

**Second cycle degree in
Building Engineering -
Architecture**



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA



The programme

Ingegneria Edile- Architettura

Un percorso di studi innovativo per affrontare i temi più attuali nell'area UE come il cambiamento climatico, l'integrazione culturale, la conservazione dell'identità urbana, l'economia circolare.



SEDE
Bologna



CLASSE DI CORSO
LM-4 – Architettura e Ingegneria Edile-Architettura



TIPO DI CORSO
Laurea Magistrale

<https://corsi.unibo.it/magistrale/IngegneriaEdileArchitettura>

Architectural Engineering

An innovative and multidisciplinary training to plan and manage all aspects of buildings in the context of building renovation, new construction and urban regeneration.



PLACE OF TEACHING
Bologna



DEGREE PROGRAMME CLASS
LM-4 – Architettura e Ingegneria Edile-Architettura



DEGREE TYPE
Master's degree

<https://corsi.unibo.it/2cycle/ArchitectureEngineering>



The programme

Ingegneria Edile- Architettura

Un percorso di studi innovativo per affrontare i temi più attuali nell'area UE come il cambiamento climatico, l'integrazione culturale, la conservazione dell'identità urbana, l'economia circolare.



SEDE
Bologna



CLASSE DI CORSO
LM-4 – Architettura e Ingegneria Edile-Architettura



TIPO DI CORSO
Laurea Magistrale

<https://corsi.unibo.it/magistrale/IngegneriaEdileArchitettura>

Architectural Engineering

An innovative and multidisciplinary training to plan and manage all aspects of buildings in the context of building renovation, new construction and urban regeneration.



PLACE OF TEACHING
Bologna



DEGREE PROGRAMME CLASS
LM-4 – Architettura e Ingegneria Edile-Architettura

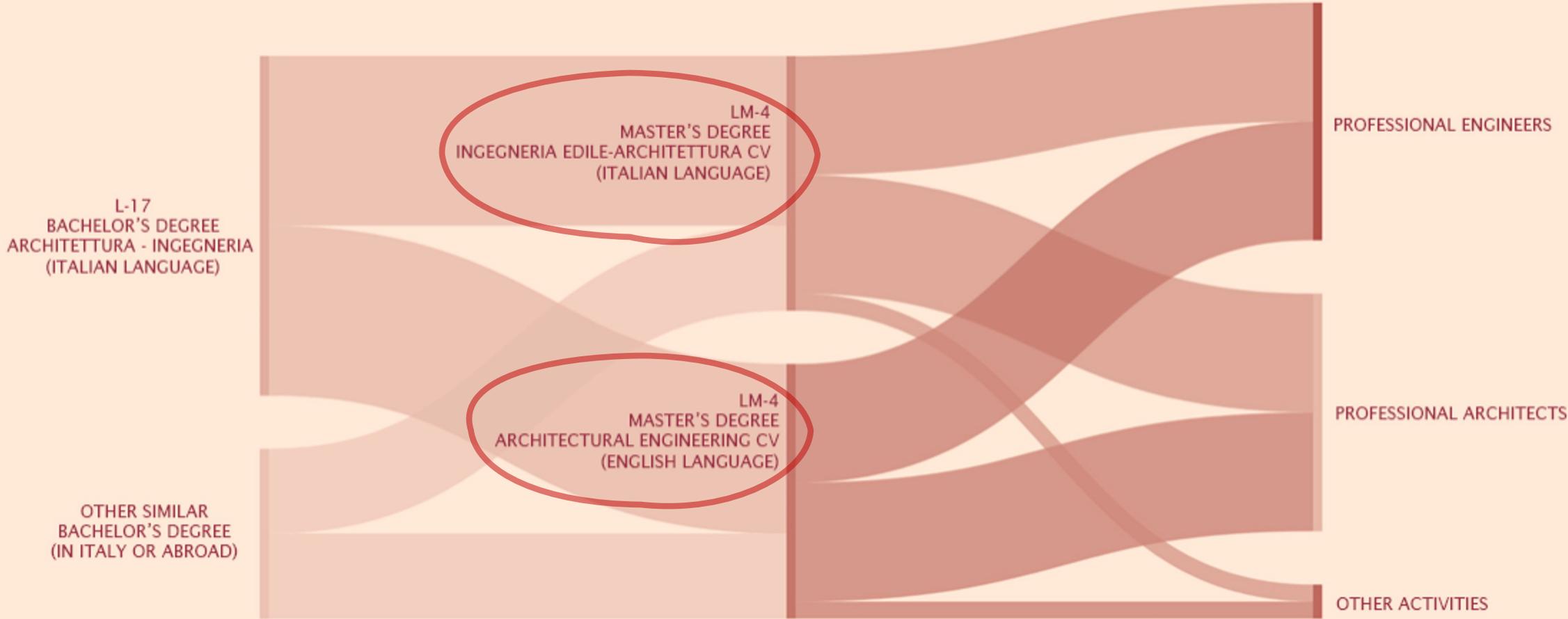


DEGREE TYPE
Master's degree

<https://corsi.unibo.it/2cycle/ArchitectureEngineering>



The training project



Highlights

The degree course is aimed at future **Building Engineers-Architects** who wish to undertake an innovative and multidisciplinary training allowing them to **plan and manage all aspects of buildings** in the context of **building renovation, new construction** and **urban regeneration**, adopting a conscious approach to the **use of materials, technologies and energy sources**

KEYWORDS

Innovative strategies
Complex buildings
Urban context integration
Landscape design
Quality of life



Internazionalization



This is an **International Master degree**:

- It is completely taught in **English Language**
- It has an international approach to teaching
- It has a **global point of view of the Architecture and Engineering field**, thanks to the involvement of the professors in International and European projects
- It includes **students from all over the world**: attending this programme means studying in an International environment

