

Syllabus for the Qualifying Review in Differential Equations

The examination will be based on the following topics:

1. Ordinary Differential Equations: First and higher order linear equations; Existence and uniqueness of solutions; Variation of parameters; Laplace transform and its application to IVPs; Power series solutions of second order linear equations; Systems of first order equations; Fundamental matrix solution; Equilibrium point; Liapunov stability; Phase plane analysis.
2. Partial Differential Equations: Linear, quasilinear and nonlinear first order PDEs; The method of characteristics; Initial and two-point boundary value problems involving second-order linear PDEs; Heat equation, Poisson equation, and wave equation; Maximum principle; Separation of variables; Cauchy problem; Sturm-Liouville problem; Fourier series.

References:

- W. E. Boyce and R.C. DiPrima, Elementary Differential Equations and Boundary Value Problems, John and Sons, Inc., (Eighth Edition), 2004.
- S. H. Strogatz, Nonlinear Dynamics and Chaos, With Applications To Physics, Biology, Chemistry, and Engineering, Westview Press, 2001.
- R. Haberman, Applied Partial Differential Equations with Fourier Series and Boundary Value Problems, Prentice Hall, 2004.
- L. Debnath, Nonlinear Partial Differential Equations for Scientists and Engineers, Birkhouse Publishing Comp., 1997.