

Introduction to numerical simulation in multiphase fluid mechanics

This course aims to provide the basics of numerical multiphase fluid mechanics and to offer a first approach to numerical simulation methods.

Topics covered include: Navier Stokes equations, geometric representation of fluid interfaces, jump relations on fluid interfaces, one-fluid formulation. Finite difference methods for the Navier-Stokes equation, projection method, Poisson equation, relaxation method, boundary conditions, exit conditions, methods for multiphase flow such as the volume of fluid method. Numerical methods for surface tension.

The participants are carrying out a project based on the free open source software platform Basilisk making it possible to produce the flows numerically, including, in particular, the Bénard Von Karman vortex street, droplet fall, vortex pairs, nucleate boiling, Lagrangian mixing, atomization and granular materials.

Prerequisite: Overall, a basic Master 1 level in applied maths, physics or mechanics is required, and some knowledge of the linux operating system

Bibliography:

1. Tryggvason G., Scardovelli R. and Zaleski S. 2011: Direct Numerical Simulations of Gas-Liquid Multiphase Flows, Cambridge University Press.
2. Basilisk <http://basilisk.fr>

Timing: The Course offered in the first part (sept-nov) of the M2 year.

Credits: 3 ECTS

Hours: 30 hours.