A Mathematical View of Modern Science

Development of the theory of partial differential equations (PDEs) was one of the key influences behind the scientific revolution of the late 19th-century as it brought a powerful quantitative tool for the study of many problems in modern science. A complete applied mathematical study addresses two issues: translation of the scientific context with model equations (derivation & interpretation), and investigation of the mathematical properties of these equations (analysis, solution & computation). In this course, methods for the derivation, solution and computation of PDE models are discussed within the context of familiar examples from the physical sciences.

The lectures will discuss how the basic linear PDE trilogy, the diffusion, potential & wave equations, naturally arise in scientific theories such as probability, gravity and sound propagation. The analysis of these equations will also be revisited through the development of various solution techniques: eigenfunction expansions, Greens functions and integral transforms. Later lectures will present advanced examples involving systems of PDEs and nonlinearity.

Computer visualization will be an important accompaniment to the lectures and assigned work. Methods for numerical computing and graphics will be introduced through the use and modification of downloadable Matlab scripts.

Professor:	David Muraki, office K10538, phone 604.291.4814
Lectures:	tuesday & thursday at 9:30-11:20pm in SSC8666
Office Hours:	tuesday 3:00-5:00pm
	or by special appointment (arrangements by phone/e-mail)
Reading:	various sources suggested during the term
	participants are expected to contribute to literature searches
Webpage:	visit *www.math.sfu.ca/∼muraki* & follow class link
	updated weekly — assignments, computing demos & announcements
	link to online notes from main library
Communication:	webct-based discussion postings as primary class e-mail
	muraki@fraser.sfu.ca: private class-related e-mail correspondence only
	muraki@math.sfu.ca: urgent correspondence only please
Computing:	Matlab is the recommended computing environment
	lecture & homework scripts will be posted on class webpage
	Matlab accessible via campus network & assignment lab (AQ3144)
	PC student versions can be ordered from *www.mathworks.com*
Responsibilities:	bi-weekly assignments
	active participation in class & e-mail discussions
	midterm & poster session