

UBC MATH 517, 2024W T2: PDE II

Instructor: Stephen Gustafson, MATH 115, gustaf@math.ubc.ca

Office hours: TBA

Website: the course Canvas page

Class schedule: Mon/Wed/Fri 1:00-1:50 in AUDX 157

Course description: in this sequel to MATH 516 (PDE I: elementary linear PDE), we focus primarily on methods for studying **nonlinear PDE**, especially **variational methods**, and techniques for **evolution equations**. Applications include: problems in geometry, quantum mechanics, waves, fluids, magnetism, heat flow, etc.

Tentative list of topics (may be tweaked based on student interests):

–Variational (and related) methods:

- direct methods in the calculus of variations
- variational problems with constraints
- properties of minimizers: regularity, symmetry, positivity
- minimax methods
- concentration-compactness
- bifurcation theorems

–(Nonlinear) evolution equations:

- constructions of weak and mild solutions
- application to nonlinear parabolic and hyperbolic PDE
- solution properties: regularity, positivity

References: useful texts for this course include (more to be added during term):

- M. Struwe, *Variational Methods*
- L. C. Evans, *Partial differential equations*
- E. Lieb, M. Loss, *Analysis*
- D. Gilbarg, N. Trudinger, *Elliptic PDE of second order*
- Q. Han, F.-H. Lin, *Elliptic PDE*

Evaluation: grades will be based on written homework assignments

–last updated: Sep. 2, 2024