

# ARCHITECTURE AND STRUCTURAL DESIGN

## ARCHITECTURAL DESIGN I

Prof. Renzi Riccardo

### Teaching Language:

English

### Suggested Readings:

N. Pevsner – A history of building types. Thames & Hudson, London, 1976, pp.111-138 (museums).

E.T.Hall – The Hidden dimension. Doubleday & co. Inc., New York, 1966.

K. Elam – Geometry of design. Princeton Architectural Press, New York, 2001.

Further readings will be provided during class time.

### Course Program:

#### Overview

The course is based on the architecture in different scale: from urban to the interior one. The student will be designing the final project starting from reading the city and then developing the concept in volumes. Later on the concept will become the final idea working with functional and organized interior spaces. The architecture of the museum, a contemporary one, is the main theme of the course.

#### Assignment

The first assignment, a brief presentation of student's capability, it will be started and finished in class the first day of lesson and it will regard a small exhibition space inside an existing building (developed in handmade drawings). The second assignment LEARNING FROM FLORENCE/ITALY will focus on a research of existing buildings, agreed with the teacher, and an analysis on their composition, language, volume, shape, functional diagrams, circulation at main floor and main section. The third assignment LEARNING FROM LE CORBUSIER/CHANDIGARH will be a new project for a small museum building in a preliminary stage, hand drawings and a small model are required. All the assignments are mandatory and they have to be presented to the teacher as scheduled. The student should also read the essential text. All the assignments are held by a single student.

#### Final Project

Final Project will be the design for a new building as specified after the third assignment is delivered. It will focus on the museum as special architecture and its role in the contemporary space of the city. The student will have to be present at Desk Critique/Review to show the project to the teaching staff. Only when the teaching staff will agree that the project is complete the student will be able to reach the final exam. The final project will be held on groups of a maximum of three students.

#### Attendance

The student has to be present at each lecture and each desk critique/review. Each project/assignment deadline as scheduled is mandatory. The student will be able to reach the final project only if has reached a minimum of 75% of presence at the lessons. In each Desk Critique/Review student will have to show drawings (handmade or printed) in scale (1:500/1:200/1:100/1:50/1:20 are the scale accepted) and handmade model of the project (1:500/1:200/1:100/1:50). The teacher will not respond at any email from the student asking suggestions or indication on the project/assignment, the Desk Critique/Review is the only way for

the student to show the work in progress. For each student is mandatory to sign in at the morning arrive in teacher's register of attendance.

#### Behaviour

During class is forbidden to use cell phones, drink and eat, and listen to music, talk loud or act in any way to disturb, etc.. During lecture is forbidden to use also computer etc. The student will have to carry always a A4 sketch book and drawings tools, plus materials for work on models as working in class.

### **Further Information:**

It should be noted that class attendance and participation are prerequisites for passing the exam. The large area reserved for practical activities provides the opportunity for all students to experience directly the use of modern topographic instrumentation.

## **BUILDING SYSTEMS DESIGN B020741**

Prof. Bennicelli Pasqualis Mariagiulia

### **Teaching Language:**

English

### **Course Content:**

The course is related to the discipline of Technology of Architecture as the discipline, which combine the architectural design to the techniques in order to reach the architectural results. The didactic is based on the understanding by design method where design activity represents the main tool of research. Problems will be then solved starting from design, through which to define constraints and "emergencies", necessary for the scenarios definition.

### **Suggested Readings:**

The main bibliography will be provided underway.

Essential bibliography:

AA.VV. (2006), IFD Industrialised, Flexible, Durable, attachment to the issue n. 24 of d'A\_d'Architettura, May-August.

AA.VV. (2012), Reduce Reuse Recycle: Architecture as resources, Hatje Cantz, Ostfildern (D).

Bisig D., Pfeifer R. (2008), Understanding by design – The synthetic approach to intelligence, in Explorations in architecture – Teaching, design, research, Issued by the Swiss Federal Office of Culture, Urs Staub, Edited by Reto Geiser, Birkhäuser, Basel-Boston-Berlin.

Staib, G., Dörrhöfer, A., Rosenthal, M., & Anderle-Neill, C. (2008). Components and systems: modular construction; design, structure, new technologies. Basel: Birkhäuser.

Reviews

Casabella

Domus

Detail

El Croquis

### **Learning Objectives:**

The main aim of the Building System Design course is to provide students with the operational tools in order to deeper the understanding and the management of the relationship between architecture and technology that means as following indicated:

- the architectural design as both a process and a product
- the understanding of the main construction models (elastic/framed-building; plastic/massive-buildings) and their possible application
- the understanding that architectural design entails the definition of complex systems instead fixed objects.

The Building System Design course contents in combination with the “understanding by design” method, is addressed to enable students to approach to the architectural design through a new awareness and a deeper understanding of the relevance and consistency of choices and the related architectural results.

## Teaching Methods:

Students are firstly asked to produce an A3 format portfolio representing their academic path. This portfolio will be delivered by the second week of the course and presented to the professor and colleagues. This is an important step to share the different architectural background of students.

The course will be developed in two main phases:

- a first phase where students will be provided with the basic knowledge of the discipline; it consists of weekly lectures followed by ex-tempore exercises to be accomplished in class. The exercises will be given from time to time, basing on the lecture contents
- a second phase where students will work on the final project applying practically the acquired knowledge in the design process.

The ex-tempore exercises are mandatory and should be accomplished individually by the students. These exercises will be collected in an A3 book as part of the final exam (see here below). The contents will focus on topics that differ from that of the final exam, in order to explore a wider range of cases and solutions.

