UNIVERSITÀ DI PAVIA

Anno Accademico 2015/2016

NUMERICAL METHODS IN FLUID MECHANICS

Enrollment year	2014/2015
Academic year	2015/2016
Regulations	DM270
Academic discipline	ICAR/01 (HYDRAULICS)
Department	DEPARTMENT OF CIVIL ENGINEERING AND ARCHITECTURE
Course	ENVIRONMENTAL ENGINEERING
Curriculum	TERRITORIALE
Year of study	2°
Period	2nd semester (29/02/2016 - 10/06/2016)
ECTS	3
Lesson hours	23 lesson hours
Language	ENGLISH
Activity type	WRITTEN AND ORAL TEST
Teacher	SIBILLA STEFANO (titolare) - 3 ECTS
Prerequisites	Basic knowledge in Fluid Mechanics and Numerical Analysis
Learning outcomes	The course is intended to give to the student a basic knowledge of the numerical methods applied to the hydraulic and fluid dynamic analysis, learning to apply them with awareness, also through the use of dedicated software.
Course contents	Equations of fluid mechanics Conservation of mass and momentum. Euler equations. Navier-Stokes equations. Discretization methods Finite Differences method. Accuracy, stability and numerical diffusion. Finite volumes method. Evaluation of flux terms. Numerical solution of the Navier-Stokes equations

	Linearization methods for the convective terms. Projection methods for the solution of the equations of motion of incompressible fluids. SIMPLE and PISO methods. Treatment of the free surface in Eulerian schemes: the VoF (Volume of Fluid) method. Turbulence modelling Turbulent flow theory. Reynolds-averaged equations. Turbulent kinetic energy and its dissipation. The k-epsilon method. Smoothed Particle Hydrodynamics Numerical techniques in a Lagrangian frame. Kerner approximation and particle approximation. SPH solution of the Navier-Stokes equations. Enforcement of boundary conditions.
Teaching methods	Lectures (hours/year in lecture theatre): 23 Practical class (hours/year in lecture theatre): 0 Practicals / Workshops (hours/year in lecture theatre): 0
Reccomended or required readings	J.H. Ferziger, M. Peric. Computational methods for fluid dynamics. Springer.
Assessment methods	he exam will consit in the discussion of a report, describing the simulations realized during the course
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Sustainable development goals - Agenda 2030	$lbl_legenda_sviluppo_sostenibile