility  
requirements  
/criteria\*

Admission  
(Doctoral  
Program)



Secondments

Transversal training activities & Teaching collaborations

PhD Thesis Defense

PhD  
Degree

PhD Registration  
(to be renewed  
every year)

Year 1

Year 2

Year 3

Year 4

Year 5

Extension 1  
(1 Year)

Extension 2  
(1 Year)

*\*Candidates must have completed the studies that lead to an official Spanish (or from another country of the EHEA) university degree awarding 300 ECTS credits, of which at least 60 ECTS credits must correspond to master level. Or they must have completed a degree in a University not adapted to the EHEA that gives access to doctoral studies*

## International Doctorate

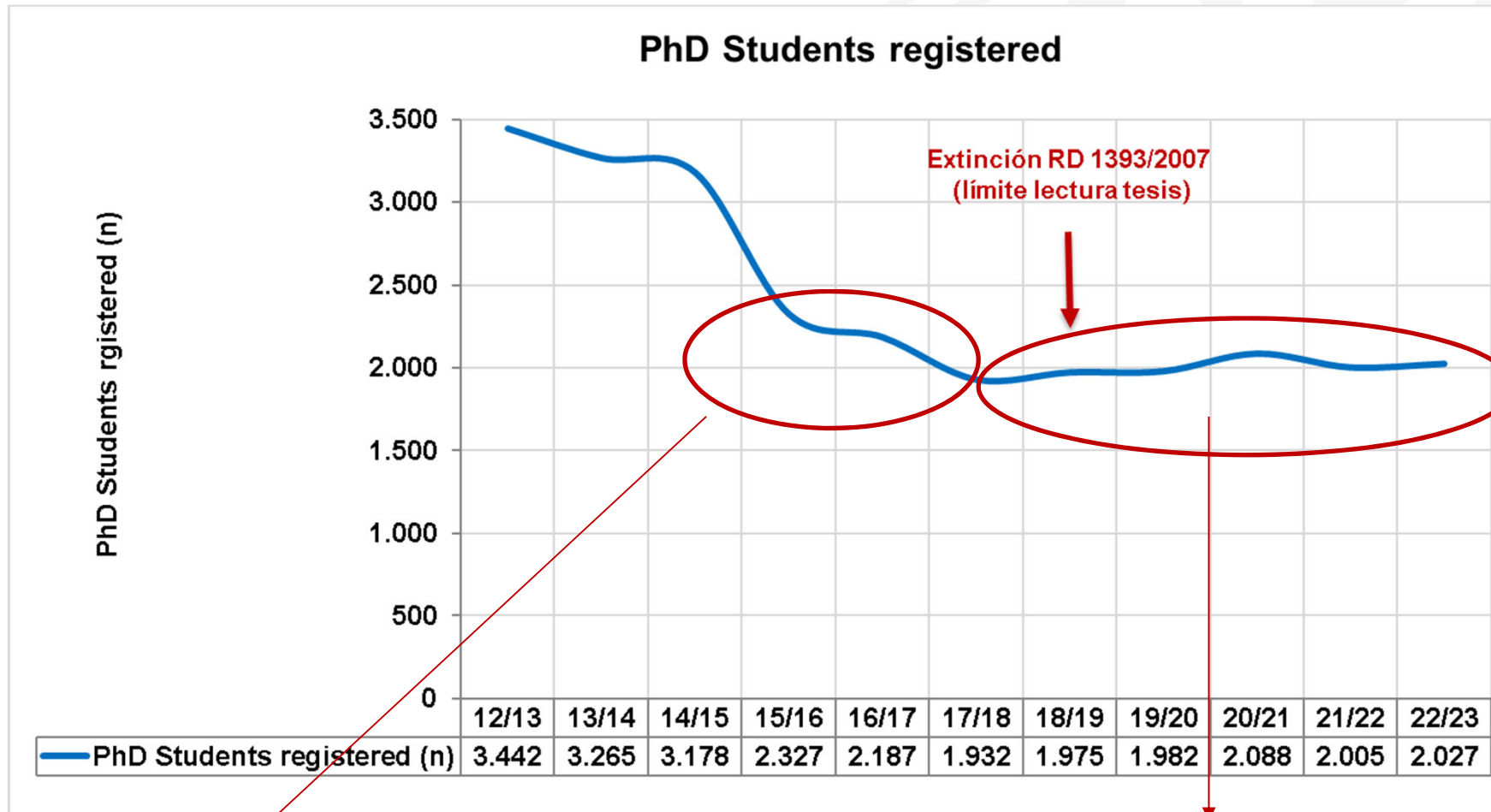
- ✓ Three months international secondment
- ✓ PhD thesis reviewed by international experts
- ✓ PhD thesis committee with international members
- ✓ PhD thesis and dissertation: Spanish and other language

