Material
Balance
Research

III edition
2026/2027

Material Balance Design

Digital Techniques And Circular Innovations In Architecture

POLITECNICO MILANO 1863 | DEPARTMENT OF ARCHITECTURE BUILT ENVIRONMENT AND CONSTRUCTION ENGINEERING

I and II Level
Master Program

Why /
Material Balance Design Master

In response to the escalating interest and rising demand for individuals adept at overseeing **intricate architectural projects**, we are delighted to introduce the second edition of the Master's program, encompassing both Level I and II:

Material Balance Design
Digital Techniques and Circular Innovations in Architecture

This program is designed to equip professionals with knowledge and skills needed to emerge as distinctive and **forward-thinking figures** in the dynamic field of architecture. Through comprehensive training, it will foster expertise in **digital techniques** and **circular innovation strategies**, aligning with the growing requirements of the national and international **construction market** seeking sustainable regeneration.

Educational objectives /

Objective_01

Train new professionals capable of facing and managing complex projects through the synergy between **digital technologies' potential and environmental balance** needs.

Objective_02

Acquire knowledge based on a new "material balance", **from concept design to construction details**, capable of designing the transformation of our future environment with a renewed awareness.

Objective_03

Study and creation of new principles, tools, processes, **and innovative products that rethink the contemporary role of the designer**.

Employment opportunities

MaBa

The Master aims to produce a professional figure capable of managing with transversal skills different activities concerning **new technologies** for **design and construction**, combining **digital technologies** and principles of the **circular economy**.

Occupational sectors

- Architectural firms
- Engineering companies
- Manufacturing industries of bio-based components and materials
- Robotics companies
- Start-ups
- Sustanability Companies

Profile expertise

- Cutting-edge technology consultant
- Architectural entrepreneur
- Expert in digital technologies
- Expert in circular innovations
- Computational designer
- Bio-based materials strategy specialist
- Expert in innovative facades
- Project manager

Who / Committee

Director
Prof.ssa Ingrid Maria Paoletti

MEMBER OF SCIENTIFIC COMMITTEE
Politecnico di Milano
(III edition 2026/27)

Prof. Massimiliano Bocciarelli
Prof. Stefano Capolongo
Prof. Emilio Faroldi
Prof.ssa Laura Elisabetta Malighetti
Prof. Francesco Pittau
Prof.ssa Tiziana Poli
Prof.ssa Valentina Rognoli
Prof.ssa Cinzia Maria Luisa Talamo
Prof.ssa Maria Pilar Vettori
Prof.ssa Alessandra Zanelli
Prof.ssa Maddalena Buffoli
Prof.ssa Elisabetta Ginelli
Prof. Alper Kanyilmaz

Technical Director
Prof. Massimiliano Nastri

MEMBER OF TECHNICAL COMMITTEE
Politecnico di Milano
(III edition 2026/27)

Louis Becker | Henning Larsen
Giambattista Brizzi | Deerns
Stefano Converso | Università Roma Tre
Mattia Giannetti | ATI Project
Mattia Mariani | Deerns
Tommaso Maserati | Snøhetta
Paolo Mazza | ACPV Architects
Francesco Perego | Aivox
Tommaso Pagnacco | LignoAlp
Lorenzo Pirone | Rimond
Andre Rossi | A-fact architecture
Giuseppina Vastola | Settanta7

Where /
MaBa.SAPERLab

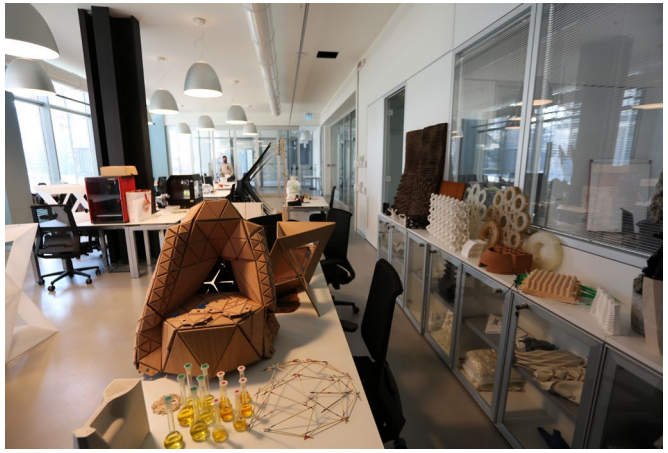
The MaBa.SAPERLab is a Politecnico di Milano Laboratory. It operates within a **multidisciplinary vision** of design and construction with research on developing innovative technologies, computational design systems and advanced manufacturing for architecture. Focused on:

