MATH 400: Applied Partial Differential Equations

Prerequisite: Complex variables (one of MATH 300, MATH 305) and an introduction to partial differential equations and Fourier series (one of MATH 256, MATH 257, MATH 316, MATH 368, MECH 368, PHYS 312). Implicit prerequisite: multivariable calculus, vector calculus, and linear algebra.

Instructor: Michael Ward, Math Annex 1217, ward@math.ubc.ca **Office Hours:** Wednesdays 10:00-12:00

Course Topics:

- Sturm Liouville Theory, Separation of Variables, Eigenfunction Expansions.
- Diffusion (Heat) Equation and Modeling: Analysis by Eigenfunction Expansion, Laplace transform, and Fourier Transform. Relevant special functions.
- Wave Equation and Modeling: Analysis by Eigenfunction Expansion and Fourier Transform; D'Alembert's formula in 1-D and multi-dimensions. More special functions.
- Laplace's (Potential equation): Steady-state temperature distributions and qualitative properties. Poisson's formula, and spherical harmonics.
- Classification of linear second order PDE's.
- Method of Characteristics for First Order Equations: Traffic Flow; Shocks, Modeling.
- Introduction to more advanced topics: dispersion relations, edge singularities, nonlinear PDEs.

Course Topics: Written notes for the course as well as HW's and HW solutions will be on my course webpage (which is mirrored on canvas): http://www.math.ubc.ca/ ward/teaching/math400.html

Book References: (No Official Text Required)

- Strauss: Partial Differential Equations: An Introduction, Wiley (2008)
- Haberman: Applied Partial Differential Equations
- Carrier and Pearson: PDE's
- Pinchover and Rubinstein; An Introduction to Partial Differential Equations, Cambridge U. Press. (2005)

Grading: There will be 2 midterms and roughly eight homework assignments. The grading scheme is 15% for each midterm, 20% for the homework, and 50% for the final exam. The Midterm dates will be in mid October and mid November done in class. **No late homeworks will be accepted.** The lowest homework score will be dropped.

Course Policies: Homework assignments submitted late are not marked. Students are allowed to collaborate with others when working on homework assignments. However, the work that they submit must be their own and not copied.

There are no make-up tests for missed midterm tests. If academic concession for a missed midterm test is requested by a student and approved by the course instructor, then the marks for the missed test are shifted onto the final examination. Examples of valid reasons include illness and being absent from home to represent the University, British Columbia or Canada in a competition or performance. Examples of reasons that are not valid include conficts with personal travel schedules or conflicts with work schedules. Note that a student who misses the midterm test and has otherwise not completed a substantial portion of the homework shall not be admitted to the final examination.

For more details on academic concession see the UBC Calendar website http://www. calendar.ubc.ca/vancouver/index.cfm?tree=3,329,0,0.

University Policy Statement: UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious and cultural observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions. Details of the policies and how to access support are available here (https://senate.ubc.ca/policies-resources-support-student-success) .