## Industrial Doctorate

- ✓ UPM-Industry collaboration agreement
- ✓ Industrial research project
- ✓ Industrial secondment

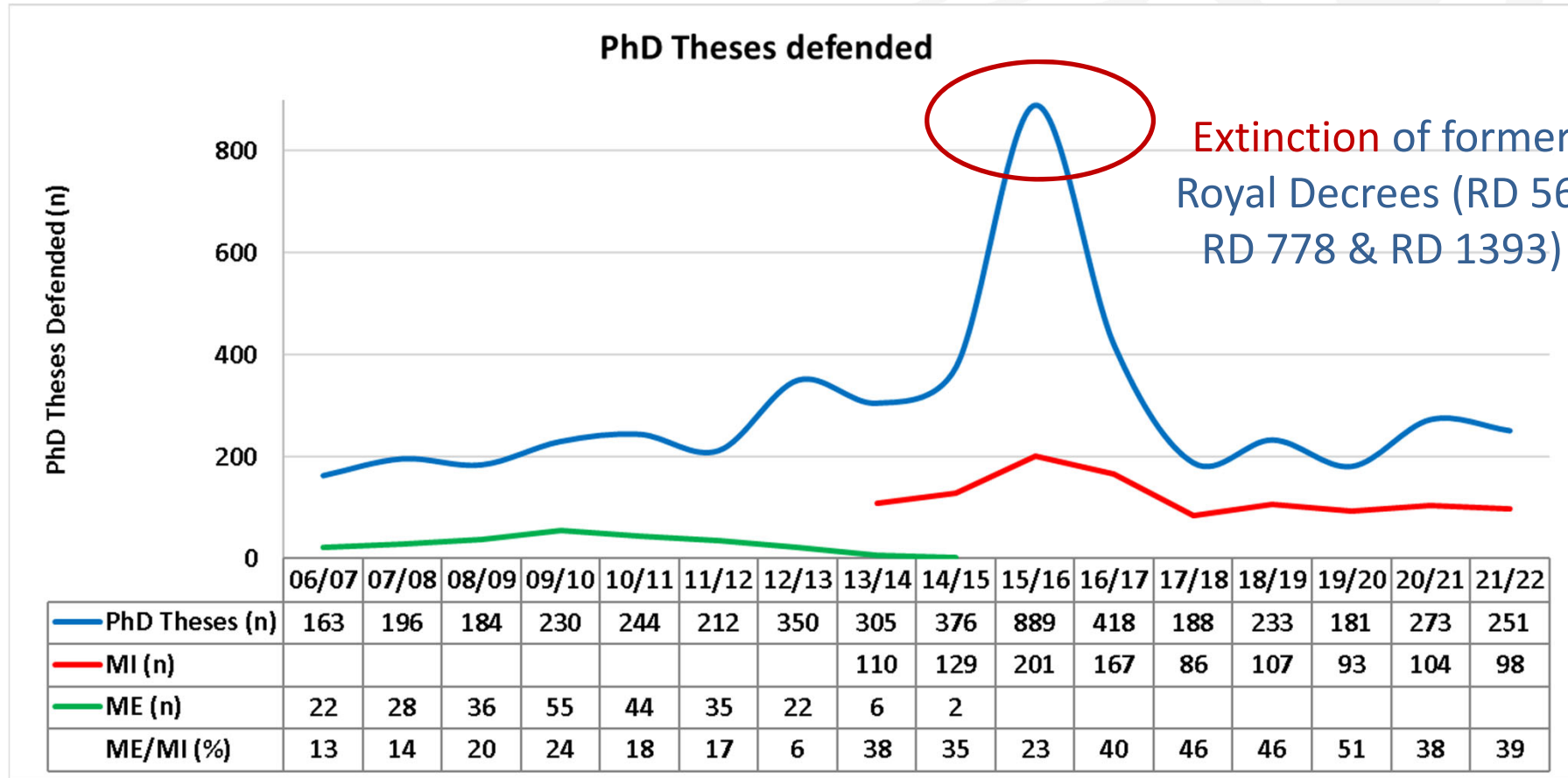
## Co-tutelle

- ✓ Individual agreement for every PhD candidate.
- ✓ Two PhD certificates, one from each university
- ✓ At least 2 PhD advisors, one from each university
- ✓ Spend part of the PhD at each university (agreed by both universities)



