

**NORTH CAROLINA STATE UNIVERSITY
DEPARTMENT OF MATHEMATICS**

MA 501: Advanced Mathematics for Engineers and Scientists
Fall, 2009

Text: *Partial Differential Equations with Fourier Series and Boundary Value Problems* by Nakhle Asmar (2nd edition)

Suggestions: Two tests during the semester are recommended. The instructor has the flexibility to rearrange, add, and delete topics.

SECTIONS	TOPICS
A.1-A.3	Review: Ordinary Differential Equations (O.D.E.)
6.1, 6.2	O.D.E. with boundary conditions, Sturm-Liouville theory and eigenfunction expansions
2.1-2.4	Fourier series. Fourier sine and cosine series
3.1-3.3, 3.5	Fourier series solution of the heat and wave equations (1-dimensional)
3.4	d'Alembert's solution to wave equation
3.5, 3.6	Nonhomogeneous heat equation
3.8, 3.10	Laplace's equation
3.7	Multiple Fourier series solutions of boundary value problems
A.4-A.6	Review: Power series solutions of differential equations. Frobenius method
4.1-4.8	P.D.E. in polar coordinates. Bessel functions
5.1-5.3, 5.5, 5.6	P.D.E. in spherical coordinates. Legendre polynomials
7.1, 7.2	The Fourier integral and the Fourier transform
7.3	The wave and heat equations in unbounded domains