PARCOURS PHYSIQUE OCÉAN ET CLIMAT
semestre 8 Physique POC

Modélisation numérique 2

Présentation

This course presents the numerical methods used to integrate partial differential equations that arise in computational fluid dynamics (CFD): from the building blocks such as transport equation and wave equation, to full nonlinear systems of equations. The course is taught in English. Practicing is an essential part of the course. The programming language is Python.

2 crédits ECTS

Volume horaire

Cours Magistral : 8h
Travaux Dirigés : 12h

Objectifs

Acquire the theoritical knowlege on which the computational fluid dynamics codes are based. Develop the critical reasoning on numerical results by knowing the potential weaknesses (e.g. instability, dispersion, excessive dissipation etc) and the various techniques to overcome them. Identify the various components of a CFD code and the impact its numerical parameters.

Pré-requis nécessaires

numerical modelling 1, fluid mechanics 1, scientific programming

Compétences visées

identify numerical methods for problem solving and validate results ; know and know how to use numerical simulation codes to tackle complex problems

Descriptif

Classes are done in computer rooms, they blend theory and practice with a computer. Small homework are asked from one class to another. The final mark is composed of a final exam (50 % of the mark), in computer room, and of one personal project (50%). The course covers

> integration of the heat equation
> integration of the transport equation (including nonlinear methods)
> integration of the wave equation
> integration of the Euler equations (blending transport and Poisson equation)
> integration of the rotating shallow water equations

The numerical techniques presented in the course range from the standard ones to more advanced and recent ones. The course is a good compliment of the applied mathematics and fluid mechanics ones.

Modalités de contrôle des connaissances

Session 1 ou session unique - Contrôle de connaissances

Nature de l'enseignement	Modalité	Nature	Durée (min.)	Coefficient	Remarques
	CT	Ecrit - devoir surveillé	150	50%	
	CC	Autre nature		50%	

Session 2 : Contrôle de connaissances

Nature de l'enseignement	Modalité	Nature	Durée (min.)	Coefficient	Remarques
	CT	Oral	30	100%	