Extinction of former  
Royal Decrees (RD 56,  
RD 778 & RD 1393)

ca. 2,000 PhD students per year  
on average



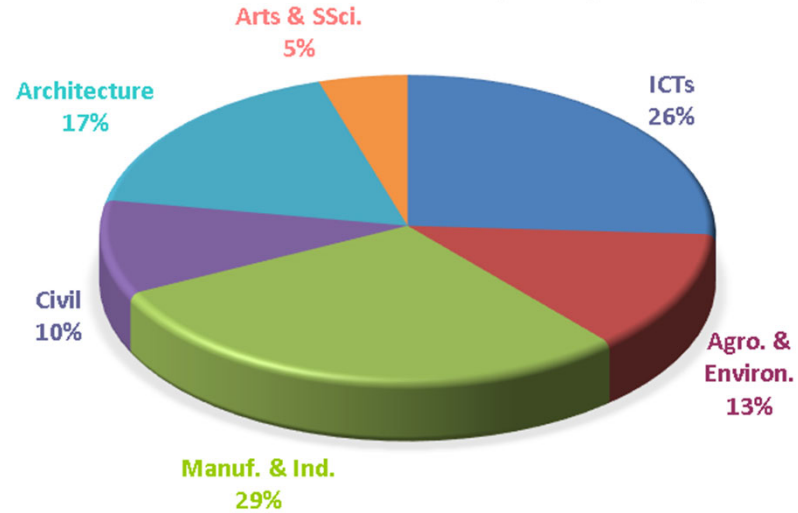
MI: International Doctorate  
ME: European Doctorate



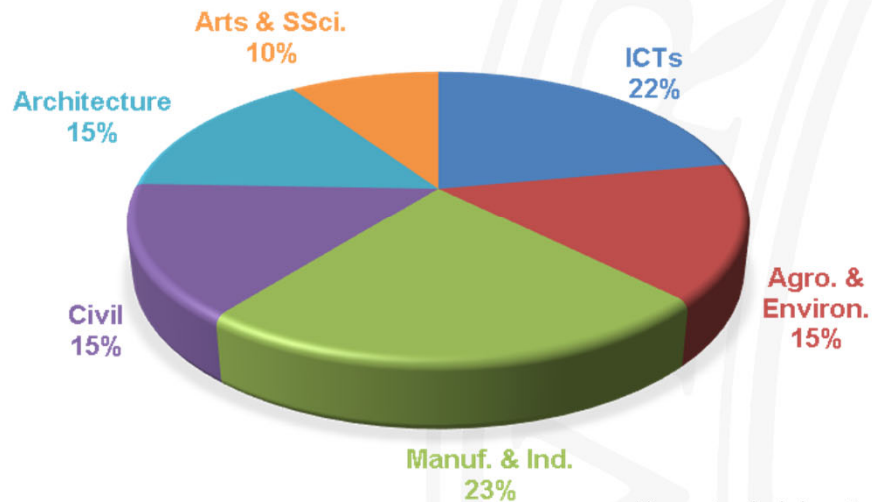
ca. 230 PhD theses defended per year on average (excl. 2014/2015-2016/2017)  
ca. 44% International Doctorates on average from 2017/2018 onwards

