M531: Foundations of Analysis of Mathematical Models

Web page: http://www.math.colostate.edu/~juliana/M531.html

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Description: The course develops the mathematical background for the analytical analysis of physical models involving linear algebra and ordinary and partial differential equations. This course provides the foundation for further study in applied mathematics and the numerical and analytical analysis of physical models. The course is aimed primarily at engineering graduate students.

Textbooks

- Sheldon Axler, *Linear Algebra Done Right,* 2nd Ed, Springer Verlag (1997)

- Mark Pinsky, *Partial Differential Equations and Boundary-Value Problems with Applications*, 3rd Ed, McGraw-Hill (1991)

Topics to be Covered

1. Linear Algebra and Matrix Theory

   (a) Mathematical modelling
   (b) Vector spaces
   (c) Linear transformations and matrices
   (d) Determinants
   (e) Eigenvalues and eigenvalues
   (f) Least-squares applications

2. Ordinary differential equations

   (a) Systems of equations
   (b) Exponential and fundamental matrices
   (c) Nonhomogeneous equations
   (d) Computing solutions

3. Partial differential equations

   (a) Classification of equations
   (b) Fourier series
   (c) Sturm-Liouville problems
   (d) Boundary value problems in rectangular coordinates
   (e) Boundary value problems in cylindrical coordinates
   (f) Fourier transforms