



COMPUTATIONAL FLUID DYNAMICS

Anno immatricolazione	2019/2020
Anno offerta	2020/2021
Normativa	DM270
SSD	ICAR/01 (IDRAULICA)
Dipartimento	DIPARTIMENTO DI INGEGNERIA CIVILE E ARCHITETTURA
Corso di studio	INGEGNERIA CIVILE
Curriculum	Idraulico
Anno di corso	2°
Periodo didattico	Secondo Semestre (08/03/2021 - 14/06/2021)
Crediti	6
Ore	51 ore di attività frontale
Lingua insegnamento	English
Tipo esame	ORALE
Docente	SIBILLA STEFANO (titolare) - 4 CFU FENOCCHI ANDREA - 2 CFU
Prerequisiti	Basic knowledge in Fluid Mechanics and Numerical Analysis
Obiettivi formativi	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.
Programma e contenuti	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. Kernel approximation and particle approximation. SPH solution of the Navier-Stokes equations. Enforcement of boundary conditions.

Metodi didattici

Lectures and practical classes with use of CFD software

Testi di riferimento

J.H. Ferziger, M. Peric. Computational methods for fluid dynamics. Springer.

Modalità verifica apprendimento

The exam will consist in the discussion of a report, describing the simulations realized during the course

Altre informazioni

Obiettivi Agenda 2030 per lo sviluppo sostenibile

[Gli obiettivi](#)