# Doctoral Areas: Registration and defence

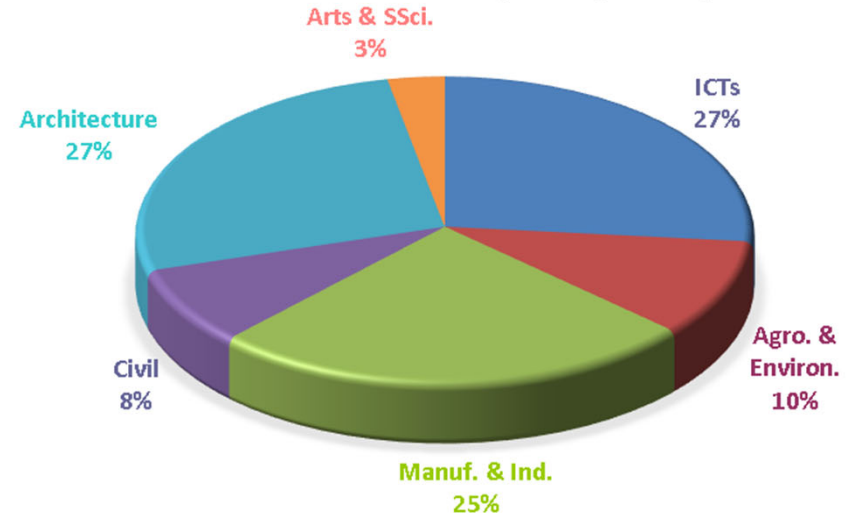
### PhD theses defended (2021/2022)



