UNIVERSITÀ DI PAVIA

Anno Accademico 2019/2020

CONTINUUM MECHANICS

Anno immatricolazione	2019/2020
Anno offerta	2019/2020
Normativa	DM270
SSD	ICAR/01 (IDRAULICA)
Dipartimento	DIPARTIMENTO DI INGEGNERIA CIVILE E ARCHITETTURA
Corso di studio	CIVIL ENGINEERING FOR MITIGATION OF RISK FROM NATURAL HAZARDS
Curriculum	Hydrogeological risk assessment and mitigation
Anno di corso	1°
Periodo didattico	Primo Semestre (23/09/2019 - 16/10/2019)
Crediti	6
Ore	51 ore di attività frontale
Lingua insegnamento	English
Tipo esame	ORALE
Docente	MANENTI SAURO (titolare) - 6 CFU
Prerequisiti	Basics of vector, matrix and tensor algebra. Mathematical foundations. Integral theorems (Stokes and Gauss).
Obiettivi formativi	The course will provide the fundamental theoretical concepts and mathematical tools for the analysis and modelling of relevant problems in the hydraulic engineering field. The students will be able to carry out computer analysis of basic engineering problems related to fluid mechanics.
Programma e contenuti	Review of mathematical foundations: vector and tensor algebra; coordinate systems; Stokes theorem and Gauss theorem. Analysis of stress: the continuum concept; Cauchy stress principle; stress tensor; principal stresses; Mohr circles; deviator and spherical

	stress tensors. Deformation and strain: Lagrangian and Eulerian description; small deformation theory; strain tensor; principal strains; spherical and deviator strain tensors; plane strain; compatibility equations; velocity gradient tensor; rate of deformation tensor; vorticity tensor. Fundamental laws of continuum mechanics: mass conservation - continuity equation; Reynolds transport theorem; linear momentum conservation; angular momentum conservation; energy conservation. Constitutive equations: generalized Hooke's law. Newtonian fluid. Navier-Stokes equations. Special cases: perfect fluid; Euler and Bernoulli equations. Laplace equation. Kelvin theorem. Viscosity and applications to engineering problems: viscosity of Newtonian fluids; Newton's law of viscosity. Flow curve. Common non-Newtonian rheological models. Experimental measurement of fluid viscosity.
Metodi didattici	=
Testi di riferimento	R. Aris "Vectors, tensors, and the basic equations of fluid mechanics" Dover pub. W. Prager "Introduction to mechanics of continua" Ginn and Co. 1961 P.C. Chou & N.J. Pagano "Elasticity, tensor, dyadic, and engineering approaches" Dover pub. Wilkinson W.L., Non-Newtonian fluids. 1960 Pergamon Press. Liu, G-R. and Liu, M.B. Smoothed Particle Hydrodynamics: a meshfree particle method. World Scientic, 2003.
Modalità verifica apprendimento	The final examination will consist of an oral discussion, with the possibility for each student to carry out in-depth analysis about a peculiar topic within the course contents
Altre informazioni	Lecture notes can be downloaded from the course page on the platform KIRO (https://elearning2.unipv.it/ingegneria/)
Obiettivi Agenda 2030 per lo sviluppo sostenibile	$lbl_legenda_sviluppo_sostenibile