Aims

The module aims to provide postgraduate students with fundamental techniques of deterministic and probabilistic mathematical modelling. Model problems will be used to develop and illustrate these techniques. To investigate the problems, Matlab programs will be developed and implemented.

Syllabus

**Introduction to Matlab:** Providing/reviewing the basics of Matlab. This will include lab work. This will allow the development of appropriate Matlab programs in the following sessions.  
(15 lectures)

**Data fitting and calibration:** Least squares data approximation, Accuracy and goodness of fit, More general models. Using Matlab.  
(6 lectures)

**Review of probability theory, Modelling and Simulation:** Basic probability and random variables. Examples such as random walks and optimal stopping. Using Matlab to solve probability problems.  
(9 lectures)

Teaching and Assessment

**Contact Hours:** 4 hours per week.

**Assessment:** 50% by class tests or other continuous assessment  
50% by end of course 2-hour exam

**Resit Type:** exam for MSc/PG Diploma
By the end of the course, students should be able to:

- develop appropriate Matlab programs to investigate and visualise mathematical problems.
- deal with fundamental deterministic and probabilistic modeling techniques and the application of these to real-life problems.
- understand Random variables, Mean, Variance, Covariance, independence
- understand Standard distributions - eg Normal, uniform, Poisson.
- understand the Central Limit Theorem, Law of Large Numbers
- perform basic Monte-Carlo simulations and Gillespie type simulations.