### PhD Students (2022/2023)

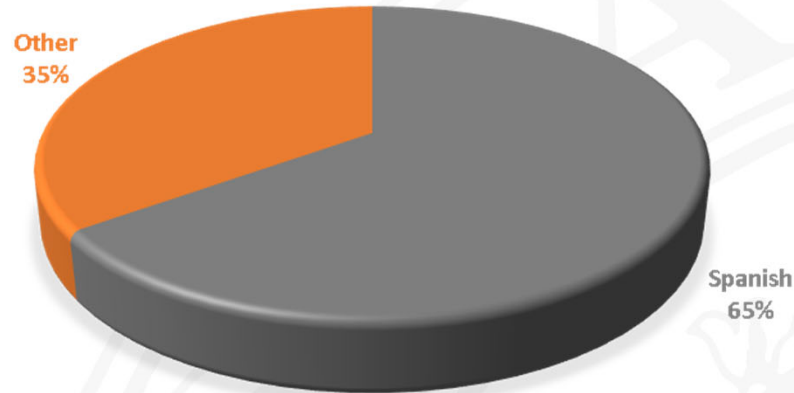


### International PhD (2021/2022)

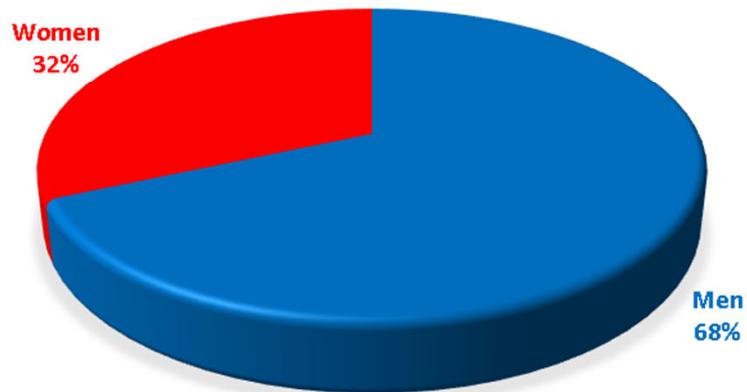


# PhD Students registration: Internationality

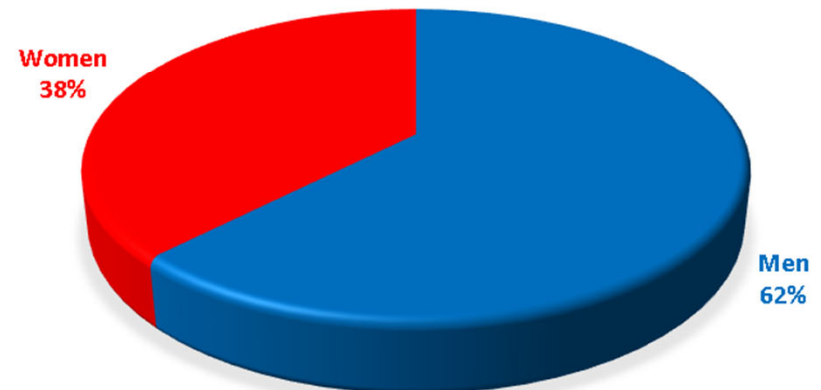
### Internationality (2022/2023)



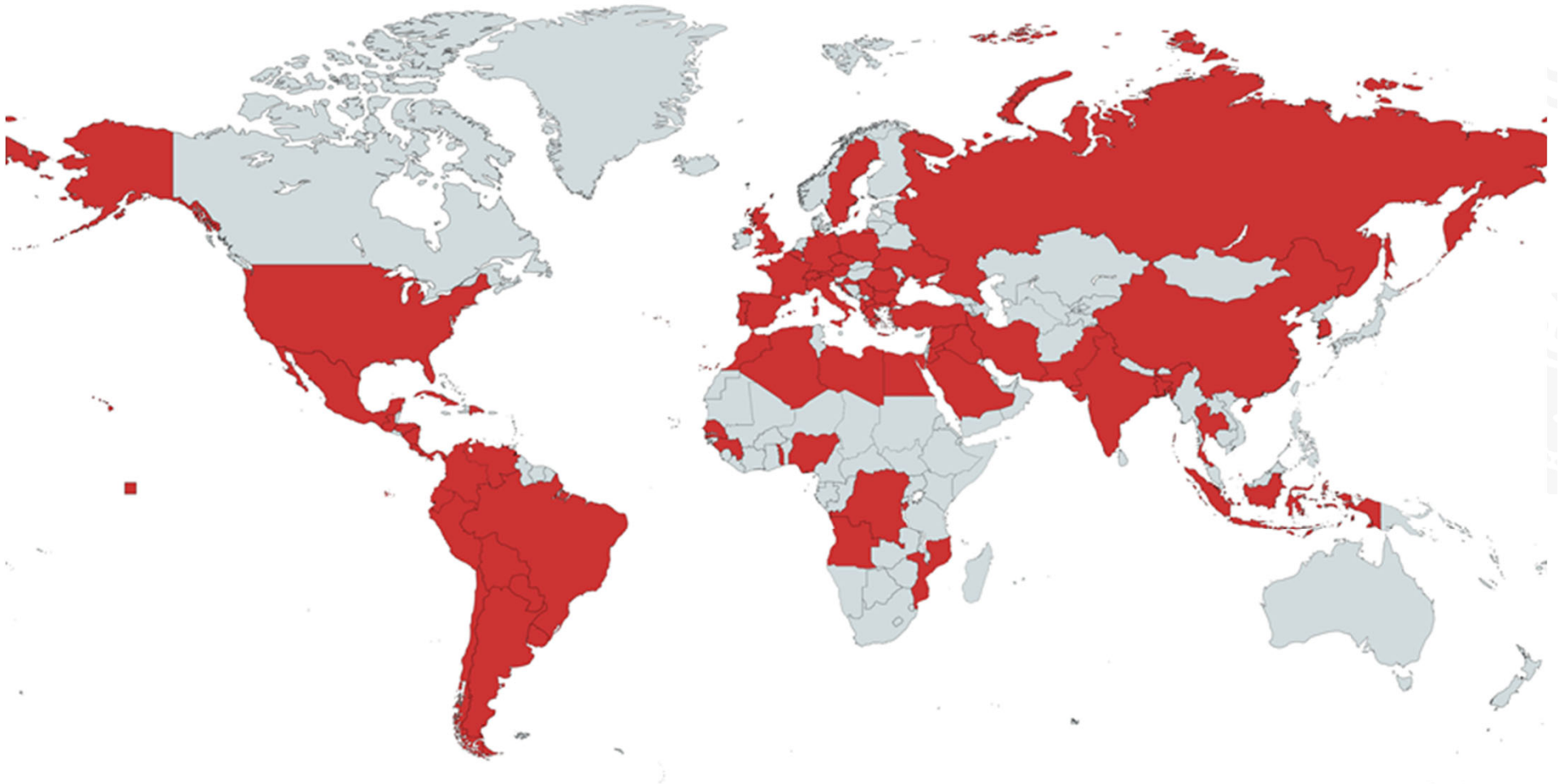
### Spanish PhD students (2021/2022)



