Polytechnic University of Madrid
Higher Technical School of Architecture
Department of Architectural Design

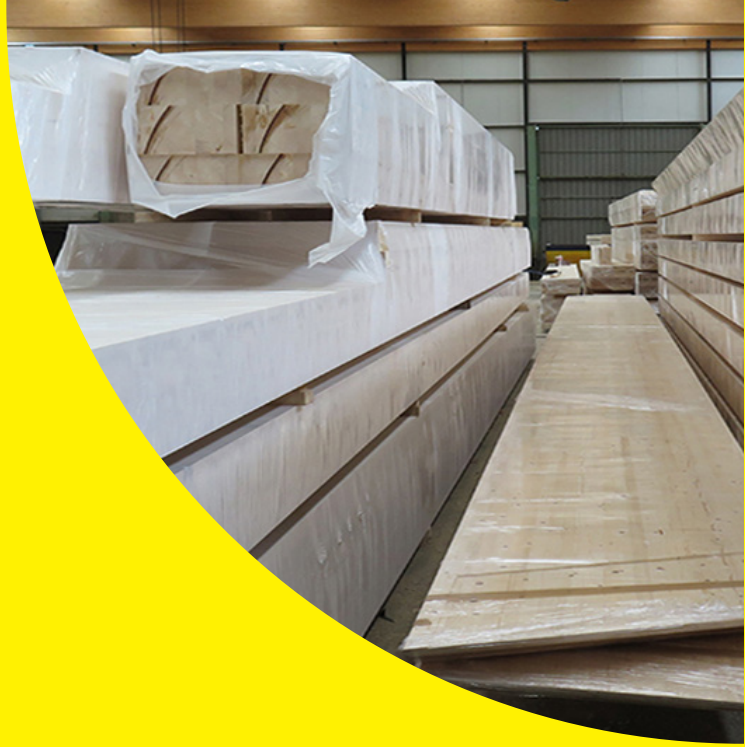
MIPPA
Master's Degree in Industrialisation, Prototyping and Architectural Design

“Industrialization is a design process, not just a technical issue, supported by construction and prototyping”

Buildings and infrastructure are responsible for 40% of global carbon emissions. 28% are linked to operation, and 11% are associated with materials and construction processes. The industrialization of these processes plays a key role in decarbonizing the sector and combating the climate emergency.

Industrializing processes optimizes resources, reduces waste, timelines, and labour risks. The industrialization of construction, manufacturing building components, new prototyping techniques, and digital fabrication are creating job opportunities for architects in industrial sectors related to construction.

These sectors can be a professional alternative for many architects compared to the model offered by traditional architectural firms, which also require professionals skilled in producing architectural projects within the context of the fourth industrial revolution. This revolution is characterized by smart manufacturing and mass customization.



About the programme

60 ECTS

10 meses

Face-to-face

Full-time

Official master's degree with access to a PhD

October to June

Intensive schedule from Monday to Wednesday

MIPPA
Master's Degree in Industrialisation, Prototyping and Architectural Design

UPM OFFICIAL PROGRAM

The Master's in Industrialization, Prototyping, and Architectural Design is an official postgraduate program at the Universidad Politécnica de Madrid (UPM).

TRANSVERSALITY

It falls under the Department of Architectural Design (DPA) but has a cross-disciplinary approach, involving faculty from the Departments of Structures, Construction, and Mathematics.

