



Dipartimento di Architettura e Territorio – dArTe

Corso di Studio in Architettura quinquennale – Classe LM-4

Degree course	Architecture U.E.
Course code	
Lecturer	Martino Milardi
Course name	Materials for Architecture
Disciplinary area	B
Disciplinary field of science	8c/1(ICAR 12)
University credits - ECTS	6
Teaching hours	60
Course year	1
Semester	1

Synthetic description and specific course objectives

The course contributes to the definition of general and basic knowledge required for the first year of a formative process of the student. On the operational side, its contents and its articulation are dedicated to the critical analysis of the material constitution of the building, understood as a central element and at the same time, a metaphor of the processes of transformation of the environment, in order to solve the needs and the housing needs of man.

The course belongs to the traditional disciplinary and large body of studies of Architecture and, for some years, is inserted in a scientific context heavily renovated and constantly evolving area of Architectural Technology, whose purpose is the study of the processes of realization in architecture. It 'a sector with its original contributions can give a lot to the formation of the architect, here we will say that the building materials and their technologies for production and employment are the central element of the construction of' artificial environment, one of the determinants of building production and realization processes, accordingly, the discipline that studies them has a leading position within the area of Architectural Technology and a supporting role transverse with respect to all other disciplines that make up the area and the wider rule of the project.

Course entry requirements

It 'a course of the first year that does not require prerequisites. The course provides the knowledge and the tools to address the issues in-depth

Course programme

The issues addressed and the educational aims can be expressed through the following aphorisms:

- 1) To address the design, in architecture as in any other sector, we must understand: the goals you want to achieve, you have the means, the characters of the context in which it operates.
- 2) The study of material technologies identified essentially with the knowledge of the means of their production cycle and their place in the building process of the final product.
- 3) The architect must consider the problem of the relationship between the architectural organism as a whole, its components, characteristics of the natural environment and the socio-technical context in which it is placed.
- 4) In designing we must know the characteristics of the materials, in relation to the problems of stability, protection and durability that the parties are called upon to carry out building.
- 5) The building is a structured set of parts which, though otherwise characterised, must be considered agents in an interactive way.
- 6) For every "problem" place to designer only exceptionally corresponds a single technical solution and the central problem of designing is to choose among the possible solutions.
- 7) The relationship between architectural form and construction technique is not fixed, nor uniquely oriented and binding.
- 8) The material choices and related techniques are never neutral for the environment, it is necessary to

assess their impact, considering the life cycle of materials, from their production to their use, at their disposal.

9) It is not correct to keep distinct the purposes of architecture from the formal possibilities to realize them through the material, its characteristics and its language, and this is true even when the material is not asked to express clearly its "truth."

10) The technical choices and the results do not depend on architectural materials individual actions, such as, more generally, creativity and innovation in architecture, depend on collective action and collaborative, within which the architect plays a role, sometimes maieutic, necessarily co-ordination and synthesis.

Expected results

In relation to the topics covered in the modules, the students are asked to perform exercises and partial tests, at intervals to be specified. To support these activities will be provided prior teaching materials, with bibliographies, bibliographic-type cards, knowledge of technological systems, material anthology, etc..

Verification of the year, aimed at certification of 6 credits provided, consists of an interview, in the reconsideration of the partial assessments and evaluation of the documents produced during the year: exercises, written and graphic, photographic documentation, etc., Enclosed in a A3 book.

In the tables (A3) that contain both designs that comments and / or remarks, to be drawn up various technical alternatives, deduced from manuals and from the production building.

The documents provided will include:

1. RELATIONSHIP BUILDING / LAND: Development of cards containing technical and constructive solutions and their decompositions in material and technical elements to be taken to the understanding of the complex relationships that exist between the building and the foundation soil.
2. THE RELATIONSHIP STRUCTURE / FUNCTION PROBLEMS: The logic of the space should be related to the logic functions, as well as the characteristics of the building materials and their uses are always made in relation to security issues, stability, durability, as well as formal expressiveness. It requires the development of technical-graphics that will contain constructive alternatives relative to the supporting structure; constructive alternatives most frequently in relation to the problems of static, durability, sustainability elements to contain horizontal and vertical.
3. RELATIONSHIP BUILDING / ENVIRONMENT: (influence of climate on the project). It is to identify what impact can affect the performance of a building project in order to achieve adequate levels of quality, meaning, the latter, as shown not only the organization of the physical and spatial variables and functional, but also of the environmental components external, as determined by the general settlement process, have a direct and significant impact on overall quality. The alternative techniques requests must verify how the building with its material characteristics, morphological, dimensional and technical-constructive, is able to establish a relationship with the external environment, such as to produce considerable variations and alterations of the conditions of thermal comfort.

Problem areas to consider are:

- Micro-climatic and biophysical components in the design process: impact on the building (microclimate; hygrometric comfort, etc..).
- Ecological quality of building materials: analysis of the environmental performance requirements for materials and components used in construction by defining production processes and quality controls appropriate to the ecological objectives of the interventions.

Building envelope is not designed as a simple barrier, but rather as a selective filter, gifted with the ability to annex and / or reject the effects induced by external environmental conditions: indoor environmental comfort depends not only on the quality, also from the ways of use of the technologies of the build, in function of the complex of the environmental variables that act outside the building.

Building, with its material characteristics, dimensional and technical and construction, must be able to guarantee within the built environment characteristics of well-being and comfort thermal, acoustic, visual.