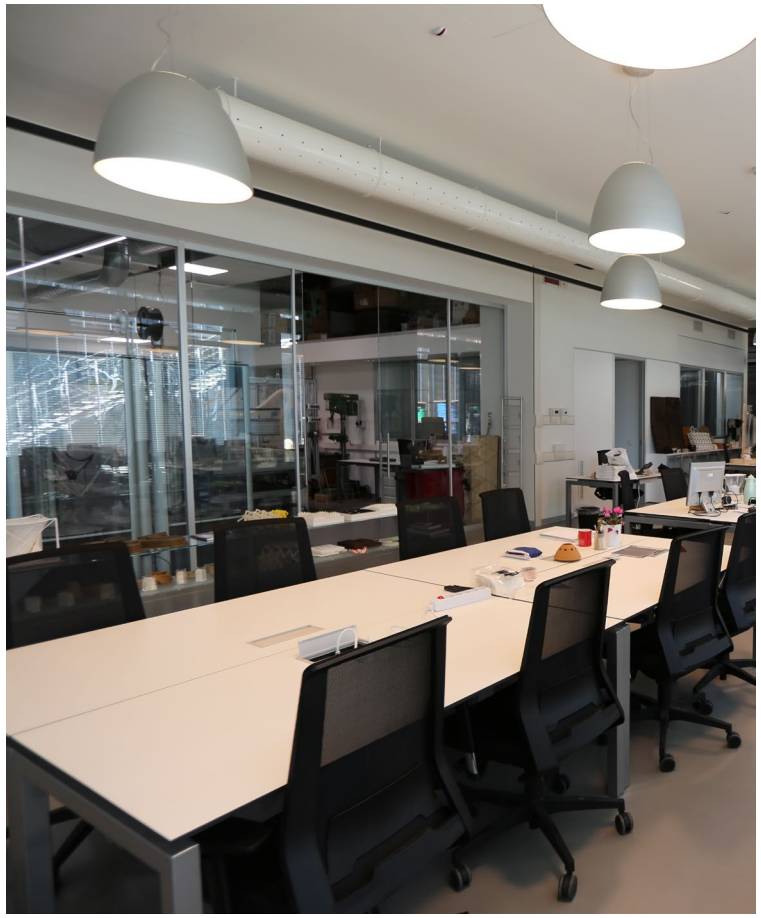
- Architectural, urban and territorial sustainability.
- Technologies for the built and natural environment.
- Process and product innovation

It fosters creative processes about settlement issues in general, sustainability of transformation processes, building and urban redevelopment issues, and advanced technologies and materials.

Where /
MaBa.SAPERLab

MaBa





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Acquired skills /

MaBa

Material scouting

Computational tools (Rhino and Grasshopper)

Performance-based software

Knowledge of digital design & software Integration (3d printing, laser cutter, CNC)

Carbon Calculator Tool

Urban Health Design

Material Balance Protocol

Digital Skills

What /
Course structure

The master’s program is blended with online theoretical and in-person practical sessions at the ABC Department’s MaBa.SAPERLab Laboratory.

Lessons

Blended mode: online and in presence

Workshop

Design exercise integrated on themes identified during the training process

Assignments

Online students will be required to complete tasks during the course of the master's programme

Internship

To be carried out independently or at one of the partner/sponsor companies

Final exam

Public discussion of the final paper based on the contents of the Master’s program and the activities carried out as part of the internship

When / Where / How
Study plan

MaBa

From April 2026 to May 2027

Classes 2/3 times a week

Schedule: 5:00 p.m. - 9:00 p.m.

In person at MaBa.SAPERLab

Remotely on Microsoft Teams

Companies' workshops and visits
(Mainly weekends , Thursday, Friday and Saturday; 9 - 18)

Master's Degree Program

MaBa

WHAT IS MATERIAL BALANCE?

Focus on the research for a new approach that aims to rebalance our relationship with the environment

SKILLS

MATERIAL BODIES & DIGITAL PHENOMENOLOGY

Designers to rediscover a material, environmental and social culture

DIGITAL FABRICATION

Computer-controlled digital production process, capable to produce 3d shapes starting from digital drawings. Deep analysis and study of innovative manufacturing techniques. The module covers:

- Architectural demonstrators
- Robotic Manufacturing
- Wood technologies
- Bespoke textile technologies

ALGORITMIC DESIGN

Material and Design process optimization by linking specific site requirements and design needs. The module covers:

- Performance-based design
- Sustainable acoustic materials
- Thermal simulations
- Lighting

EXECUTIVE DESIGN DEVELOPMENT

Facade Technologies

CIRCULAR MATERIALS SCOUTING

Research of materials and products that are wholly or partially derived from plants and vegetables.

CONSTRUCTION AND SUSTAINABILITY DESIGN STUDIO

URBAN HEALTH DESIGN

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Master's Degree Program

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Material Balance

- Material Bodies & Digital Phenomenology
- Digital Fabrication
- Algorithmic Design
- Circular Material Scouting
- Urban Health Design
- Executive Design Development
- Construction and Sustainability Design Studio
- Skills

It focuses on finding a new balance/sustainable approach that aims to rebalance our relationship with the **environment**. The idea is to challenge our imagination of material culture and investigate new materiality inclusive of **environmental, cultural and social issues**.
Material biographies will be explored in order to understand contemporary matter **impact** and potentialities.

