

THE ENVIRONMENT  
AS A QUESTION OF  
ARCHITECTURAL  
EDUCATION

TEACHING A NEW  
ENVIRONMENTAL  
CULTURE

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**Environmental Issues  
in the Architectural Design Studio**



## **Environmental Issues in the Courses of the School**

Design education in the NTUA is sensitive to most environmental issues. Professors of design courses agree that the examination of environmental parameters should be realized in all studio courses. But in action, this is not always a clear parameter for the projects' requirements. It therefore falls into disuse, under the pressure of the other factors forming the final result, given that students find it difficult to simultaneously confront all parameters coming into play within the architectural design. Besides, these parameters are weighed differently by each professor and each student group – something becoming obvious in the results of the student projects and in their evaluation criteria.

But, although the environmental parameter constitutes by definition an integral part of the architectural design and should always be introduced into the educational procedure, experience has shown that it would be educationally useful to highlight it in one of the design courses, in favor of a better understanding on behalf of the students.

At the same time, it would not be possible to include specialized issues concerning construction methods and computing systems within the framework of design courses; these should form instead the object of special technological courses which should also exist in the school.

The curriculum of the NTUA School of Architecture first acquaints students with an obligatory course for the 3<sup>rd</sup> semester, entitled 'Environment and Spatial Design' which introduces subjects and concepts regarding the man-made and natural environment and the repercussions it suffers from design. As also mentioned by the course guidebook, the course's aim is to understand basic concepts and methods within the approach of the environment and ecosystems as well as to understand the causes behind its degradation.

In the 5<sup>th</sup> semester of studies within the context of technological courses, another obligatory course develops, among others, the issues of 'Bioclimatic and Energy Planning' through theoretical courses and corresponding exercises.

At the same time, the curriculum offers two electives covering environmental questions. The first, entitled 'Environmental – Bioclimatic Design' is offered in the 5<sup>th</sup> semester by the Department of Synthesis in cooperation with the Department of Technology. The course aspires to make students understand the importance of introducing environment-posed parameters into the synthetic concept, in all levels of spatial design. The second course, entitled 'Special Environmental Issues' is organized by the Department of Urban Planning in the 8<sup>th</sup> semester and delves into the repercussions that housing development and design have on the natural and man-made environment, on an urban scale.

This paper will present the reasoning, the evolution and the results of the first course, which is the only relevant course actively implicating professors from the educational Department of Synthesis in collaboration with the professors of Technological courses.

### **«Environmental Bioclimatic Planning and Design»**

#### ***Theory and Practice Compulsory by choice Module in 5<sup>th</sup> semester***

Through a program of theoretical courses and small design subjects (projects) on different design scales – from the building to the city –, this particular course has strived throughout these latest years to help students:

- understand the principles of Environmental Planning and Design and how they participate in the design process
- understand the role of design choices and the interest that can acquire the design process through highlighting the parameters of this design
- probe into the notions of bioclimatic design, through alternative methods of volumetric organization and formation of the section and facades of a building or complex, thus aiming at achieving optimum lighting and ventilation, thermal comfort, the quality of interior spaces, energy saving and the aesthetic interest of the final project.

#### **Manner of teaching – Scope of the exercises**

Being an elective, the course is taught for three hours per week: one hour is dedicated to theory while during the other two, the students work in groups of two or three on common exercises with the help of a group of teachers.

The course is supported through the presentation of architectural works whose design respects environmental principles, as well as through special courses concerning proper lighting, ventilation, cooling methods, the choice of proper construction and building materials, etc.

The presentations as well as the notions that the students are called upon to elaborate in their assignments are organized in themes and cover the following categories:

##### a) Basic notions

- Bioclimatic architecture
- Energy-efficient architecture
- Environmental design
- Green architecture
- Sustainable buildings

##### b) Subjects pertaining to energy

- Energy consumption of buildings
- Energy saving
- Use of mild forms of energy



c) Sustainability in the building's cycle of life

d) Principles of sustainable design

- Climate and microclimate
- Harmonization of the building with the environment
- Orientation / Lighting / Shading / Solar Geometry
- Thermal comfort / Energy exchange between the building and the environment
- Insulation of the building shell.

e) Lessons learned from traditional architecture.

