



POLITECNICO
MILANO 1863

DIPARTIMENTO DI ARCHITETTURA,
INGEGNERIA DELLE COSTRUZIONI
E AMBIENTE COSTRUITO

MATERIALBALANCE



DESIGN

I EDITION 2023/24

MASTER
I and II level

MATERIAL BALANCE DESIGN

DIGITAL TECHNIQUES AND CIRCULAR INNOVATIONS IN ARCHITECTURE

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DIGITAL TECHNIQUES AND CIRCULAR INNOVATIONS IN ARCHITECTURE

WHY THIS MASTER

Considering the growing interest and the increasingly recurring demand for figures capable of managing complex architectural projects, we are pleased to offer the I edition of the Master of level I and II “Material Balance Design. Digital Techniques and Circular innovations in Architecture”. The Master aims to train professionals to become **unique and anticipatory figures in the evolving context of architecture**. It will develop skills in digital techniques and strategies for circular innovations that are increasingly in demand in the national and international construction market that needs regeneration.

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The master's program is in **blended** mode with online theoretical sessions and in-person practical sessions at the ABC Department's Maba.SAPERLab Laboratory. The academic sessions aim to acquire basic technical-scientific knowledge that will then serve for the application sessions. The most advanced and sustainable methodologies of design, fabrication, and prototyping of architectural components will be explored during the latter. The course concludes with individual papers that foreshadow future scenarios for experimentation on the project, also developed through the internship experience.

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Director

Prof.ssa Ingrid Maria Paoletti - Politecnico di Milano

Technical Director

Prof. Massimiliano Nistri - Politecnico di Milano

Member of the master's Scientific Committee

Prof.ssa Maria Pilar Vettori - Politecnico di Milano

Prof.ssa Cinzia Maria Luisa Talamo - Politecnico di Milano

Prof. Francesco Pittau - Politecnico di Milano

Prof. Emilio Faroldi - Politecnico di Milano

Prof.ssa Laura Elisabetta Malighetti - Politecnico di Milano

Prof. Stefano Capolongo - Politecnico di Milano

Prof.ssa Alessandra Zanelli - Politecnico di Milano

Prof. Massimiliano Bocciarelli - Politecnico di Milano

Prof.ssa Valentina Rognoli - Politecnico di Milano

Prof.ssa Tiziana Poli - Politecnico di Milano

Members of the master's Technical Committee:

Andrea D'Antrassi - Associate partner | MAD Architects

Tommaso Maserati - Architect | Snøhetta

Nicholas Bewick - Art and Project Director | AMDL Circle

Francesco Forcella - Architect | AMDL Circle

Tommaso Pagnacco - Branch Manager | Bollinger+Grohmann

Stefano Converso | Università Roma Tre

Lorenzo Pirone - Team Coordinator, Comput.Designer | Rimond

Piero Fioretti - CEO & Founder | Versy

Francesco Perego - Founder | Materea

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EDUCATIONAL OBJECTIVE

The Master "Material Balance Design. Digital Techniques and Circular Innovations in Architecture" proposes to train new professionals capable of facing and managing complex projects through the synergy between digital technologies' potential and environmental balance needs. The course represents an opportunity to 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. Students will actively contribute to the study and creation of new principles, tools, processes, and innovative products that rethink the contemporary role of the designer.

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THEORETICAL BACKGROUND

WHAT IS MATERIAL BALANCE?

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

PUBLIC SPACE EXPERIMENTAL DEMONSTRATOR

yearly installation built in
POLIMI campus

FUTURE SCENARIOS/ METAVERSE

tools to anticipate
trends in
architecture

DIGITAL FABRICATION

as a computer-controlled digital production process, capable to produce solid and three-dimensional shapes starting from digital drawings. Deep analysis and study of innovative manufacturing techniques.

- ARCHITECTURAL DEMONSTRATOR
- ROBOTIC MANUFACTURING
- WOOD TECHNOLOGIES
- BESPOKE TEXTILE TECHNOLOGIES

ALGORITHMIC DESIGN

allows to optimize material use and the design process linking it to the specific site requirements and design needs. The module covers:

- PERFORMANCE-BASED DESIGN
- SUSTAINABLE ACOUSTIC MATERIALS
- THERMIC SIMULATIONS MATERIALS
- LIGHT FILTERING MATERIALS

MATERIAL BALANCE PROTOCOL

CIRCULAR MATERIALS SCOUTING

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

- BIO-BASED MATERIALS
- NATURE BASE SOLUTION

PROJECT COMMUNICATION

EXECUTIVE DESIGN DEVELOPMENT

Facade Technologies

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STUDY PLAN

The course will be held from March 2023 till February 2024. Until October 2023 the classes will be held every Monday and Thursday remotely (5:00 p.m. - 9:00 p.m.) and one weekend per month in-person (Thursday, Friday, and Saturday (9:00 a.m. - 6:00 p.m.) at Politecnico di Milano - Leonardo campus and/or remotely. The training concludes with in-depth activities:



from March 2023
to February 2024

- **Workshop:** Design exercise integrated on themes identified during the training process
- **Internship:** To be carried out 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

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ADMISSION REQUIREMENTS AND MODALITIES

Candidates with a Bachelor's and/or Master's degree in Engineering, Architecture, and related disciplines are admitted to the Master's program. Any other degree courses will be evaluated during the interview process. For foreigner candidates will be considered valid the equivalent degrees in their respective curricula.

