Research, Innovation and Doctoral Studies at UPM

Doctoral Studies @ UPM

Prof. Asunción Gómez-Pérez
Vice-Rector for Research, Innovation and Doctoral Studies
# Table of contents

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*
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)
Rectorate in Madrid
5 Campuses in Madrid area
2 International Excellence Campus awarded by the Ministry of Education (MEC-MINECO)
- 15 Schools
- 1 Faculty (Sports)
- 1 Fashion Design Center
- 5 R&D&I Institutes
- 16 R&D&I Centers
- 215 Research Groups
- 61 Departments

**Budget (2021)**

359.7 M€ Total funds
UPM: Some figures

Research in 2020 – ca. 76M€

- 67.83 M€ in financed projects
  - 14.03 M€ National & Regional projects
  - 35.11 M€ International projects
  - 18.69 M€ Private projects (companies and foundations)
- 8.53 M€ in HR competitive contracts
- +2,300 indexed publications

Technological Innovation

- 567 patents in force to date
- 34 priority patents filed in 2020
- 75 University-business chairs in 2020
- +280 spin-offs created and coached from 1998 to date
- 10 exploitation contacts in 2020
- >67% spin-off Survival rate (3rd year)
- +114 M€ from investors (2010-2020)
Higher education, research and innovation in all Engineering fields:

<table>
<thead>
<tr>
<th>Field</th>
<th>Programmes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aeronautics</td>
<td>52 Bachelor Degrees</td>
</tr>
<tr>
<td>Agronomy</td>
<td>67 Master Degrees</td>
</tr>
<tr>
<td>Architecture</td>
<td>44 Doctoral Programmes</td>
</tr>
<tr>
<td>Biomedicine</td>
<td>94 Double degree agreements with</td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>foreign universities</td>
</tr>
<tr>
<td>Energy</td>
<td>18 Undergraduate + Master Joint</td>
</tr>
<tr>
<td>Forestry</td>
<td>Programmes</td>
</tr>
<tr>
<td></td>
<td>123 University-Specific Programmes</td>
</tr>
<tr>
<td></td>
<td>(Expert, Life-long learning...)</td>
</tr>
</tbody>
</table>

+ Sports and Fashion Design

*High potential for increasing participation in multidisciplinary engineering areas*
21 R&D&I Centers

**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.novation 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)
13. Technological Center for Safety and Quality in Energy Industries and Mines (TECMINERGY)

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

**INDUSTRIAL ENGINEERING**
18. Center for Automation and Robotics (CAR, UPM-CSIC)
19. Laser Center
20. Center of Electronics for the Industry (CEI)
21. Institute for Microgravity “Ignacio da Riva” (IDR)

**INNOVATION**
22. Innovation and Technology for Development Centre (itdUPM)
23. Centre for Support for Technological Innovation (CAIT)
Human Resources

- 2,928 Faculty academics
  +380 Full professors
- 1,785 Administration and Service Staff
- 508 competitive contracts in 2020
  - 311 predoctoral researchers
  - 127 postdoctoral researchers
  - 70 technicians and managers

Students

- 29,300 Undergraduate students
- 6,180 Master degree students
- 2,000 PhD students
- +1,300 International mobility (incoming)
- +1,800 International mobility (outgoing)
- +6,300 Internships
- +45 Associations
- +125 Medals obtained in official competitions
Connected to Research & Innovation networks

- Human Brain Project
  Unifying our understanding of the human brain.
- ARTEMIS Industry Association
- Big Data Value Association (BDV)
- EIT Digital
- Quantum Flagship
- 5G PPP
- EuRobotics
- AIOTI
- NESSI
- Future Internet Public Private Partnership (PPP)
- NETWORKED & ELECTRONIC MEDIA
- POLÍTÉCNICA
- UNIVERSIDAD POLITÉCNICA DE MADRID
- IREDA
- HR Excellence in Research
- EID
- Vicerrectorado de Investigación, Innovación y Doctorado

The association for R&D actors in embedded systems
2. UPM International Doctorate School
International Doctorate School

