

Course Title: Advanced Metallic Structures

ECTS: 9

SSD: ICAR 09

Year: II

Semester: II

Teacher: Gaetano Della Corte

Course Objectives: The course main objective is to provide students with a deeper understanding of the behavior, design and analysis of steel and aluminum structures. Students will be exposed to advanced analysis tools, considering non-linear material and geometric response of structures. They will learn the design principles and rules according to the Eurocodes. Finally, the course will provide students with knowledge and skills required for an international professional career.

Course Content: The Course is currently articulated into two parts. One part is dedicated to a general overview of steel structures all over the world; lectures for this part are given in the form of seminars by Federico Mazzolani, a recognized international expert of steel and aluminum structures, as well as Emeritus Professor at the University of Naples Federico II. The second part is more specifically addressed to provide students with design and analysis tools, according to the Eurocodes.

Part 1: The main features of structural steelwork; The big challenges of steelwork in buildings; The big challenges of steelwork in bridges; Steel buildings in urban habitats; Seismic upgrading of RC buildings; Passive control of new and existing buildings; Steel in structural restoration; Reticular space structures; Cold-formed thin-walled structures; Aluminum alloy structures.

Part 2: Introduction to Eurocode 3; Engineering aspects of the production process and mechanical properties of steel; Elastic and plastic resistance of cross sections; Classification of cross sections; Buckling of members; Second-order geometric effects, frame stability and global geometric imperfections; Buckling-restraining systems; Connections and joints; Design and analysis of traditional and innovative seismic resistant steel structures; Eccentrically braced frames; Buckling-restrained braced frames; Metal shear panels; Introduction to Eurocode 9; Design and analysis of aluminum alloy structures.

Required/expected prior knowledge: Basic principles and code rules for the design and analysis of steel structures

Education method: Lectures with both slides and blackboard; Tutorials and examples of calculation sheets.

Textbooks and learning aids:

1. Copy of lecture slides and specific references provided during lectures.
2. *Steel designers' manual, 7th Edition*, SCI Steel Construction Institute, Buick Davison (Editor) Graham W. Owens (Editor), February 2012, Wiley-Blackwell.
3. L. S. da Silva, R. Simoes, H. Gervasio, *Design of steel structures, Eurocode 3: Design of Steel Structures, Part 1-1 General rules and rules for buildings*, ECCS Eurocode Design Manuals, Ernst and Sohn.
4. J.-P. Jaspart, K. Weynand, *Design of Joints in Steel and Composite Structures*, ECCS Eurocode Design Manuals, Ernst and Sohn.
5. M. Bruneau, C.-M. Uang, R. Sabelli, *Ductile design of steel structures, 2nd Edition*, McGraw Hill.

Assessment method: Oral examination.