



NONLINEAR COMPUTATIONAL MECHANICS

Enrollment year	2020/2021
Academic year	2021/2022
Regulations	DM270
Academic discipline	ICAR/08 (CONSTRUCTION SCIENCE)
Department	DEPARTMENT OF CIVIL ENGINEERING AND ARCHITECTURE
Course	CIVIL ENGINEERING
Curriculum	Strutturistico
Year of study	2°
Period	2nd semester (07/03/2022 - 17/06/2022)
ECTS	6
Lesson hours	45 lesson hours
Language	Italian
Activity type	WRITTEN AND ORAL TEST
Teacher	AURICCHIO FERDINANDO
Prerequisites	A good knowledge of the basic concepts given within the courses of Mechanics of Solids and Structures, Numerical Analysis, and Computational Mechanics is required.
Learning outcomes	This course aims at giving a concise introduction to the basic concepts of nonlinear mechanics of solids and at providing the basic ingredients to perform simulations of solid mechanics problems at large strains via the finite element method.
Course contents	<ul style="list-style-type: none">• Basics of nonlinear mechanics: Kinematics Equilibrium Hyperelastic constitutive laws• Elements of numerical analysis: Solution of nonlinear equations and systems: theory and Matlab

	<p>implementation of basic algorithms</p> <p>Nonlinear finite elements</p> <ul style="list-style-type: none"> • Application to 1D rods at large strains (and Matlab implementation) • Application to 2D plane strain problems at large strains (and Matlab implementation) • Use of a commercial nonlinear finite element code
Teaching methods	Blackboard lectures, hands-on tutorials in Matlab, Mathematica, AceGen/AceFEM, and commercial finite element software.
Reccomended or required readings	<p>Suggested references are (among others):</p> <p>J. Bonet, R.D. Wood. Nonlinear Continuum Mechanics for Finite Element Analysis. Cambridge University Press.</p> <p>O.C. Zienkiewicz, R.L. Taylor, J.Z. Zhu. The Finite Element Method: Its Basis and Fundamentals. Elsevier.</p> <p>O.C. Zienkiewicz, R.L. Taylor, J.Z. Zhu. The Finite Element Method for Solid and Structural Mechanics. Elsevier.</p> <p>P. Wriggers. Nonlinear Finite Element Methods. Springer.</p> <p>T.J.R. Hughes. The Finite Element Method: Linear Static and Dynamic Finite Element Analysis. Dover Publications.</p>
Assessment methods	The exam consists in the assignment of homework and in an oral discussion.
Further information	
Sustainable development goals - Agenda 2030	\$lbl legenda sviluppo sostenibile