Numerical Analysis & Scientific Computing

Traditionally, the subject of numerical analysis is about the design and analysis of algorithms for solving mathematical equations on a digital computer. The idea of modern scientific computing, however, encompasses numerical methodologies as well as issues such as model development and graphical visualization. The aim of this course is to discuss numerical techniques for solving differential equations, both ordinary (ODEs) and partial (PDEs) – but from a case study perspective which emphasizes deriving an understanding of differential equations using computational methods.

A rough outline of topics includes:

- initial value ODEs – linear, nonlinear & systems
- boundary value ODEs – including eigenvalue problems
- hyperbolic PDEs – characteristics & the *wave* equation
- parabolic PDEs – the *diffusion* equation
- elliptic PDEs – the *Laplace* & *Poisson* equations
- special – integral equations, variational methods, monte-carlo techniques

Professor: David Muraki, office TLX 10538, phone 604.291.4814

Lectures: MWF 10:30-11:20am in AQ 5020

Office Hours: wednesday 2:00-4:00pm (tentative)
by appointment (arrangements by phone/e-mail)

Readings: *Scientific Computing: An Introductory Survey*
Michael T Heath, McGraw-Hill (1997)
Numerical Analysis
RL Burden & JD Faires, Brooks/Cole (1997) – suggested

Webpage: visit *www.math.sfu.ca/∼dmuraki*

E-Mail: essential channel for class communications
math416-d1@sfu.ca: central class e-mail address
dmuraki@fraser.sfu.ca: private class-related e-mail correspondence
dmuraki@math.sfu.ca: urgent correspondence only please

Computing: Matlab is the recommended computing environment
lecture & homework scripts will be posted on class webpage
Matlab is accessible from the computer lab in AQ 3144
PC/mac student versions available from SFU bookstore

Responsibilities: weekly computing assignments with written report ($\approx 60\%$)
emphasis on presentation of concepts & problem solving
evaluation: correctness, clarity, conciseness
discussion while working problem sets is encouraged
active participation in class & e-mail discussions ($\approx 5\%$)
midterm exam ($\approx 15\%$), final project/exam (tbd, $\approx 20\%$)