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Master's Degree Program

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- Material Balance
- **Material Bodies & Digital Phenomenology**
- Digital Fabrication
- Algorithmic Design
- Circular Material Scouting
- Urban Health Design
- Executive Design Development
- Construction and Sustainability Design Studio
- Skills

Material bodies and digital phenomenology intersect at a pivotal juncture, merging the **tangible and intangible realms**. In an era dominated by virtual experiences, designers must realign with **materiality, environmental awareness, and social contexts**. Through a holistic approach, designers can craft experiences that fuse materiality, sustainability, and social consciousness, thereby amplifying their impact and significance.

Master's Degree Program

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- Material Balance
- Material Bodies & Digital Phenomenology
- **Digital Fabrication**
- Algorithmic Design
- Circular Material Scouting
- Urban Health Design
- Executive Design Development
- Construction and Sustainability Design Studio
- Skills

Advanced manufacturing processes with digital techniques such as **additive manufacturing** (3D printing), **subtractive** (CNC milling), and **hybrid analogue-digital** (assembly) will be reached through the workshop modules that will have each a specific theme.
Each theme will also have a network of companies supporting it.

Master's Degree Program

- Material Balance
- Material Bodies & Digital Phenomenology
- Digital Fabrication
- **Algorithmic Design**
- Circular Material Scouting
- Urban Health Design
- Executive Design Development
- Construction and Sustainability Design Studio
- Skills

It aims to develop competencies in the digital realm intersecting algorithmic design with **optimization, scarcity of resources and material behaviour**.
The module will investigate all the contemporary design and engineering tools, looking deeper into their integration.

Master's Degree Program

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- Material Balance
- Material Bodies & Digital Phenomenology
- Digital Fabrication
- Algorithmic Design
- **Circular Material Scouting**
- Urban Health Design
- Executive Design Development
- Construction and Sustainability Design Studio
- Skills

From waste to advanced materials and products for architecture. The module aims to provide tools and theoretical and technical foundations and to push the **use and dissemination of materials** and/or products that are **wholly or partially derived from waste** to reduce the environmental impact of construction.

Master's Degree Program

- Material Balance
- Material Bodies & Digital Phenomenology
- Digital Fabrication
- Algorithmic Design
- Circular Material Scouting
- **Urban Health Design**
- Executive Design Development
- Construction and Sustainability Design Studio
- Skills

In the Urban Health Design module, participants delve into the intersection of **urban planning and public health**. Employing thoughtful design methodologies, the goal is to **enhance urban well-being** by emphasizing accessibility, physical activity, green spaces, and safety.
Through the integration of health considerations into urban development, the module aims to foster cities that advocate for healthier lifestyles, encourage community engagement, and tackle social and environmental health factors. Individuals are encouraged to join and explore how Urban Health Design can **reshape cities into healthier and more inclusive environments**.

Master's Degree Program

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- Material Balance
- Material Bodies & Digital Phenomenology
- Digital Fabrication
- Algorithmic Design
- Circular Material Scouting
- Urban Health Design
- **Executive Design Development**
- Construction and Sustainability Design Studio
- Skills

The module includes explaining and transmitting professional and international **technical executive design procedures**.
Particular attention will be given to **envelope design** and engineering, crossing the borders between creativity and regulations.

Master's Degree Program

- Material Balance
- Material Bodies & Digital Phenomenology
- Digital Fabrication
- Algorithmic Design
- Circular Material Scouting
- Urban Health Design
- Executive Design Development
- **Construction and Sustainability Design Studio**
- Skills

This module provides students with practical experience in designing and implementing construction projects with a strong focus on sustainability. Students will have the opportunity to **explore and apply sustainable design principles** through a series of practical projects and **case studies**.
In addition, they will have the opportunity to develop skills in teamwork, communication and creative problem solving as they work to create innovative and sustainable solutions to the challenges of the built environment.

Master's Degree Program

- Material Balance
- Material Bodies & Digital Phenomenology
- Digital Fabrication
- Algorithmic Design
- Circular Material Scouting
- Urban Health Design
- Executive Design Development
- Construction and Sustainability Design Studio
- **Skills**

Participants dive into the essential qualities required for effective **project management** and **communication strategies**. Topics include communication strategies, team collaboration, conflict resolution, and leadership development. Through practical exercises and case studies, participants enhance their abilities to lead projects successfully, foster team cohesion, and navigate challenges with confidence.

Partners & Supporters

ACPV ARCHITECTS
ANTONIO CITTERIO PATRICIA VIEL

RIMOND

ATI | Project
CREATING A BETTER REALITY

a-fact
ARCHITECTURE FACTORY

Snøhetta

Henning Larsen

Deerns

GIÒFORMA

AIVOX

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baka studio

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Paolo Mazza
Architect, Partner

