

Math 110.417  
Partial Differential Equations

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# Course Introduction

## 1. Syllabus [Course Webpage](#)

- Office hours
- HWs, Quizzes, Exams: in-classroom or Blackboard (Vote)
- DRP, Youtube videos

## 2. Contents

# Contents

## Equations:

- ▶ Heat equation
  - IBVP, equilibrium, fundamental solutions, maximum principles
- ▶ Laplace equation
  - Sturm-Liouville eigenvalue problems, (Green's functions, Poisson's formula, maximum principles, potential theory)
- ▶ Wave equation
  - Cauchy problem, domains of influence and dependence, (Poisson's solution, energy inequalities)

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## Methods:

- ▶ separation of variables and expansions of solutions
- ▶ Fourier series (bounded domain)
- ▶ Fourier transform (infinite domain)
- ▶ Green's function / Method of characteristics (optional)
- ▶ Laplace transform (optional)

## Philosophy: formulation, solution and interpretation

**PDEs:** equations containing partial derivatives.

**Notations:**

Variables  $x$  space,  $t$  time

Derivatives  $\partial_t u := \frac{\partial u}{\partial t}$ ,  $\partial_x u := \frac{\partial u}{\partial x}$

**Review: solving ODEs**