

# MATH 522 Spring 2015 Syllabus, Jan. 12, 2015 Edition\*

Zachariah Etienne

## Instructor Contact Information

- Zachariah Etienne, zbetienne \*`<at>`\* mix.wvu.edu
- Office hours:
  - Armstrong Hall 409C
  - Monday and Friday 1:30–2:30PM, or by appointment

## Course Website

- <http://math.wvu.edu/~zeticienne/>

## Course Prerequisites

- Good computer programming skills
- A basic course in differential equations

## Text

- There is no required textbook. Optional textbooks include
  1. “**The Finite Difference Method for Partial Differential Equations**”, by Mitchell & Griffiths
  2. “**Numerical Solution of Partial Differential Equations**”, by Everstine.
    - Available freely online at <http://gwu.geverstine.com/pdenum.pdf> .
  3. “**Numerical Recipes: The Art of Scientific Computing**”, by Press, Teukolsky, Vetterling, and Flannery. Any edition except the first should be fine.
  4. “**Numerical Methods for Partial Differential Equations**”, by Evans, Blackledge, and Yardley.

## Course Objective

- Partial differential equations (PDEs) are used to describe the dynamics of a wide variety of phenomena in many scientific and engineering contexts, though can be difficult or impossible to solve by hand. Motivated by such a wide variety of applications, this course will provide necessary training for analyzing PDEs and solving them on the computer, with particular focus on finite difference solutions to hyperbolic, parabolic, and elliptic PDEs.

---

\*Note that this syllabus is subject to revision, at the option of the instructor. If revised, the new syllabus will not become official until the instructor has distributed it to students at a regularly-scheduled course meeting.

# Grading

Grading will be based on the total number of points earned by a student. The points will be divided as follows:

- Homeworks/Computer Assignments: 40%
  - Full credit on homework problems will only be given if the student shows all work, providing the corresponding full source code listing if applicable. **Each student must complete each assignment individually. Written solutions or source code listings that are substantially the same will receive zero credit for all students involved. Homework assignments will be due at the start of class on the due date.** Please see Late Homework Policy below.
- Midterm Exams (Friday, Feb 20 and Wed, Mar 18, normal class time/location): 35%
- Comprehensive Final Exam (Thurs, May 7, 8:00AM–10:00AM, normal class location): 25%

## Grading Scale

- A- to A+: 90–100%
- B- to B+: 80–89%
- C- to C+: 70–79%
- D- to D+: 60–69%
- F: Below 60%

## Late Homework Policy

Turning in homeworks on time is essential for doing well in this class, as they are scheduled according to the lecture material. Late assignments will be penalized as follows:

- Up to 48 hours late: 20% score reduction
- 48–96 hours late: 50% score reduction
- More than 96 hours late: 75% score reduction

## Tentative Course Outline

- Finite-precision mathematics on the computer: roundoff error
- Classification of PDEs
- Finite difference approximations to derivatives, and its relation to interpolation; higher-order approximations.
- Truncation error and convergence
- Hyperbolic equations; explicit schemes; solving the wave equation
- Stability and Consistency; Lax equivalence theorem
- Parabolic equations; solving the heat equation; exact solutions via Fourier series
- Implicit schemes; algorithms for solving matrices on the computer
- Elliptic equations; solving the Poisson equation

## Academic Dishonesty

The integrity of the classes offered by any academic institution solidifies the foundation of its mission and cannot be sacrificed to expediency, ignorance, or blatant fraud. Therefore, I will enforce rigorous standards of academic integrity in all aspects and assignments of this course. For the detailed policy of West Virginia University regarding the definitions of acts considered to fall under academic dishonesty and possible ensuing sanctions, please see the Student Conduct Code [http://studentlife.wvu.edu/office\\_of\\_student\\_conduct/student\\_conduct\\_code](http://studentlife.wvu.edu/office_of_student_conduct/student_conduct_code). Should you have any questions about possibly improper research citations or references, or any other activity that may be interpreted as an attempt at academic dishonesty, please see me before the assignment is due to discuss the matter.

## Inclusivity Statement & Accommodations

“The West Virginia University community is committed to creating and fostering a positive learning and working environment based on open communication, mutual respect, and inclusion. If you are a person with a disability and anticipate needing any type of accommodation in order to participate in this class, please advise me [the instructor] and make appropriate arrangements with the Office of Accessibility Services (293-6700). For more information on West Virginia University’s Diversity, Equity, and Inclusion initiatives, please see <http://diversity.wvu.edu>.”

**Students requesting special accommodations are required to inform the instructor at least 48 hours in advance of a test.**

## Electronic Device Policy

During class and during exams, cellular phones and other electronic devices (including but not limited to **calculators**, tablet computers, laptops, PDAs, MP3 players, Blackberrys) are not permitted, except with the consent of the instructor. All forbidden devices must be turned off before the beginning of the class period and placed out of sight (for example, in a backpack or purse) until the class has concluded.

Failure to comply with this policy may result in expulsion from the course.