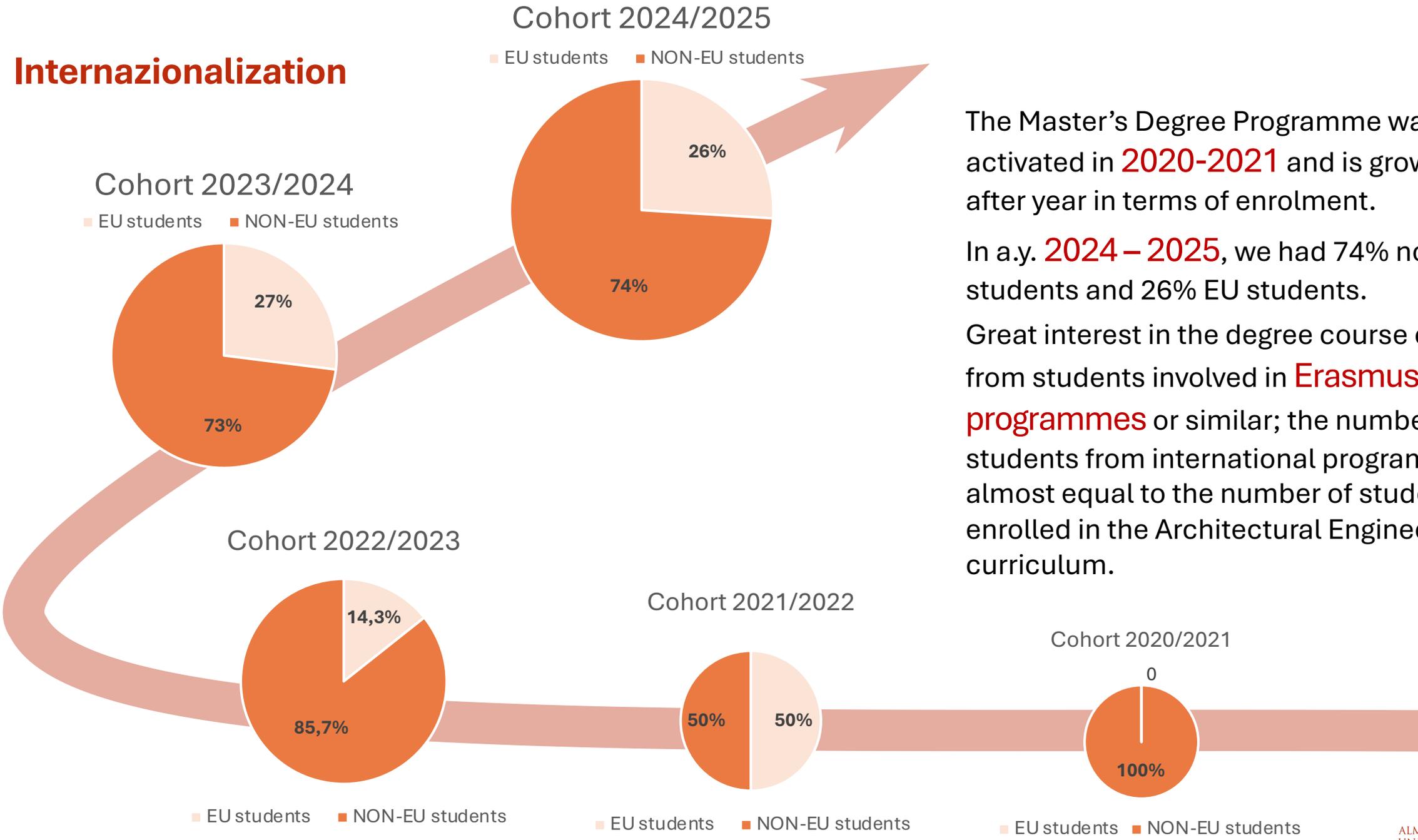
KEY POINT

European Acknowledgment of the title

Graduates will be allowed to work as Architects all over Europe



Internazionalizzazione



The Master's Degree Programme was first activated in **2020-2021** and is growing year after year in terms of enrolment.

In a.y. **2024 – 2025**, we had 74% non-EU students and 26% EU students.

Great interest in the degree course comes from students involved in **Erasmus + studio programmes** or similar; the number of students from international programmes was almost equal to the number of students enrolled in the Architectural Engineering curriculum.



Teaching activities

Students will deepen the knowledge in disciplinary areas related to both architecture and engineering.

Architecture area – architectural representation and design, history of architecture, restoration technique

Engineering area – structural analysis, building management, sustainable building design and Building Information Modeling

The programme is completed by insights on **urban economics** and **building cost analysis** and by the study of **urban planning and regeneration techniques** aiming at promoting sustainable, inclusive and healthy cities.



KEY FEATURES

Design workshops to prepare for teamwork.

Work placement, to prepare for the future career and professional challenges



Admission Procedures



Title required

Bachelor's degree in Architecture (**L-17, L-7, L-23** for Italian students) or similar;

In case of Italian Bachelor's degree, passing the **ARCHED test** is required;

Foreign titles will be evaluated by the admission board



Document requested and evaluated by the board

The training curriculum: exam grades and graduation mark, teaching program of the bachelor's degree;

Portfolio of works, including texts and iconographic material, documented internship or extracurricular work experience;

Fully documented internship or extra-curricular work experience;

Other certified and documented research or extracurricular training titles

English language skills: **at least B1 level**

The first call for application will open on **March, 9th**

Number of available places:
40 (30 reserved to NON-EU students)



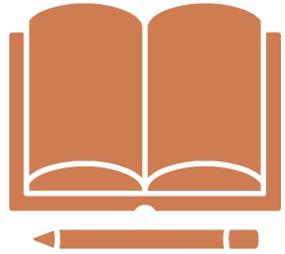


The study plan

1st year

- Advanced Building Physics
- Built Heritage Workshop I.C. (*Heritage Conservation + Construction History*)
- Geomatics for Urban and Regional Analysis
- Sustainable Building Design Workshop I.C. (*Building Technologies + Building Design*)
- Sustainable Building Process Workshop I.C. (*Advanced Building Site + Cost Analysis*)
- Architectural Design and Building Information Modeling Workshop I I.C. (*Architectural Design I + Building Information Modeling I*)
- Structural Engineering and Design





The study plan 2nd year

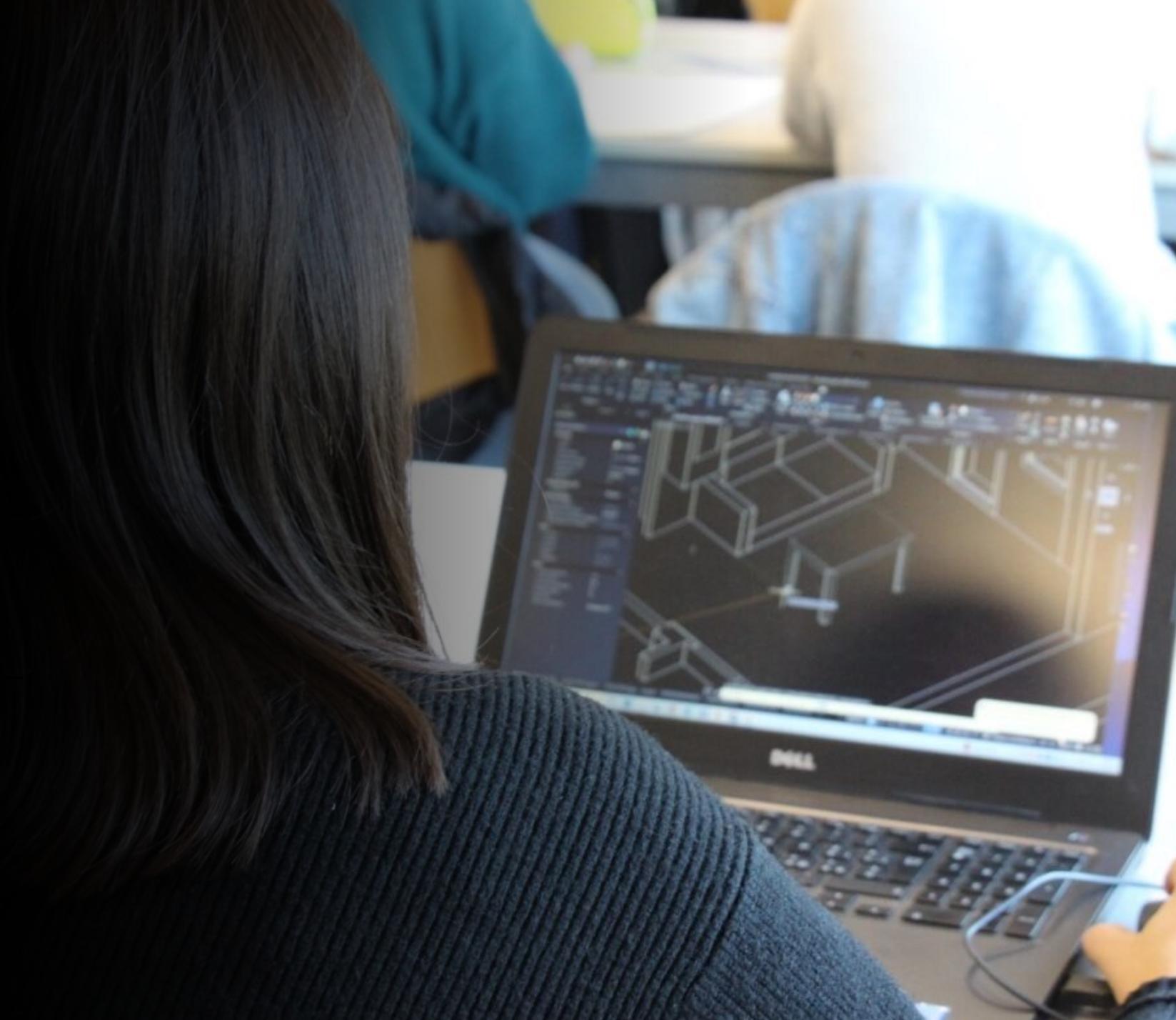
- Project Management Workshop I.C. (*Construction and Facility Management + Managing Engineering and Construction Processes*)
- Architectural Design and Building Information Modeling Workshop II I.C. (*Architectural Design II + Building Information Modeling II*)
- Sustainable Urban Design and Planning Workshop I.C. (*Planning in a Changing Society + Planning in a Changing Climate*)
- Building Renovation Workshop I.C. (*Historic Building Techniques + Building Renovation Project*)
- English Language Test B-2
- Two Elective Courses*
- Internship
- Final Examination

* ELECTIVE COURSES:

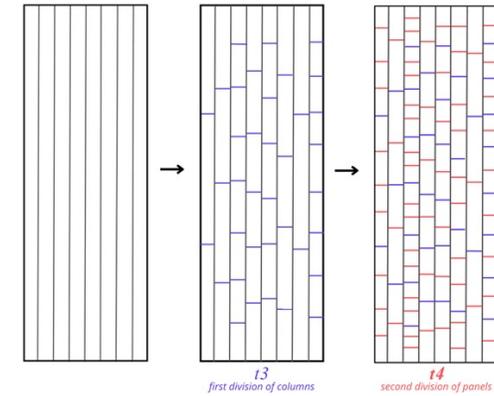
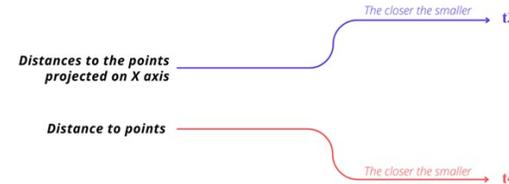
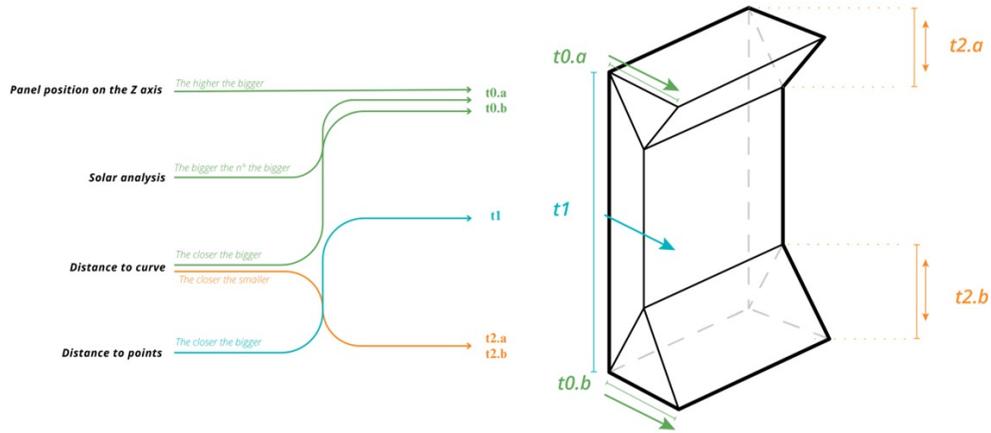
- Mechanics of Historical Masonry Structures
- Structural Strengthening & Rehabilitation
- Material and Sustainability
- Building Energy Modeling
- History and Cultural Heritage in European Cities



Teaching courses and design workshops

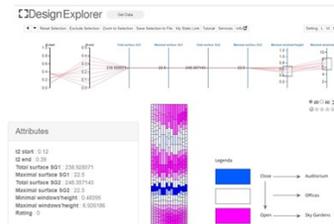
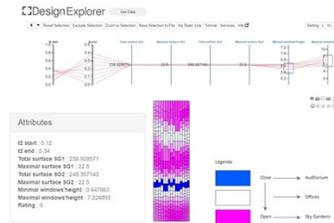
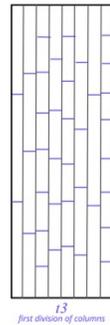
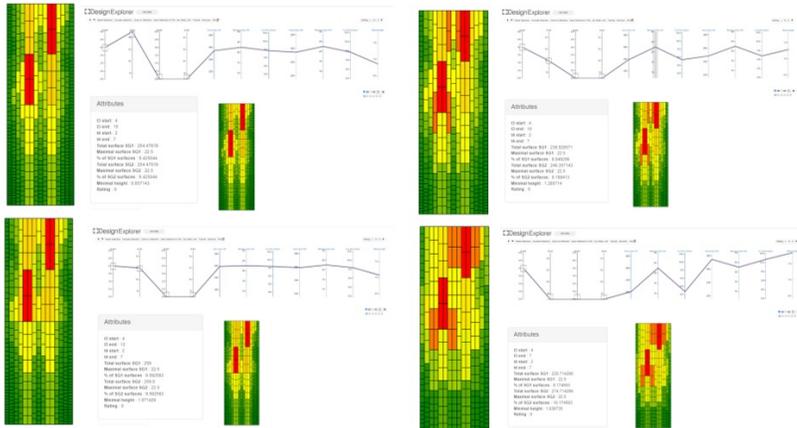


Architectural Design and Building Information Modeling Workshop I I.C. (Architectural Design I)

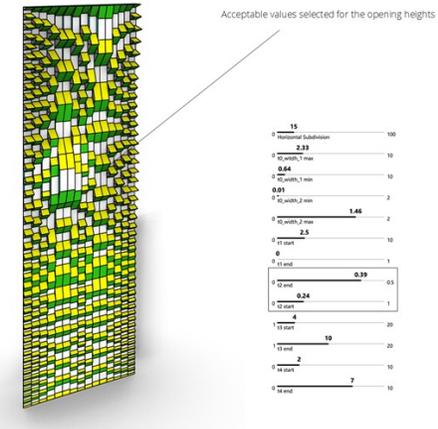


Configuration tests Parameter t3

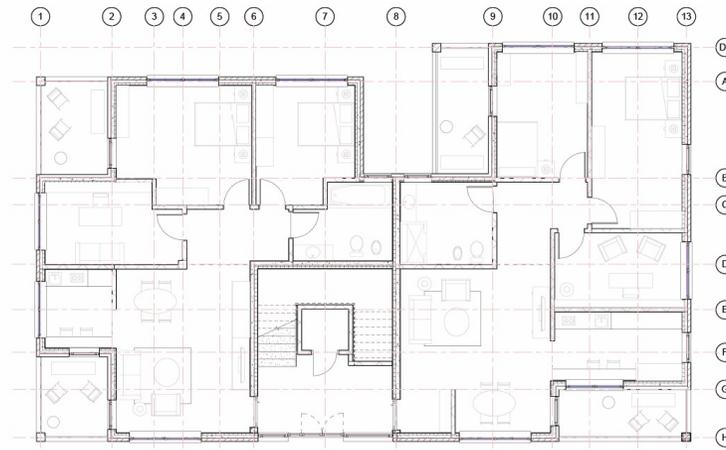
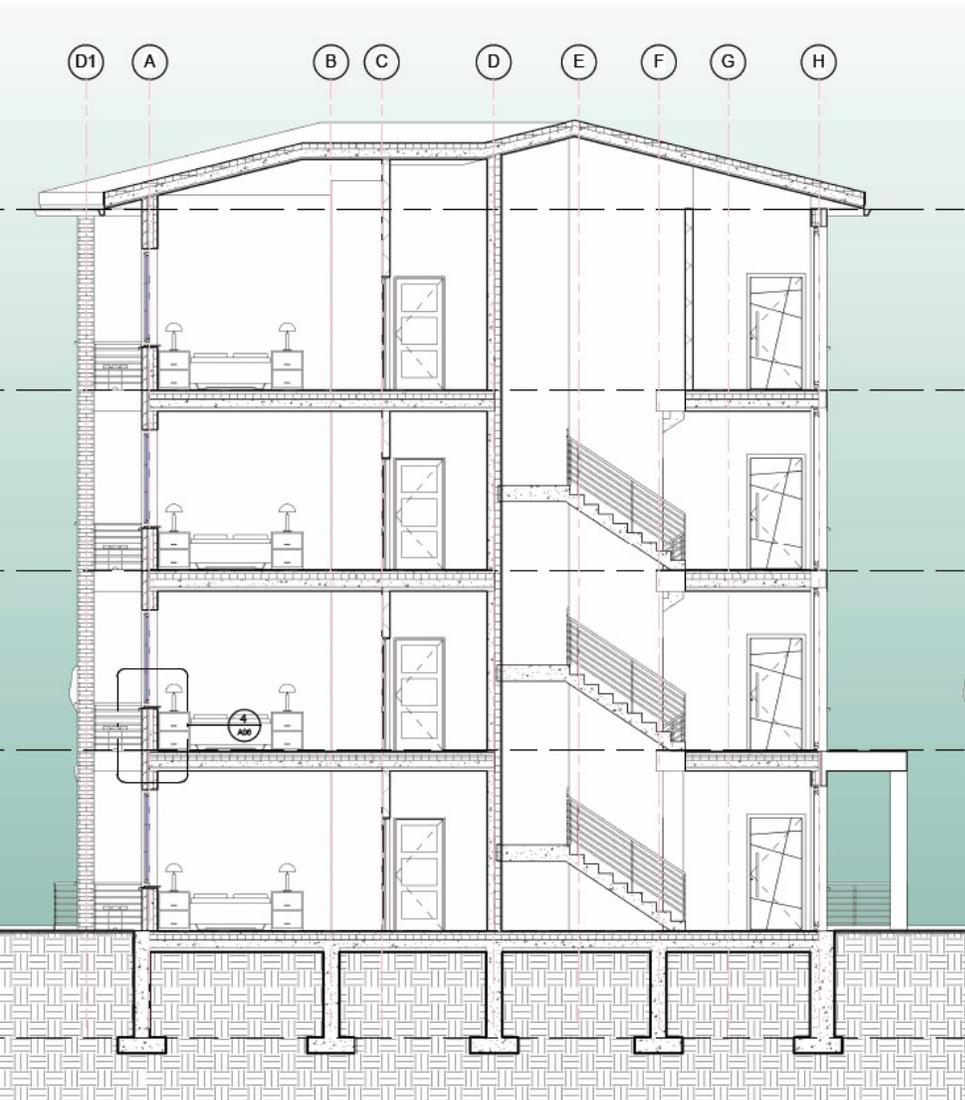
Aim of the test: Interrogate the facade, on what is the maximum and minimum surface and height of the panels, where the sky gardens are located.