INDUSTRY

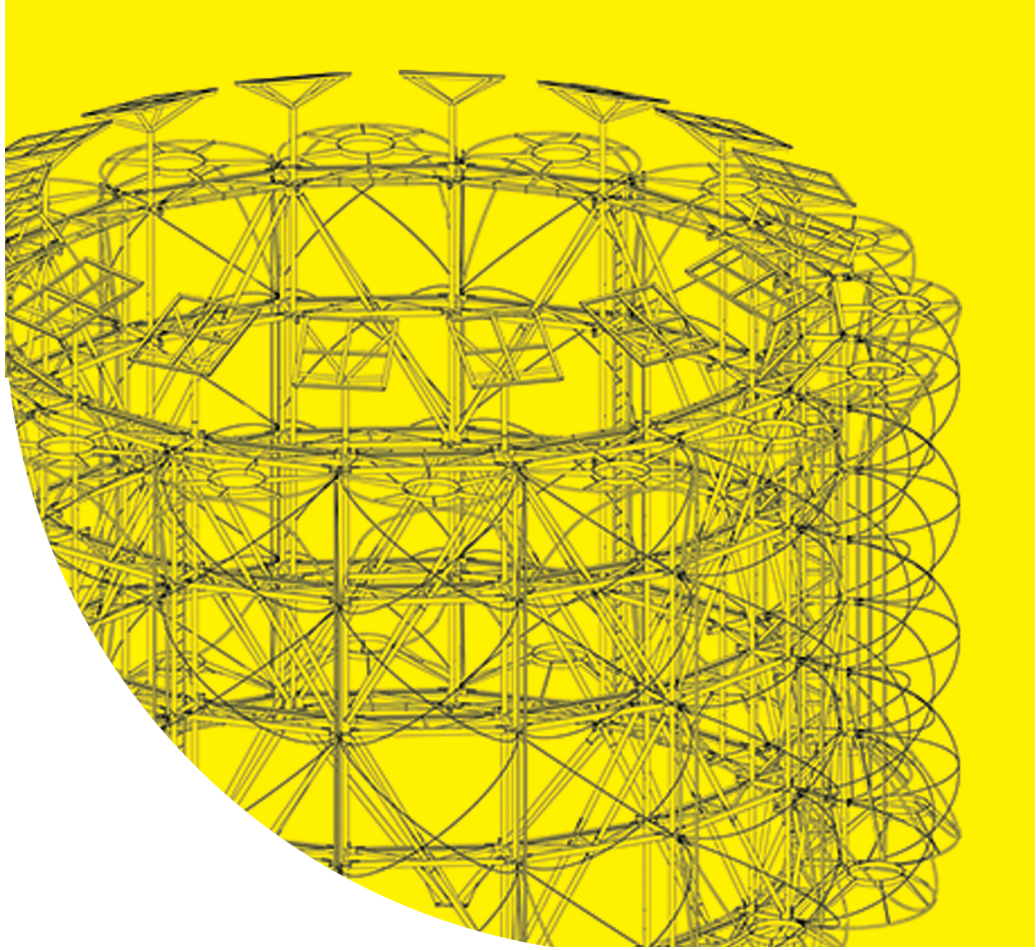
This program arises in response to the demands and needs of our society regarding architectural production and its relationship with contemporary industry.

INVESTIGATION

It's an applied research master's that equips architects to practice professionally in collaboration with industry and academic research, providing access to doctoral studies.

SKILLS

It prepares architects to leverage the synergies between three techniques—prototyping, industrialization, and architectural design—that are not typically developed together during architectural disciplinary training.



Profile

Industrializing architecture requires specific training that includes other design techniques, understanding of industrial production processes, and the use of prototypes to test and assess the projected outcome before its fabrication.

WHY TO DO THIS MASTER'S DEGREE. Those interested in:

01. INNOVATION. Generate knowledge through applied research by exploiting the synergy derived from the fusion of industrialization, prototyping, and design.

02. INDUSTRY. Specialize as agents capable of promoting a built architecture that responds to current demands of climate change.

03. TECHNIQUE. Incorporate technology, intelligent manufacturing, and mass customization into the productive processes of architecture.

04. SPECULATION. Become agents with critical capacity to design using these new tools.

CAREER OPPORTUNITIES. This master's degree will enable you to:

01. INTEGRATION. Work in the construction industry with an expert profile that integrates design, prototyping and manufacturing.

02. ENTREPEUNEURSHIP. Become an entrepreneur by creating startups linked to industrialized construction.

03. RESEARCH. Develop an academic career based on applied research.

04. PRACTICE. Build a professional career focused on construction through industrialized components and procedures.

Program structure

OPENING ACTIVITIES	October weeks 1-2	2 ECTS	visits to production sites and lectures
FIRST SEMESTER	October January weeks 3-16	28 ECTS *(+4,5ECTS elective)	INSTRUMENTAL + THEORETICAL seminars
SECOND SEMESTER	February June weeks 1-10	12 ECTS	PRACTICAL workshops
FINAL MASTER'S THESIS	March June weeks 3-16	16 ECTS 12 individual 4 collective	knowledge transfer
CLOSING ACTIVITIES	June weeks 15-16	2 ECTS	assembly and presentation of master's thesis

*queries: mippa.proyectos.arquitectura@upm.es

3 SIMULTANEOUS MODULES

Industrialization, prototyping, design

2 SEMESTERS

The first has a theoretical-instrumental nature, while the second has a practical-experimental approach.

SEMINARS

The theoretical-instrumental subjects utilize seminars as a space to share knowledge and debate ideas.

