Introduction to Partial Differential Equations: Theory, Computing & Graphics

What we perceive of the world around us are variations of physical effects (like heat, sound & light) over space and time. Partial differential equations (PDEs) are the mathematical concept for describing this sensory landscape in terms of continuous functions. This year's course contains the core of the traditional *boundary value problems* curriculum, but will also introduce the computer graphics and numerical computational tools associated with the analysis of PDEs and their solutions.

Central to the theory of linear PDEs are the Fourier series and Fourier transform. The numerical implementation of the Fourier series, the *fast Fourier transform* (FFT), is one of the most important numerical algorithms in scientific computing. The "three stars" of elementary PDEs: the potential, heat and wave equations will be introduced through their Fourier solutions. The generalization of these to higher dimensions will naturally lead to the "special" functions, such as the Bessel function and spherical harmonics.

The computational tools will be developed from numerical routines based upon the linear algebra of matrices and vectors. The numerical computing and graphics will be performed through the modification of downloaded Matlab scripts, and the occasional Maple worksheet.

Professor:	David Muraki, office K10538, phone 778.782.4814
Lectures:	monday/wednesday/friday at 12:30-1:20pm in AQ 3005
Office Hours:	tuesday 3:00-5:00pm, or by special arrangement
TA:	Joseph Qranfal, tuesday tutorial at 12:30-1:20pm in AQ5018, and office hours – TBA
Readings:	*Applied Partial Differential Equations* (required) P DuChateau & D Zachmann, Dover (reprint, 2002) *Numerical Computing with Matlab* (recommended) C Moler, online (2004)
Web Postings:	webct & *www.math.sfu.ca/∼muraki* updated weekly — assignments, computing demos & announcements
Communication:	webct-based discussion postings as primary class e-mail *muraki@sfu.ca*: private class-related e-mail correspondence only *muraki@math.sfu.ca*: urgent correspondence only please
Computing:	Matlab & Maple will be the environments for computing lecture & homework scripts will be posted on class webpage Matlab/Maple accessible via campus network & assignment lab
Responsibilities:	weekly assignments (≈ 30%) active participation in class & webct discussions midterm (≈ 25%) & final exam (≈ 45%)