

# MATH 516 101 2020W Partial Differential Equations I

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## Math 516 Partial Differential Equations I

**Term 1** (Sep 08, 2020 to Dec 03, 2020)

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**Class:** MWF 1pm-2pm (Vancouver time!). ONLINE via **ZOOM** available through **Canvas**.

**Find the Zoom link in the left menu in the Canvas page, below Home.**

This course is an introduction to the qualitative theory of partial differential equations, focusing on elliptic and parabolic problems. Our main goal is to understand basic concepts of weak solutions in appropriate function spaces such as Sobolev spaces. This course should be useful to students with interests in applied mathematics, differential geometry, mathematical physics, probability, harmonic analysis, dynamical systems, and other areas, as well as to PDE-focused students.

### Main textbook (optional)

Partial Differential Equations 2/E. L. C. Evans. AMS

- **Pre/co-requisites**
  - Basic measure theory, such as Math 420 (or equivalently Math 507) is necessary. Some functional analysis, such as Math 421 (or equivalent Math 510) would be helpful, as would some previous exposure to PDE.
- **Evaluation skim:** Homework assignments (3 or 4 problem sets) and class participation

### Topics (subject to changes):

- 1. Laplace / heat / wave equations (2 - 3 weeks)
  - fundamental solutions
  - mean value properties, regularity, maximum principles, uniqueness
  - for boundary (and initial) value problems.
- Sobolev Spaces (4 weeks)

- Linear Elliptic Equations (3 - 4 weeks)
  - existence of weak solutions
  - regularity
  - maximum principles
  - eigenvalues / eigenfunctions
- Linear Parabolic equations (1 + 1/2 weeks)
  - existence of weak solutions
  - regularity, maximum principles
- Supplementary topics (only if time permits): TBD

### HW policy:

- Students may work together on the HW assignments but must write up their solutions **independently**. Copying is forbidden. Any 2 (or more) assignments with some virtually identical answers deemed the result of copying will be given 0 total credit, and there will be further consequences for such dishonest actions. The students are reminded of the plagiarism policies of UBC.
- We will be using Canvas for collecting the HWs.
- **Late homework is not accepted.**
- Unreadable homework will get a zero mark. You should write neatly and organize your material for a third party can understand.
- Work must be shown.
- Missed homework will count as a zero mark.
- The number of each homework problem should be clearly printed.
- It is probable that only a subset of those problems turned in would be graded, and you will not be informed (in advance) which ones these are. For example, if your homework does not contain any of the problems to be graded (which will be known only after the due date), you will get zero mark. So, it would be better for you to do all the problems to be handed in.
- For selected problems, only some important steps and/or the final answer will be checked.

### Copyright:

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## Course Summary:

**Date**

**Details**

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