DEADLINE: 20th February 2023

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FEES, CONTRIBUTIONS, AND FACILITIES

The total cost of the University Master's Degree is € 7,000.00 (V.A.T. exempt according to art. 10, Presidential Decree No. 633 of 26/10/1972, as amended), to be paid in three installments. This amount includes the registration fee for Politecnico di Milano of € 500.00.

Payment schedule :

I tranche € 2.500,00 at enrolment

II tranche € 2.500,00 by 05/06/2023

III tranche € 2.000,00 by 02/10/2023

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MASTER'S DEGREE PROGRAM

I Module

WHAT IS MATERIAL BALANCE ?

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

Professors: *Ingrid Maria Paoletti, Valentina Rognoli*

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MASTER'S DEGREE PROGRAM

II Module

ALGORITHMIC DESIGN

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.

Professors: Arturo Tedeschi , Tommaso Pagnacco

Companies: Arturo Tedeschi Computational Design , Bollinger+Grohmann

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MASTER'S DEGREE PROGRAM

III Module

PERFORMANCE BASED DESIGN

The module aims to develop skills for performance in the design workflow.

For this reason, the module has specific sessions on:

- General principles and simulations of sustainable acoustic materials;
- Principles and simulations of thermal optimization of confined spaces;
- General principles of natural and artificial light control;
- Integrate indoor environmental quality considerations.

Professors: Andrea Giglio, Tiziana Poli, Stefano Capolongo, Alessandra Zanelli, Cinzia Maria Luisa Talamo

Companies: TBA

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MASTER'S DEGREE PROGRAM

IV Module

DIGITAL FABRICATION

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.

Professors: Giorgio Castellano, Massimiliano Bocciarelli, Maria Anishchenko, Tommaso Pagnacco,
Francesco Perego

Companies: MAD, Materea, Spazio Meta , Rimond, Bollinger+Grohmann

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MASTER'S DEGREE PROGRAM

V Module

SOFT SKILLS: PROJECT COMMUNICATION

Communication is one of the essential soft skills nowadays. This Module will discuss the 360° communication management of a project that aims to manage stakeholder relations, develop strategies and plans to carry out elaborate and appropriate communication outputs and activities for different stakeholders and apply skills to enhance the effectiveness of communications.

Professors: Paola Mungo, Elena Carpani

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VI Module

CIRCULAR MATERIALS SCOUTING

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.

Professors: Olga Beatrice Carcassi, Francesco Pittau, Laura Elisabetta Malighetti

Companies: TBA

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MASTER'S DEGREE PROGRAM

VII Module

EXECUTIVE DESIGN | BUILDING ENVELOPE

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

Dedicated companies will be invited.

Professor: Massimiliano Nastri, TBA

Companies: TBA

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MASTER'S DEGREE PROGRAM

VIII Module

PUBLIC SPACE EXPERIMENTAL DEMONSTRATOR

The public space experimental demonstrator will be the occasion to use a real test bed as Mind site to design and develop a real mix-functional structure with innovative techniques and materials.

Professors: Maria Pilar Vettori, Emilio Faroldi

Companies: TBA

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MASTER'S DEGREE PROGRAM

IX Module

FUTURE SCENARIOS - METAVERSE

Through theoretical speculation and scenario building, this module explores how the conception, design, production, and use of architecture and cities will be influenced by radical environmental changes, social revolutions, and technological development.

A specific exercise will be done on a metaverse space.

Professors: Marta D'alessandro, Federico Leoni, Piero Fioretti

Companies: Versy

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MASTER'S DEGREE PROGRAM

X Module

MATERIAL BALANCE PROTOCOL

This module aims to help designers to rediscover a material, environmental and social culture. The material balance protocol is created to provide clear and practical methods and tools to navigate this maze and effectively translate climate crisis awareness into design practice.

Professors: Olga Beatrice Carcassi, Ingrid Maria Paoletti, Niccolò Aste

Companies:

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ACQUIRED SKILLS

- Material scouting
- Computational tools like Rhino and Grasshopper
- Performance-based software and their integration
- Knowledge of digital fabrication techniques
- Carbon foot user-friendly calculation tool
- Metaverse creator platform
- Material Balance Protocol

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EMPLOYMENT OPPORTUNITIES

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. Prestigious institutional and industrial partners will support the Master.

Occupational sectors:

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

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

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OUR PARTNERS

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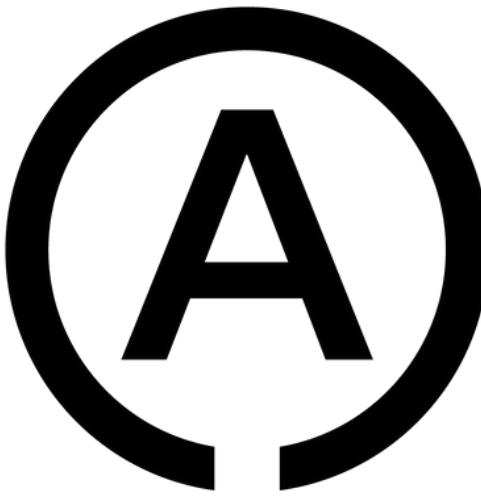
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mad
architects



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 **MDL CIRCLE**



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Snøhetta



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BOLLINGER+GROHMANN



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MATEREA

Automate the non-standard



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10%*

Payment schedule :

I tranche € 2.350,00 at enrolment

II tranche € 2.000,00 by 05/06/2023

III tranche € 2.000,00 by 02/10/2023

*The promotion is valid for the first 10 participants

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FOR INFORMATION:

materialbalance-dabc@polimi.it

materialbalance.polimi.it

To stay updated follow us on our channels :



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