UPM R&D&I Strategy

EID
ESCUELA INTERNACIONAL DE DOCTORADO / UPM

PhD Programs
quality
PhD Students
training

PhD visibility
International Doctoral School: Visibility and “School” model

INTERNAL

+2,000 PhD Students & +2,000 PhD Advisors (UPM and external)

EXTERNAL

Information, Foreigners Outreach, and Industrial PhD

Governance Archive Documentation

FORMATIVE – QUALITY

Training & Entrepreneurship
PhD Theses contests and prizes
“Programa Propio de Investigación”
3. Doctoral Areas and 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
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

### 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

### 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

### 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
4. Doctorate at UPM
Eligibility requirements/criteria*

**Admission (Doctoral Program)**

- **PhD Registration** (to be renewed every year)
- **Transversal training activities & Teaching collaborations**
- **Year 1**
- **Year 2**
- **Year 3**
- **Year 4**
  - Extension 1 (1 Year)
- **Year 5**
  - Extension 2 (1 Year)
- **Secondments**
- **PhD Thesis Defense**
- **PhD Degree**

*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.*
Doctorate at UPM: Modalities

**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)
PhD Students registration

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

ca. 2,000 PhD students per year on average
PhD Theses defended

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

ca. 230 PhD theses defended per year on average (excl. 2014/2015-2016/2017)
ca. 48% International Doctorates on average from 2017/2018 onwards (excl. 2020/2021)
Doctoral Areas: Registration and defence

PhD theses defended (2020/2021)

- Architecture: 14%
- Civil: 16%
- Agro. & Environ.: 11%
- Manuf. & Ind.: 29%
- ICTs: 23%
- Arts & SSci.: 7%

PhD Students (2021/2022)

- Architecture: 16%
- Civil: 14%
- Manuf. & Ind.: 23%
- Arts & SSci.: 9%
- ICTs: 23%
- Agro. & Environ.: 15%

International PhD (2020/2021)

- Architecture: 4%
- Civil: 8%
- Manuf. & Ind.: 33%
- ICTs: 26%
- Arts & SSci.: 4%
- Agro. & Environ.: 7%
PhD Students registration: Internationality

Internationality (2021/2022)

- Spanish: 67%
- Other: 33%

Spanish PhD students (2021/2022)

- Men: 68%
- Women: 32%

Other PhD students (2021/2022)

- Men: 62%
- Women: 38%
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

[Logos of various companies and institutions associated with the industrial doctorate program]
Co-tutelle (from 2017 onwards)

Villard de Honnecourt framework agreement (Architecture)

Università Iuav di Venezia

paris-belleville
ecole nationale supérieure d’architecture

TU Delft Bouwkunde

Delft University of Technology
Faculty of Architecture
and the Built Environment
5. Transversal training activities for PhD candidates
## Transversal training activities for PhD candidates (tentative)

<table>
<thead>
<tr>
<th>January-February</th>
<th>March-April</th>
<th>May-June</th>
<th>October-November</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Innovation and entrepreneurship</td>
<td>✓ Patents and copyrights</td>
<td>✓ Postdoctoral career projection</td>
<td>✓ Researchers' digital identity</td>
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<tr>
<td>✓ Introduction to business</td>
<td>✓ Science communication and dissemination</td>
<td>✓ Symposium “Your thesis in a nutshell”</td>
<td>✓ Normative aspects of the doctorate</td>
</tr>
<tr>
<td>✓ Technology commercialization</td>
<td>✓ Technology commercialization</td>
<td>✓ Methodology to support research II</td>
<td>✓ Making my research more responsible: Exploring RRI</td>
</tr>
<tr>
<td>✓ Methodology to support research I</td>
<td>✓ Methodology to support research I</td>
<td>✓ Bibliographic resources</td>
<td>✓ International R&amp;D&amp;I projects</td>
</tr>
<tr>
<td>✓ ERC Writing Days</td>
<td>✓ ERC Writing Days</td>
<td>✓ MSCA-IF Writing Days</td>
<td>✓ Writing in Engineering</td>
</tr>
</tbody>
</table>

### 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
6. Programa Propio de Investigación
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!