# APM 570     Differential Equations II     SS 2021

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9:00-10:15 am T Th     Zoom (presumably)     LINE # 12580

This is a basic course on partial differential equations and one of the six core courses of the Ph.D. program in Applied Mathematics.

### Topics include

- Method of characteristcs, first order quasilinear equations, wave equation, vibrating string.

- Elements of abstract and concrete Fourier series, weak solutions to the vibrating spring equation.

- Heat equation for bounded one-dimensional space, series solutions, maximum principle for arbitrary space dimensions, Green's function.

- Laplace equation on rectangles and disks, maximum principle.

- Applications of Gauß' theorem and Green's formulas to obtain qualitative information on solutions.

- Heat equation on the whole space.

**Prerequisites**: advanced calculus (like MAT 371), familiarity with partial derivatives, basic knowledge of ordinary differential equations.

### Complete notes will be posted on Canvas after each lecture.

Optional background reading:
R. Guenther, J. Lee, Partial Differential Equations of Math. Physics and Integral Eqns. Chap. 1, Sec. 2-1, 2-2, 2-6, 3-1 to 3-5, 4-1 to 4-5, 5-1 to 5-5, 8-1 to 8-4, 9-1 to 9-3, 10-5.

Fritz John, Partial Differential Equations. Fourth edition, Sections 1.1-1.6, 2.3, 2.4, 4.1-4.3.

**Course requirements**: weekly homework, midterm exam (take home and open notes), and a final exam (take home and open notes).