

# SMSTC: Probability

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- Probability
- Course outline and teaching team
- Prerequisites
- Assessment
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“Chance, too, which seems to rush along with slack reins,  
is bridled and governed by law.”

– Boethius (ca. 480–505),  
*The Consolation of Philosophy*

- mathematical modelling of uncertainty: random events and processes.
- foundations in measure theory, analysis, functional analysis, combinatorics.
- strongly driven by physical intuition and ideas of information evolving in time.

# Probability 1: Foundations of Probability (9 lectures)

- **Fundamentals:** probability spaces,  $\sigma$ -algebras, probability measures, conditioning and independence  
Damian Clancy (Heriot-Watt)
- **Random variables** and their distributions, important special distributions (binomial, Poisson, geometric, normal, exponential etc.)  
Burak Buke (Edinburgh) and Fraser Daly (Heriot-Watt)
- **Convergence and limit theorems**  
Michela Ottobre (Heriot-Watt)
- **Conditional expectation and martingales**  
David Siska (Edinburgh)

## Probability 2: Stochastic Processes (9 lectures)

- **Markov chains and processes, Poisson processes**  
Sergey Foss (Heriot-Watt)
- **Applications**, including connections to statistics and graph theory  
James Cruise and Fraser Daly (Heriot-Watt)
- **Brownian motion and stochastic calculus**  
István Gyöngy (Edinburgh)

# Prerequisites

- elementary calculus, analysis and linear algebra
- the ability to think both rigorously and intuitively

Some suggestions for further/background reading are on the handout

“I can see looming ahead one of those terrible exercises in probability where six men have white hats and six men have black hats and you have to work it out by mathematics how likely it is that the hats will get mixed up and in what proportion. If you start thinking about things like that, you would go round the bend. Let me assure you of that!”

– Agatha Christie, *The Mirror Crack'd from Side to Side*



Each module is assessed by two written assignments.

Provisional deadlines:

- Probability 1: 15 November and 10 January.
- Probability 2: 28 February and 11 April.

Assignments will be available at least two weeks before the deadline.

Solutions for (at least) one assignment from each module should be prepared using  $\text{\LaTeX}$ .

- is a two-way process.
- if you have any questions/concerns, get in touch with me (f.daly@hw.ac.uk, 0131 451 3212) or another member of the teaching team.
- please don't wait for the end of the course!