Instructor. Dr. Ian Knowles, Room 481A, Campbell Hall, iknowles@uab.edu, (205) 934-2154.

Office Hours. After class, or drop in anytime, or email for an appointment.

Prerequisite Course. MA227, or permission of instructor.

Class Meetings. MWF: 9:00-9:50am, Room HHB221.

Grading. The course grade is calculated solely from the (approximately weekly) written assignments/projects. MA561 students will be required to prepare all assignment reports using the typesetting program T\LaTeX.

Course Outline:

- Practical examples of partial differential equations, including Poisson’s equation, the heat/diffusion equation and the wave equation; discussion of boundary conditions and their practical interpretation.

- Derivation of partial differential equations from physical laws.

- Introduction to MATLAB and its PDE Toolbox, and COMSOL.

- Introduction to finite difference and finite element solution methods.

- Continuum mechanics and linear elasticity.

- Fluid flow and the Navier-Stokes equations; class boat race for the “Aussie Cup”.

- The Maxwell equations and electromagnetic waves.

- Mathematical finance.

- Specialized modeling projects in topics such as heat flow, groundwater modeling, waveguides, structural failure, soap bubbles, medical and industrial imaging, fluid mechanics including blood flow and hurricane simulation, and acoustic/electromagnetic and finance industry applications.