

**MASTER SUARCH
SUSTAINABLE
ARCHITECTURE**

Post Bachelor degree
Master programme
E-learning blended
Learning



UNIVERSITÀ
DEGLI STUDI
FIRENZE



Université Internationale de Rabat
THE INNOVATIVE UNIVERSITY

UNIFI | University of Florence |
Department of Architecture (DIDA)

&

UIR | Université Internationale de Rabat |
Ecole d'Architecture

Post-graduate professional

II level Master

“Sustainable Architecture and Smart Cities” (SUArch)

*Application of BIM methodology and Digital Twin to implement the
sustainability of the built environment*

E-learning/blended | English language

Academic Year 2022/2023

Director | Imane Bennani & Co-director | Debora Giorgi



**“If you weren’t an
optimist it would be
impossible to be an
architect”**

(Norman Foster)



MASTER SUARCH SUSTAINABLE ARCHITECTURE

This MSc Programme is for professionals worldwide with an interest in sustainability in the built environment, including architects, engineers, and urban designers. It is available on e-learning or blended solutions. A holistic perspective stresses the many architectural expressions and possibilities encompassed within environmental design and nature-based solutions for urban resilience by connecting the skills and knowledge to the material aspects of the anthropic system, enriching the process of Resilient Responsive Design with the immaterial dimensions.

The MSc promotes a cross-disciplinary and integrated design approach to apply the principles, methodology and tools for environmental responsive design, green architecture and dynamic-adaptive building, bridging the traditional gap between arts and the sciences, research and practice, developing critical thinking and design skills to challenge established practices. The graduates from this program will implement knowledge and skill in the area of innovative sustainable architectural design: they will be able to develop more attractive sustainable building plan, more aesthetic solutions for renewables integration in building, more competitive real estate investment, and more soft-green solutions for urban retrofitting and resilience actions environmental responsive design and nature-based solutions for urban resilience.

E-LEARNING PROGRAM STRUCTURE

Total Credits 60

The annual Master teaching activity is organized in modules, in which are discussed issues latest developments inherent to specific professional profiles, taking into account their constant evolution. Master course is taught in English and is divided into those section:

| | |
|----------------------------|--------|
| • 4 Modules..... | 24 CFU |
| • 2 Design Workshop..... | 16 CFU |
| • Internship..... | 12 CFU |
| • Dissertation Thesis..... | 8 CFU |

FAD 400 equivalent hours for a total of 1500 hours didactic activities.

TEACHING / TRAINING METHODOLOGY

Lessons, design tutorial on case studies, project work -workshop (multidisciplinary), e-learning (on-line tutorial), internship (training experience in design company/public administration), hybrid written and design-project thesis.

ADMISSION REQUIREMENT

Post Bachelor Degree or Second level master courses are accessible only to students that have a Second Cycle (Master's) Degree or equivalent, in one of the following qualifications: architecture, or related classes in engineer. The selection procedure is divided in two stages:

- Academic evaluation of CVs
- Interview

TUITION FEE for the full Master Programme

It covers the following: Academic and tutorial costs - Didactic material (mainly in electronic format) - Florence Workshops, internship, thesis dissertation.





DESIGN WORKSHOP

The Design Workshops are focused in the implementation of Pilot Project, investigating the different aspects of sustainable architecture: how to think and project in order to respect the earth and the natural elements of air, green and water, mixing the employment of natural materials with energy saving strategies.

The Design Workshops are designed to stimulate MSc students to experiment a holistic design approach, as work in progress to rich the sustainable and Green Architecture: linking the contents of the previous modules they drive the new challenge of conscious design of the future, believing green building can contribute towards meeting the Sustainable Development Goals.

The students will be able to formulate and manage the architectural design process, investigating the concept of new sustainable and responsive architecture of the future.

Experimenting how the innovative green technologies, renewable energy, natural material as Green and Water could influence energy performance, students will apply the knowledge and skills acquired in the Modules 1-2-3-4 in one or more Pilot Projects During the case study projects elaboration, students are supported by on-line tutors.

The results of design workshops will be discussed during the final assessment - Thesis Dissertationis - and evaluated as final exam of Master Programme.

