058:113 Mathematical Methods in Engineering  
Fall Semester 2001

2001 Catalog Data: 58:113  
3 s.h.

Catalog Description: Linear ordinary differential equations, series solution of differential equations, special functions, Laplace transforms, Fourier series, matrices, linear systems, eigenvalue problems, and second-order partial differential equations

Prerequisites: 22M:040, 22M:041 and 22M:042

By topic: Calculus, including vector calculus, matrix algebra and differential equations


Goals: The student will acquire an understanding of the mathematics required to solve engineering problems, including linear algebra and solution of ordinary and partial differential equations.

Student Group: This course may be taken either as an elective for undergraduates or as a course in the MS or PhD programs. In recent offerings, the course has been predominately taken by graduate students.

Learning Objectives:

- Students will have an understanding of methods used to solve nonlinear and linear ordinary differential equations with constant and variable coefficients.
- Students will recognize and know the properties of differential eigenvalue problems of the Sturm-Liouville type.
- Students will understand how to construct and apply an eigenfunction expansion, and know its relationship to Sturm-Liouville problems.
- Students will know the properties of a vector space and understand the basic theorems of linear algebra.
- Students will be able to solve linear partial differential equations using separation of variables and transform methods.

Topics (Class Hours)

1. Nonlinear ordinary differential equations (6)
2. Series solution of ODE’s (3)
3. Bessel functions and Legendre polynomials (3)
4. Sturm-Liouville problems (3)
5. Eigenfunction expansions (6)
6. Laplace transforms (3)
7. Vector spaces and linear algebra (6)
8. Second-order partial differential equations (12)
9. Transform solution of PDE’s (3)
Total (45)