Instructor: Dr Ian Knowles, Room 4024, University Hall.
Email: iknowles@uab.edu
Class Meeting Times and Location: MWF: 9:05-9:55am, HHB221.
Office Hours. After class; you may also email for a private Zoom appointment.
My Zoom Meeting Number: 367-980-5688
Textbook. None: we use my lecture notes; download these from Canvas.
Prerequisite Course. MA252 with a Minimum Grade of C.
Important Dates: First day of classes is Monday January 10, 2022, and the last day of
classes is Friday April 22, 2022; Martin Luther King Holiday, Monday January 17, 2022;

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

Course Outline

- The classification of second order linear partial differential equations into the three
types: elliptic, parabolic and hyperbolic equations.
- Practical examples of second order partial differential equations, including Poisson’s
equation, the heat/diffusion equation and the wave equation; discussion of initial and
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 numerical solution methods for PDE.
- Continuum mechanics and linear elasticity.
- Fluid flow and the Navier-Stokes equations; class boat race for the “Aussie Cup”.
- Mathematical finance.
- Specialized modeling projects in topics including heat flow, epidemiology and in par-
ticular community transmission of the COVID-19 virus, structural failure, fluid me-
chanics, and mathematical finance applications.