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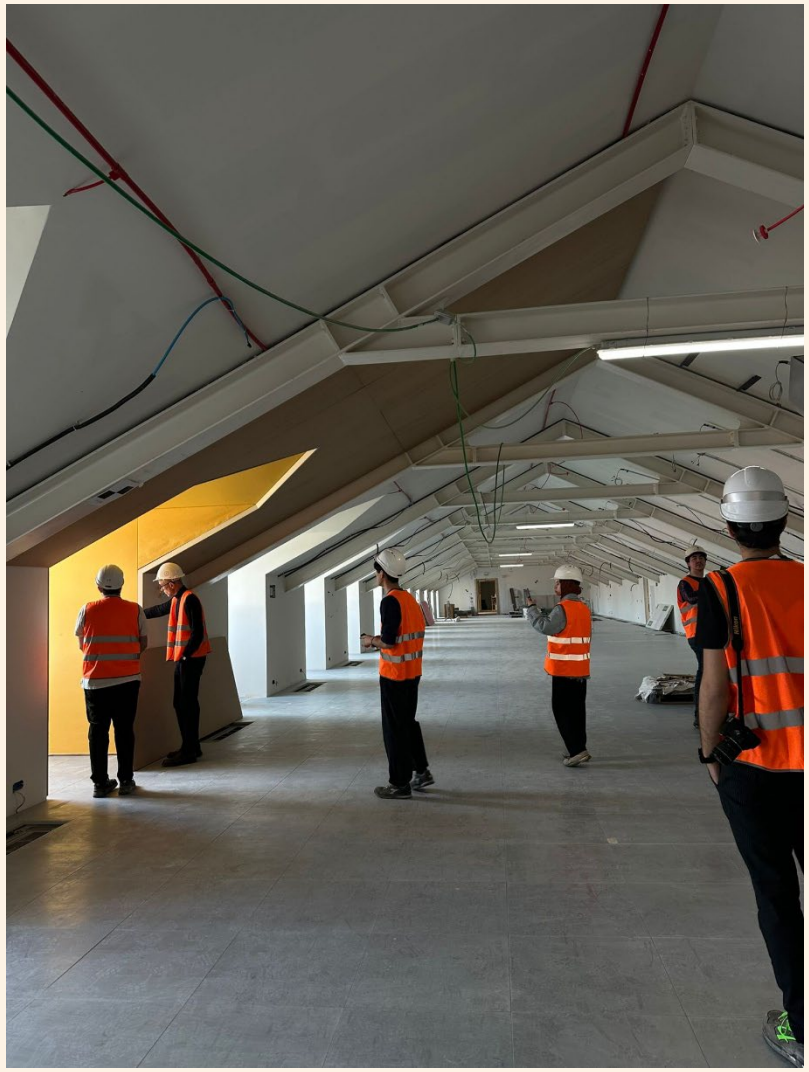

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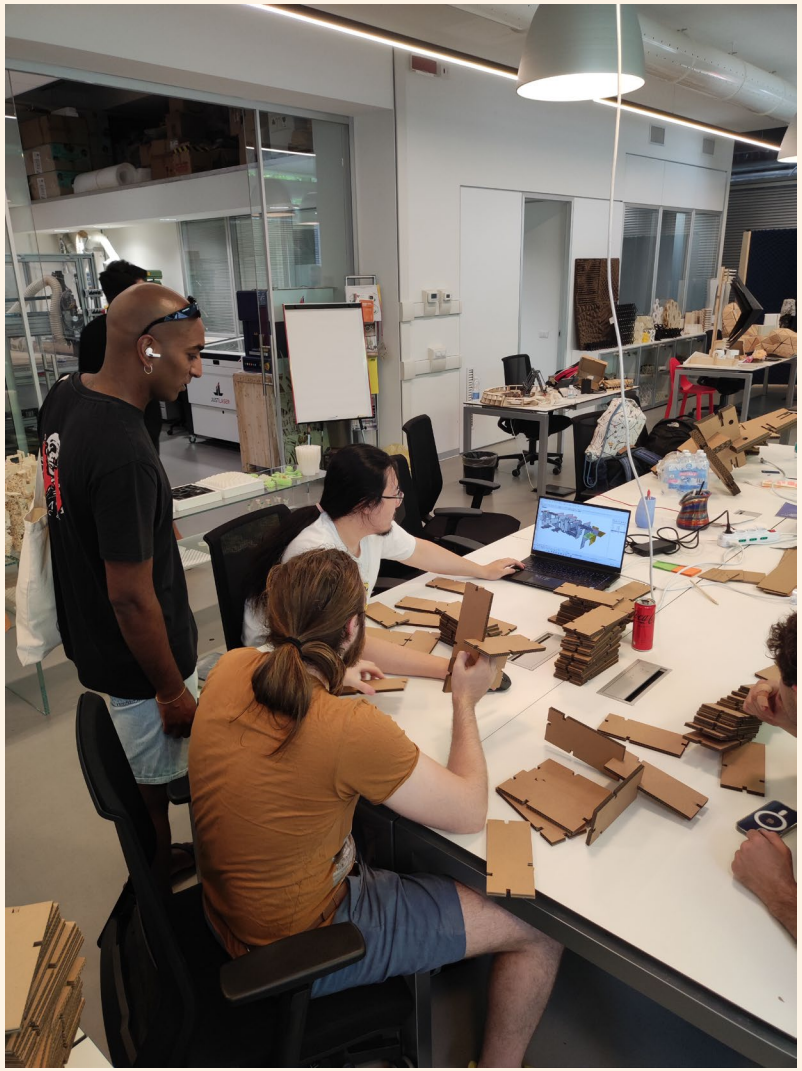
Mattia Giannetti; Luca Ofria;
Erica Scribano

