UNIVERSITÀ DI PAVIA

Anno Accademico 2021/2022

FUNDAMENTALS OF MECHANICS OF MATERIALS AND STRUCTURES

Enrollment year	2020/2021
Academic year	2021/2022
Regulations	DM270
Academic discipline	ICAR/08 (CONSTRUCTION SCIENCE)
Department	DEPARTMENT OF ELECTRICAL,COMPUTER AND BIOMEDICAL ENGINEERING
Course	INDUSTRIAL ENGINEERING
Curriculum	Meccanica
Year of study	2°
Period	2nd semester (07/03/2022 - 17/06/2022)
ECTS	6
Lesson hours	54 lesson hours
Language	Italian
Activity type	WRITTEN AND ORAL TEST
Teacher	MORGANTI SIMONE (titolare) - 5 ECTS ALAIMO GIANLUCA - 1 ECTS
Prerequisites	Calculus 1, Physics 1, Mathematical Physics, Algebra
Learning outcomes	Understanding and assimilation of basic concepts related to the foundations of continuum mechanics for general 3D elastic solids and elementary mechanics of deformable one-dimensional structures. Acquisition of operational capabilities necessary to solve statically determinate and indeterminate beams of basic type using different approaches, as well as the schematic design and verification of beams with general loading conditions.
Course contents	Basic concepts: force, moment, couple, vector/tensor operations, notations Beam equilibrium: Kinematics and statics of the straight beam, internal

	actions and diagrams. Euler-Bernoulli beam theory, consistency, equilibrium, constitutive law. Elastic-linear-isotropic law and formulation of the elastic problem. Strain state. Consistency of the deformable continuum and kinematics relations. The finite-deformation tensor (Green-Lagrange). Hypothesis of "small displacements": small deformation tensor. Principal deformations and invariants. Volume and shape change. Internal consistency. Stress state: General aspects of the structural problem. Force and stress. the Cauchy stress tensor. Principal directions and invariants. 2D and 3D stress states. The Mohr stress representation. Equilibrium conditions. Constitutive law. Stress-strain relations and experimental evidence. Elasticity, anelasticity, failure. Elastic law: energy aspects, existence and uniqueness of the elastic response. Elastic-linear-isotropic law: elastic constants. Elastic limit and failure-yield criteria. The elastic problem. Formulation of the problem and uniqueness of the solution. Position of the problem of De Saint Venant. Axial action and bending. Torsion. Shear: approximate treatment.
Teaching methods	Lectures: 32 hours Practical classes: 22 hours
Reccomended or required readings	Course notes. P. Casini, M. Vasta, Scienza delle Costruzioni 4/ed, Cittàstudi, 2019. Corradi dell'Acqua L.. Meccanica delle strutture 1 - Il comportamento dei corpi continui 2/ed. McGraw-Hill, 2010.
Assessment methods	Written test with exercises (on person or remotely) + possible oral examination.
Further information	Written test with exercises (on person or remotely) + possible oral examination.
Sustainable development goals - Agenda 2030	$lbl_legenda_sviluppo_sostenibile