

60 ECTS Master’s degree

# Parametric design in Architecture

Technological efficiency through computational design



UNIVERSITAT POLITÈCNICA DE CATALUNYA  
BARCELONATECH  
School of Professional & Executive Development



UPC VALLÈS  
Escola Tècnica Superior d’Arquitectura del Vallès



BigO research project by CODA. Photo credit: Somoskoi Gabor

Technological efficiency through computational design

Performance-based strategies minimizing ecological footprint

Designing novel form-finding strategies through the methodological integration of forces, matter and processes

**Complexity integration**  
We propose a critical revision of computational design towards a more challenging and self-demanding commitment to environmental constraints.  
The emergence of ICT has supposed a paradigm shift for architecture. Parametric design, digital manufacturing and prototyping are revolutionizing the scene of the 21st Century architecture and opening doors to new models of sectoral development and new multidisciplinary professional profiles able to meet the challenges of this socio-economic change.  
The architectural project is a complex process that should allow linking knowledge management with design in an operative way. We call parameters to all categories of information that affect decision-making in the development of a project. This is the goal of parametric architecture: go beyond geometry and form to design a system with all variables / categories involved in the process. This is the potential of current software tools: Grasshopper, Revit, Dynamo, etc; which allow to change the design process, transforming architects in builders of systems and not just modelers.

Ramon Sastre Sastre. Master’s Director

**Professional oriented structure**  
The Master is organized into two four-month postgraduate courses, 16/18 weeks each, which can be taken together to obtain the Master degree, or separately. For the Master’s degree it is also compulsory to register for the Master Thesis (6 ECTS). Each annual post-graduate course is structured in a thematic module of 27 ECTS.

**Syllabus**  
**Digital Design and Fabrication:**  
Design process in general, and particularly in architecture, is a complex process that involves a combination of knowledge, skills, experiences, practices, etc. In recent decades it emerges clearly an unstoppable trend, the so-called digital design, which adds to all the aforementioned factors the use of digital tools. All these techniques converge in parametric design. Already vividly present in the first half of the twentieth century in the automotive sector (geometric design) finally impact on architectural design which represents a new step that has led to a new understanding of Architecture.

**Performative Parametric Design:**  
At the end of this second postgraduate course the students will become holistic computational architects and will be able to offer skills on handling parametric tools applied to architectural design in all its aspects. These skills could hardly be obtained through independent courses just based on using parametric software and hardware.

**Metropolitan Faculty and Workshops**  
The faculties of the Master will be diverse, most of them currently teaching in the schools of architecture at the UPC, mainly in the ETSAV. At the same time, other parametric-design professionals will be incorporated in a more general concept beyond architecture. It is intended, as it has already been shown previously, to impart a general architectural formation using parametric design, expressly avoiding partial and exclusive approaches to parametric software or digital fabrication.

**Acquisition of emergent design skills**  
Once the students have qualified the 60 ECTS of MaPDArch they will:

- Be fluent in Parametrics and Algorithmics.
- Acquire both a solid theoretical and technical framework and a strong set of practical parametric design skills.
- Understand digital design paradigm shift, the impact in our society and its state of the art technology.
- Be able to lead cutting-edge architectural performance driven design teams understanding the integration of efficiency at design processes.
- Develop a critical attitude in the design itself, so that the knowledge gained will serve for a better, more sustainable and comfortable architecture
- Improve the competitiveness of professionals in architectural design, based on novelty, change and evolution.
- Achieve and shape a work niche, a new form of enterprise, taking advantage of the entrepreneurial nature of future professionals in parametric design.

**Apply before end of September 2016**  
**Register at**  
<http://www.talent.upc.edu/ing/professionals>

## PG1. Digital design and fabrication

**Parametric Geometry**

PG1.1 6ECTS  
Theoretical lectures on mathematical modeling of shapes and objects, with architectural examples.

**Digital Fabrication**

PG1.2 6ECTS  
Knowledge and use of tools, both theoretical (software) and practical (hardware) that have allowed the emergence of this type of architectural design.

**Architecture in the 21st Century. From Sign to Algorithm?**

PG1.3 6ECTS  
Knowing the historical process that has led to a type of architecture has become the paradigm of modernity in the early twenty-first century.

**Studio 1. Information and systems**

PG1.4 9ECTS  
Learn how to approach architectural design through complexity negotiation.

## PG2. Performative parametric design

**Parametric Design with BIM**

PG2.1 6ECTS  
Application of existing BIM architectural software in parametric design.

**Algorithmics in Technology in Architecture**

PG2.2 6ECTS  
Project development on construction designs, structural facilities or applying knowledge acquired in the course.

**Parametric Design in Planning and Landscape**

PG2.3 6ECTS  
Data mining and visualization of a set of parameters to propose new urban planning strategies.

**Studio 2. Postproduction and building**

PG2.4 9ECTS  
Learn how to approach architectural design through complexity negotiation.