

# FACULTY OF **ENGINEERING**

DEGREE COURSE: **CIVIL AND ENVIRONMENTAL  
ENGINEERING BS**

**SUBJECT:** STRUCTURAL DESIGN

**LECTURER:** FABRIZIO COMODINI

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## **OBJECTIVES**

This course will:

1. Provide the student with the basic tools for the analysis and design of civil and industrial buildings.
2. Study the theoretical basis and code references paying a special attention to the modern design technologies.
3. Learn the basic concepts on estimating the loads acting on the structures, for designing steel members, reinforced and pre-stressed concrete members and steel connections.

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## **CONTENTS**

1. The structural design methodology.
2. Probabilistic theory of building safety. Models for actions and materials strength. Eurocodes.
3. Structural behavior of steel elements at the serviceability limit state and at the ultimate limit state.
4. Section design of steel elements.
5. Buckling critical load. Global and local buckling. Bending-torsional buckling.
6. The most common types of steel connections. Bolted and welded joints.
7. Truss beams and bracing elements. Steel-concrete cross sections.
8. Structural behavior of the reinforced concrete elements at the serviceability limit state and at the ultimate limit state.
9. Design of reinforced concrete members: axial, bending, shear, and torsion.
10. Slender columns. Particular structural problems.
11. Technology and design of pre-stressed concrete beams.

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## **LEARNING OUTCOMES**

The student will

- acquire the skills necessary for the design of structural plans, which are the basis of the design of complex civil engineering structures.
  - be able to use the European codes for the structural systems design.
  - be able to manage the main issues related to the safety checks and the manufacturing processes that allow the correct design accounting for durability issues.
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## ASSESSMENT

Written exam: multiple choice and open questions

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## RECOMMENDED TEXTBOOKS

In order to understand the topics of this course, a basic knowledge of the structural mechanics principles is required.

The main concepts of the course will be presented in the teaching support provided by the professor. The teaching material will be mostly self-contained.

Most of the topics can be also studied in-depth in the following books:

- **Design of Steel Structures: With Worked Examples to EN 1993-1-1 and EN 1993-1-8** Frantisek WALD, Kang-Hai TAN and Sing-Ping CHIEW - Research Publishing Service, 2012
  - **Reinforced Concrete Design to Eurocode 2**, Mosley, W.H., Hulse, R. and Bungey, J.H., Macmillan Press, 1996.
  - **Reinforced Concrete Structures**, Park R. and Paulay T., Wiley, 1975 (NO e-book)
  - **Reinforced Concrete Fundamentals**, Ferguson P.M., Breen J.E. and Jirsa J.O., 5th Edition, Wiley
  - **Prestressed Concrete Design**, Second Edition, M.K.Hurst, Spoon Press and Routledge, New York 1998
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