TEACHING AND LEARNING METHODS

- Planning and design (in site/on-line tutorial on case studies
- Render and design animations
- Work in progress continuously presented and discussed in a critical forum
- Case studies and application
- On-line Power Point Presentations,
- Frontal/streaming lessons, Virtual Class, room lectures, & Guest Lecturers
- Feedback, Discussion, & Solved Examples.
- Site & Field trips (Visiting Construction sites)
- Referring to internet related web sites
- Case studies and application

E-LEARNING PROGRAMME STRUCTURE

MODULE 1
CFU 6

**Responsive
Architecturing**

MODULE 2
CFU 6

**Environmental
performance
and assesment tools**

MODULE 3
CFU 6

**NBS & environmental
responsive design**

MODULE 4
CFU 6

**Design the future:
Green architecture
for resilient cities**

DESIGN WORKSHOP 1
CFU 8

**Adaptive and dynamic
envelope for building
retrofitting**

DESIGN WORKSHOP 2
CFU 8

**Green architecture
to design the future**

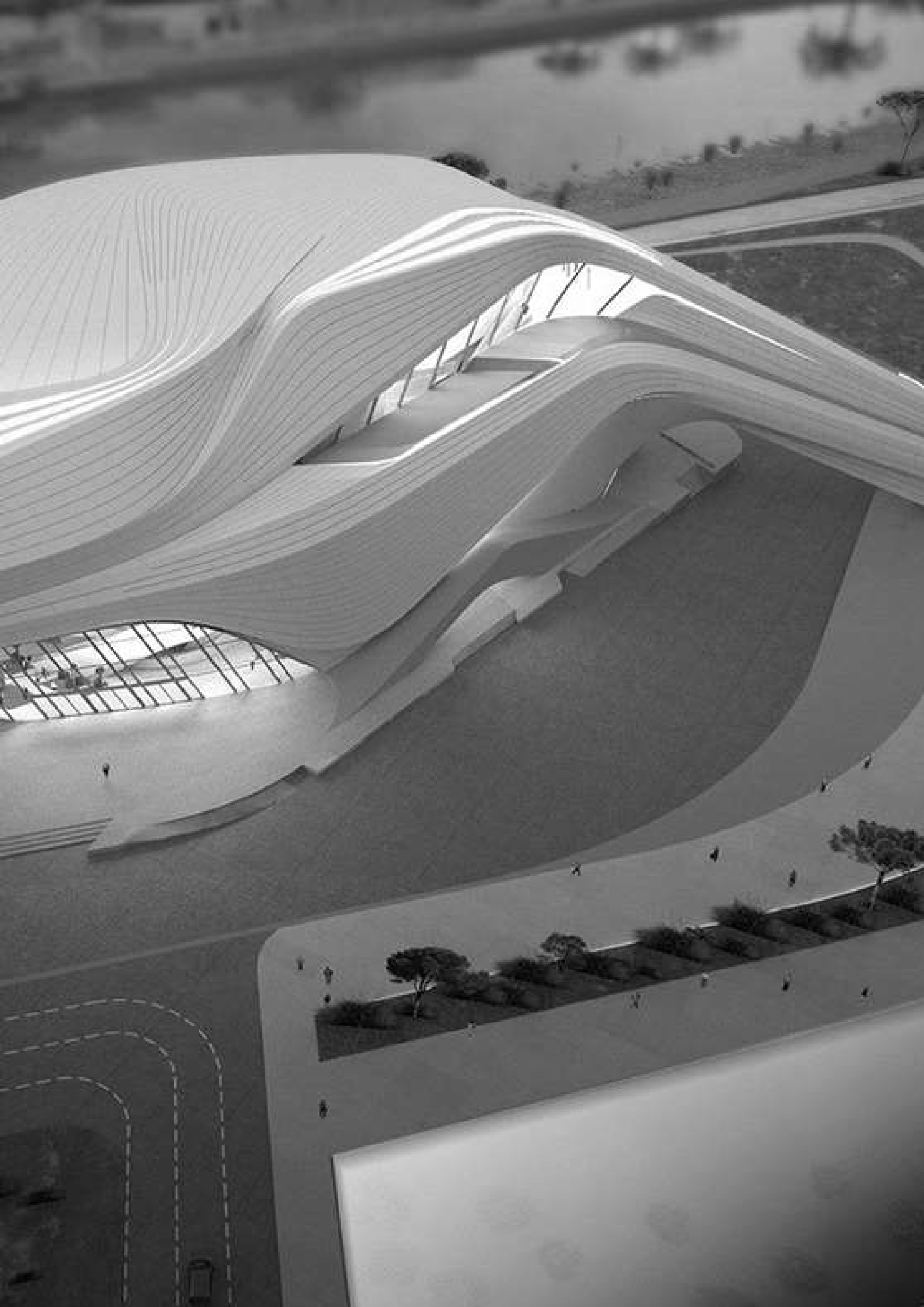
INTERNSHIP

**Design process
experience**
CFU 12

THESIS

**Elaboration
Dissertation**
CFU 8





MODULE | 1

RESPONSIVE ARCHITECTURING

- *Principles of bioclimatic architecture & vernacular architecture;*
- *Analysis and relations of the architecture with the context;*
- *Passive & Solar Architectural Design*
- *Smart Materials and Innovative Technologies - Dry structures;*
- *Mass Modeling for Conceptual Design (BIM);*
- *Adaptive and Dynamic envelope.*

Providing local architectural solutions to global issues requires an understanding of what makes a good environment for occupants and how this may vary across climates, building types and individual preferences. This Module introduces a generative framework for an adaptive, culturally sensitive, occupant-centred architecture seeking a symbiotic relationship with the city and natural environment.

