

# MAT 400 APPLIED PARTIAL DIFFERENTIAL EQUATIONS: OUTLINE

2016/2017 Term 1

**Instructor:** Juncheng Wei, LSK 303B, Tel. 604-822-6510, E-mail: jcwei@math.ubc.ca

**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

- 14 Lecture Notes can be downloaded from my course website.

## Topics and Teaching Scheme

- Solving First-order (linear and nonlinear) PDEs, Methods of Characteristics
- Quasilinear PDEs, Shocks, Expansion Fans, and Traffic Flow
- Wave Equation on Infinite Line: D'Alembert's representation
- Heat Equation on Infinite Line: Gaussian, Comparison of Wave Equation and Heat Equation
- Wave and heat equations in half line: method of extensions
- 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:**

Monday, Wednesday, Friday, 4:30-5:20pm

**Final Remark:** Any questions? Please send me an email or drop by my office LSK 303B.