Along with theoretical courses, the students' groups work on common projects which are differentiated each year, in an effort to cover the spectrum of the fields where the aforementioned principles are implemented. The subjects chosen so far for the studio project can be placed into two basic categories:

a) Environmentally degraded urban public spaces.

The aim of the exercise was to redesign street networks in the centre of Athens, central squares and free spaces manifesting functional and formal degradation, as well as environmentally challenged riparian areas of streams within the urban tissue, all with a special emphasis of environmental parameters.

The students were called to study and use various synthetic tools in this direction, according to the specificities of each subject, such as:

Study to upgrade their microclimate through the use of lightweight seasonal lodgments and planting; these interventions offer cooling and shadow and operate as a filter to exhaust gas and noise pollution.

## ECOLOGICAL DESIGN FOR AN EFFECTIVE URBAN REGENERATION



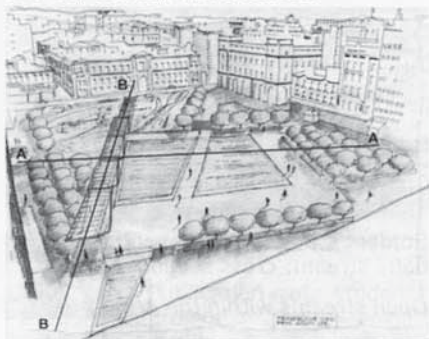
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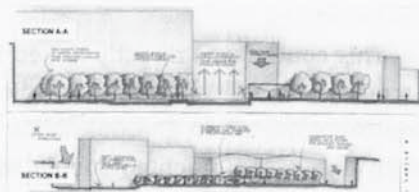
Student's project: Interventions in Athens city center, master plan, 2001 -02



Student's project: Interventions in Athens city center, Aiolou street



Student's project: Kotzia square, master plan



Student's project: Kotzia square, cross sections

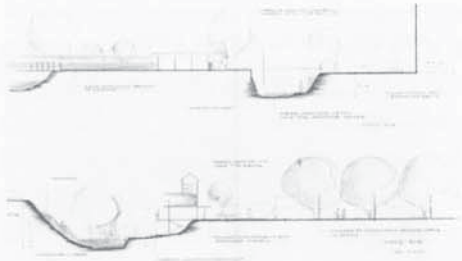
Roads network in the centre of Athens/  
Central squares in Athens



Student's project: Interventions in Pikrodafni stream: master plan, part 1, 2002 -03



Student's project: Interventions in Pikrodafni stream: master plan, part 2



Student's project: Interventions in Pikrodafni stream: cross sections, part 3

*Open streams within the Athens urban tissue*

b) Environmental upgrading of existing buildings, such as school buildings or buildings of social housing etc, through interventions in their existing shell and surroundings.

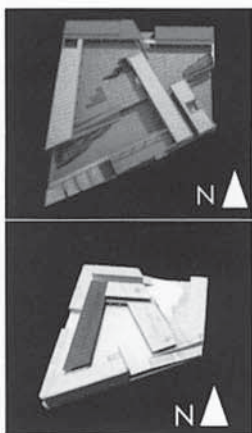
This course was directly linked for a number of years with the design course (studio) of the 5<sup>th</sup> semester, in which students design a school complex; students are therefore given the possibility to immediately control their design choices. With one of its teaching rooms as the particular field of research, the school building designed in the studio was examined in reference to its environmental features. Specific alterations were suggested in regards to:

- the placement within the building plot and its volumetric and functional organization, in relation to the environmental features

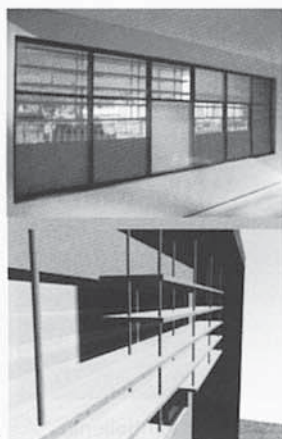
- Redesigning pedestrian and vehicle movement by means of widening sidewalks and streets of mild circulation, and using water surfaces and short waterwalls between the pedestrians and vehicles; the planting and use of lodgments offering cooling while delimiting movement
- Replacement of surface construction materials with new ones, light-colored, recycled and water-permeable
- Lighting and signaling redesign through the use of renewable energy sources
- Maintenance, promotion and utilization of these streams as natural elements and organic spaces within the city, through upgrading their immediate environment
- Arrangement of the gradients and the bed according to the seasonal water flow
- Connection of the riparian regions and the use of lightweight constructions with natural materials defining areas for walks, stops, informing and recreation and locally bridging their width
- Formation of seasonal constructions into streams inner part.