The students will be able to define a concept building design, through practical experimentation, design workshop and laboratory exercises, operating with Building Integration Modeling methodology (BIM) and Parametric Massing Design tool in order to optimize the dynamic design, green-soft strategies as well as the adaptive architectural solutions and smart materials to enhance thermal performance of building envelope, solar control, natural ventilation, daylighting, passive solar heating and cooling etc.

MODULE | 2

ENVIRONMENTAL PERFORMANCE AND ASSESMENT TOOLS

- *Energy management & energy performance modeling;*
- *Environmental and energy parameters calculation;*
- *Post-occupancy evaluations;*
- *End User behavior;*
- *Inside Comfort and psychological aspects;*
- *Method for Indoor Environmental Quality assessment.*

The Module introduces the analytical procedures and computational tools, beginning with fieldwork techniques based on indoor and outdoor observations and environmental measurements. This is followed by computer modelling of selected processes and spaces, testing of models against measurements and performing simulations to assess the effects of solar, thermal, airflow and daylighting processes against targets and benchmarks. A range of computational tools will be introduced and applied to diagnostic tasks as well as generative processes. Their application will initially be explored on the team projects providing the essential expertise required for undertaking the Units of M3 and M4 and the Design workshops. The Module analyses the international methodologies for Indoor Environmental Quality assessment and the tools available to evaluate and compare the environmental and energy performance of different design scenarios in the specific climatic and environmental context.

MODULE | 3

NBS & ENVIRONMENTAL RESPONSIVE DESIGN

- *Principles of Immaterial resilience for Responsive Design;*
- *Sustainable use of natural sources for Climate change adaptation and mitigation;*
- *Responsive use of recycled and eco-friendly materials;*
- *Urban regeneration through nature - based solutions;*
- *Green and soft solutions (nature-based) for improving well-being in urban areas;*
- *Evaluation of Urban environmental comfort and tools.*

The Module analyses a new challenge: how Nature Based Solution (NBS) can improve quality of life in cities, reducing energy consumption and ecological footprint, adapting them to climate change, re-integrating nature and natural processes into built areas, accelerating the environmental quality and comfort at buildings and urban scale.

The Units are oriented to understand the Principles of immaterial resilience to be applied in the Responsive Design process, focusing on the sustainable use of natural sources (green and water): nature-based solutions are proposed and integrated as architectural innovative solutions that use natural elements to achieve environmental and societal goals. The Module 3 investigates the significant potential of NBS to provide energy and resource-efficient responses to climate change, and to enhance our natural capital, providing additional multiple benefits to city residents.

MODULE | 4

DESIGN THE FUTURE: GREEN ARCHITECTURE FOR RESILIENT CITIES

- *Principles, strategies and examples of resilient cities (City Resilience Index);*
- *Design concept of new green architecture;*
- *Architectural Integration of renewables (BIPV);*
- *Green envelope and vertical farm;*
- *Architectural Integration of Green and Water to renaturing Cities.*

The Module proposes the new challenge for cities: to be sustainable, they must be resilient and green. This Module, linking the contents of the previous modules, it focuses on a city's resilient performance through green architectural and urban design. Introducing resilience principles into the architecture and design of new buildings and cities is not always easy, but we need to despite the uncertainties and complexities of understanding the interacting systems, technologies and materials in a dynamic changing environment. The retrofitting actions of the existing buildings and urban areas to produce resilience appear to be lagging behind and even more complex in many cities.

This Module deals with key areas of environmental design research as these relate to architecture and urban design. Topics include urban climatology, the ecology and environmental performance of materials; renewable energy technologies in the urban environment; and the science and art of measurement and performance assessment.

DESIGN WORKSHOP | WS1

ADAPTIVE
AND DYNAMIC
ENVELOPE
FOR BUILDING
RETROFITTING

This interdisciplinary and international Design Workshop will provide students with skills in the field of adaptive design, applying the principles of Sustainable and Responsive Architecture, green buildings, energy conscious design into the concept design of Pilot Project, investigating energy efficiency strategies and architectural integration of Renewables, in specific climatic and environmental context.

