

# FACULTY OF **ENGINEERING**

DEGREE COURSE: **CIVIL AND ENVIRONMENTAL ENGINEERING**

MASTER DEGREE: **CIVIL ENGINEERING**

**SUBJECT:** ADVANCED STRUCTURAL DESIGN

**LECTURER:** FABRIZIO COMODINI

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## **OBJECTIVES**

- Providing the student with skills in the analysis, design and assessment of engineering structures subject to static, seismic and extreme loading and environmental conditions. This course also deals with the design and simulation aspects of recurring special structures. The student will study for each type of structure, the modeling and analysis aspects and the design criteria.
- Learning the advanced concepts on estimating the loads acting on the structures, and linear and non-linear analysis methods for designing reinforced concrete structures.

## **CONTENTS**

- The structural design methodology.
- Models for actions and materials strength.
- The current philosophy of force-based seismic design of buildings for controlled inelastic response: capacity design and detailing of plastic hinge regions for ductility requirements.
- The trade-off between strength and ductility.
- Conceptual design of earthquake-resistant concrete buildings.
- Main features and conceptual design of frame, wall, or dual (frame-wall) structures.
- Cyclic behavior of concrete beams, columns, walls and joints.
- Modeling of cyclic strength and deformation capacity of concrete members in flexure at the local and at the element level.
- Derivation of member detailing rules in Eurocode 8 for a target deformation capacity.
- Linear and Non-linear analysis of structures: static and dynamic.
- Theory and design of plate elements, tubular structures and funiculars structures.
- "Strut and Tie" models.

## **LEARNING OUTCOMES**

The student will acquire the necessary skills for design of complex structures.  
The student will be able to use the European codes for the seismic structural design.  
The student will be able to perform the linear and non-linear analysis for structural design of the new buildings and for seismic assessment to existing building.

## **ASSESSMENT**

Written exam: multiple choice and open questions

## **RECOMMENDED TEXTBOOKS**

- Chopra A. "Dynamic of structures: theory and application to earthquake engineering ". Prentice Hall. 1995.
- Bozorgnia Y., Bertero V.V. "Earthquake Engineering". CRC Press
- R.Park, T.Paulay "Reinforced concrete structures", Wiley. 1975