R&D, BIM Coordinator
R&D, BIM Coordinator
BIM Specialist, AI Researcher



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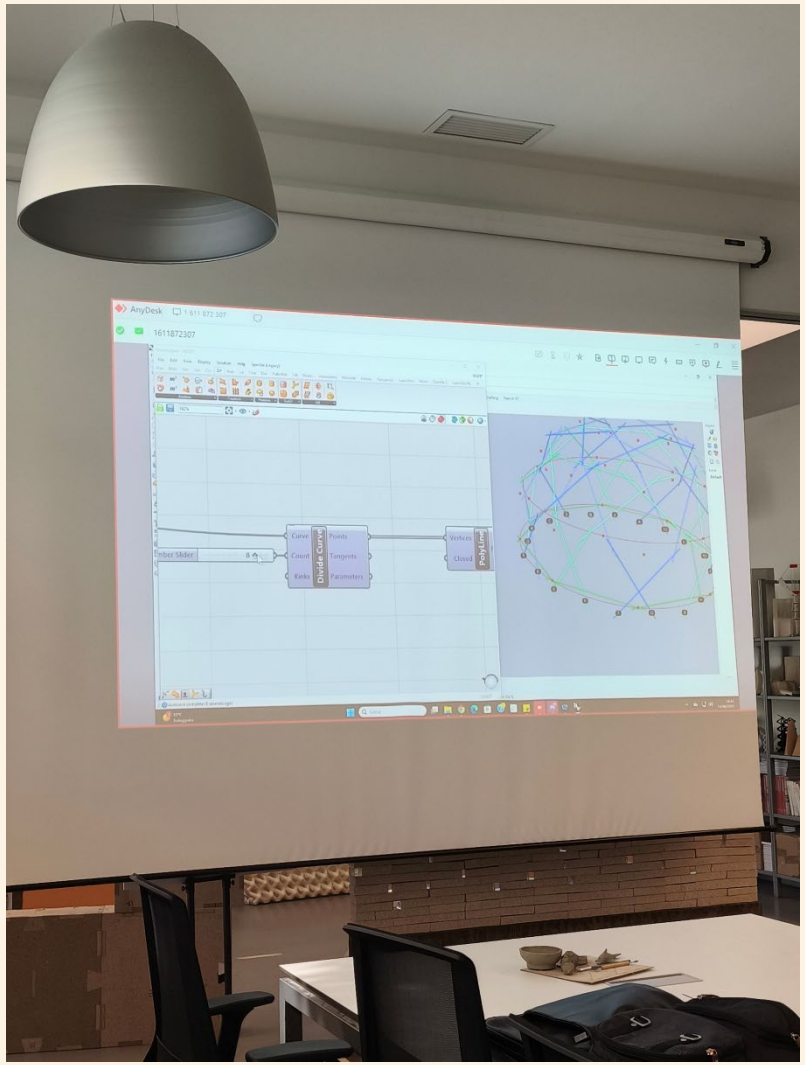

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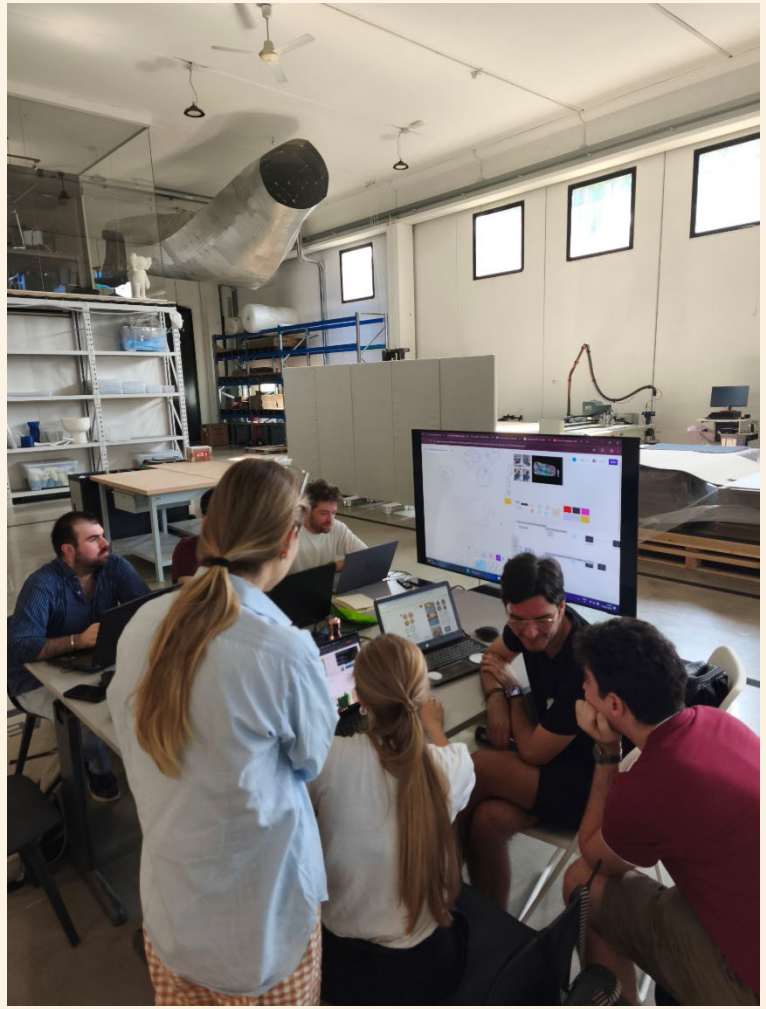
Francesco Perego, Matteo Lomaglio, Simone Oggiano

