Preliminary schedule CME 326

(Section numbers refers to the course reader, also Handouts as reading material)

I. Well-posedness and stability for initial value problems

Lecture 1: Introduction. General principles and ideas.

Lecture 2-3: Periodic solutions and Fourier analysis. The Petrovski condition for PDE and the von Neumann condition for difference schemes. (Sec. 2.1-2.2)

II. Well-posedness and stability for initial boundary value problems

Lecture 4-6: The energy method. Semi-bounded operators. Symmetric and skew-symmetric operators. (Sec. 2.3)

Lecture 7-9: Normal mode analysis. The Kreiss condition. (Sec. 2.4 + Handouts)

Lecture 10: Well-posed boundary conditions in practise. (Handouts)

III. Well-posedness and stability for reliable and accurate solutions

Lecture 11: The error equation. Energy estimates. Accuracy of discrete approximation. Unceartainty in data. Initial and boundary conditions. (Sec. 3.1-3.2 + Handouts)

IV. High order finite difference approximations

Lecture 12: Effectiveness of high order schemes. (Sec. 1.1-1.2)

Lecture 13: Approximation in space. Standard and staggered grids. Pade' type difference operators. (Sec. 4.1-4.3)

Lecture 14: Approximation in time. The test equation. Runge-Kutta and linear multi-step methods. The Lax-Wendroff principle.(Sec 5.1-5.3,6.1)

V. Summation-by-parts operators and weak boundary conditions

Lecture 15-16: Boundary treatment. Summation by parts (SBP) operators. Weak boundary conditions. Strict/time stability. (Sec. 7.1-7.4 + Handouts)

VI. Extension of previous concepts to techniques for complex geometries

Lecture 17-18: Structured multi-block methods. Unstructured finite volume methods and discontinuous Galerkin methods. The spectral difference method. Stability and conservation. (Sec. 12.2 + Handouts)