Mathematics 415 **Au, Wi, Sp, Su** **4 cr.** **Ordinary and Partial**
Mathematics 415C * **Au, Wi, Sp** **Differential Equations**
(415C may be discontinued Wi08.)*

Prerequisite:

Mathematics 254

Catalog Description:

Ordinary, partial, linear and non-linear differential equations. Fourier series, boundary value problems and Bessel functions.

Purpose of Course:

To master the standard techniques of elementary ordinary differential equations, Fourier series, and separation of variables in partial differential equations. It is a combination of 255 (Differential Equations) and 512 (Fourier Series and Boundary Value Problems).

Text:

Elementary Differential Equations and Boundary Value Problems, 7th edition, Boyce and DiPrima. (415)

Differential Equations & Mathematica, Davis (415C)

Continued.

Topics List:

Section	Topic
1.1-1.3	Introduction to differential equations, including some applications for motivation
2.1	Linear first order ordinary differential equations (ODEs) and integrating factors
2.2	Separable equations
2.3	Applications of linear equations
2.4	Bernoulli's equation: Differences between linear and nonlinear equations
2.5	Qualitative theory for solving nonlinear ODEs
2.6	Exact equations
3.1	Homogeneous equations with constant coefficients
3.2, 3.3	Fundamental solutions, linear independence, Wronskian
3.4	Complex numbers and complex roots of the characteristic polynomial
3.5	Repeated real roots of the characteristic equation and the method of reduction order
3.6	Nonhomogeneous equations: method of undetermined coefficients
3.7	Nonhomogeneous equations: method of variation of parameters
3.8, 3.9	Vibrations with and without damping and forcing
5.1	Review of power series
5.2	Examples of series solutions near regular points
10.1	Two-point boundary value problems
10.2, 10.3	Fourier series, Fourier convergence theorem
10.4	Fourier series for even and odd functions
10.5	Heat equation with zero boundary conditions
10.6	Heat equation with other boundary conditions
10.7	Wave equation and D'Alembert's solution
10.8	Laplace's equation