MA 332 Differential Equations II

Syllabus*

Course Description

Series solutions of second order linear equations. Numerical methods. Nonlinear differential equations and stability. Partial differential equations and Fourier series. Sturm-Liouville problems.

Prerequisites C or better in MA 227 and MA 238.

Textbook *Differential equations and Boundary Value Problems,* 4th edition by C.H. Edwards and D.E. Penney. Published by Prentice Hall. ISBN #9780135143773

Topics & Time Distribution

Coverage: Chapter 5	(omit 5.3)	4 weeks
Chapter 6	(omit 6.3, 6.4 and 6.5)	1.5 weeks
Chapter 8	(omit 8.5 and 8.6)	3 weeks
Chapter 9	(omit 9.4)	4 weeks
Chapter 10	(omit 10.3-10.5)	1.5 weeks

Note - time allotments are approximate and do not include exams.

MA 332 Differential Equations II Learning Objectives

- Understand the linear algebra approach to solve the first-order linear systems
  - Be able to find the eigenvalues and eigenvectors of a matrix; write a system of differential equations in matrix form
  - Use the eigenvalue method to solve first-order linear systems
  - Be able to find the fundamental matrix for a homogeneous linear system, to find matrix exponential solutions
  - Be able to solve the nonhomogeneous first-order linear systems with constant coefficient matrix (the methods of undetermined coefficients and variation of parameters)
- Understand phase-plane analysis techniques and critical points. Sketch and interpret phase plane diagrams for systems of differential equations.
- Understand the power series method of solution of differential equations
  - Power and Taylor series
  - Regular and ordinary singular points
  - Frobenius' method

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- Fourier series method
  - Find the Fourier series of periodic functions
  - Find the Fourier sine and cosine series for functions defined on an interval
  - Apply the Fourier convergence theorem
  - Use the method of separation of variables to find solutions to some partial differential equations.
  - Find solutions of the heat equation, wave equation, and the Laplace equation subject to boundary conditions
- Solve eigenvalue problems of Sturm-Liouville type and find eigenfunction expansions