Computational designer
Digital manufacturing specialist
Creative technologist



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Deerns

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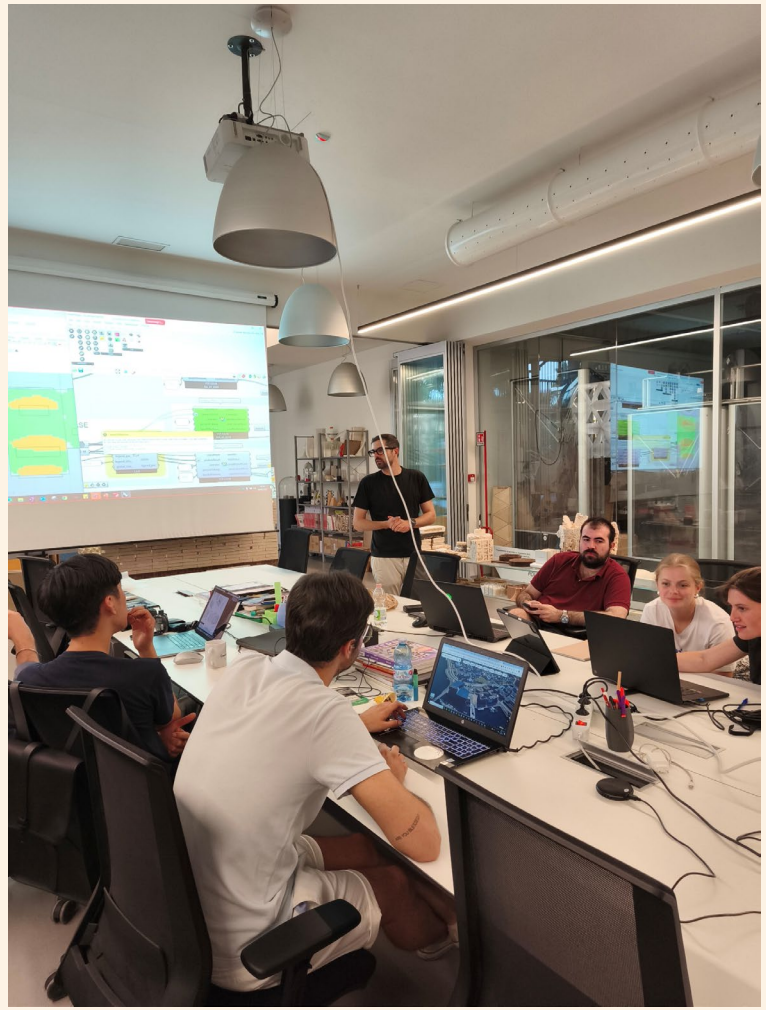
Giambattista Brizzi, Mattia Mariani, Mattia Esposito, Walter Tiano, Matilde Cedrone, Matthieu Majour

Senior Building Physics Specialist
Operations Director Building Performance Group
Sustainability Engineer and Energy Modeler
Acoustic Expert
Building Physics Engineer
Junior Building Physics Specialist