WORKSHOPS

The practical-experimental subjects make use of workshops. The prototyping workshop is the space for experimentation and the production of real models through digital and analogy fabrication. The project workshop is where circular synergies between architecture, prototype, and industrialized solutions are explored.

1st SEMESTER. 16 weeks / 30 ECTS

2nd SEMESTER. 16 weeks / 30 ECTS

MODULE 00
ON-SITE ACTIVITIES
Weeks 1-2

M 0.1
2 ECTS

Opening activities
Presentations
Lectures
Visits to production sites

MODULE 01
INSTRUMENTAL
[basic training courses]
Weeks 3-16

M 01.1 4,5 ECTS
- **BIM tools** 3h / week

M 01.2 4,5 ECTS
- **Digital construction** 3h / week

M 01.3 4,5 ECTS
- **Algorithmic design** 3h / week

MODULE 02
THEORICAL
[seminars]
Weeks 3-16

M 02.1 5 ECTS
- **Industrialization** 3,5h / week

M 02.2 5 ECTS
- **Architectural prototyping** 3,5h / week

M 02.3 5 ECTS
- **Industrialised architecture** 3,5h / week

M 02.4 4 ECTS
- **Transversal knowledge** 2,5h / week

MODULE 03
PRACTICAL
[workshops]
Weeks 1-10

M03

2,4 ECTS	2,4 ECTS	2,4 ECTS	2,4 ECTS	2,4 ECTS
Workshop 01. Weeks 1-2 12h / week	**Workshop 02.** Weeks 3-4 12h / week	**Workshop 03.** Weeks 5-6 12h / week	**Workshop 04.** Weeks 7-8 12h / week	**Workshop 05.** Collectiveprototyping Weeks 9-10 12h / week

MODULE 04
FINAL MASTER'S THESIS
[knowledge transfer]
Weeks 3-15

M 04

4 ECTS
- **Collective Master's Thesis** Weeks 11-14

12 ECTS
- **Individual Master's Thesis** Weeks 3-15
  Patent / Publication / Test / System / Prototype

MODULE 00
ON-SITE ACTIVITIES
Weeks 15-16

M 0.1
2 ECTS

Closing activities
Assembly
Master's thesis presentation

Industrialization

The fourth industrial revolution is characterized by the digitalization and interconnection of machines and local production systems with the global flow, saving time, energy, and raw materials.
It offers higher quality and the ability to customize products of all kinds—*mass customization*—among which architectural components are included.
In their drive to promote specialization, successive curricula defining the training of architects are becoming increasingly narrow, and today's architects receive minimal education on the milestones in industrial production techniques. These techniques are essential to understand the processes involved in manufacturing materials or construction components that materialize an architectural project. It is also not common for students today to consider an architectural project through the lens of planning, logistics, transportation, phases, and assembly timelines—issues that the industry has always dealt with.

