

Architectural Education and the Reality of the Ideal: **Environmental design** for innovation in the post-crisis world



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**European Network of Heads of Schools of Architecture
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Master course in architecture and environmental technologies

A post graduated course for integrated education of architects in the use of environmental strategy in the project

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Abstract

May architects design without taking care of environment? Should they approach to energy saving technologies? May planners image towns without evaluate their impact on local and global environment? It is possible to restore buildings forgetting about materials and their life cycle? In order to give some answer to this (not exhaustive) questions, since 2002, the Interuniversity ABITA centre (a network of Italian Universities) organized a second level Master in *Ecological Architecture and Technological Innovation for Environmental* in order to create the new generation of designers who have to know of use of environmental strategy in the project (building and urban projects). Not just an architect o a technician but an enabler who manages to comprehend and activate thi multitasking kind of projects

The ABITA Centre is engaged in education, consulting and research in the field of environmental project and sustainable approach in the building construction and building-related environmental issues. Moreover is devoted to high-quality and practice oriented supplementary education on the basis of relevant academic as well as professional experience.

The concept of this post graduate Master Course, teaching programs, experiences obtained and results, continual improvement, specialization training and intensification co-operation, will be described in this paper.

Keywords: Postgraduate education, Environmental design, Renewable energy

1. Introduction

Building design decisions are increasingly being taken by clients and service engineers and the whole process of separating the building from its local regional and global environment has not only diminished the importance of the architect in the building process but also resulted in poorer environmental standards of buildings design.

The future of comfortable, healthy, low energy, low CO2 buildings lies largely with architects, not engineers or developers. But one of real chances we must face in their performance and this shift of performance based design will have to be underpinned by a change of the emphasis in the teaching of designers.

There is an urgent need to improve the environmental performance of buildings in the city of the future, though great steps have been taken in the field of renewable energy use and integration of related technologies in architecture. But the integration of technologies and systems to renewable energy into buildings, requires training of architects in this field. Sill today in Italy there is a paucity of architects (also engineers) who work with these objectives and dealing to these issues; so this situation lead to a failure in market penetration of techniques and systems for the exploitation of renewable energies in the architectural and urban project.

The renewable energy industry is growing rapidly amidst rising concerns about oil depletion and climate change. Renewable energy is seen by many as part of the appropriate response to these concerns and some national Governments have put programs in place to support the wider use of sustainable energy systems. This has led to a rapid increase in demand for renewable energy specialists who are able to design, and moreover install and maintain such systems. Most architects are not trained to use these renewable energy technologies and most are not aware of the principles of sustainability. There is therefore an urgent need to develop and implement new courses that prepare architects, scientists and energy planners to work with renewables to use responsible sustainable energy generation systems.

In order to give some answer to this (not exhaustive) questions, since 2002, the Interuniversity ABITA centre (a network of Italian Universities www.centroabita.unifi.it) organized a second level Master Course in *Ecological Architecture and Technological Innovation for Environmental* in order to create the new generation of designers who have to know of use of environmental strategy in the project (building and urban projects). Not just an architect or a technician but an enabler who manages to comprehend and activate the multitasking kind of projects

The ABITA Centre is engaged in education, consulting and research in the field of environmental project and sustainable approach in the building construction and building-related environmental issues. Moreover is devoted to high-quality and practice oriented supplementary education on the basis of relevant academic as well as professional experience. In fact, the high level of all the professional and academic teacher group, assure an interdisciplinary training supported by an high number of research centers and national and international companies partners.

2. Master Structure

This Master Course, born - in accordance with EU directives - as a response to the high interest expressed both in the public administrations by companies and businesses to the wise management of environmental resources and planning sustainable built land. So this course is finalized to offer a specific advanced level course in order to complete the proposed training courses offered by Italian high level schools in Architecture and engineering, so to give new input and instruments for environmental project in a eco-compatible perspective.

The educational goal is to define a cultural base capable of formulating and managing eco-friendly design criteria through the identification of procedures and instruments to determine methods of intervention and economic viability for both the new and existing buildings, in terms of quality, environmental and energy recovery.

The MS course program aims to provide students with state-of-the-art knowledge and expertise in some of the most important renewable energy disciplines; in detail, the environmental design carried out by teachers, is linked to the subject area of technology of architecture and is a powerful tool to stimulate student's projects friendly solutions with sustainable matters, materials and low-impact use of territory. The peculiarity of the subject consists in its actually real connection to the 'world-we-live-in', even if it counts on a wide source in theory and analysis

The MS course will run for 18 months (including the final thesis project dissertation), with a principal period characterised by theoretical lessons and a second period characterised by an applicative stage. It is based on accumulating a given number of credits (70 CFU) from a collection of obligatory courses (8 modules) a internship and a final project. Assessment is based on coursework, exams, and final dissertation with its presentation. The MS course runs in autumn and terms in spring; usually the Easter term is mainly directed at the dissertation.

The MSc course comprises assessed modules, several integrated group projects and an individual final project. Students undertaking the Postgraduate Master Diploma have to complete all the provided modules, the internship period with the final project.

The MS Course program is organised in eighth modules specialization areas characterised by a principal core module followed of specialist modules.

The core module are address to deeper knowledge regarding Sustainable Development and technology in the project while the areas of specialist modules are addressing to energy sustainability at different levels:

Small-scale | Indoor Climate and Comfort

Besides studying the design and operation of Heating, Ventilation, and Air Conditioning (HVAC) systems, this area soughs to improve competences in topics such as analysis of comfort, simulation of energy in buildings, computational analysis of fluid dynamics, or the influence of the buildings' opaque envelope on comfort. The publication of the EU Directive EPBD (Energy Performance of Buildings Directive) has induced national laws and regulations concerning the certification of buildings and the monitoring of their consumptions. This new reality demands for an increase of the number of professionals with specialized technical education in the areas of HVAC in European countries, justifying the creation of this specialization area in the MS. Course program.

