

INTRODUCTION TO PARTIAL DIFFERENTIAL EQUATIONS

MA 483G – Fall 2011

[**Note:** I reserve the right to change or amend this syllabus as I deem necessary, at any time, and for any reason.]

Basic Information

- **Time and Place:** MWF 12:00–12:50 p.m. in CB 345.
- **Instructor:** Prof. Michel Jabbour, 729 POT, ext. 7-8836, jabbour@ms.uky.edu.
- **Office Hours:** MWF 2:00–3:00 p.m. (or by appointment) in 729 POT.
- **Exams:** There will be **two in-class** and **one take-home** exams. Whereas each in-class exam will last *50 minutes*, the duration of the take-home exam will be *two hours*. The exact dates of the in-class exams will be announced *one week* in advance; they will depend on the pace at which the class will move, but *tentative* dates are *30 September* for the first exam and *31 October* for the second exam. The *cumulative* take-home exam will be distributed *one week* before its due date. You will have the freedom to take it any time during this week, as long as you do not exceed the allotted two hours. A *tentative* due date for the take-home exam is *02 December*; the exact date will be confirmed by *18 November*.

You are expected to work on the take-home exam on your own and to follow all instructions regarding the exam as specified by the instructor. *You are not allowed to collaborate on the take-home exam with other students.* No makeup exams will be given unless your absence is due to a *documented* illness.

Material

- **Textbook:** *Partial Differential Equations. An Introduction* (2nd ed.) by Walter A. Strauss, Wiley.
- **Abstract and Prerequisites:** This is a one-semester introductory course in partial differential equations (PDE's). You are expected to have a working knowledge of calculus, including basic facts about: continuous and differentiable functions of one and multiple variables; vector fields; infinite series of functions; derivatives of integrals; curves and surfaces in three-dimensional space; and Green's and the divergence theorems. (For a brief review, see the appendices in the textbook by Strauss.) An elementary knowledge of linear ordinary differential equations (ODE's), particularly those with constant coefficients, is also expected. A certain amount of mathematical rigor will be implemented. Specifically, significant results will be stated as theorems and careful proofs will be given where needed. Roughly, emphasis will be placed

on the general properties of **linear** PDE's and techniques for obtaining solutions of initial-boundary value problems (IBVP's) that appear in the natural sciences and engineering. In particular, the classical **diffusion**, **wave**, and **Laplace** equations will be studied at some length.

- **Topics:** We will cover parts of the following chapters of Strauss' textbook:
 - Chapter 1: Where PDE's Come From.
 - Chapter 2: Waves and Diffusions.
 - Chapter 3: Reflections and Sources.
 - Chapter 4: Boundary Problems.
 - Chapter 5: Fourier Series.
 - Chapter 6: Harmonic Functions.
 - Chapter 7: Green's Identities and Green's Functions.
 - Chapter 12: Distributions and Transforms.
 - Chapter 13: PDE Problems From Physics.

Attendance, Homework, and Quizzes:

- **Attendance:** You must be present at, prepared for, and engaged in class each lecture. If you need to miss class for some reason, please notify me ahead of time.
- **Homework:** Problem sets will be assigned at the end of each section that we cover in class but shall not be graded. The purpose of these assignments is for you to develop the necessary technical skills for solving PDE's, but also to sharpen your understanding of the underlying mathematical structure of the subject. *In order to be best prepared for the quizzes and exams, you should diligently attempt to solve all assigned problems.* You are encouraged to discuss homework problems with each other; however, do not let cooperation degenerate into one person solving the problems and other people copying his/her answers.
- **Quizzes:** We will have in-class quizzes periodically. Dates will be announced in class *one week* before each quiz. Makeup quizzes will not be given except in cases such as a *documented* illness.

Grading and University Policies:

- **Final Grade:** Attendance and the quiz average will count for **30%** of your final grade, each of two in-class exams will count for **20%**, and the take-home exam will represent **30%**. The letter grade will be determined according to the standard scheme, i.e., the letter grade A would correspond to 90% and above, the letter grade B to a numerical grade between 80% and 89%, the letter grade C to a numerical grade between 70% and 79%, the letter grade D to an average between 60% and 69%, and the letter grade E to a numerical grade smaller or equal to 59%.

- **Academic Integrity and Classroom Demeanor:** All students are expected to follow the academic integrity standards as explained in the University Senate Rules, particularly Chapter 6, found at:

<http://www.uky.edu/USC/New/SenateRulesMain.htm>

Turn off all cell phones, pagers, etc. prior to entering the classroom. *The use of cell phones and other electronic devices during class is strictly prohibited.* An attitude of respect for and civility towards other students in the class and the instructor is expected at all times.