

Math 674

Applied Partial Differential Equations

Class Policies

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Office Hours: MWF 2:00 – 3:00

Fall 2005

M: 5:00-7:40 p.m.

Section: 101

Prerequisites: MATH 265 (Elementary Linear Algebra) and MATH 374 (or MATH 574) (Differential Equations) and MATH 379 (or MATH 579) (Advanced Calculus) and MATH 475 (or MATH 577), (Complex Analysis) or consent of chairperson.

Catalog Description: Discussions of the typical partial differential equations of applied mathematical physics: Heat equations, Wave equations, Beam equations, Laplace equations. Separation of variables, variation of parameters and and Fourier transform for initial and boundary value problems, Calculus of variation and Ritz-Galerkin's numerical method.

Learning Objectives:

1. To understand the basic theory of the heat equation, including the derivation, series methods, the fundamental solution and Green's functions.
2. To understand the basic theory of Laplace's equation, including the derivation, series methods, the fundamental solution, Green's functions, and solution by integral equations.
3. To understand the basic theory of the wave equation, including derivations from the vibrating string, shallow water waves, and compressible fluids. Initial and initial-boundary value problems. The D'Alembert solution. Dispersion.
4. To understand the general classification of second order partial differential equations.
5. To understand quasilinear first order equations. Weak solutions, shocks, and rarefaction fans.
6. Further topics if time permits.

Academic Integrity: The nature of higher mathematics requires that students adhere to accepted standards of academic integrity. Violations of academic integrity include cheating, plagiarism, falsification and fabrication, complicity in academic dishonesty, personal misrepresentation and proxy, bribes, favors and threats. Cheating is a serious offense that will have grave consequences for your academic life.

Students who violate these standards will either fail the course outright or, at the instructor's discretion, may merely receive a zero on any assignment for which the student receives inappropriate assistance. Particularly serious violations of these standards will be referred to the administration for possible additional action.

Instructional Material: The primary required text is *Partial Differential Equations* by J. Kevorkian. Other useful references include

- *Introduction to Partial Differential Equations with Applications*, E.C. Zachmanoglou and Dale W. Thoe
- *Introductory Applications of Partial Differential Equations*, by G.L. Lamb Jr.
- *Applied Partial Differential Equations*, by J. Ockendon, S. Howison, A. Lacey and A. Movchan
- *Introduction to Partial Differential Equations*, by A. Tveito and R. Winther
- *Partial Differential Equations*, by F. John
- *Partial Differential Equations*, by H. Levine
- *Methods of Mathematical Physics*, by R. Courant and D. Hilbert
- *Basic Partial Differential Equations*, by D. Bleecker and G. Csordas.

Attendance: Attendance is expected; you should only miss a class for a compelling reason. If you do miss a class, you are responsible for any material that you miss, including any homework assignments given in that class. Unexcused absences can result in a lower grade.

Grading: Problem sets will be assigned each week; they will be collected 1-2 weeks later. There will be no midterm examinations, but there will be a final exam. The final grade shall be determined by a weighted average of the

homework grade and the final exam grade; the final exam is worth 30% and the homework assignments will be worth 70%.

Guidelines for Homework:

- (1) Late work will not be accepted without a compelling reason.
- (2) Assignments are required to be neat, clean, and paper-clipped or stapled.
- (3) Assignments must include the author's name, and a brief description of the assignment.
- (4) Students are allowed to discuss homework problems with their classmates, however all work that is

turned in must be the student's own work.

Any assignment that does not meet these criteria may receive a deduction in score, or more generally will simply be rejected.

Final Exam: The Final Exam is scheduled for **Monday, December 12, from 5:00-7:00 pm**. The final exam will not be rescheduled. Attendance is expected; a make-up exam will not be given without an extremely compelling reason. The final exam shall be comprehensive.

Withdraw: The last day to withdraw from the course with a grade of "W" is November 9.

Help: If you have difficulty completing a homework assignment, do not hesitate to ask for help, either from your friends, or from me. You are welcome to stop by my office, for whatever reason, and at whatever time, even if there are no office hours scheduled then. If you wish, you may also simply send an e-mail message.

Web Page: My web page at <http://www.towson.edu/~moleary> has copies of all of the old exams that I have given while at Towson.