4. STUDY ABOUT CONSTRUCTION MATERIALS: It involves the production of tabs on the materials studied, with the discussion of the following topics: the evolution of the material in history of architecture; evolution of productive factors; relationships between matter and form; quality of the material; physical behavior of material in relation to the needs environmental, ecological nature of the material: flows of energy and matter cycles.
5. REALIZATION AND CONSTRUCTION ASPECTS: A critical study of the evolution of the site over time, in relation to the socio-technical character of the area. Photographic documentation on the site.

Course structure and teaching

Lectures (hours/year in lecture theatre): 35

Practical class (hours/year in lecture theatre): 20

Practical / Workshops (hours/year in lecture theatre):5

The frequency of the course will be assessed and evaluated through partial evidence related to three cycles: a training and guidance (Module A), one of knowledge of the behavior of materials in use (Module B), one of the information and design studies on technical-constructive (Module C). Cycles are not necessarily sequential, instrumentally distinct, but related from the point of view of logic and operational.

Module A

Materials between material culture and the culture of the project: definitions, classifications, and historical systematization of materials, techniques and utilization of the factors of production; critical principles and riferimenti processuality to the design and construction:

- Culture of materials and design culture: the relationship between material and form;
- Building materials in the history of architecture;
- Materials and evolution of productive factors;
- Knowledge of materials as constitutive factor of the building process;

The module will conclude with tests and other checks on the level of acquisition achieved.

Module B

Materials science as cognitive support is indispensable for the understanding of their behavior and their use in building; relationship between design principles and design choices; essenziali references to the purposes and principles of performance and sustainability:

- The paths of material information;
- The nature of the materials;
- The "quality" of the building materials, the objectives of environmental well-being and sustainability of decisions; analyzes and comparisons between alternative design solutions (classifications, features, performance, from the technical solution that complies to the construction element);
- The technical problems of the confined physical, environmental conditioning for human wellbeing;
- The physical behavior of building materials, in relation to environmental requirements;
- Materials and technological solutions with low impact, reuse, recycling;
- Building materials compared (classifications, characteristics, performance);

The module will conclude with tests and other checks on the level of acquisition achieved.

Module C

Relationships between housing reasons (goals), materials (characteristics, certification), building techniques and architectural form, appropriate technology, problems of durability, reliability and maintainability:

- The building structure as a system of functions;
- The constituent parts of the body construction;
- The construction process;
- Other classifications constructive apparatus, with reference to industrialized processes;
- The construction process (machinability, ways and means to carry out the construction)
- Design criteria, taking into account the functional requirements, duration and preservation

The module includes the development of technical-graphics on materials and technical elements of alternative, less from manuals and from the field of building production,, and focus on critical issues of the project.

Student's independent work

The student will study the texts recommended the topics covered in lectures, he will have to draw critically constructive elements explained in the classroom supporting the drawings with photographic documentation of the data and he will have to prepare materials and synthetic summary of the material aspects dealt with in the respective seminars on materials building.

Testing and exams

In relation to the topics covered in the modules, students are asked to perform exercises and partial tests, at intervals to be specified. To support these activities we will provide pre-course material, with bibliographies, boards of technological systems, material collected, etc..

Verification of the year, aimed at certification of 6 credits provided, consists in a discussion, in the reconsideration of the partial assessments and evaluation of the documents produced during the year: exercises, written and graphic, photographic documentation, etc., Enclosed in a A3 book.

The book will be a sort of "textbook personalized" product direction, containing information on the nature, characteristics, on the role and aesthetic message of traditional materials and not on the opportunities of choice in several occasions design and construction.

More in detail, provides the following structure:

- Notes, with summaries, comparison tables and graphs, according to the indexes-specific driving.

- Study of a monographic material: we anticipate the production of a paper on one of the materials studied, with the discussion of the following topics: the evolution of the material in the history of architecture; evolution of productive factors, the relationship between matter and form; quality of the material ; tax behavior of the material in relation to the needs environmental, ecological nature of the material: flows of energy and matter cycles.
- Tables (in the format indicated by the teachers) with drawings, comments and annotations, using graphic conventions "official", referring to the theoretical deconstruction of a theoretical edifice. It provides for the development of various technical alternatives, deduced from manuals and manufacturing community. The work will be individual and, in part, produced in the classroom. The tests will take place periodically, based on states of progress planned; checks can be translated into partial "credits" useful for the examination.

Suggested reading materials

- AA.VV. 2005 (2010 R), Grande Atlante di Architettura (Vol 1, 2, 6, 7, 9, 15, 16,19, 20, 23) Torino, UTET.
- Prestipino C. 2014, I materiali da costruzione nel processo edilizio, Roma, Ed Legislazione Tecnica.
- Torricelli MC, Del Nord R., Felli P. 2001, Materiali e tecnologie dell'architettura, Bari, Laterza.
- Torricelli M. 2016, I materiali da costruzione, Rimini, Maggioli Editore.
- Askeland D.R., Fulay P.P, Wright WJ, 2017, Scienza e tecnologie dei materiali, Torino, Città Studi Edizioni.
- Boaga G. (cur) 1988, Dizionario dei materiali e dei prodotti, edizioni UTET collana Dizionari di architettura..
- Bertolini L., Gastaldi M. 2001, Introduzione ai materiali per l'architettura, Torino, Città Studi Edizioni.
- Campioli A., Lavagna M. 2013, Tecniche e Architettura, Torino, Città Studi Edizioni.
- Frigione G., Nicoletta M. 2006, Materiali per l'edilizia, edizioni Hoepli collana Ingegneria civile.
- Milardi M. 2014, L'edificio risorsa. Caratteri e indicatori di ecoefficienza in edilizia, Roma, Ed Nuova Cultura.