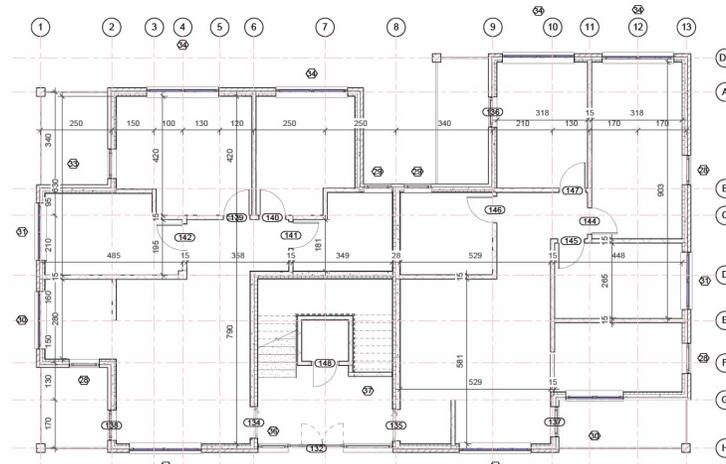
Aim of the test: Interrogate the openings, on what is the maximum and minimum height.



Architectural Design and Building Information Modeling Workshop I I.C. (Building Information Modeling I)



1 00 - Ground level
1:50



3 00 - Ground level
Annotations



2 00 - Ground level Color
Rooms

- Room Legend
- Bedroom
 - Bedroom
 - Hallway
 - Kitchen
 - Living Room
 - Staircase
 - Studio

| Room Schedule level 1 | | | | |
|-----------------------|-------------|-------------------|-------------------|----------------------|
| Number | Name | Level | Area | Volume |
| 1 | Bedroom | 00 - Ground level | 19 m ² | 56.23 m ³ |
| 2 | Bedroom | 00 - Ground level | 14 m ² | 40.52 m ³ |
| 3 | Studio | 00 - Ground level | 13 m ² | 38.72 m ³ |
| 4 | Hallway | 00 - Ground level | 7 m ² | 20.40 m ³ |
| 5 | Bathroom | 00 - Ground level | 8 m ² | 25.44 m ³ |
| 6 | Kitchen | 00 - Ground level | 7 m ² | 19.74 m ³ |
| 7 | Living Room | 00 - Ground level | 28 m ² | 83.57 m ³ |
| 8 | Staircase | 00 - Ground level | 24 m ² | 83.09 m ³ |
| 9 | Living Room | 00 - Ground level | 31 m ² | 92.57 m ³ |
| 10 | Kitchen | 00 - Ground level | 11 m ² | 32.87 m ³ |
| 11 | Studio | 00 - Ground level | 12 m ² | 35.58 m ³ |
| 12 | Hallway | 00 - Ground level | 8 m ² | 22.65 m ³ |
| 13 | Bathroom | 00 - Ground level | 9 m ² | 28.26 m ³ |
| 14 | Bedroom | 00 - Ground level | 20 m ² | 59.29 m ³ |
| 15 | Bedroom | 00 - Ground level | 14 m ² | 42.39 m ³ |

Architectural Design and Building Information Modeling Workshop I I.C. (Building Information Modeling I)



| Multi-Category Material Takeoff Copy 1 | | |
|--|---------------------|----------------------|
| Material: Name | Material: Area | Material: Volume |
| Floor hatch | 54 m ² | 0.05 m ³ |
| Glas GEALAN | 274 m ² | 5.13 m ³ |
| Glass | 178 m ² | 3.35 m ³ |
| Glass - Clear, Grey | 62 m ² | 0.19 m ³ |
| Glass - SVF - Transparent | 8 m ² | 0.10 m ³ |
| Glass, White, High Luminance | 0 m ² | 0.00 m ³ |
| GRANITO | 86 m ² | 6.14 m ³ |
| Grass | 7534 m ² | 91.19 m ³ |
| Gypsum Wall Board | 427 m ² | 6.39 m ³ |
| Hags - HPL Black | 5 m ² | 0.02 m ³ |
| Hags - HPL Dark Grey | 5 m ² | 0.04 m ³ |
| Hags - Plastic - Black | 7 m ² | 0.19 m ³ |
| Hags - Plastic - Vibrant Green | 0 m ² | 0.00 m ³ |
| Hags - Steel | 3 m ² | 0.03 m ³ |
| Hags - Steel - Galvanized | 0 m ² | 0.00 m ³ |
| Hags - Steel - Grey | 7 m ² | 0.12 m ³ |
| Hags - Steel - Light Grey | 6 m ² | 0.01 m ³ |
| Hags - Steel - Powder coated - Red | 4 m ² | 0.06 m ³ |
| Hags - Steel - Slide | 6 m ² | 0.00 m ³ |
| Hags - Steel - Vibrant Green | 3 m ² | 0.06 m ³ |
| Hags - Wood - Bark brown | 17 m ² | 0.30 m ³ |



2 Section 2 Realistic
1:100

Sustainable Building Design Workshop I.C.



pro:Holz
student
TROPHY 24

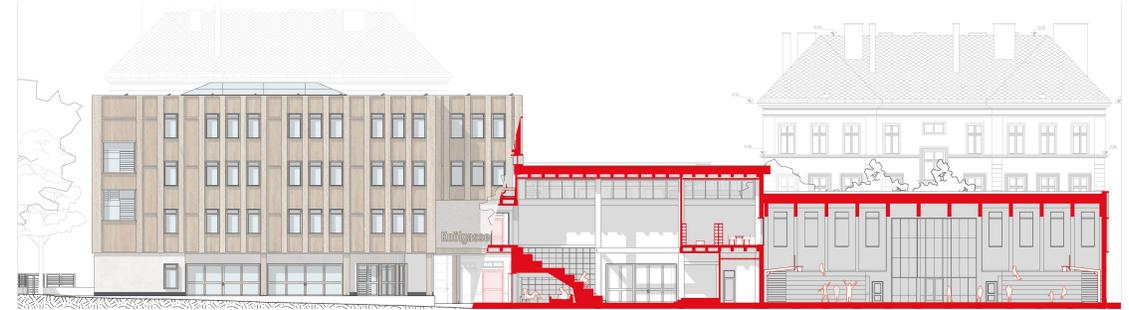
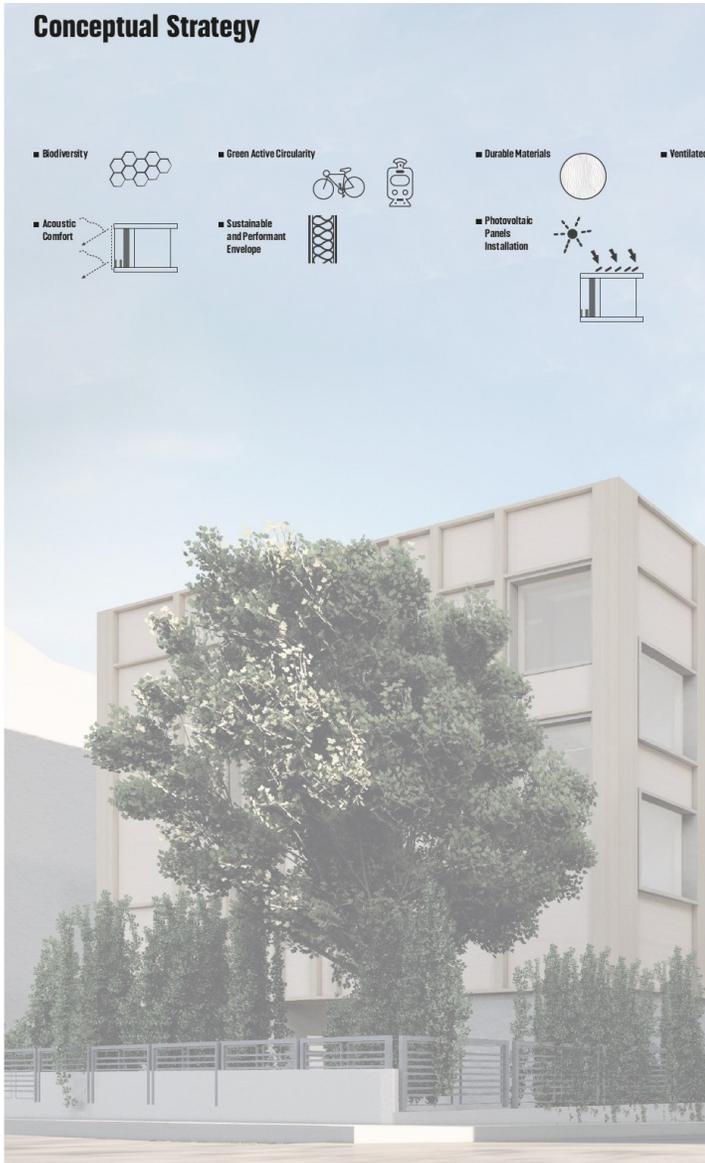


