## PARTIAL DIFFERENTIAL EQUATIONS, PART 1 M 393C Fall Semester 2022

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The topic of the graduate course will be on Nonlinear partial differential Equations, with emphases on elliptic and parabolic equations.

#### Second order Elliptic equations

- 1. Existence of weak solutions
- 2. Interior and exterior regularity
- 3. Maximum principle
- 4. Harnack's inequality
- 5. Cacciopoli's inequality and applications
- 6. Campanato's spaces
- 7. Schauder's theory
- 8. Hölder regularity estimates
- 9. Calderon Zygmund decomposition

#### Second order Parabolic equations

- 1. Existence of weak solutions
- 2. Regularity
- 3. Maximum principle
- 4. Schauder's estimates

### Applications to kinetic equations

- 1. Landau equation
- 2. Landau-Fermi-Dirac equation

#### **Bibliography:**

- L.E. Evans, Partial Differential equations
- E. H. Lieb and M. Loss, Analysis

G. M. Lieberman, Second order parabolic differential equations

O. A. Ladyženskaja, V. A. Solonnikov, and N. N. Ural'ceva, *Linear and quasilinear equations of parabolic type* 

D. Gilbarg, N.S. Trudinger, Elliptic Partial Differential Equations of Second Order