

Partial Differential Equations

Spring 2015, MATH-UA 263

Course details

Instructor: Prof. Oliver Bühler, room 1013, Warren Weaver Hall,
ph 83265, obuhler@cims.nyu.edu
office hours: Monday, 4-6pm.

Lectures: Mo & Wed, 11:00-12:15am, WWH 312
Recitations: Fridays, 11:00-12:15am, WWH 312

Teaching Assistant: Nadia Drenska, room 507 WWH
office hours: Thursday, 3-4pm

Homework out Wednesdays, due back the following Wednesday.

Textbook: Peter J. Olver, "Introduction to Partial Differential Equations",
Springer Undergraduate Texts in Mathematics, 2014.
Online access for NYU students:
<http://link.springer.com/book/10.1007/978-3-319-02099-0>

Assessment: mid-term and final exam, homework.

Syllabus

Hyperbolic equations: first-order PDEs, method of characteristics, wave equation in one dimension, initial value problem, energy conservation, spherical waves, characteristic formulation, method of images. Fourier series solution, normal modes.

Traffic waves, nonlinear shocks, conservation laws, weak solutions and lack of uniqueness.

Parabolic equations: heat equation in one dimension, fundamental solution, maximum principle, boundary conditions, well-posedness.

Elliptic equations: Laplace and Poisson equation, averaging property, well-posedness, Green's function approach, multipole expansion. Classification of second-order equations.

Linear dispersive waves, Fourier transform method, group velocity.

Weakly nonlinear waves, KdV equation and solitons.