UNIVERSITÀ DI PAVIA

Anno Accademico 2021/2022

INTRODUCTORY COMPUTATIONAL MECHANICS

Enrollment year	2020/2021
Academic year	2021/2022
Regulations	DM270
Academic discipline	ING-IND/34 (INDUSTRIAL BIOENGINEERING)
Department	DEPARTMENT OF ELECTRICAL,COMPUTER AND BIOMEDICAL ENGINEERING
Course	BIOENGINEERING
Curriculum	Cellule, tessuti e dispositivi
Year of study	2°
Period	2nd semester (07/03/2022 - 17/06/2022)
ECTS	6
Lesson hours	50 lesson hours
Language	Italian
Activity type	WRITTEN AND ORAL TEST
Teacher	AURICCHIO FERDINANDO (titolare) - 3 ECTS MORGANTI SIMONE - 3 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).
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.
Teaching methods	Lectures at the blackboard as well as with slide projection, exercises using the computer. Registered video lectures and virtual lectures if on-site teaching will be forbidden.
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 starting from a report with exercises following indications given during the course. The examination could be converted in a single oral session (starting from a report with exercises following indications given during the course) during the Sars-Cov-2 health emergency.
Further information	
Sustainable development goals - Agenda 2030	$lbl_legenda_sviluppo_sostenibile