CLASS POLICY SHEET
MATH 5474 CRN 84617; CS 5474 CRN 82218

Instructor: Pengtao Yue
Email: ptyue@math.vt.edu
Phone: 540-231-7533
Office: 440 McBryde
Office hours: MW 10:15-11:15am, Th 3:30-4:30pm, other time by appointment.

Course web page: [http://www.math.vt.edu/people/ptyue/class_homepages/5474_84617.html](http://www.math.vt.edu/people/ptyue/class_homepages/5474_84617.html)

Class Time and Location: TuTh, 2:00-3:15pm, McBryde 233


Prerequisites: Math 3414 (Numerical Methods) and Math 4525 (Advanced Calculus).

Contents:

- Basics: introduction to finite difference methods, classification of partial differential equations.
- Two-point boundary value problems: truncation error, global error, consistency, stability, convergence, norms, Dirichlet and Neumann boundary conditions.
- Elliptic equations: overview of elliptic equations, 5-point Laplacian, 9-point Laplacian, ordering unknowns.
- Hyperbolic equations: 1. overview of hyperbolic equations; 2. FD schemes for hyperbolic equations; 3. convergence, consistency, stability and CFL condition; 4. Fourier analysis and von Neumann analysis; 5. order of accuracy; 6. convergence estimates; 7. multistep schemes; 8. dissipation and dispersion; 9. modified PDE.
- Parabolic equations: overview of parabolic equations, FD schemes for parabolic equations, convection-diffusion equation
- Finite difference schemes in multi dimensions
- Second order (in time) equations
- Special topics to be determined

Grading Scheme:
The following guideline will be used to calculate grades:

- Homework (40%).
- Projects (40%).
- Exam (20%).

Homework:
Homework will be assigned regularly. Late work will not be accepted except for valid reasons and consultation with the instructor in advance. You may have discussions with your classmates, but you are not allowed to copy solutions from others’ work. The homework that you hand in must be the product of your own understanding of the material. Complete solution is required and no points will be given to unsupported work. Software like Mathematica may be used for some tedious derivations.

Projects:
Students need to turn in a report (not necessarily very lengthy) for each computing project. There is no requirement on the programming language, but Matlab is recommended. You may have discussions, but you still need to finish the coding and the report independently.

Exam:
A final exam is planned at the end of the semester. The exam date and whether the exam will be in-class or take-home will be announced later. You are not permitted to seek help from any other person.

Honor system:
The Virginia Tech Honor Code applies to all graded work in this course. Students are responsible for understanding and adhering to the Honor Code.