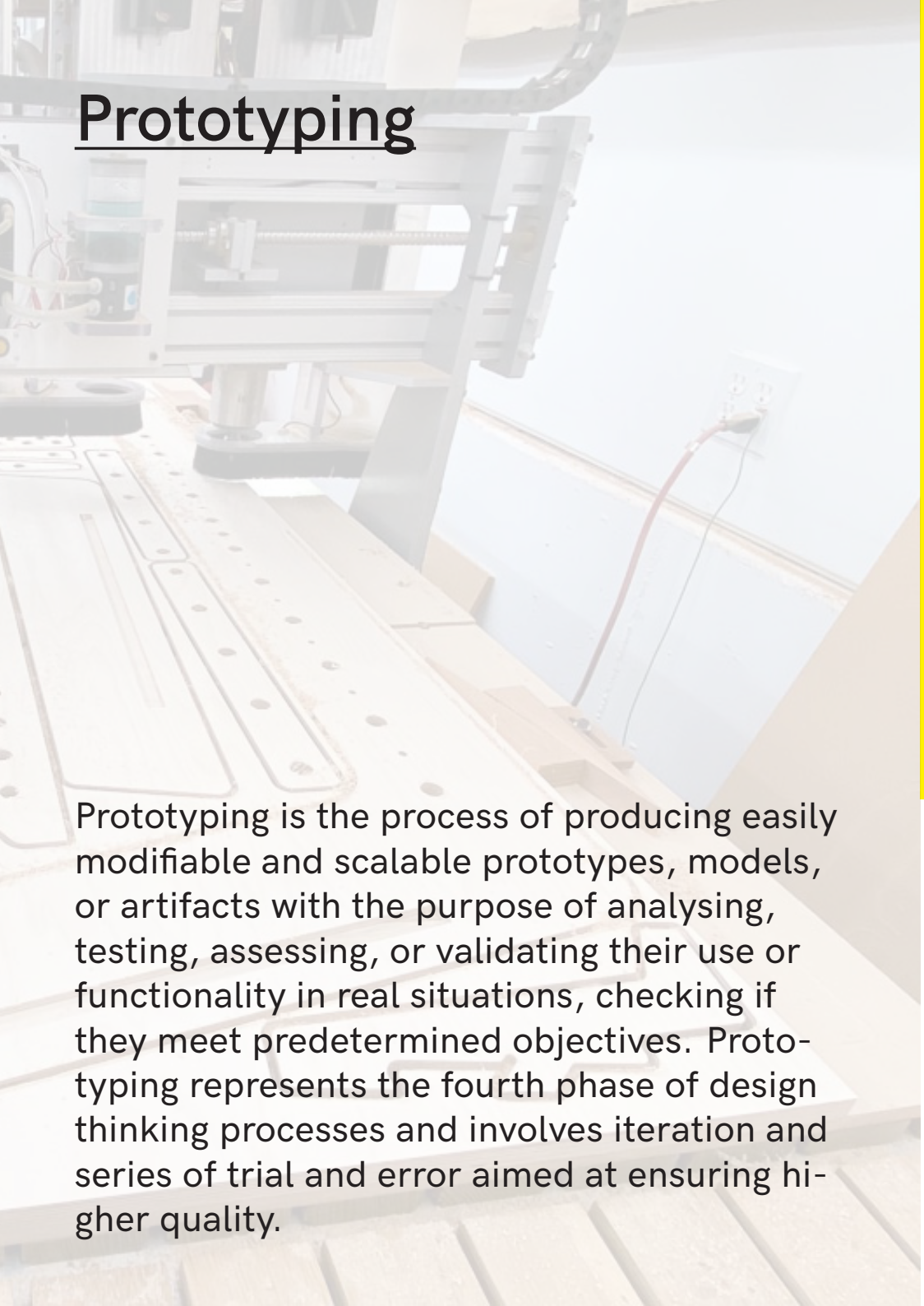
It aims to reinforce this educational deficit, to reintegrate architects into an industrial ecosystem of which they have always been a part as professionals. It aims to provide them with the knowledge, competencies, and skills derived from an industrial philosophy, allowing them to design architecture in collaboration and with fluent dialogue with the industry that will produce the architecture of the **future**.

It focuses on primarily practical knowledge, and although a theoretical foundation will be necessary to establish the fundamentals of industrialization linked to architectural production, students will be encouraged to explore what they've learned and apply it from the outset in the realm of architectural design and **its realization.**

In the INDUSTRIALIZATION module, students will gain advanced knowledge of logistical processes, value chain management, construction systems, historical milestones in industry innovation, standards, material manufacturing, assembly techniques, and technological transfer strategies applicable to **architectural projects.**

Industrialization is not merely a technical problem but a procedural one in design. It doesn't solely involve applying existing advanced techniques in each context, but primarily understanding the relationship between **industrial production systems, design procedures, and available technologies**.

Prototyping



Prototyping is the process of producing easily modifiable and scalable prototypes, models, or artifacts with the purpose of analysing, testing, assessing, or validating their use or functionality in real situations, checking if they meet predetermined objectives. Prototyping represents the fourth phase of design thinking processes and involves iteration and series of trial and error aimed at ensuring higher quality.

It takes architects' training a step further by promoting a design process with a **scientific foundation** that utilizes prototyping to develop and 'bring to life' the architectural project beyond paper.

To create prototypes, in addition to manual tools, the specific tools available in the digital fabrication laboratories (FabLab) at ETSAM, and by extension, at UPM, will be used. FabLabs are spaces equipped with computer numerical control (CNC) machinery such as laser cutters, 3 and 5-axis milling machines, 3D printers, vinyl cutters, etc. Students will gain training to personally operate these **machines**, understanding the necessary safety **protocols**.

The industrialization processes included in the previous module will be highly complementary in the development of prototypes focusing on construction aspects, assembly processes, or systematizing connections and solutions.

In the PROTOTYPING module, competencies will be provided on prototyping techniques and processes. This includes translating ideas and concepts developed on paper or computer into physical reality (CAD-CAM), determining the appropriate method for analysing and evaluating specific characteristics, and making extrapolations based on particular features.
Students will have several opportunities to collectively and individually manufacture various physical and scaled prototypes, allowing them to put into practice the acquired skills and knowledge, as well as test and evaluate certain characteristics of their designs.