## Type of Assessment:

Final project\_ As part of the ARCHITECTURAL STRUCTURAL DESIGN LAB, the final project will be defined accordingly with the ARCHITECTURAL DESIGN 1 and STRUCTURAL DESIGN courses programmes and didactic objectives. Concerning the BUILDING SYSTEM DESIGN course, students will have to deliver specific drawings aimed to define the feasibility of the project and the integration of the diverse components of the building system. The scale of the drawings will be defined basing on the specific needs of the solutions representation modalities.

The course will focus particularly on the building envelope solutions.

Final exam\_ The final exam will consist of the delivery of the final project, in accordance to the other teacher of the Architecture Structural Design Lab, and the evaluation of the A3 portfolio collecting the exercises produced by each student during the course.

## Course Program:

Contents\_ The course is related to the discipline of Technology of Architecture as the discipline, which combines the architectural design to the techniques in order to reach the architectural results. The didactic is based on the understanding by design method where design activity represents the main tool of research. Problems will be then solved starting from design, through which to define constraints and “emergencies”, necessary for the scenarios definition.

Didactic aims\_ The main aim of the Building System Design course is to provide students with the operational tools in order to deeper the understanding and the management of the relationship between architecture and technology that means as following indicated:

- the architectural design as both a process and a product
- the understanding of the main construction models (elastic/framed-building; plastic/massive-buildings) and their possible application
- the understanding that architectural design entails the definition of complex systems instead fixed objects.

The Building System Design course contents in combination with the “understanding by design” method, is addressed to enable students to approach to the architectural design through a new

awareness and a deeper understanding of the relevance and consistency of choices and the related architectural results.

**Methods\_** Students are firstly asked to produce an A3 format portfolio representing their academic path. This portfolio will be delivered by the second week of the course and presented to the professor and colleagues. This is an important step to share the different architectural background of students.

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- a first phase where students will be provided with the basic knowledge of the discipline; it consists of weekly lectures followed by ex-tempore exercises to be accomplished in class. The exercises will be given from time to time, basing on the lecture contents
- a second phase where students will work on the final project applying practically the acquired knowledge in the design process.

The ex-tempore exercises are mandatory and should be accomplished individually by the students. They would be collected in an A3 book as part of the final exam (see here below). The contents could focus on topics that differ from that of the final exam, in order to explore a wider range of cases and solutions.

**Final project\_** As part of the ARCHITECTURAL STRUCTURAL DESIGN LAB, the final project will be defined accordingly with the ARCHITECTURAL DESIGN 1 and STRUCTURAL DESIGN courses programmes and didactic objectives. Concerning the BUILDING SYSTEM DESIGN course, students will have to deliver specific drawings aimed to define the feasibility of the project and the integration of the diverse components of the building system. The scale of the drawings will be defined basing on the specific needs of the solutions representation modalities.

The course will focus particularly on the building envelope solutions.

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## **STRUCTURAL DESIGN B018879**

Prof. De Stefano Mario

### **Teaching Language:**

English

### **Course Content:**

The Modulus of Structural Design aims at providing the students with the main theoretical bases and code requirements necessary for the structural design in seismic zones. Students will be able to understand the main structural features of reinforced concrete and masonry buildings and problems arising from regularity/ irregular shapes both in plan and elevation; they will also analyse o building damages and collapse mechanisms due to seismic events.

### **Suggested Readings:**

EC8, Eurocode EN 1998, European Union norm on construction. Design of structures for earthquake resistance, 1998.

Seismic Design of Reinforced Concrete and Masonry Buildings, Paulay, T. and Priestley, N., John Wiley & Sons, 1992.

Design of Earthquake Resistant Buildings, Wakabayashi, M., McGraw-Hill, New York, NY, 1986.

The Seismic Design Handbook, F. Naeim, Ed., Kluwer Academic Publishers, 2001.

Earthquake Resistant Design, Dorwick, D., Wiley, New York, NY, 1989.

Fundamentals of Earthquake Engineering, Newmark, N. and Rosenblueth, E., Prentice Hall, New York, NY, 1971.

## **Learning Objectives:**

The Course of Architectural Structural Design Lab includes an integrated multidisciplinary teaching in: Architectural Design, Structural Design, and Building Systems Design, focused on structural analysis. The specific educational purposes of a further discussion of the theoretical and operative basis behind structural design and dimensioning are integrated with the more general control of the design and composition, and of its constructive connotations, according to an educational plan aimed at providing, through the new Laboratories, an ever increasing organic consultation between the various aspects involved in the design process.

## **Prerequisites:**

3-year degree in Architecture

## **Teaching Methods:**

Specific topics of the Modulus of Structural Design are presented during initial lectures. Subsequently, structural design of particular elements will be carried out and students will have to present their drawings at Desk Critique/Review to discuss and revise them with the teaching staff.

## **Futher Information:**

During class is forbidden to use cell phones, drink and eat, and listen to music, talk loud or act in any way to disturb, etc.. During lecture is forbidden to use also computer etc. The student has to be present at each lecture and each desk critique/review. Each project/assignment deadline as scheduled is mandatory. The student will be admitted to the final exam only if has reached a minimum of 75% of attendance at the lectures.

## **Type of Assessment:**

Final exam will grade the final integrated project.

## **Course Program:**

Topics

Lessons from earthquakes:

- The L'Aquila seismic event of 6th of april, 2009.
- Reinforced concrete buildings damages and collapse mechanisms
- Masonry buildings damages and collapse mechanisms
- The effect of the structural regularity/irregularity
- Eurocode requirements

Principles of Conceptual Design:

- Structural simplicity
- Regularity
- Bi-directional strength and stiffness
- Torsional strength and stiffness
- Floor slabs as rigid diaphragms
- Adequate foundations

Design of reinforced concrete structural elements:

- Concrete and steel
- Ultimate Limit State
- Serviceability Limit State
- Bending design of rectangular cross sections
- Design of rectangular cross sections under combined axial and bending actions