Partial Differential Equations
Fall 2020, MATH-UA 263

Course details: this class is to be held online

Instructor: Prof. Oliver Bühler, room 1013, Warren Weaver Hall,
              ph 83265, obuhler@cims.nyu.edu
              office hours: Mo 2-3pm & 8-9pm, zoom.

Lectures: Tu & Th,   9:30-10:45am, zoom & recorded.
Recitations: Fri   12:30-1:45pm, zoom.

Teaching Assistant: Wenjing Dong wd583@nyu.edu

Homework out Thursdays, due back the following Thursday.

Textbook: Peter J. Olver, "Introduction to Partial Differential Equations" ,
            Springer Undergraduate Texts in Mathematics, 2014.
            Corrected printing 2016
            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.

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.