

# MAT 400 APPLIED PARTIAL DIFFERENTIAL EQUATIONS: OUTLINE

2013/2014 Term 2

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**Objectives:** This course is intended for analytical methods in solving partial differential equations (PDE's) coming from physical applications. The focus is on the analytical techniques. Very few proofs will be involved.

**Textbook :** No required textbook. Optional textbook: Walter A. Strauss, Partial Differential Equations, An Introduction, John Wiley & Sons, Inc., 1992

## Additional References

- Richard Haberman, "Elementary Applied Partial Differential Equations"

## Topics and Teaching Scheme

- Solving First-order PDEs, Methods of Characteristics
- Quasilinear PDEs, Shocks, and Traffic Flow
- Wave Equation on Infinite Domain: D'Alembert's representation, Fully Nonlinear First Order PDE and Caustic
- Heat Equation on Infinite Domain: Gaussian, Comparison of Wave Equation and Heat Equation
- Steady-state solutions for the Heat Equation
- Heat and Wave Equation in Bounded Domains: Separation of Variables, Sturm-Liouville, and Eigenfunction Expansion
- Laplace and Poisson's Equation: Poisson Formula, and Qualitative Properties of PDE
- Bessel Functions: Heat and Wave Equation in High Dimensions

- Integral Transforms and Infinite Domain Problems: Fourier Transformations, Laplace Transforms
- Nonlinear PDEs (time permits)

**Assignments:**

There will be 7 assignments. (I will post them on my web page: [www.math.ubc.ca/~jcwei](http://www.math.ubc.ca/~jcwei).) There will be one midterm and one final examination.

Lecture notes, assignments, solutions to assignments and examinations will be posted on my web when they are ready.

**Assessment Scheme**

Final Examination	1	50%
Midterm Examination	1	15 %
Assignments	7	35 %
Total		100 %

**Office Hours:**

TBA

**Final Remark:** Any questions? Please send me an email or drop by my office Math Annex 1224.