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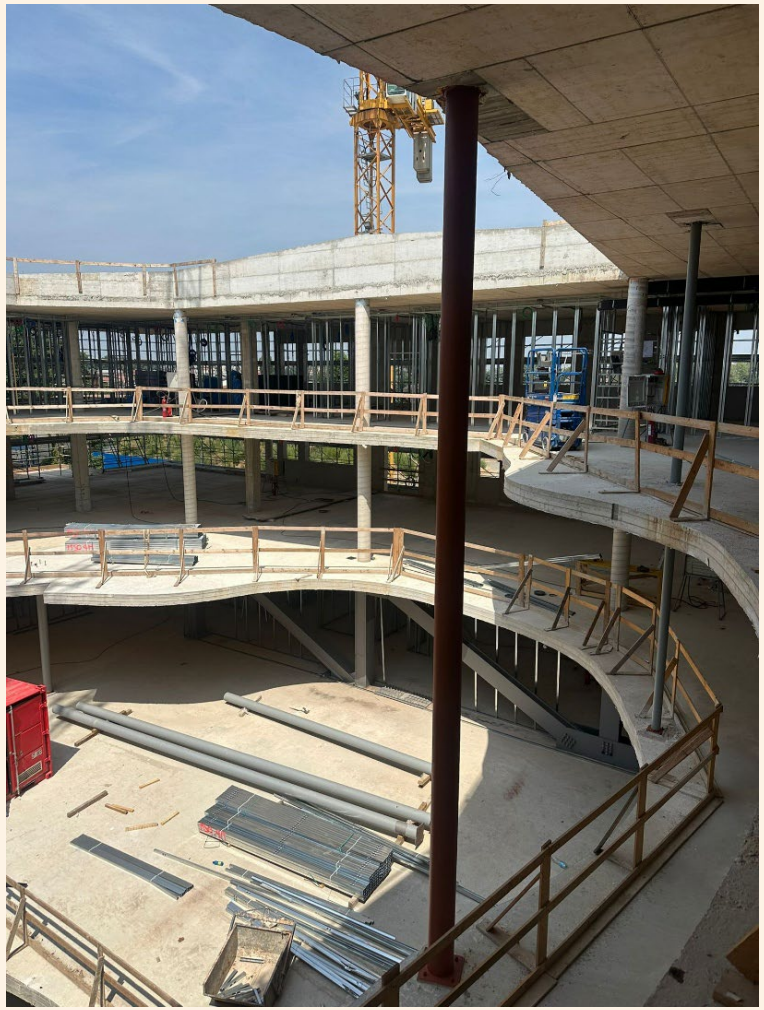
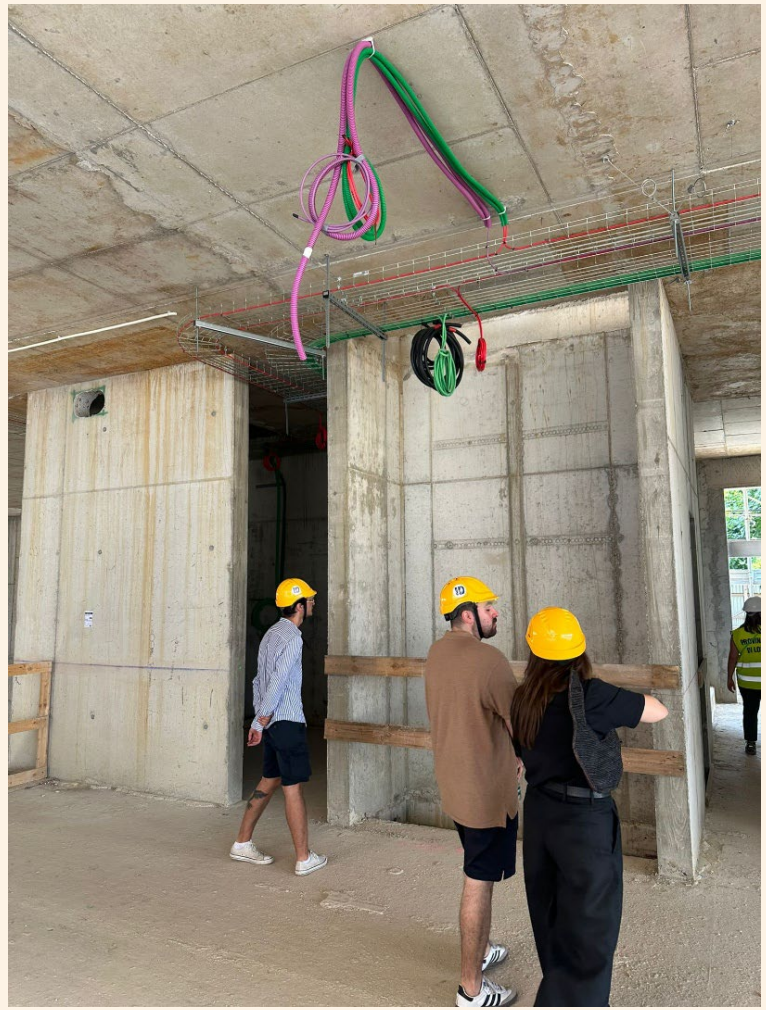
Giuseppina Vastola

Architect, project manager





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Material
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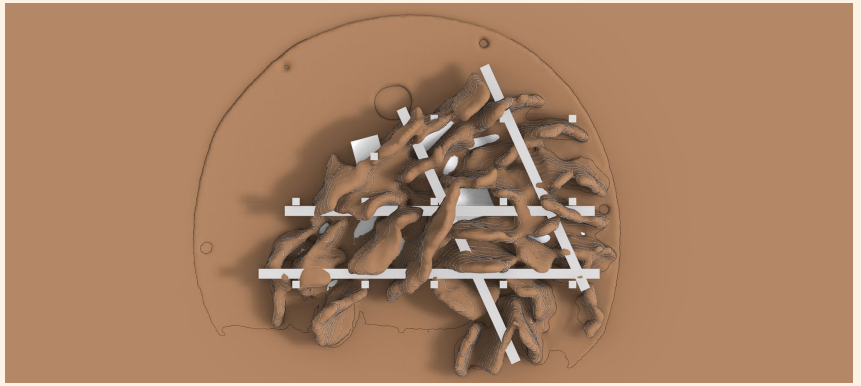
Giorgio Castellano
Phd, ABC Department
Architect, Baka studio architettura