woodency
An open competition for
timber construction



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

Sustainable Building Design Workshop I.C.

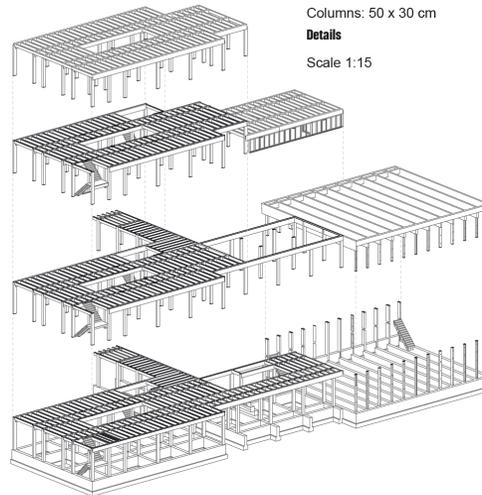


pro:Holz
student
TROPHY 24

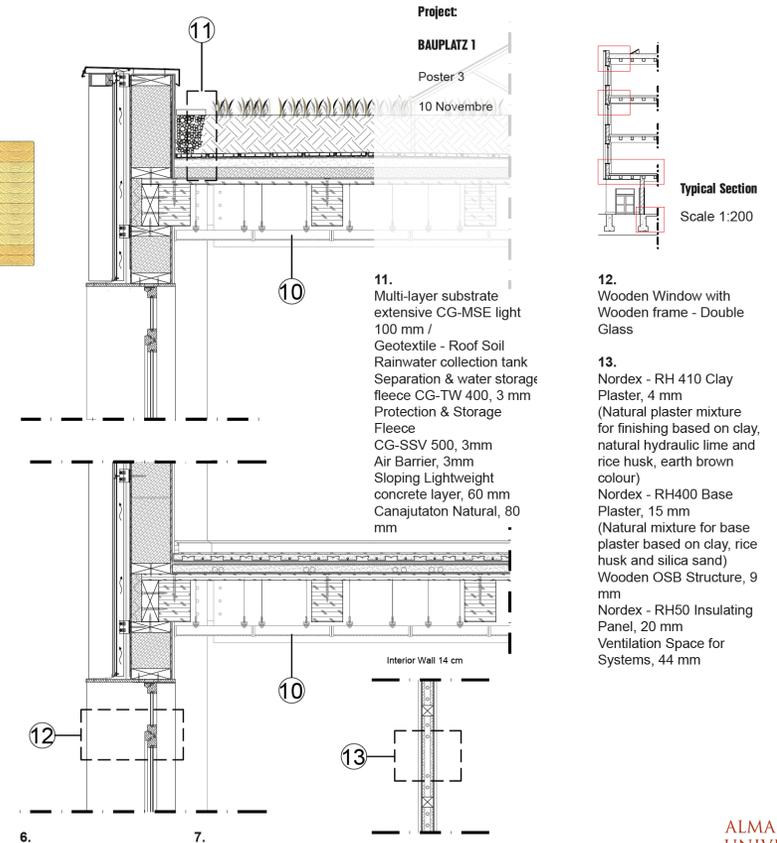


woodency
An open competition for
timber construction

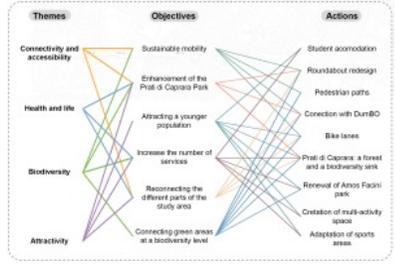
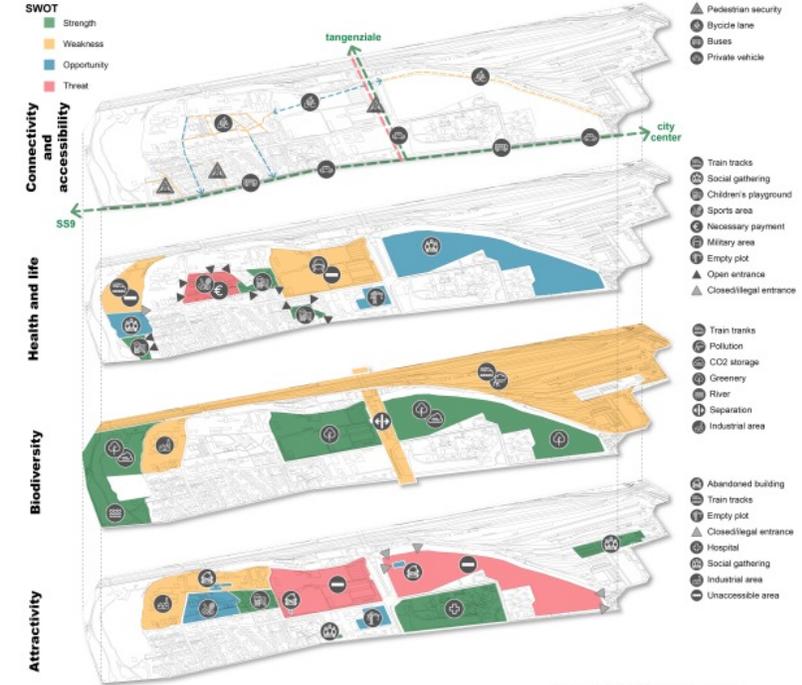
Dimensions Glue Laminated Timber Pieces
Girders: 48 x 32 cm
Secondary Beams: 32 x 24 cm
Columns: 50 x 30 cm
Details
Scale 1:15



Posts and Beams Structure



Sustainable Urban Design and Planning Workshop I.C.



Focus project 3: Prati di Caprara

For our third focus project, we open part of the Prati di Caprara park to the public, leaving it in its natural state.

To conserve the rich biodiversity of the area we will also use the abandoned structure to the northwest as a social meeting point.

The darkened area is the part we keep closed to the public as to conserve its rich fauna and flora diversity, based on the study of species we did in Phase 2.

Connection between projects

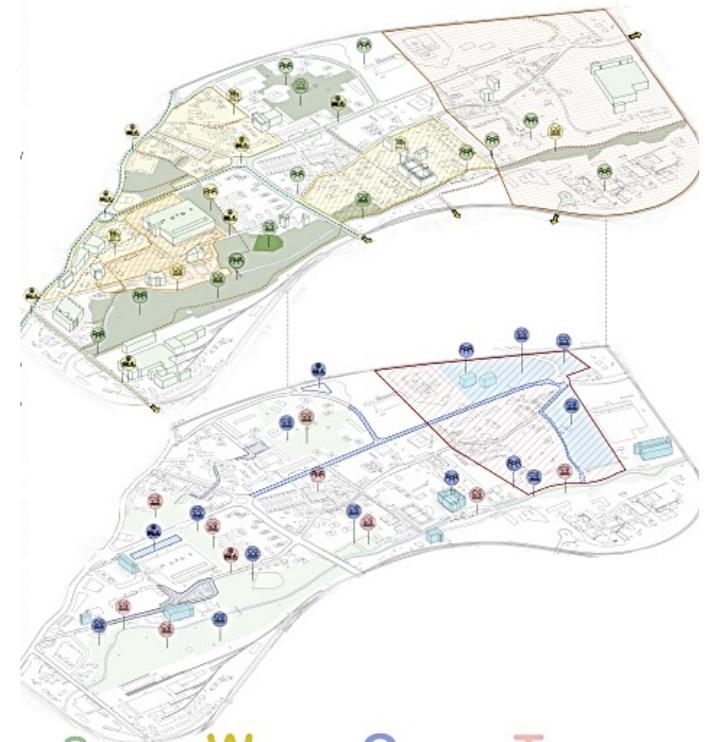


To guide people from one point to the other, we renewed the paths connecting our three focus projects.