### Other PhD students (2021/2022)



# PhD Students nationalities (2021/2022)





# Industrial Doctorate (from 2017 onwards)

- ✓ **Industrial Doctorate contracts** granted by the Government of Madrid
- ✓ **Framework agreements** (UPM-company) to carry out Industrial Doctorates



AIRBUS

ALTER  
TECHNOLOGY GROUP

LEAN X CALE



CEDRION



CENER

CENTRO NACIONAL DE  
ENERGÍAS RENOVABLES  
NATIONAL RENEWABLE  
ENERGY CENTRE



étulos

Silk  
BIOMED



servicio integral  
de asesoría eólica

GEOLYDER  
Logística y Desarrollo para la Reducción de GeoRiesgos

QPV  
Qualifying PhotoVoltaics



nutega  
Expertos en Nutrición



Solar Technology Advisors



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**Co-tutelle (from 2017 onwards)**



UNIVERSITÉ  
TOULOUSE III  
PAUL SABATIER



Université  
de Toulouse



UNIVERSITÀ  
DEGLI STUDI  
FIRENZE



**U LISBOA**

UNIVERSIDADE  
DE LISBOA

Universidade Federal  
de Campina Grande

**Villard de Honnecourt framework agreement (Architecture)**

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Università Iuav  
di Venezia



# 5. Transversal training activities for PhD candidates

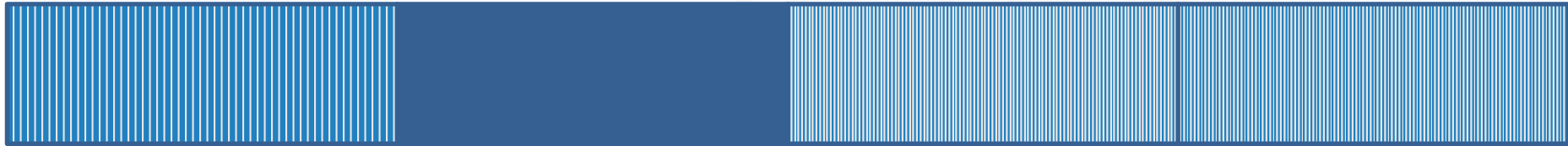
# Transversal training activities for PhD candidates (tentative)

