UNIVERSITÀ DI PAVIA

Anno Accademico 2017/2018

INTRODUCTORY COMPUTATIONAL MECHANICS	
Enrollment year	2015/2016
Academic year	2017/2018
Regulations	DM270
Academic discipline	ICAR/08 (CONSTRUCTION SCIENCE)
Department	DEPARTMENT OF ELECTRICAL,COMPUTER AND BIOMEDICAL ENGINEERING
Course	BIOENGINEERING
Curriculum	PERCORSO COMUNE
Year of study	3°
Period	2nd semester (05/03/2018 - 15/06/2018)
ECTS	6
Lesson hours	60 lesson hours
Language	Italian
Activity type	WRITTEN AND ORAL TEST
Teacher	AURICCHIO FERDINANDO (titolare) - 4 ECTS MORGANTI SIMONE - 2 ECTS
Prerequisites	Intermediate knowledge of algebra, mechanics of solids (introductory concepts on strain and stress), numerical analysis.
Learning outcomes	The course is an introduction to classical computational mechanics methods. In particolar, starting from the standard displacement-based method for planar frames, we will develop the finite-element method for shear-undeformable and shear-deformable beams. We will then approach the development of finite-elements for two-dimensional continuum problems (addressing both triangular and quadrangolar elements). Finally, the course will address the solution of non-linear problems relative to stability issues discussing arclength methods.
Course contents	Review of standard displacement method for planar frames

	Development of a finite element scheme for Euler-Bernoulli beam, starting from elastica differential equativo Development of a finite element scheme for Timoshenko (shear deformable) beam starting from total potential energy. Locking issues and possible solution techniques: linked interpolation, under-integration, Hellinger-Reissner mixed approach. Two-dimensional problems. Development of triangular and iso-parametric quadrangolar finite elements. Numerical integration. Locking issues and possible solution techniques: under-integration, enhanced method, mixed approach. Rigid frame structures with pointwise elastic joints. Equilibrium stability issues and their non-linearity. Techniques for the solution of non-linear problems, in particular for the case of non-monotonic paths: arc-length methods.
Teaching methods	Lectures with slide projection and exercises using the computer
Reccomended or required readings	- Zienkiewicz, O. and R. Taylor (1991). The finite element method (fourth ed.), Volume I. New York: McGraw Hill. - Taylor, R. (2000). A finite-element analysis program. Technical report, University of California at Berkeley. http://www.ce.berkeley.edu/rlt.
Assessment methods	Written examination (programming) and Oral examination
Further information	
Sustainable development goals - Agenda 2030	$lbl_legenda_sviluppo_sostenibile