The roundabout in Via Prati di Caprara has been redesigned to provide a more direct access from the opened park to the student accommodation center.

We also used the walls across Via Paolo Nanni Costa, covering them with colored panels to create interest and attract people from the accommodation center to the Portofino Park, main point of access to the multiactivity space.

We also added colored lines on the floor to guide people depending on the interest: orange following the bicycle lane, green to the green spaces, blue to areas with activities and purple to areas of reunion.



| Strengths | Weaknesses | Opportunities | Threats |
|---|--|--|--|
| <ul style="list-style-type: none"> High quality green areas Presence of Urban Agriculture Regulating Ecosystem Services supply Recreational Ecosystem Services supply | <ul style="list-style-type: none"> Lack of Green Areas Unaccessibility and Bad management of Naville Canal area Lack Recreational facilities Lack of Public Transport Lack of connections to the surrounding area Fragmented cycle path Unsafe Hybrid roads Traffic congestion Urban heat island High Co2 Emission | <ul style="list-style-type: none"> Increase of Urban Agriculture Tree Planting Increase the supply of Ecosystem Services Abandoned Area Potential Area for a New Cycle Path Potential area for additional Bus Stop Potential area for Car Sharing Station New Recreational Activities New Cultural Events Potential Meeting points Abandoned Building Generification | <ul style="list-style-type: none"> Maintenance of Green areas Maintenance of the Naville Canal Lack of urban lighting Noise pollution Abandonment or misuse of Sharing Mobility Increase of traffic Ageing of inhabitants |



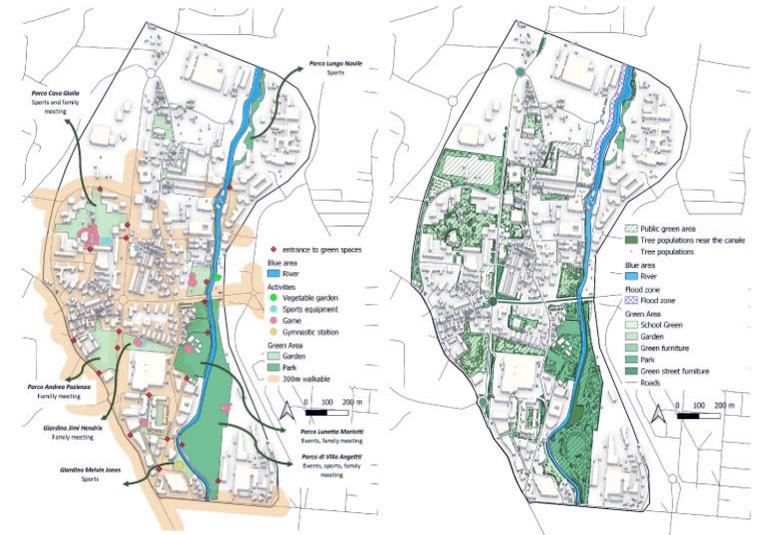
With our first focus project, we will create a living space for students through the provision of new accommodation and services, alleviating the accommodation problem in Bologna and moving people from the city center to the outskirts of the city. The buildings will mainly provide student accommodation to meet the high demand the city is dealing with.

With our second focus project, we will give activities and points of interest for the new young and student population we have welcomed into the neighborhood with our first project. Abandoned buildings in the northern part of the Portofino Park are being used to create new premises, offering services such as a place to study, rooms for association activities or a place to work for older people. These premises will be accessible to all the population and will offer activities for all ages. In addition, this project will also connect the residential areas in the industrial zone to the rest of the areas and revitalize this part of the district.



Sustainable Urban Design and Planning Workshop I.C.

Environment



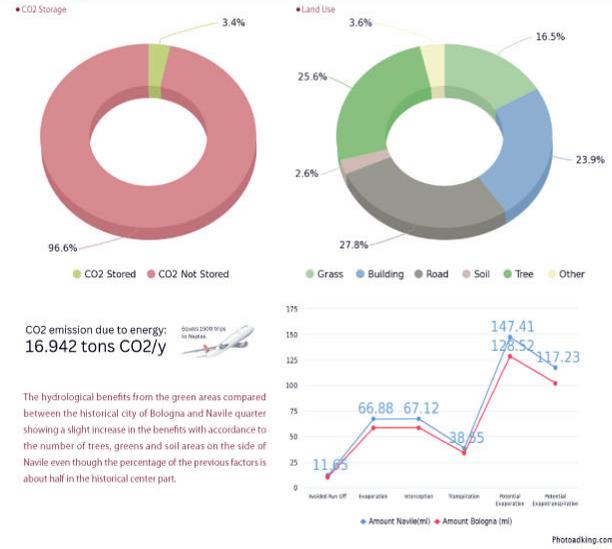
Green spaces occupy a large part of the neighborhood with a significant proportion of trees, which makes it a strength.

To the north of the Canale Navile an area is vulnerable to flooding and reaches the Industrial Heritage Museum. Populations living in the north have more difficulty accessing green spaces than the rest of the district, in fact the walking distance is longer.

All green spaces have many activities. Three parks are ideally located for families and sports enthusiasts: Parco Lunetta Mariotti, Parco di Villa Angeletti and Parco Casa Gialla. In these places you can find all the activities offered and especially games. Only one park, Parco Andrea Pazienza.

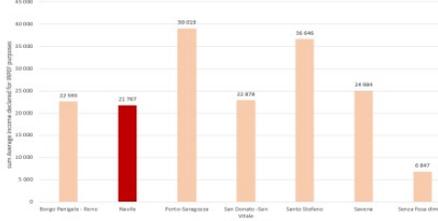
The activities are poorly distributed, the majority are located in the south of the district unlike in the north. Finally, in the Parco Casa Gialla and in the parks located to the east, some people do not feel safe, especially women at night, according to the Whw application.

Canopy

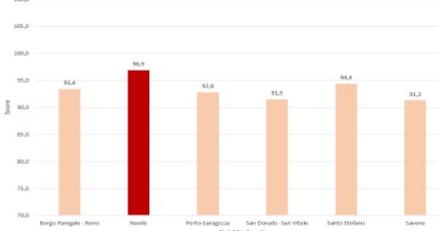


Social Issues

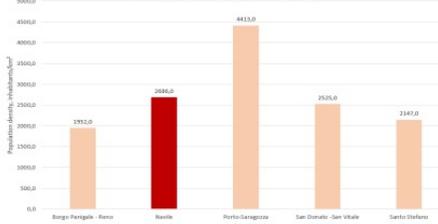
Average income declared for personal income tax purposes (2018)