January-February

March-April

May-June

October-November



Teaching collaboration (up to 60h/year - max. 180h/PhD candidate)

- ✓ Innovation and entrepreneurship
- ✓ Introduction to business

- ✓ Patents and copyrights
- ✓ Science communication and dissemination
- ✓ Technology commercialization
- ✓ Methodology to support research I
- ✓ ERC Writing Days

- ✓ Postdoctoral career projection
- ✓ Symposium "Your thesis in a nutshell"
- ✓ Methodology to support research II
- ✓ Bibliographic resources
- ✓ MSCA-IF Writing Days

- ✓ Researchers' digital identity
- ✓ Normative aspects of the doctorate
- ✓ Making my research more responsible: Exploring RRI
- ✓ International R&D&I projects
- ✓ Writing in Engineering



GRECO Workshop

APPLYING RESPONSIBLE RESEARCH AND INNOVATION (RRI) CONCEPTS



STRATEGIES FOR COMMUNICATION:  
Presenting Your Thesis Effectively

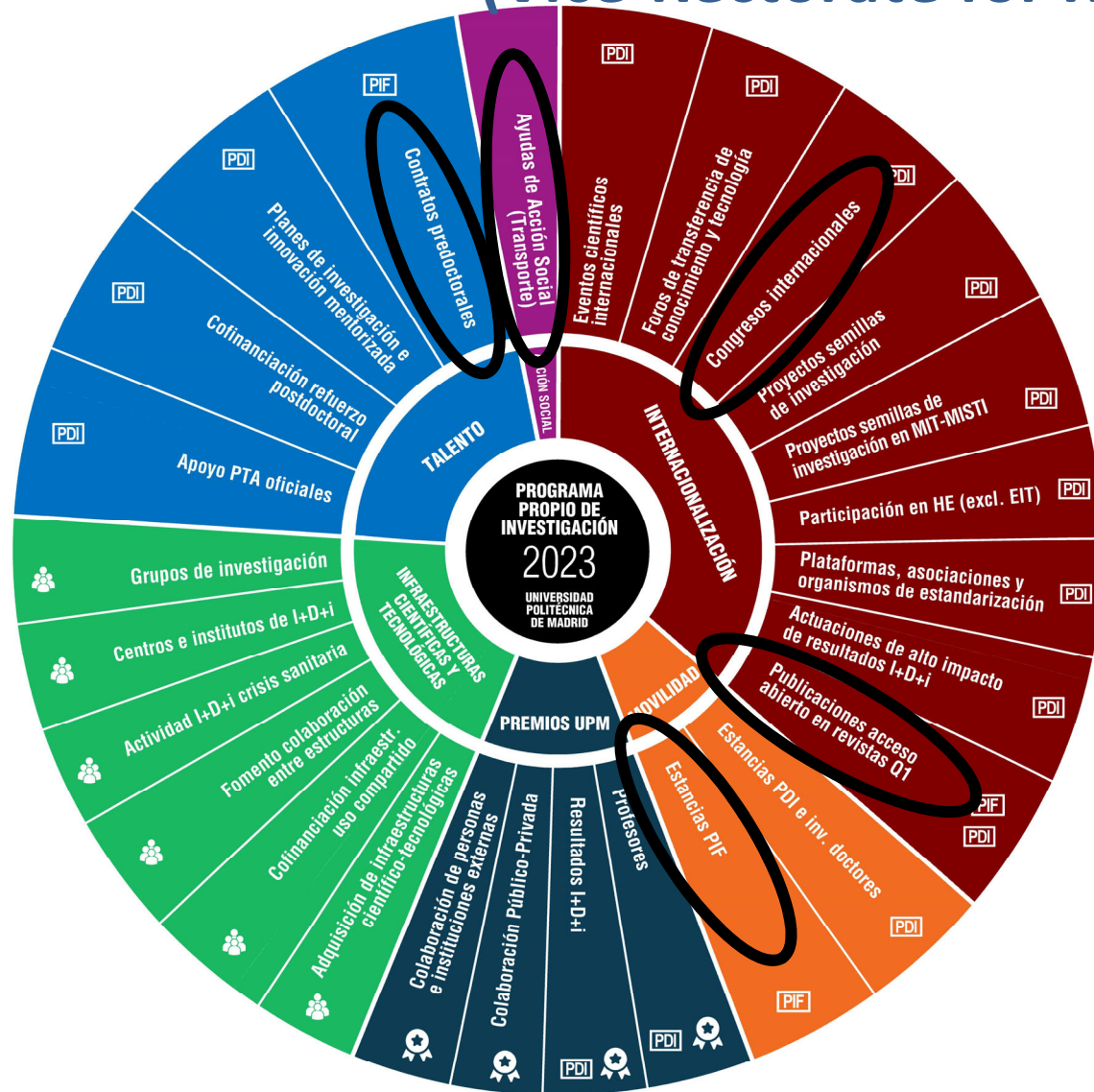
# Transversal training activities for PhD candidates II