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Activities /
Climate Fresk

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Activities / Prototyping

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Activities /
On-site lectures

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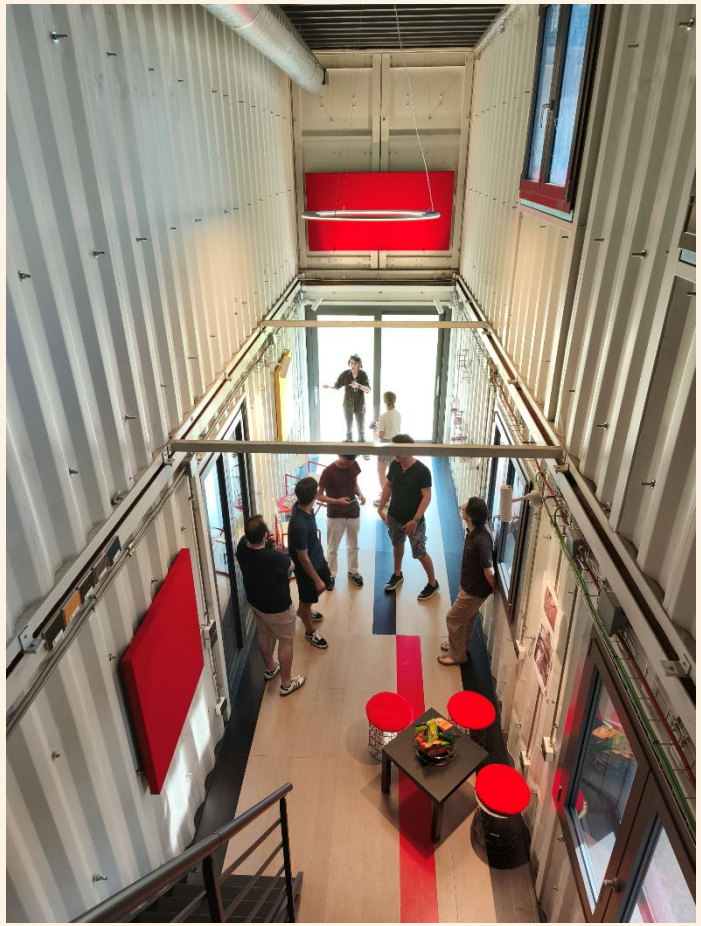
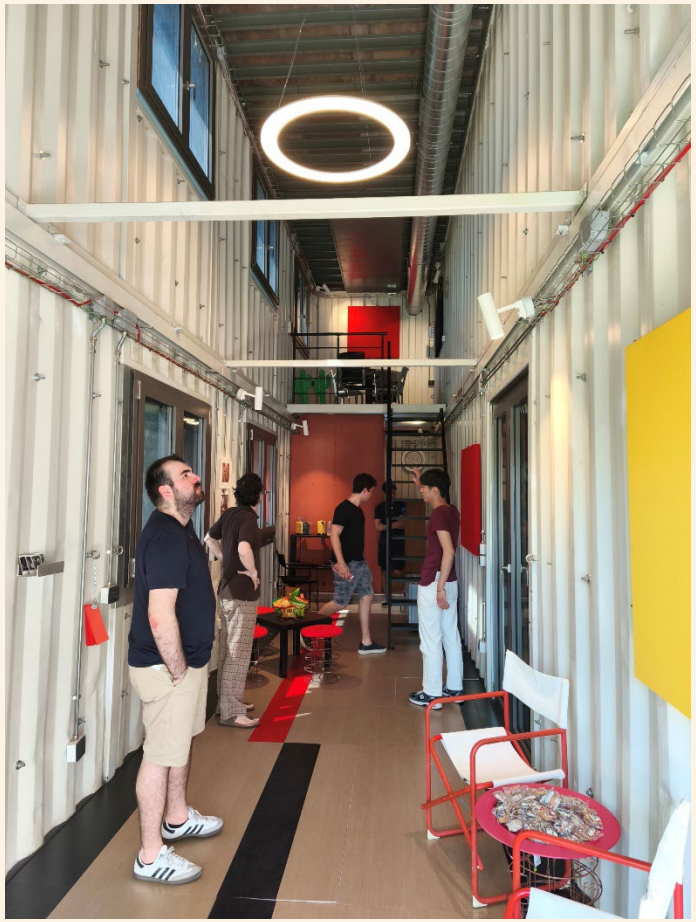
OFFLab cHOMgenius
Prof.ssa Elisabetta Ginelli, DABC, PhD candidate Giulia Vignati





Tuition fees

In-presence attendance

€ 7,516.00

Divided as follows:

- Politecnico di Milano enrolment fee is € 516.00
- Participation fee is € 7,000.00 per student

Online attendance

€ 4,516.00

Divided as follows:

- Politecnico di Milano enrolment fee is € 516.00
- Participation fee is € 4,000.00

Write to us to discover early bird discount !

Personal contacts

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