Objectives
This course covers the basic theory of finite difference methods and finite element methods for parabolic and hyperbolic partial differential equations (PDE), including first order nonlinear conservation laws. Each topic will start with a review of the corresponding PDE class.

Prerequisites
Some basic knowledge of PDE and elementary numerical analysis is recommended. The required PDE theory will be reviewed. No previous exposure to MATLAB is necessary.

Textbooks

Syllabus
1. Parabolic PDE: the heat equation. Maximum principle, energy methods and Sobolev spaces, finite differences and finite element methods, stability and error estimates, applications to Navier-Stokes equations.
3. Linear first order PDE: upwinding and monotone schemes, finite difference, finite volume, and discontinuous Galerkin methods, convergence and error estimates.

Evaluation
Homeworks, both theoretical and computational (using MATLAB), with a ratio of about 75/25%.