MAT 400-101 APPLIED PARTIAL DIFFERENTIAL EQUATIONS: OUTLINE

2022/2023 Term 1

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

Time and Place: Mon-Wed-Fri: 9am to 10am in Frederic Lasserre Building (LASR)-102

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. All lectures will be posted online at Canvas. Optional textbook: Walter A. Strauss, Partial Differential Equations, An Introduction, John Wiley & Sons, Inc., 1992

Additional References

•• **15** Lecture Notes can be downloaded from canvas or from my course website (http://www.math.ubc.ca/
101-2020.html).

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

Midterm dates: Midterm One, Oct. 7, 2022; Midterm Two, Nov. 14, 2022. There are no make-up midterms. If you miss a midterm for a valid medical reason, the weighting for the final will be adjusted. Other than this, no re-negotiating of the weights of the different components of the overall grade will be considered.

Assignments:

There will be weekly assignments. No late homeworks will be accepted for any reason. I will drop the lowest HW score.

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

Assessment Scheme

Final Examination	1	50%
Two Midterm Examination	2	30 %
Assignments	8	20 %
Total		100 %

Office Hours:

In-office hours: Monday, Wednesday, 3:30-5pm
Online office hours: Friday, Sunday: 8:30-10pm

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