Introduction to PDEs

Many areas of mathematics and the sciences involve functions of more than one variable that are defined as a solution to an equation relating its partial derivatives. This introduction to the theory of partial differential equations (PDEs) begins with a study of the three basic linear prototypes, known as:

- the Laplace & Poisson equations,
- the diffusion equation, and
- the wave equation.

The linear theory is developed by combining familiar ideas from multi-variable calculus, linear algebra, and ordinary differential equations. In addition to developing analytical methods for the solution and understanding of these equations, more abstract notions of existence, uniqueness, and solution properties will be explored. The study of these PDEs will also include a discussion of their origins and applications beyond mathematics. For instance, probabilities can be understood in terms of diffusion; sound propagation can be described by waves; and gravitational forces are derivable from Poisson potentials.

Additional topics include: Fourier series and transform methods, nonlinearity and shock waves, calculus of variations, and optimization.

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Lectures:	Monday/Wednesday/Friday at 12:30-1:20pm in AQ 5016
Office Hours:	Monday 3:00-5:00pm or by special appointment (arrangements by phone/e-mail)
Readings:	*Partial Differential Equations: An Introduction, 2nd Edition* W.A. Strauss, Wiley (2007) *Partial differential equations in action: from modelling to theory (SFU ebook)* S. Salsa, Springer (2008)
Web Access:	webct & *www.math.sfu.ca/∼muraki*: follow class links 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 are the recommended computing environments lecture & homework scripts will be posted on class webpage Matlab &Maple accessible via campus network & assignment lab (AQ3144)
Responsibilities:	weekly assignments ($\approx 40\%$) active participation in class, notetaking & webct discussions midterm ($\approx 25\%$) & final exam ($\approx 35\%$)