UNIVERSITÀ DI PAVIA

Anno Accademico 2021/2022

COMPUTATIONAL FLUID DYNAMICS

Enrollment year	2020/2021
Academic year	2021/2022
Regulations	DM270
Academic discipline	ICAR/01 (HYDRAULICS)
Department	DEPARTMENT OF CIVIL ENGINEERING AND ARCHITECTURE
Course	CIVIL ENGINEERING
Curriculum	Idraulico
Year of study	2°
Period	2nd semester (07/03/2022 - 17/06/2022)
ECTS	6
Lesson hours	51 lesson hours
Language	English
Activity type	ORAL TEST
Teacher	SIBILLA STEFANO (titolare) - 4 ECTS FENOCCHI ANDREA - 2 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 and practical classes with use of CFD software
Reccomended or required readings	J.H. Ferziger, M. Peric. Computational methods for fluid dynamics. Springer.
Assessment methods	The exam will consit in the discussion of a report, describing the simulations realized during the course
Further information	
Sustainable development goals - Agenda 2030	$lbl_legenda_sviluppo_sostenibile