- the elaborating of its section in regards to the lighting and ventilation possibilities
- the kind and placement of openings, in relation to the orientation and the sun-protection systems used
- the final elaboration of the surfaces in the shell of the building, but also of the courtyard space.



Student's project: Elementary school in Athens, model, 2005-06



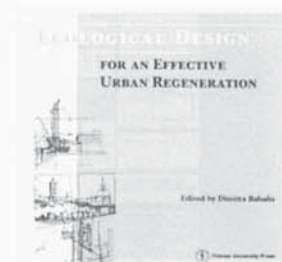
Student's project: Elementary school in Athens, openings design

In most of the years, this elective course was combined with the participation of a group of students in a 7-10 days «Intensive Programme» of inter-university cooperation organized by the Florence University within the context of the European Program Erasmus on the subject of Sustainable Design.

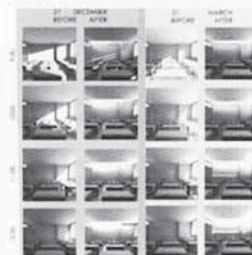
During the program, the students attended lectures by university professors within the context of a workshop and they jointly elaborated subjects ranging from the scale of urban planning to the scale of a building. Their projects as well as the communications presented in the workshop were published in international reviews.



Student's project: Elementary school in Athens, model of a classroom



Publication of the workshops' outcomes, 2003



Student's project: Elementary school in Athens, interior pictures of a classroom



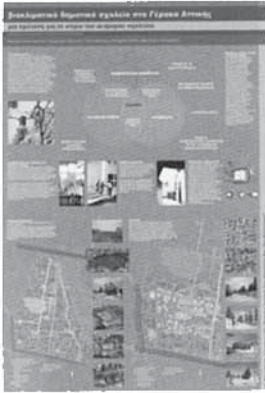
Publication of students project

## Outcomes of the Module

The scope of the course presented is the understanding of the principles of Sustainability in Architecture and the highlighting of their importance for the design of new interventions in the urban space.

The architectural choices and design decisions determining at each time the placement, form and construction of buildings, the formation of their open spaces and the interventions in their immediate surroundings, should guarantee:

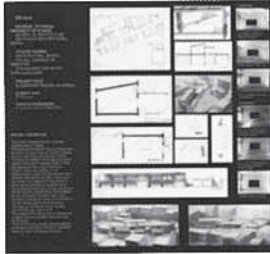




Poster, 4<sup>th</sup> Panhellenic Congress, Sustainable school of the Future 2010



Diploma project, Elementary school in Athens, 2008



Participation, International Student Competition «Environmental Architecture and Sustainable Towns», Istanbul, 2006



Diploma project, Elementary school in Athens

a) The harmonization with the natural and built environment, lifestyle and local climate characteristics.

b) The creation of closed as well as open quality spaces for living, with all necessary conditions for thermal and visual comfort.

c) The aesthetic quality combined with an environment-friendly construction.

d) Energy saving and use of environment-friendly infrastructures.

Through the variety of the subjects elaborated, the realization of the aforementioned special course influenced substantially the thinking of all participants (professors, PhD candidates, students) and brought to light the importance of the studio as a central axis for the acquisition of environmental culture. Many of the students having attended the course participated with their projects in related exhibitions and contests and chose corresponding subjects for their diploma project, while many continued with postgraduate studies in this same field.

The experience from the realization of this particular course highlighted the view that environmental subjects should be incorporated and promoted in every synthetic subject of the studio, while at the same time reinforced by more specialized courses. Moreover, they should cover all design scales and result in construction elements throughout the period of study, from the first year until the diploma project, in the aim of fostering a broader environmental culture.