



### STRUCTURAL ENGINEERING AND MECHANICS C

<b>Enrollment year</b>	2019/2020
<b>Academic year</b>	2021/2022
<b>Regulations</b>	DM270
<b>Academic discipline</b>	ICAR/08 (CONSTRUCTION SCIENCE)
<b>Department</b>	DEPARTMENT OF CIVIL ENGINEERING AND ARCHITECTURE
<b>Course</b>	CIVIL AND ENVIRONMENTAL ENGINEERING
<b>Curriculum</b>	Ingegneria civile
<b>Year of study</b>	3°
<b>Period</b>	1st semester (27/09/2021 - 21/01/2022)
<b>ECTS</b>	6
<b>Lesson hours</b>	55 lesson hours
<b>Language</b>	Italian
<b>Activity type</b>	WRITTEN AND ORAL TEST
<b>Teacher</b>	AURICCHIO FERDINANDO (titolare) - 2 ECTS MORGANTI SIMONE - 2 ECTS PATTON ALESSIA - 2 ECTS
<b>Prerequisites</b>	Knowledge of Analytical Mechanics and of Mechanics of Solids and Structures. Matlab programming basics.
<b>Learning outcomes</b>	<p>The main goal of this course is the introduction of the finite element method for the solution of frames, along with its Matlab implementation. Moreover, structural instability problems will be introduced and discussed as well.</p> <p>The aim is to help students in developing the ability to build tools to analyze complex problems related to frames, which cannot be solved in an analytical way.</p>
<b>Course contents</b>	1) Introduction to the finite element method:

- basics of beam theory;
  - direct method for planar frames;
  - finite element method basics:
    - a) axial problem;
    - b) Euler-Bernoulli bending problem;
    - c) Timoshenko bending problem;
  - finite element method implementation for planar frames;
  - shear locking problem:
    - a) introduction;
    - b) solution via under-integration and implementation.
- 2) Introduction to structural instability:
- problem introduction;
  - instability of lumped elasticity systems;
  - numerical solution of nonlinear equations (Newton's method) and application to instability problems;
  - Euler's problem;
  - solution via the finite element method and implementation.

**Teaching methods**

Blackboard lectures and Matlab-based tutorials.

**Reccomended or required readings**

- Course notes;
- T.J.R. Hughes, The Finite Element Method: Linear Static and Dynamic Finite Element Analysis. Dover.

**Assessment methods**

Written examination and possible oral discussion (or oral examination in special situations identified by the teacher).

**Further information**

**Sustainable development goals - Agenda 2030**

[\\$lbl legenda sviluppo sostenibile](#)