## EVENTOS, CURSOS Y SEMINARIOS DEL VICERRECTORADO DE INVESTIGACIÓN, INNOVACIÓN Y DOCTORADO (2023)

	ene	feb	mar	abr	may	jun	jul	ago	sep	oct	nov	dic	
INVESTIGACIÓN Cursos, eventos y Writing Days (OPI, PPI,...)	Promoción y gestión proyectos y actividades internacionales								OPI days 2023				
	Ofertas web UPM /Euraxess				Claves de éxito AIR4S			Welcome day new researchers					
	Infor day PF/DN supervisores	Evento empresas H2	Info day PF con NCP	OPI para doctorandos FTD	Gen Assembly Hydrogen Europe Res					ERC Reading days FECYT			
WS Estratégicos										Hidrógeno			
INNOVACIÓN Y COMERCIALIZACIÓN	Compra pública innov. (22)												
EMPRENDIMIENTO				actuaupm: premios ideas	Formación básica actúaupm						Formación upm2t	WIT UPM2T	actuaupm: premios finales
Inscripciones	actúaupm (hasta 21-mar)			UPM2T (jun-sep)						Formación avanzada actúaupm			
DOCTORADO Cursos de formación transversal para doctorandos (EID)	Novedades Normativa permanencia. Novedades Thesis	Patentes y derechos de autor	actúaupm Lleva tu investigación al mercado	Gestión de datos en proyectos de investigación	Identidad digital Ética en la investigación	Introducción a Machine Learning con Microsoft Azure	Gestión de datos en proyectos de investigación						
		Mujer y niña en Ciencia (10)	Cómo aumentar el impacto de tus publicaciones	Technological Innovation and Entrepreneur- ship	Comunicación y divulgación de la ciencia	¿Quieres internaciona- lizar tu investigación? (OPI)	Investigación e innovación responsable						
Eventos UCC+I - Divulgación Científica	Mujer y niña en Ciencia		Comunicación y divulgación Ccia (19-20)			Noche Europea de los Investig. (29)			Semana de la Ciencia				
SEMIANRIOS UPM - COMUNIDADES UPM	Pendiente												

## 6. *Programa Propio de Investigación*

# Programa Propio de Investigación (Vice-Rectorate for Research, Innovation and Doctoral Studies funds)



**Specific calls for PhD candidates  
(total budget: +1,70 M€)**

- ✓ Pre-doctoral contracts
- ✓ International conferences
- ✓ Secondments (3-month international secondment to obtain the International Doctorate)
- ✓ Open access publications (Q1)
- ✓ Social action (transport)

**Thank you for your attention!**

