

Finished volumes



Component
École Nationale
Supérieure
d'Électrotechnique
d'Électronique

In brief

- **Ametys Code:** N9EE33D
- **Open to exchange students:** Yes

Presentation

Objectives

Construction of the Finite Volumes scheme for the numerical solution of unsteady Maxwell's equations and introduction to other specific schemes (Finite Differences in the time domain, discontinuous Galerkin method)

Description

In this course, we aim to study the Finite Volume method for the numerical solution of Maxwell's equations in the time domain. The advantage of this scheme lies in its great flexibility (use of meshes closely resembling geometries, with different types of meshes, consideration of discontinuous materials, thin sheets, etc.) while remaining extremely efficient. Starting from Maxwell's time-domain equations, we demonstrate how to construct the scheme, first by following the standard methodology, which bridges the gap with the extensive literature on schemes developed in CFD, and then by using a purely electromagnetic flux construction. We also study various evolutions through increasing order, time-domain schemes, boundary conditions, and so on. Finally, we present a set of applications and two other schemes: the discontinuous Galerkin method (viewed as an evolution of Finite Volumes) and the Finite Difference Scheme specific to electromagnetism (FDTD). The module is divided into a lecture part and a practical part which will allow you to see how to program the scheme and test its properties.