Complex Fragility



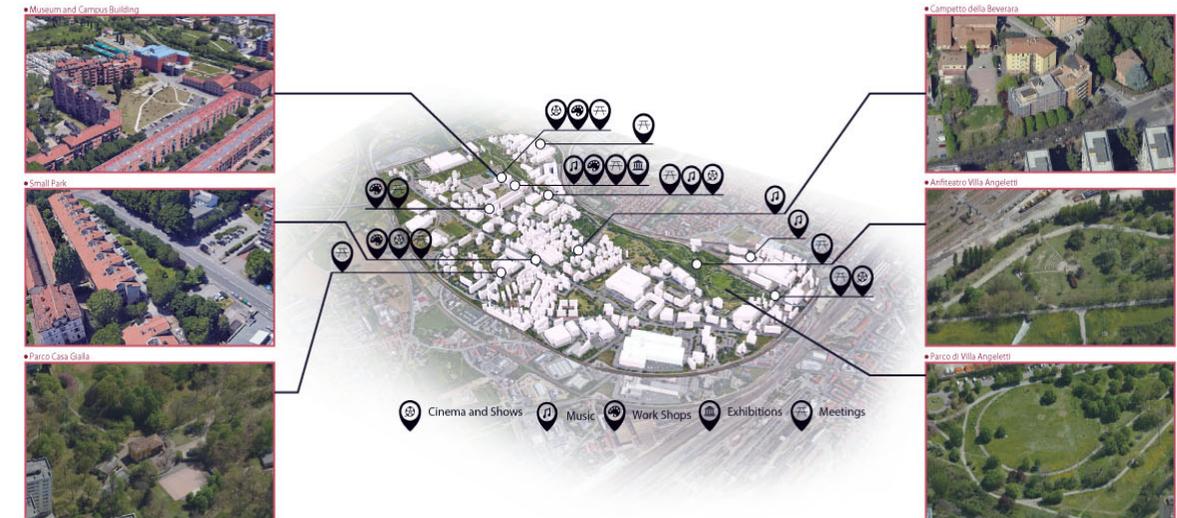
Population density in Bologna



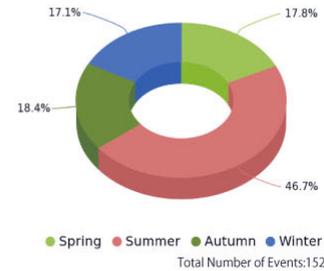
Complex fragility includes 3 indicators: demographic, social and economic. A score was assigned for each of the districts, varying between 70 and 130. For a score below 100, the area is considered to be weakly fragile. The Navile district is certainly below 100 but it remains the highest score of all the districts. Its economic and social fragility exceeds the score of 100. Indeed, neighborhood incomes are the lowest in the area.

The population density of Navile is slightly lower than that of Bologna: 2,800 inhabitants/km²

Environment



Events during the year



Building Renovation Workshop I.C.

BUILDING RENOVATION WORKSHOP I.C.



Stone masonry (rubble, irregular)

Material: Predominantly irregular fieldstone with variable sizes, laid in random coursing; limited use of through-stones and frequent chocking stones.
Mortar (lime-rich, weak or earth-lime mortar), with visibly porous joints, likely degraded by moisture
Brick use appears around openings and possibly at corners to "true" edges and distribute loads.
Connections: poor transverse ties between leaves, limited or absent metal ties. Wall intersection relies on masonry interlocking; the annex joint looks weak.
From the analysis, we can imply that the walls have good compressive strength; low tensile/shear capacity; anisotropic - stronger in-plane than out-of-plane when leaves are bound.

Solid brick masonry

Fried clay bricks, irregular bonding stretcher, used to correct geometry near openings, spandrels, and possibly to patch previous damage.
Weaker lime mortar than modern cement, joints may be thick and uneven.
The role of this is stress concentration relief at opening, more homogeneous than rubble but thinner.
This implies better predictability in compression, but thin piers are vulnerable to out-of-plane bending and local shear around openings.



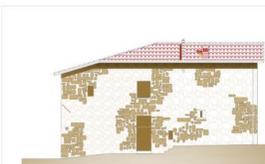
NORTH-WEST FACADE 1:50

CURRENT STATE



Intermediate floor

Timber joists spanning between opposite masonry walls, planked deck above, possible light screed or secondary boarding.
End-bearing in wall pockets without metal anchoring, variable seat length, the ends are prone to rot.
Flexible, discontinuous, it does not effectively tie the walls together.
Load path: Vertical loads to masonry supports, limited in-lane shear transfer during seismic action.
The weak points are deflection, notching at supports, split ends, and slip in pockets.



SOUTH-WEST FACADE 1:50

Roof

The roof consists of either clay pantiles or flat tiles, typical for the region.
The structure is mainly timber rafters bearing on perimeter walls, purlins supported by gable walls. There are no visible metal ties.
Connections - Seat bearing onto wall tops, likely no uplift anchors.
The roof is likely adequate for gravity loads, but vulnerable to wind, seismic thrusts and racking. The displacement under freeze-thaw and wind is common.

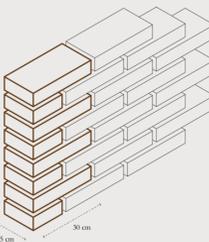
Evidence suggests mixed/light roofing on the annex roof, possible corrugated sheet or simplified tile layer over sparse timber.
Nailed/ screwed timber-to-timber, bearing directly on stone wall tops or rough ledges, with little to no straps to masonry.
Lower mass but poor continuity, highly vulnerable to local collapse and detached at supports.

WALL - BRICK QUALITY ASSESSMENT

TASK 1
BUILDING RENOVATION PROJECT

Overall

- Regular Brick Masonry
- Good Quality



| | | | |
|---------------------|-----------------------------|--|--|
| High quality mortar | Square shaped elements | Presence of headers - Low wall thickness | Resistant elements of large dimensions |
| Staggered joints | Presence of horizontal rows | Resistant elements with a good quality | Reinforcement of the wall corner |

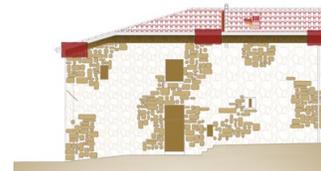
WALL - STONE QUALITY ASSESSMENT

TASK 1
BUILDING RENOVATION PROJECT

Overall

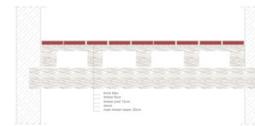
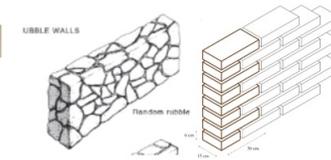
- Irregular Brick Masonry
- Medium Quality

| | | | |
|---------------------|-----------------------------|--|--|
| High quality mortar | Square shaped elements | Presence of headers | Resistant elements of large dimensions |
| Staggered joints | Presence of horizontal rows | Resistant elements with a good quality | Reinforcement of the wall corner |

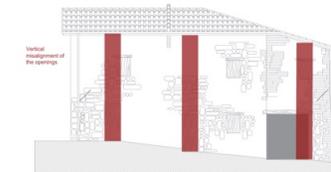


the case study is a building is located in a rural setting, characterized by low building density.

The site lies in a seismically active region, where traditional buildings were constructed primarily to resist vertical loads, with little consideration for horizontal forces.



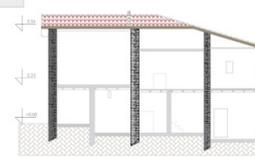
Timber elements are present in the roof and intermediate floor systems. Although timber is lightweight and potentially beneficial in seismic conditions, the existing elements show signs of aging and poor connections to both masonry systems, limiting their effectiveness in transferring horizontal loads.



NORTH-WEST FACADE

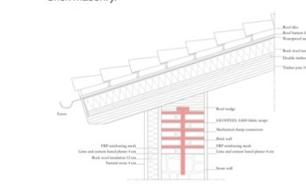
The façade presents irregular openings that reduce the effective wall length of the stone masonry panels, weakening their in-plane shear capacity.

Stress concentrations are particularly evident around openings and at the interfaces between stone and brick masonry.



NORTH-WEST FACADE

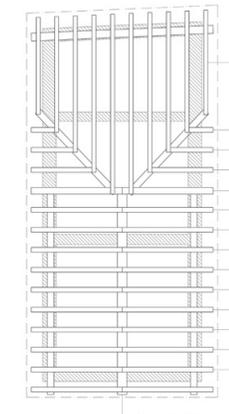
The overall state of conservation ranges from fair to poor. Stone masonry shows mortar loss, surface erosion, and moisture-related decay. The brick masonry wall, although structurally more regular, exhibits cracking at its interfaces with stone walls due to differential stiffness and previous uncoordinated interventions.



GROUND FLOOR

The existing roof is replaced with a new timber roof system with visible beams, reducing seismic mass and improving structural clarity. A reinforced concrete ring beam, integrated with GFRP reinforcement, is introduced at roof level to connect all perimeter walls.

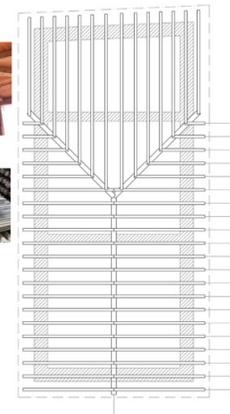
The intervention significantly reduces in-plane vulnerabilities by improving shear resistance and force redistribution, and out-of-plane vulnerabilities by tying walls together at roof and floor levels.



Ridge beam 35 x 35 cm



Timber joist 18 x 18 cm



Ridge beam 18 x 25 cm

Timber joist 10 x 15 cm

Skills acquired



SUSTAINABLE DESIGN

Design new complex building systems and manage the re-qualification of existing ones through the integration of technological, systemic, and structural security components, with a specific focus on innovation, functional and social requirements, and the figurative, aesthetic and environmental aspects.