Design

It emerges with an interdisciplinary and interdepartmental vocation, but it does so from the Department of Architectural Design at the School of Architecture of the UPM, which is a strong statement of purpose. The synergies and interconnections between prototyping, industrialization, and design will provide a body of knowledge and distinctive competencies to its graduates.

It diverges from current trends primarily focused on form-finding and instead shows interest in tools that use computers to parameterize designs and manage architectural project information in an integrated manner. That's why it's essential for students to be trained in computational design tools that utilize algorithms and simulations, or in the BIM methodology (Building Information Modelling) that helps organize, systematize, and manage the complex information of a project. This serves as a bridge between the industry and architectural production.

Designing architecture within the framework of this program not only involves abstracting, diagramming, iterating, and anticipating the materialization of an object, but also utilizing advanced tools and techniques that promote systematization of solutions, compatibility among systems and components, rationalized industrial production, simplified assembly that combines tasks to reduce timelines, and those aspects that consider the replacement of parts and even the disassembly and recyclability of its construction components, thus promoting circularity and reducing construction waste.

The DESIGN module, similar to the DfMA methodology (Design for Manufacturing and Assembly/Disassembly), promotes architecture that is easily manufacturable and assemble; architecture that is projected differently and with this purpose from the outset; systematic architecture that reduces the number of its assembled parts on-site, decreases assembly time and costs, and also minimizes disruptive emissions during construction.

Frequently asked questions

What are the MIPPA entry requirements?

Admission to the programme is open to all those who meet the entry profile determined by the qualifications corresponding to the Bachelor's Degree in Architecture in Spain, which must be certified by the applicant's university of origin. The programme is mainly taught in Spanish, so a minimum level of C1 is required for foreign students to be able to access the programme and to be able to fully follow its activities and development.

When and how can I apply for admission to the master's pogramme?

There are four application deadlines for MIPPA:

22 January to 7 March 2024 [first phase].
8 March to 9 May 2024 [second phase]
10 May to 4 July 2024 [third phase]
5 July to 3 September 2024 [fourth phase, if places are available]

1. Applications must be submitted to the HELIOS programme (https://www. upm.es/helios) of the Polytechnic University of Madrid.

2. Then, the student must send the following documents to the address mippa.proyectos.arquitectura@upm.es:
- CV+portfolio
- Letter of interests answering the following questions (200 words max/question):
    +What are you most interested in to learn?
    +Do you have any previous experience that you consider relevant to highlight in relationship to the content of the master's degree?
    +What would you be interested in doing after completing this master's degree?

Is there a limit of students who can attend the MIPPA?

There is a limit of 25 students. This limit has been established to guarantee the quality of teaching and research and training opportunities expected in an Official Master's Degree.

Can I start the Master's in the spring semester?

The Master's Degree only admits new students for the academic year from September to September and following the deadlines established by the Polytechnic University of Madrid.

What is the price of the MIPPA?

The public prices charged for each ECTS are established by Decreto 43/2022, de 29 de junio, del Consejo de Gobierno, which establishes the public prices for university studies qualifying for official degrees and services of an academic nature in the public universities of the Community of Madrid.
https://www.upm.es/Estudiantes/Estudios_Titulaciones/Estudios_Master/Matricula

Depending on student's nationality, the following prices are established per ECTS credit for 1st registration:

EU student (European Union):	45,02 €/ECTS
Non-EU student (*):	84,07 €/ECTS
Student registration fee:	27,54 €
Administration fee:	6,11 €

(*) Foreign students, who do not have the status of residents, excluding nationals of Member States of the European Union and those to whom the EU regime is applicable.
https://www.upm.es/Estudiantes/Estudios_Titulaciones/Estudios_Master/Matricula

Which documents do I need to submit?

All students must provide the original documents presented in the application form for verification, meaning those issued by the institution that conferred the degree, at the time of enrolment.

Students will have a maximum period of two months from the time of enrolment to present the original documents to the Secretary's Office. Those qualifications that do not belong to the European Higher Education Area (EHEA) must be legalised.
*Apostille of the Hague, Consular Seal or Seal of the Spanish Embassy in the country of issue of the degree.

Academic commission
Almudena Ribot
Diego García-Setién
Begoña de Abajo

Organisation and communication
Rocío Saez
Victoria Dafos

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