

MAT 454: Partial Differential Equations (PDE) II

Instructor: Evan Miller

Time: 8-8:50, Spring 2026

Testbook: *Partial Differential Equations: An Introduction* by Walter Strauss

Prerequisites: MAT 453, PDE I

Course description: Nonlinear PDEs, which are often overlooked in undergraduate courses, are ubiquitous in nature and exhibit behaviours not seen in the linear case such as turbulence (see Leonardo da Vinci's "Studies of Turbulent Water" below). Nonlinear PDEs are often unpredictable in ways that are both interesting and important, as nonlinear PDEs govern a wide range of phenomena, from supernovae to ocean dynamics, to the flow of the Stillwater river.

This course will be a continuation of MAT 453: PDE I, but aims not only to add a few more examples of linear PDEs to our repertoire, but also to explore some of the exciting topics in nonlinear PDEs that are only possible once the core theory of linear PDEs has been covered. A nonexhaustive list of topics includes the viscous and inviscid Burgers equation, fixed point methods, vector valued PDEs, applications to fluid mechanics and quantum mechanics, and more.

