

**COLLOQUIUM****Uncertainty quantification for PDEs****Professor Ivan Graham**
University of Bath, UK**Abstract**

In this talk I'll give an overview of work in the uncertainty quantification of PDEs with random input data, where the main objective is to compute expected values of quantities of interest derived from the solutions of the PDEs. I'll give some practical examples and then I'll explain how, via parametrization, the random PDE can be written as a parametrized family of deterministic PDEs with parameter lying in a possibly (very) high dimensional space. Such problems can then be solved by sampling the PDE (often many times over) and then averaging, to obtain expected values.

A successful algorithm then consists of (a) making good choices of points in high-dimensional parameter space at which to sample the data, (b) computing the samples of the data, and (c) fast computation of samples of the PDE, very many of which may be needed.

In recent years there are many successful algorithms combining (a), (b) and (c) for some classes of PDEs, particularly the diffusion equation, and I'll describe a method which uses quasi-Monte Carlo for (a), circulant embedding for (b) and algebraic multigrid for (c). Recently I've been working on the frequency domain wave equation, which arises in the study of waves in random media. There the problems which arise are much more difficult particularly because there is no nice method to achieve (c), and so there are many open problems. I'll present some recent progress in this area.

Date:	December 13, 2019 (Friday)
Time:	10:30 - 11:30am
Venue:	Room 210, Run Run Shaw Bldg., HKU