Math 511  
Numerical Methods for Partial Differential Equations  
Winter Semester 2016  

Professor:  Vianey Villamizar  
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Office Hours: Monday 5:00-6:30 (at my office)  
Friday 3:30-4:30 or by appointment.

Texts: 1) Finite Difference Methods for Ordinary and Partial Differential Equations  
by Randall J. LeVeque, SIAM, 2007  
2) Own Notes.

Tentative Class Schedule

Week 1  (Jan 4 – Jan 8):  Chapter 1 (LeVeque): Finite Difference Approx.  
Weeks 2 – 6  (Jan 11 – Feb 8):  Chapter 2 (LeVeque): Steady State. Two Point BVP  
Week 6  (Feb 8 – Feb 12):  Chapter 3 (LeVeque): Elliptic Equations  
Weeks 7 - 8  (Feb 15 – Feb 26):  Chapter 4 (LeVeque): Iterative Methods and  
Elliptic Grid Generation (Own Notes)  
Weeks 9 – 10  (Feb 29 – Mar 11):  Parabolic Eqs (Own notes). Chapter 9 (LeVeque)  
Week 11  (Mar 14 – Mar 18):  Acoustic Scattering  
Week 12 - 14  (Mar 21 – Apr 8):  Hyperbolic Eqs (Own Notes). Chapter 10 (LeVeque):  
Weeks 15 -16  (Apr 11 – Apr 20):  Review and Finals

Important Dates

- Fri Jan 15:  Add/Drop Deadline.  
- Monday, Jan 18:  Martin Luther King  Holiday  
- Monday, February 15:  Presidents Day Holiday  
- Tuesday, February 16:  Monday Instruction  
- Midterm  Feb 26 – Feb 29:  Friday - Saturday and Monday  
- Tuesday, Mar 15:  Withdraw Deadline  
- Apr 12:  Last Day of Class  
- Wed-Thu, Apr 13-14:  Exam Preparation Days  
- Apr 15-16, 18-20:  Final Exams  
- Final Exam/Project due Apr 15.

Course Objectives: This course is designed to prepare students to solve mathematical problems modeled by  
partial differential equations that cannot be solved directly using standard mathematic techniques, but which  
are amenable to a computational approach. Students are introduced to the discretization methodologies, with  
particular emphasis on the finite difference method that allows the construction of accurate and stable numerical schemes. In depth discussion of theoretical aspects such as stability, analysis, and convergence will enhance the students’ understanding of the numerical methods. Students will also be required to perform programming and computation so as to gain experience in implementing the schemes and to be able to understand the numerical performance of the various numerical methods.
I believe that my role as your instructor is to help and assist you in the process of learning mathematics. I will do my best to fulfill this role. I know that we will enjoy this class as we go along by making a consistent effort throughout the semester. My best advice to you is found in D&C 4:2 replacing the first line by …. O ye that embark in Math 511, see that ye work with all ….

Homework: Homework will consist of some theoretical questions and applications of the numerical methods learned in class to some initial and/or boundary value problems. They will be more like small projects. You will need to use a computer to implement the algorithms needed for the homework. I expect that you have good programming skills. Programming is an important part of this class. I strongly recommend that you use MATLAB as your programming language, but you can also use Python, FORTRAN, JAVA, or C++. Late homework will not be accepted.


Midterm Exam and Final Project: The Midterm exam will be based on the material covered until the previous Monday. The midterm exam will be given in the testing center on February 26-Feb 29 (Fr-Sat, Mon). I expect that most students will finish it in at most three hours. However, the time limit will be up to four hours. Only basic scientific calculators (no graphic or symbolic ones) will be allowed in this exam. Also, a one-sided card of notes, no larger than 8” by 5”, will be permitted. No books and no other notes will be allowed.

Grading: Grades will be based on cumulative points earned as follows:

Homework 45%, Midterm Exam 20%, Midterm Project 10%,
Final Exam/Project 25%

At the end of the semester, I will make an average based on each one of the above forms of evaluations with their corresponding weights. Then, a Gaussian curve will help me to determine your final grade. In any event, the Gaussian curve will not hurt your grade. I will guarantee the following letter grades:

- B+ = 89-97%, C+ = 79-77%, D+ = 69-67%
- A = 100-93%, B = 86-83%, D = 66-63%, E = 59-0%
- A- = 92-90%, B- = 82-80%, C- = 72-70%, D- = 62-60%

Keep in mind that a good grade is the end result of a good learning process. All of you can get a good grade by successfully experiencing this learning process.

Sexual harassment: BYU's policy against sexual harassment extends not only to employees of the university but to students as well. If you encounter sexual harassment, gender-based discrimination, or other inappropriate behavior, please talk to your professor, contact the Equal Employment Office at 422-5895 or 367-5689, or contact the Honor Code Office at 422-2847.

Students with disabilities: BYU is committed to providing reasonable accommodation to qualified persons with disabilities. If you have any disability that may adversely affect your success in this course, please contact the University Accessibility Center at 422-2767. Services deemed appropriate will be coordinated with the student and instructor by that office.

### TENTATIVE HOMEWORK ASSIGNMENTS

**Math 511: Introduction to Numerical Methods for PDE’s – Winter 2010**

**Instructor: Vianey Villamizar**

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* Homework is due at 6:00 pm on the designated Day.