



## Dipartimento di Ingegneria Civile, dell'Energia, dell'Ambiente e dei Materiali - DICEAM

Corso di Laurea in Ingegneria civile – ambientale

Classe L-7

Degree course	Corso di Laurea in Ingegneria civile – ambientale - Classe L-7
Course code	
Lecturer	Raffaele Pucinotti
Course name	Analysis and Design of Building Structures I + II
Disciplinary area	Tecnica delle Costruzioni (08/B3 – ICAR09)
Disciplinary field of science	08/B3 – ICAR09
University credits - ECTS	12
Teaching hours	96
Course year	3
Semester	1st and 2nd

### Synthetic description and specific course objectives

The main purpose of the course is to provide the knowledge and basic skills in the design and verification of safety of simple structures built with different construction materials in accordance with the main national and international standards. The course providing students with the tools to identify and understand the structural functioning of existing buildings and the ability to optimize the choice of the structural system as a function of architectural complexity of new buildings.

### Course entry requirements

Students are expected to have completed all prerequisites consisting in the principles of statics, rigid body equilibrium and Mechanics of Materials.

### Course programme

This course introduces students to the analysis and design of building structures and to the concept of structural safety and prepares students to analyze and design structural elements and systems according to the Italian and European standard. The course starts with the analysis and design of reinforced concrete and steel structures culminating in the consideration of building systems design. The quantitative understanding of interior forces and bending moments, stresses, and deformations are an integral part of the learning process throughout the course. Moreover, both destructive (drilling cores) and nondestructive evaluation of concrete structures and assessment of existing buildings will be introduced.

The course moreover offers addresses the analysis and design of structural elements such as trusses, continuous beams, rigid and braced frames. It also introduces seismic design, the use of structural elements in a building context and simplified methods of analysis of indeterminate structures.

In the course, simplified methods of quantitative analysis will be introduced.

### Expected results

Understanding of the Limit State design philosophies and behavior of structure:

2. Ability to analyze and design of tension members.
3. Ability to analyze and design of columns.
4. Ability to analyze and design of beams.

5. Ability to analyze and design of beam-column joints.
6. Ability to analyze and design of simple bolted and welded connections.
7. Ability to design steel framing system and connections of a building in a team setting.
8. Familiarity with reinforced concrete and structural steel fabrication process and construction through field trip and/ or speaker presentation.
9. Familiarity with professional and ethical issues and the importance of lifelong learning in structural engineering.

## Course structure and teaching

Lectures (*hours/year in lecture theatre*): 72

Practical class (*hours/year in lecture theatre*): 16

Practical / Workshops (*hours/year in lecture theatre*):8

## Student's independent work

Ability to perform analysis and design of members and connections:

2. Ability to design reinforced concrete and steel structural systems.
3. Familiarity with professional and contemporary issues.
4. Ability to assessing a reinforced concrete existing structure.

**Assignment 1:** Design of a reinforced clay floor.

**Assignment 1:** Design of a reinforced concrete plane frame.

**Assignment 2:** Design of a destructive and nondestructive testing campaign of an existing building.

**Assignment 3:** Design of a pre-stressed reinforced concrete beam.

**Assignment 4:** Design of a steel truss girder.

The examination includes discussion of assignments and assessment of skills acquired through an oral examination.

## Suggested reading materials

1. Cosenza E., Manfredi G., Pecce M., *Strutture in Cemento Armato*, Hoepli, 2010;
2. Nunziata V. *Teoria e pratica delle strutture in cemento armato. Vol. 1: Teoria*, , Dario Flaccovio Editore (2012).
3. Raffaele Pucinotti, *Patologia e diagnostica del cemento armato*, Dario Flaccovio Editore (2006).
4. Bursi Oreste S.; Pucinotti Raffaele; Zanon Gabriele, *Progettazione di Giunzioni e Strutture Tubolari in Acciaio*, Dario Flaccovio Editore (2012).
5. Lecture notes provided by the teacher.