Math 454, Winter 2014, Section 001

Instructor: Peter Bosler, 4823 East Hall, pbosler@umich.edu
Class Time / Location : Tu & Thu, 12 – 1:30 PM, 1311 EECS
Office Hours : W 3–4PM, F 12–1PM, and by appointment

Textbook : Richard Haberman. *Applied Partial Differential Equations, 5th ed.*, Pearson, 2013. ISBN 0-321-79705-1.

Prerequisites : multi-variable calculus (*e.g.* Math 215, 255, 285, or 316).
differential equations (*e.g.* Math 216, 256, 286, or 316).
linear algebra (*e.g.* Math 217, 417, or 419) is helpful but not required.

Course Website: www-personal.umich.edu/∼pbosler/teaching/math-454—winter-2014.html

Math 454 is an introduction to Partial Differential Equations (PDEs). We will emphasize the connections between mathematics and physics at each step, and study the canonical PDEs: the heat equation, Laplace's equation, the wave equation, Poisson's equation, and the advection equation. Our first goal will be to learn to solve PDEs using the method of separation of variables, which will lead us to the theory of Fourier series. We proceed to the related methods of eigenfunction expansion and the more general context of Sturm-Lioville problems. We will explore in detail the effects of boundary conditions on problems' solutions and complexity. Time permitting, we will explore Green's functions, spherical harmonics, the method of characteristics, and Laplace transforms.

Syllabus :

heat equation
separation of variables
Laplace equation
Fourier series
Sturm-Lioville problems
spherical harmonics
Poisson's equation
Green's functions
infinite domain problems and the Fourier transform
method of characteristics

Exams :

Midterm Exam 1 : Tuesday, February 11, in class
Midterm Exam 2 : Tuesday, March 25, in class
Final Exam : Thursday, May 1, 1:30 – 3:30 PM, room tba

Grading Policy : homework = 15%, midterm 1 = 25%, midterm 2 = 25%, final exam = 35%

Homework Policy : This course will include weekly homework assignments, mostly from the required textbook. I encourage you to use software (i.e., Matlab, Mathematica) to plot your solutions, but the emphasis of this course is on analysis and theory, not computational results. Students are encouraged to discuss the problems with each other, but each student must write up and submit his or her own solution set. Presentation must be neat and legible, and multiple sheets must be **stapled**. Loose papers will not be accepted.

Other policies :

1. Questions are encouraged in class (and outside of class too – use email or office hours).
2. Please – keep your electronic devices on silent. No texting, web surfing, *etc.,* during class.