The Design Workshop is the challenge for the students to practically operate with BIM and Parametric Massing Design tool optimizing the building form solutions according to the climate data analysis, in order to implement Pilot Project with adaptive and dynamic solutions for the building envelope, implementing solar control systems, natural ventilation, day-lighting, passive solar heating and cooling technologies, maximizing energy performance and environmental quality.

Students will be able to analyze the environmental performance, testing the IEQ assessment tools in the Pilot Project, evaluating and comparing the energy performance of different design scenarios of Pilot Project. They will experiment the analytical methods, applying specific tools for climate and microclimate analysis as well as indoor environmental quality assessment, energy parameters calculation, thermal comfort surveys, end user behavior and post-occupancy evaluations.

DESIGN WORKSHOP | WS2

GREEN
ARCHITECTURE
TO DESIGN THE
FUTURE

In the Green Architecture Design Workshop the aim is to integrate the architectural design concept with green strategies and natural based solutions to improve environmental resilience capacity and buildings energy performance in a Pilot Project for the requalification or new design of urban area.

With the support of international experts team, students will define a concept design fostering the architectural integration of green/soft technologies, experimenting how the use of eco-friendly materials and innovative nature-based solutions could influence the environmental quality of architecture, with responsive and site specific design.

The Design Workshop gives the opportunity to design a Pilot Projects as best practice and examples of the new generation of green architecture of the future, to meet and anticipate the challenges of technological, environmental, and societal progress to renaturing resilient cities.

Students will be able to select and apply - in the specific climatic and environmental context – the principles and strategies of resilient cities as well as to manage International evaluation tool to evaluate and assess the building solutions following the GBC Green Building Council, Leadership in Energy and Environmental Design (LEED) and Building Research Establishment Environmental Assessment Method (BREEAM).]

INTERNSHIP

DESIGN PROCESS
EXPERIENCE

The Internship is organized as training experience to be performed by MSc Students in design companies, public administrations, consulting companies to implement knowledge and skills.

The Internship is designed to stimulate MSc students to experiment the design process, as opportunity to put into practice the new challenge of conscious design of the future. The international Internships provide the perfect opportunity to put into practice what MSc Students have learned during the Modules' Lectures and Design Workshops. First class architecture firms, in both buildings and urban scales projects, are selected at national and international level. Students will be supported in their professional growth by top companies/industry professionals with a wealth of experience in the planning, design and construction of high quality projects in the different fields of Sustainable Architecture.

The Internships aim to give Students a well-rounded experience of every step in developing an integrated project experience in the different fields of Sustainable Architecture. They will acquire skills to plan and manage architectural projects reflecting functional, technical, environmental, and aesthetic considerations while also appreciating the pragmatic aspects, including scheduling, cost estimation, and construction administration.

The students will be able to put into practice their knowledge experimenting the architectural design process, investigating the concept of new sustainable and responsive architecture of the future.

THESIS

ELABORATION
DISSERTATION

The Thesis provides the perfect opportunity to put into practice their knowledge and present to the experts' commission what MSc Student has learned during the Modules' Lectures, Design Workshops and Internship experience.

The Thesis elaboration and dissertation aims to give Students a deep personal design experience, stimulating their capacities and skills in a professional growth, experimenting the holistic design approach as well as the capacity to develop and assess the own sustainable project.

During the Thesis elaboration the Student has to implement the project work, supported by on-line tutors. The graduates will spend their expertise to develop and present more attractive sustainable architecture design solutions, analyzing and evaluating the building performance, implementing the ability in making design decisions to put into practice the principles of bioclimatic design and the application of natural and innovative techniques for sustainable architecture and urban design.

The THESIS elaboration and dissertation are the last activities of the MSc Programme. The final assessment vote is expressed in 110th with eventual mention of praise. It is based on the average rating of the interim modules assessment that will be calculated with a simple arithmetic average.





INTERNATIONAL PARTNERSHIP FOR BLENDED VERSION

UNIFI | UIR Master Programme SUArch Sustainable Architecture

The blended version of Master Programme SUArch aims to meet the local needs, customizing the training path and implementing e-learning modules with the plus of local onsite training and design experience in order to support the participation and enhance learning results of students enrolled in the Master Programme SUArch Sustainable Architecture, structured by University of Florence in e-learning typology.

The blended version will apply the same structure and multimedia material of e-learning one.

It will be enriched by:

- The frontal lectures | 144 hours
- The Design Workshops | 96 hours developed in Rabat

Internship, as well, will be performed in Rabat or Italy.

Thesis dissertation & Ceremony will be held in Rabat by UIR.



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