A. A. 2019/2020 – secondo semestre
Corso di studio magistrale in Architettura – Percorso Interni

LABORATORIO 2
COSTRUIRE NEL COSTRUITO / A

Teachers:
Giovanni Marras – Architectural Design
Fabio Peron – Building Physics
Salvatore Russo – Structural Engineering

Tutors:
Architectural Design: Mattia Marzaro
Building Physics: Erika Guolo, Tiziano Dalla Mora
Structural Engineering: Eleonora Spoldi, Ileana Ippolito, Alberto Bretini, Giacomo Imposa

Training Objectives

Through an interdisciplinary approach involving Architectural Design, Building Physics Structural Engineering, the "Workshop of build in built", starts from the premise of redefining the ambitions and the scale of the architectural project in the context of the contemporary city.
The teaching staff will guide the Students in a project experience in a real study area.
The students will apply the theoretical skills, acquired in the individual courses that make up the laboratory, developing an integrated project proposal for the study area, starting from the definition of likely use programs.
Students will be required to perform the following tasks: analysis of existing buildings at appropriate scales; integrated design hypotheses based on the developed analyzes; design solutions representation, by hand drawings and digital models, appropriate to the different project phases; synthetic public presentations of the project, step by step; final representation of the project with the required boards and models; presentation of the motivations of the project solutions by means of a brief project report.
Specific indications on the activities listed above will be provided during the project seminars.

In the course of **Architectural Design**, the students, starting from a careful survey of the values and critical aspects of the existing buildings, will have to propose possible scenarios for the study area.
Students will be required to critically base the project hypotheses, starting from their basic knowledge, interpreting the themes proposed during the lessons and arguing design choices also through bibliographic and iconographic references.

The **Building Physics** course is proposed to give the architecture student the knowledge necessary to make a conscious design, more sounded in the field of the physical and energy performance of the building. In addition to the necessary presentation of theoretical developments, basic application tools for checking the performance of the building in design stage will be provided. In brief, the essential objectives of the course are:
- in-depth knowledge of issues related to the interaction climate-building, to environmental comfort, the thermo-physical behavior of materials, and energetics of the building;
- knowledge of the characteristics and modes of operation of the main types of environmental control systems, passive and active;
- the ability to coordinate the choices concerning the energy performance of the building-plant system and the location of the building with the architectural design decisions in order to achieve a sustainable construction;
- the ability to apply operational methods and IT tools for the quantitative assessment of the physical behavior of the building and its sustainable design.

The lessons dedicated to **Structural Engineering** are first focused on the structural/construction approach of each topic time by time selected.
That is related with the need of growing of analysis, evaluation and calculation capacities in relation to a global, aware and responsible design approach. It means to the sensitive relation between shape and structures, to the first dimensioning and to the possibility of using both traditional and new materials, as well as high strengh concrete, ultra high performance concrete, structural glass, polymer material. That frame allows to plan the course also with dedicated lessons to specific buindings intended as news or existing ones.

Prerequisites
In addition to the prerequisites set in the student degree program and in the academic regulations are considered preparatory and propedeutic:
- basis knowledge of building physics and architecture technology;
- preliminar basis on structural mechanic and mechanical behaviour of main material for construction.

Course Program
The urban landscape of Italian cities is largely make up by an obsolete building heritage, built in the last century. Public and private houses, schools, office buildings, production and commercial complexes, which are frequently affected by degradation and abandonment processes. This heritage is increasingly inadequate in terms of typological characteristics, structural and anti-seismic requirements, with problems related to energy sustainability.
With reference to the study areas proposed by the teachers, the existing artefacts, with their marked typological, structural and material identities will be the starting point, the pretext, to rethink the future of the part of the city or landscape on which these buildings insist.

In the course of **Architectural Design**, will be examined the different compositional approaches to the problem of reusing existing buildings, exploring the different options, from the most conservative practices to those of renovating with the insert of new architectural and urban regeneration devices. Particular attention will be paid to the definition of the characters of the living space intended as interior, both public and private.
Students will be required to set and present their own critical point of view on the topics proposed during the lessons, by means bibliography and iconographic references.
Students will be required to present design solutions with appropriate representations for the different phases of the project with the related scales: from the concept (sketches, drawings and study models), to the dimensional check (plans, sections, elevations), to the final delivery (technical drawings and models prescribed by the teachers).

The basis of the course of **Building Physics** consist of knowledge related to building physics acquired in the first level degree from which will be deepened the topics listed below.

- Interaction climate-environment-building. Climate and Comfort. Indoor environmental quality.
- Solar radiation, energy availability, shading.
- The air motions in the neighborhood and within buildings.
- Bioclimatic Architecture principles. Active and passive environmental control systems
- Efficient architectural design. Thermo physical characterization of the opaque envelope elements.
- The glass and its application in architecture.
- Daylight and use of natural light. Artificial lighting. Natural and artificial lighting integration.
- Indoor acoustic quality.

Two type of lessons and didactical methodologies will characterize the **Structural Engineering** course. The first one through taditional approach and so ex cathedra, also with specifci and dedicated practical excercises. The second one will be characterized by external inspection in didactical yard/work site and also in Iuav lab of Strength of Material and design by testing. The use of new materials in existing building represents course's main part. Detailed draw dedicated to structural aspects are one of the more important course's aim.

Didactic Methods
The workshop is divided into three modules: **Architectural Design**, **Building Physics Structural Engineering**. The different modules are closely coordinated and assume the contents of the workshop as a pretext for the verification of the theoretical assumptions of the different disciplinary approaches.
As well as by type of project seminars, each individual module will consist of lectures aimed at critical illustration of the different methods of intervention and the development of disciplinary tools, they will find scope in the design experimentation.
The three modules will contribute to the definition of the hypothesis of the project according to the following steps.
In the first phase will be done a survey that defines the state of the art related to the proposed theme, as well as the acquisition of appropriate technical tools and reading and analysis on which to begin formulating the design assumptions.
The knowledge and tools acquired in the first phase and the critical evaluation of the first conceptualizations compositional form the basis for developing the project, which will be verified at different scales according to the different disciplinary approaches that characterize the Workshop.
For the elaboration of projects, students will be divided into working groups formed by a maximum of 3 components.

Learning Assessment Procedures
For the final exam student must have attended lectures and seminars intensive, and gained the credits of all the exercises and interim tests and oral interviews (if any) relating to three modules.
The final assessment will take account both of the evaluations obtained in the various tests and that of the final project.
For the final exam, students will deliver the materials provided in digital format when scheduled and at the exam they will have to set up an exhibition of the materials required, which will be assessed jointly by the commission in private session. At the end of the committee's work the judgments and final evaluations will be communicated to students.

Reference Texts
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Lotus International n. 133, 2008, *(Viral Architecture)*;
Detail n. 7, 2000; n. 6, 2001; n. 10, 2002; n. 10, 2003; n. 5, 2005; n. 11, 2006; n. 11, 2007; n. 11, 2009;

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Structural Engineering**:**

Russo, S., Strutture in Composito, Hoepli, 2007
Migliacci, A., Progetti di strutture, Masson 1997
Ballio G., F.M., Mazzolani, Strutture in acciaio, HOEPLI, 1979
O.Belluzzi, Scienza delle Costruzioni, Volume 1, Zanichelli