Math 2003	**DIFFERENTIAL EQUATIONS**	**(CR3)**
Preq.	**Math 1001, 1002**	

Objectives
The objectives of this course are to understand different techniques solve the differential equations.

Syllabus

Definitions and terminology, Initial-value problems, Linear and nonlinear equations, general solution, Particular solution, explicit solution, implicit solution, First order differential equation, Separable variables, linear differential equations, exact equations, Solution by substitution, Higher-order differential equations, linear equations (Initial-value and Boundaryvalue problems, homogeneous equations, non-homogeneous equations), Reduction of order, Homogeneous linear equations with constant coefficients, Undetermined coefficients (Superposition approach, Annihilator approach), Variation of parameters, Cauchy-Euler equations, Solving systems of linear equations by elimination, Spring/Mass systems (Free undamped motion, Free damped motion and driven motion), Resonance and Beats Series Circuit (RC series circuit, LC series circuit, RL series circuit and RLC series circuit), nonlinear equations Bernoulli's equation, first order non-linear ordinary differential equation, Clairaut's equation, Riccati equation, higher order exact linear equations, series solutions, series solutions about ordinary points, power series solution, solution about singular points, method of Frobenius series solutions, Legendre's equation, Bessel's equations, Laplace transform, Definition of the Laplace transform, Inverse transforms, Transforms of derivatives, Translation Theorems (translation on the s-axis and t-axis), Additional operational properties, Transforms of an integrals and a periodic functions, Dirac Delta function, Laplace transform of a Dirac Delta function, applications to differential equations and systems of linear differential equations, systems of linear first order differential equations.

Recommended Books

1. *Mathematical Methods for Physicists (Seventh Edition) by G. B. Arfken, H. J. Weber and F. E. Harris, Academic Press (2012)*
2. *A First Course in Differential Equations with Modeling Applications (10th Edition) by D. G. Zill, Jones and Bartlett (2013)*
3. *Elementary Differential Equations and Boundary Value Problems by W. E. Boyce, R. C. DiPrima and D. B. Meade, Wiley (1992).*
4. *Mathematical methods for physics and engineering, Cambrige University Press (1999)*
5. *Elementary Differential Equations with Boundary Value Problems by C. H. Edwards and D. E. Penney, Prentice Hall (1989).*