Medium-scale | Buildings and Urban Environment

This area builds competences for designing and analyzing urban-scale systems, both under a perspective of space organization, at the crossroads of criteria related to the sustainable use of natural resources, functionality, and fruition, and the under a perspective of buildings as complex systems, addressing conception and operation in a context of efficiency, as well as human comfort and health.

Macro-scale | Energy Systems and Policy

In this area, courses are offered to allow students to master topics related with energy and environmental economics, energy markets in various forms of organization and regulation, efficient use of energy and overcoming market barriers, organization of systems for sustainability, among other topics. During the MS course period, several thecnical vists are provided.



Fig. 1 A technical vist to a construction site

Modules:

| | |
|---|-------|
| MOD.1 Principles of Sustainability (core module) | 6 CFU |
| MOD.2 Sustainable Design for the built environment | 6 CFU |
| MOD.3 Natural Resource Management | 6 CFU |
| MOD.4 Integrated design of photovoltaic systems | 6 CFU |
| MOD.5 Certification and simulation efficiency of buildings. | 6 CFU |
| MOD.6 Natural and artificial lighting | 6 CFU |
| MOD.7 Sustainable urban planning | 6 CFU |
| MOD.8 Economic evaluation of projects | 6 CFU |

In detail the educational programs provide to:

- prepare architects as a technician enabler to manages to comprehend and activate the multitasking kind of projects
- prepare students for careers in renewable energy advanced research and management;
- train the researchers and architects who will help to prepare and implement energy strategies and policies for leading manufacturers, innovative start-ups and public organizations.

Group project

The the period of lectures is followed by some group projects; the group project experience is highly valued by both students and prospective employers. It provides students with the opportunity to take responsibility for a consultancy-type project, working within agreed objectives, deadlines and budgets.

The internship

At the end of the lesson period, students have to carry out an national intership or intership abroad in professional offices or partner companies; in detail, an internship abroad is a great opportunity not only to make work experience, but also to develop other types of competences like the improvement of your language knowledge, of the culture, and of the lifestyle of the host country. The internship allows to discover the business world and helps the participant to complete the theory and the methods that were taught during the professional career.



Fig. 2a Group projects.



Fig. 2b Group projects

Many students who have participated in this master after doing an internship in Italy or abroad, have had the opportunity to stay in professional offices or in companies with success. This means that the training imparted during this course allows you to get good job prospects in the field of architecture in which increasingly requires specialization and application of systems and innovative components for building.



Fig. 3a The final study in Copenhagen



Fig. 3b The final study in Barcellona

Individual thesis project

The individual thesis project, usually in collaboration with an external organisation, offers students the opportunity to develop their research capability, depth of understanding and ability to provide solutions to real business or industrial challenges in renewable energy technology.

3. Strengths

One of the most important purposes of this MS Course is related to introduce in the studio-projects the open environment (not only the urban, but also the landscape) as interface for built architecture: time has come to comprehend architecture doesn't exist without environment!

So, a strenght of this didactic experience is to teach a multidisciplinary subject explaining to architectural students how to relate their project with the realty of the settlements, the open spaces, and the wide territory.

The lecture and operational-based learning model adopted in this MS Course, is a teacher-centered practical approach in which learning is derived from the instructor, in a technical lecture setting, imparting what is known about a subject and, thus, hopefully resulting in knowledge transfer.

The point of focus in this specific learning model is on the teacher and the content being imparted. This method of teaching promotes thechnical learning and utilizes assessment methods that reward student reproduction of facts.

In detail:

Internationally recognized partner schools and laboratories: The program gives students the opportunity to learn about some of the most important renewable energy issues from expert researchers.

Strongly committed business partners: The research units of the businesses partnering the program make a considerable contribution, both in the classroom and in the field via student internships.

An international outlook: some lessons of the program are taught in English also, making it accessible to students from around the world.

An innovative structure: Students also benefit from cross-disciplinary courses and seminars on various technologies. The ABITA Master's program provides targeted training in specific renewable energy disciplines and a holistic understanding of the related issues.

4. Expected

Students will enter the job market with the necessary skills to help leading manufacturers, innovative start-ups and public organizations define and implement their energy strategies and policies, worldwide; moreover the program also prepares students for jobs in research or teaching. The wide array of businesses and laboratories involved in the program offers students extensive employment opportunities in the sector and, at the end of the program, students will be able to choose from a number of career options, including:

- undertaking a Ph.D. at an academic or industrial laboratory.
- becoming an expert operational project manager, in a public agency or an energy company.
- embarking on a technical, business or sustainable development career in the energy industry.
- embarking on a career in energy strategy development and implementation for a major manufacturer or producer.
- contributing to the development of small businesses focused on renewable energies.

The traditional lecture-based learning model is a teacher-centered pedagogical approach in which learning is derived from the instructor, in a lecture setting, imparting what is known about a subject and, thus, hopefully resulting in knowledge transfer.

This traditional format often results in students memorizing the material for the purpose of passing an objective examination. A growing amount of research indicates that this traditional approach does not appear to be an efficient method for the learner to effectively apply and integrate knowledge in a problem-solving situation.

So the MS course applicative-based instruction appears to be not limited in developing retention of learned concepts and, more importantly, application of the knowledge in a environmental technical setting that requires critical thinking.

It also very interesting to explain that this new teaching methodology and techniques offered in this Course, with the pedagogy introduced and illustrate, contribute to an innovation of the work of students. A precise description of educational objectives and teaching methods, enhance the quality of the final project and respective presentation.

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