Course Overview

Partial differential equations are pervasive in physic and engineering, appearing in models of fluid flow, gravity, quantum mechanics, heat flow, and electrodynamics just to name a few. This course covers the elementary theory of PDEs, considered from a rigorous and mathematical perspective. We'll study the "Big Three" second order PDEs in some detail: Laplace's equation, the heat equation, and the wave equation. The goal is to describe the properties of the solutions of these equations, largely using representation formulas. We'll also consider the theory of nonlinear first order equations via the method of characteristics.

Essential Information

Professor	David Maxwell
Office	Chapman 308C
Email	`ffdam@uaf.edu`
Phone	474-1196
Web	`http://www.math.uaf.edu/~maxwell`
Prerequisites	MATH F422 or my permission.

Course Texts

We will use a now classic book as our requried text:

Partial Differential Equations, Lawrence C. Evans, Graduate Studies in Mathematics, American Mathematical Society.

Our goal is to cover roughly chapters 1-4. It's a comprehensive book, and will server as a good reference for you in the future.

The remaining books are all optional.

Partial Differential Equations, Methods and Applications, Robert C. McOwen, Prentice Hall,

is similar in scope to Evans, and would have been a good candidate for the course text.

An Introduction to Partial Differential Equations, Yehuda Pinchover and Jacob Rubinstein, Cambridge University Press,

is a very nice text written at a more elementary level.

Finally,

Partial Differential Equations with Numerical Methods, Stig Larsson and Vidar Thomée, Texts in Applied Mathematics, Springer,

is an unusual text, combining an introduction to the theory and numerics of PDEs.

Class Time

There will be three hours of class lecture each week. As the semester progresses, I'll try to have some problem solving sessions during class time if the homeworks warrent them.

Lecture Times
MWF 3:30–4:30 Chapman 107

Office Hours

I will schedule 2 hours a week of formal office hours. These times will be chosen after consulting with you. I will post the times on my website and outside my office door. I have an open door policy; if I'm in my office and my door is open, please feel free to drop by with questions. You are also welcome to schedule a meeting outside of my formal office hours by sending me an email

Homework

There will be a homework assignment due roughly every week. Homework will be due in my box by 5:00pm on the due date. Please don't put homework under my office door; I might not check there!

Every semester I seem to have a different late homework policy, trying to find a good balance. This semester the policy is as follows: you can hand in an unexcused late homework for full credit until such time that the solutions are posted, after which point you can get 1/2 credit for your late homework. However, no more than two assignments will be accepted late.

Midterms

There will be one in-class midterm exam. It is tentatively scheduled to be held on Monday, October 24.

Final Exam

There will be a comprehensive take home final exam, to be handed in on December 16. More details about the exam will be announced later.

Evaluation

Course grades will be determined as follows:

Homework	50%
Midterm	25%
Final	25%

Letter grades will be assigned according to the following scale. This scale is a guarantee; I also reserve the right to lower the thresholds.

A	90–100%
B	80–89%
C	70–79%
D	60–69%
F	0–59%

Tentative Schedule

Week	Topics and Events
9/1	Overview of PDEs. Derivation of the heat equation. (Evans Ch.1)
9/6 – 9/8	Transport Equation, start Laplace's Equation (Evans 2.1, 2.2)
9/11 – 9/15	More Laplace's Equation (Evans 2.2)
9/18 – 9/22	Still more Laplace's Eqation, start Heat Equation (Evans 2.2, 2.3)
9/25 – 9/29	Start Heat Equation (Evans 2.3)
10/2 – 10/6	Finish Heat Equation, start Wave Equation (Evans 2.3, 2.4)
10/9 – 10/13	Finish Wave Equation (Evans 2.4)
10/16 – 10/20	Start first order PDEs. Complete integrals and characteristics (Evans 3.1, 3.2)
10/24 – 10/28	More on characteristics (Evans 3.2) Midterm: Oct. 24
10/30 – 11/3	Conservation laws (Evans 3.4)
11/6 – 11/10	More on conservation laws (Evans 3.4)
11/13 – 11/17	Hamilton-Jacobi Equations (Evans 3.3)
11/20 – 11/22	Separation of variables, similarity solutions (Evans 4.1, 4.2) Thursday: Thanksgiving
11/27 – 12/1	More similarity solutions. Transform methods (Evans 4.2, 4.3)
12/4 – 12/8	Asymptotics (Evans 4.5)
12/11	Review

Rules and Policies

Collaboration You are encouraged to work together in solving homework problems. But each student must write up his or her own solutions independently. If you receive significant help solving a problem, it is customary to make a note in your homework to give the person who helped you credit.

Makeup Exams and Absences

Although attendance is not included as part of your grade, you are strongly encouraged to attend every class. However, this is a graduate class, and there are circumstance where you might be reasonably away during part of the course (e.g. attending a conference). If you know you are going to be away for part of the class, please contact me with the details as soon as possible, and we will make arrangements for you to hand in homework late or make up the midterm exam if need be.

Cell Phones Turn off your cell phone before you come to class.

Disabilities Services I will work with the Office of Disabilities Services (203 Whitaker, 474-7043) to provide reasonable accommodation to students with disabilities.

Incomplete Grade Incomplete (I) will only be given in Computer Science, Mathematics or Statistics courses in cases where the student has completed the majority (normally all but the last three weeks) of a course with a grade of C or better, but for personal reasons beyond his/her control has been unable to complete the course during the regular term. Negligence or indifference are not acceptable reasons for the granting of an incomplete grade. (Note: this is essentially the old University policy.)

Late Withdrawals A withdrawal after the university deadline from a Department of Mathematical Sciences course will normally be granted only in cases where the student is performing satisfactorily (i.e., C or better) in a course, but has exceptional reasons, beyond his/her control, for being unable to complete the course. These exceptional reasons should be detailed in writing to the instructor, department head and dean.

Academic Dishonesty Academic dishonesty, including cheating and plagiarism, will not be tolerated. It is a violation of the Student Code of Conduct and will be punished according to UAF procedures.