INNOVATION IN CONSTRUCTION

Know and apply innovative construction materials and components.



DIGITAL INNOVATION

Manage the advanced modelling and digital integration of processes with a particular focus on the integration of architectural requirements, construction methods, physical-environmental requirements and structural safety, also through the use of Building Information Modelling (BIM).

Skills acquired



MANAGEMENT OF THE BUILDING PROCESS

Deal with construction management, facility management, project management and asset management). Manage and coordinate the engineering phases and complex technical-administrative procedures, through advanced systems such as BIM.



PLANNING PROJECTS

Participate in interdisciplinary working groups on complex urban projects in terms of technical aspects, economic feasibility and environmental compatibility. Design and manage the urban regeneration of real estate in accordance with environmental and social sustainability, in pursuit of circular economy aims.



BUILDING RENOVATION

Recognise the historical and environmental features of the built heritage and deal with plans and designs to protect and enhance it. Analyse and evaluate the existing building heritage in all its aspects, including the restoration of buildings and within the limits permitted by the laws in force in Italy and in Europe.



Job prospects and career

Once licensed to practice as **Engineer or/and Architect** (both are possible in Italy – Architect in other EU Countries), registration to the section A - civil/environmental sector for the Engineers' Professional Board and section A for Architects' Professional Board is possible.

Some examples of professional activities are:

Engineer-architect designer of buildings, plants and structural systems and components,

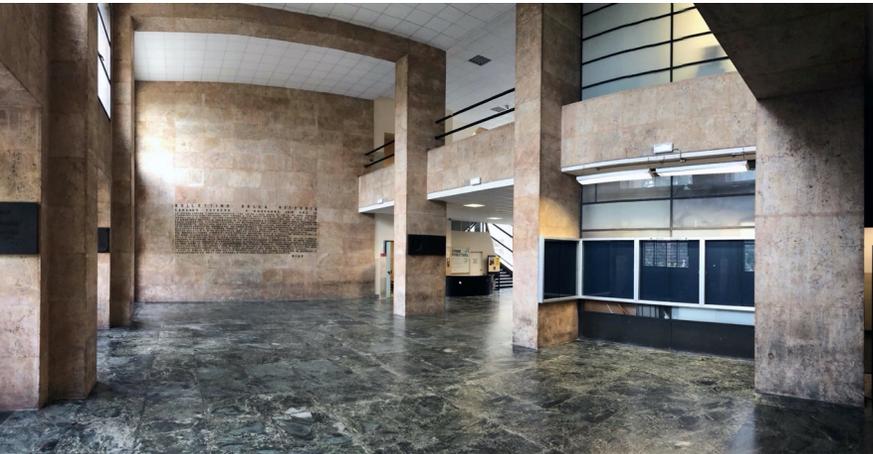
Engineer-architect with the role of project manager/design manager/facility manager,

Engineer-architect process manager in the public administration departments: urban planning – building – public works – environment – heritage, etc.





Teaching sites



The historic complex where laboratories, classrooms, areas for students, researchers and teachers are is in **Bologna** at **Viale Risorgimento 2**, in the Saragozza district.



The building is important evidence of Twentieth-century Italian architecture, designed by the architect Giuseppe Vaccaro in 1928 and inaugurated in 1935.





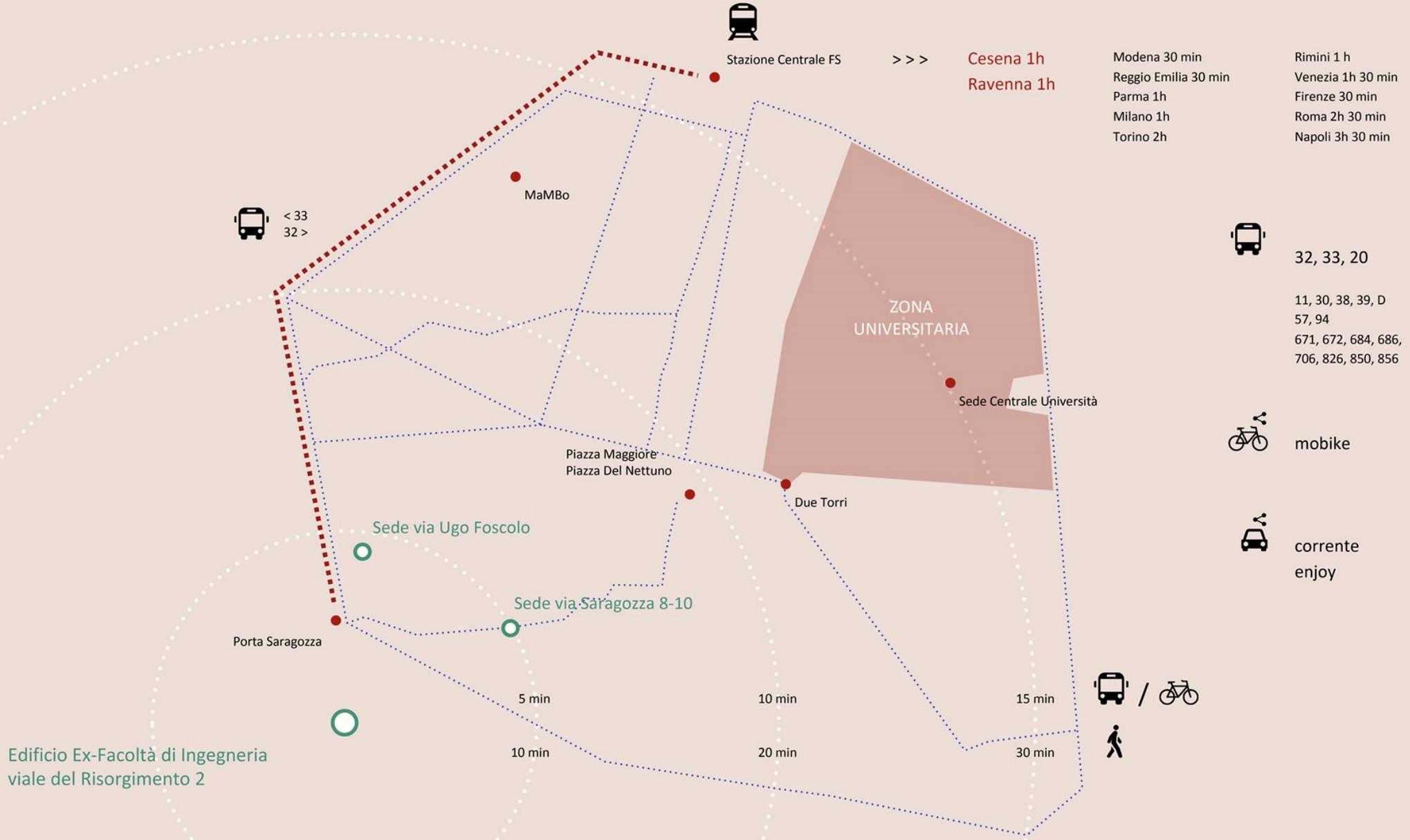
Teaching sites

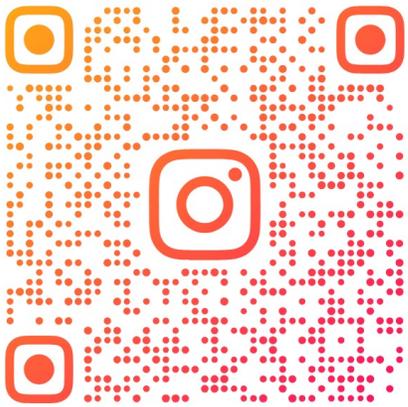


Other classrooms and workshop rooms are located in another historical building, in **Via Foscolo 7**, just a few minutes' walk from the main building, designed and built at the beginning of the Twentieth century.



Teaching sites





@ARCH.ING.BO



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA



Architecture-Engineering and Building
Engineering-Architecture UNIBO

Giorgia Predari

Programme Director

giorgia.predari@unibo.it

Desideria Santella

Programme Coordinator

desideria.santella2@unibo.it

Cecilia Mazzoli

Angelo Massafra

Guidance Delegates

cecilia.mazzoli@unibo.it

angelo.massafra@unibo.it

Alexandrina Postolachi

Degree Programme Tutor

da.tutor@unibo.it

Seguici su:  TikTok @joinunibo e  Instagram @unibo

| www.unibo.it



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA