



NUMERICAL METHODS IN FLUID MECHANICS	
<b>Enrollment year</b>	2015/2016
<b>Academic year</b>	2016/2017
<b>Regulations</b>	DM270
<b>Academic discipline</b>	ICAR/01 (HYDRAULICS)
<b>Department</b>	DEPARTMENT OF CIVIL ENGINEERING AND ARCHITECTURE
<b>Course</b>	CIVIL ENGINEERING
<b>Curriculum</b>	IDRAULICO
<b>Year of study</b>	2°
<b>Period</b>	2nd semester (01/03/2017 - 09/06/2017)
<b>ECTS</b>	6
<b>Lesson hours</b>	54 lesson hours
<b>Language</b>	ENGLISH
<b>Activity type</b>	WRITTEN AND ORAL TEST
<b>Teacher</b>	SIBILLA STEFANO (titolare) - 6 ECTS
<b>Prerequisites</b>	Basic knowledge in Fluid Mechanics and Numerical Analysis
<b>Learning outcomes</b>	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.
<b>Course contents</b>	<p>Equations of fluid mechanics Conservation of mass and momentum. Euler equations. Navier-Stokes equations.</p> <p>Discretization methods Finite Differences method. Accuracy, stability and numerical diffusion. Finite volumes method. Evaluation of flux terms.</p> <p>Numerical solution of the Navier-Stokes equations</p>

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.

**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 consist in the discussion of a report, describing the simulations realized during the course

**Further information**

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

**Sustainable development goals - Agenda 2030**

[\\$lbl\\_legenda\\_sviluppo\\_sostenibile](#)