
WF 8:30-9:45am Physics 227

Instructor

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Site: math.duke.edu/~leili/teaching/duke/math660s16/math660s16.html

Textbooks and references

- C. Johnson, Numerical Solution of Partial Differential Equations by the Finite Element Method, Dover 2009


Grading Policy

70% is roughly B and 80% is roughly A−. Those who wish to do something else can do optional projects to replace the homework. I’ll provide some topics later if someone is interested.

- Attendance (70%). I’ll not check the attendance explicitly but I know who come.
- Homework (30%). There will be roughly 3 or 4 homework assignments through the semester. I’ll focus on your ideas for designing schemes instead of the actual coding. For coding, you can use whatever language you prefer. MATLAB, however, is recommended.

Tentative Schedule: (There will be 26 lectures.)

- Lec1-Lec10: Finite Difference Methods (FDM) for typical elliptic, and evolutionary (parabolic and hyperbolic) equations. The consistency, stability and convergence analysis for the schemes will be emphasized.
- Lec11-Lec15: Fourier Spectral Methods (DFT/FFT) and Chebyshev spectral methods for PDEs with certain boundary conditions.
- Lec16-Lec22: Finite Element Methods (FEM) for typical elliptic (the main part) and evolutionary equations. Some simple examples of discontinuous Galerkin’s method (DG) and boundary element methods will be introduced.
- Lec23-Lec26: If time allows, brief introduction to finite volume methods (FVM) for conservation laws (mainly hyperbolic) will be given. The concepts of shocks and rarefaction waves, entropy weak solutions will be emphasized. Flux or slope limiters may be touched.