Steel Structure, a.y.: 2023/2024
Lecturer: Roberto Nascimbene
Date: 26/10/2023 – 20/11/2023

WEEK #	DAY	TIME	CONTENT	HOMEWORK	CLASSROOM	HOURS
1	Thursday, 26 (October)	14.00-18.00	Basics of steel: production, guidelines, material properties		Aula 1-15	4
	Friday, 27 (October)	9.00-13.00	Steel structures: CBF and MRF. Seismic resistant steel structures		Aula 1-15	4
2	Tuesday, 31 (October)	9.00-13.00	Section classification. Limit states and capacity design. Gravity and lateral load resisting systems		Aula 1-17	4
		14.00-16.00	Analysis and design tutorials	Set Homework #1 on section classification	Aula 1-17	2
	Thursday, 2 (November)	9.00-13.00	Types of Analyses: first and second order. Non linearity in material and geometry. Displacement limitations		Aula 1-15	4
		14.00-16.00	Analysis and design tutorials	Due Homework #1 and correction and set Homework #2 on serviceability limit state	Aula 1-15	2
	Friday, 3 (November)	9.00-13.00	Analysis and capacity design of beams: tension, compression,		Aula 1-15	4

			bending, shear and torsion			
		14.00-16.00	Analysis and design tutorials	Due Homework #2 with correction on limit state and set Homework #3 on section verification	Aula 1-15	2

WEEK #	DAY	TIME	CONTENT	HOMEWORK	CLASSROOM	HOURS
3	Monday, 6 (November)	9.00-13.00	Analysis and capacity design of columns: buckling under compression	Due Homework #3 and correction	Aula 1-17	4
		14.00-16.00	Analysis and design tutorials		Aula 1-17	2
	Wednesday, 8 (November)	14.00-18.00	Analysis and capacity design of columns and beams: lateral-torsional buckling and LTB under compression	Set Homework #4 on buckling	Aula 1-17	4
	Friday, 10 (November)	9.00-13.00	Capacity design of bolted connections		Aula 1-15	4
		14.00-16.00	Analysis and design tutorials	Set Homework #5 on bolted connections	Aula 1-15	2
4	Monday, 13 (November)	9.00-13.00	Capacity design of welded connections		Aula 1-16	4

		14.00-16.00	Analysis and design tutorials	Due Homework #4 and #5 (both with correction) and set Homework #6 on welded connections	Aula 1-16	2
	Wednesday, 15 (November)	9.00-13.00	The paramount role of joints and exam preparation		Aula 1-15	4
	Friday, 17 (November)	9.00-13.00	Basics of alternative seismic resisting systems		Aula 1-15	4
		14.00-16.00	Analysis and design tutorials	Due Homework #6 with corrections	Aula 1-15	2

WEEK #	DAY	TIME	CONTENT	HOMEWORK	CLASSROOM	HOURS
5	Monday, 20 (November)	Starting from 13.30	Final exam		Aula 1-15	4

TOT. 62 HOURS

Office hours: daily, by appointment

Brief Contents Description and Course Syllabus:

Steel material has been used in construction since the 19th century for slender and tall structures, and nowadays has also become an option for smaller buildings and personal residence. This unit teaches you about design and analysis procedures for steel structure members and connections focusing on the seismic design. Furthermore this course will drive you insight the design of suitable bolt and welded connections. First, the types of steel structures for seismic resisting systems are introduced, along with a description of relevant engineering properties of the steel material. Then the course deals with limit states design, tension, bending, shear and torsional analysis of structural steel members; bolted and welded connections; stability; analysis and design of braced and unbraced steel frames. Subsequently, specific information is provided on the seismic design and analysis of two structural types: (i) concentrically braced frames (CBFs) and (ii) moment resisting frames (MRFs). Eventually, fundamental issues for the seismic response of alternative structural systems (e.g., eccentrically braced frames, buckling-restrained braced frames) are introduced and discussed.

Course Methodology:

1: Lecture by instructor, 2: Problem solving by instructor, 3: Problem solving assignment (Homework)

Material for studying

Slides calculation tutorials are shared with the students on electronic media during the course. In addition, interested readers might consult the following book: Michel Bruneau, Chia-Ming Uang, Rafael Sabelli, Ductile design of Steel Structures, Mac Graw Hill, 2011 (2nd Edition) and “Steel Structures” by Robert Englekirk.

Grading

Homeworks: 50 % Final written exam: 50 %