The LTCC fosters the training of doctoral research students in the Mathematical Sciences. Its courses cover the areas of Statistics, Applied Mathematics and Pure Mathematics, with the aim of providing students with an overview of these areas, and of acquiring a working knowledge of classical results and recent developments in their own broad research fields but outside the specialised domains of their individual research projects. There is a wide range of expertise among the staff of the institutions currently in the LTCC consortium:

- Departments of Mathematics and Statistical Science, University College London (UCL)
- The School of Mathematical Sciences, Queen Mary University of London
- Department of Mathematics, Imperial College London
- Department of Mathematics, King's College London
- Departments of Mathematics and Statistics, The London School of Economics and Political Science (LSE)
- Department of Mathematics, City St George's, University of London
- Department of Mathematics, Statistics and Actuarial Science, University of Kent
- Department of Mathematics, Royal Holloway University of London
- School of Mathematics and Statistics, Open University

The LTCC programme emphasises direct teaching and personal contact rather than distance learning, and includes modular lecture courses and short intensive courses.

Note: A fee is payable by students from non-LTCC departments/institutions.

Lecture venue:

De Morgan House
57-58 Russell Square
London
WC1B 4HS

Office address:

LTCC
Department of Mathematics
University College London
Room 610, 25 Gordon Street
London WC1H 0AY

Phone: 020 7679 4309
E-mail: office@ltcc.ac.uk
www.ltcc.ac.uk

This course list is subject to change. Further information, venue details, full text syllabi, the registration form and timetable are available online at **www.ltcc.ac.uk** or contact us at office@ltcc.ac.uk

Basic Courses 2025 - 2026

LTCC

London Taught Course Centre

for PhD students in the mathematical sciences

6 October - 3 November 2025 (Block 1)

Applied Bayesian Methods

Professor Petros Dellaportas, UCL

This course introduces the Bayesian approach to statistical inference and relevant theories, methodologies and computational techniques for its implementation.

Fundamental Theory of Statistical Inference

Professor Alastair Young, Imperial

This course describes the key aspects of Bayesian, Fisherian and frequentist approaches to statistical inference. The module will cover: statistical inference from a decision-theoretic perspective; Bayesian methods; exponential and transformation families of models; principles of statistical inference and data reduction; key elements of frequentist theory of point estimation and hypothesis testing.

Homological Algebra

Professor Markus Linckelmann, City St George's

The first half of this course will be a systematic introduction to the basic concepts and methods in homological algebra, such as chain complexes, cohomology, Ext and Tor, homotopy, long exact cohomology sequences, derived functors and categories. The second half of the course will focus on applications in group cohomology, Hochschild cohomology of algebras, deformation theory, algebraic topology, and time permitting some basics on functor cohomology.

Mathematical Biology

Dr Philip Pearce and Dr Andrei Sontag, UCL

The course aims to provide an introduction to multiscale methods in mathematical biology, including a survey of relevant applications. Emphasis is placed on how realistic biological effects at the microscale (e.g. gene expression within cells) can be captured in macroscopic models (e.g. PDEs for whole cell populations).

Measure Theory

Dr Robert Simon, LSE

We cover the basic structure of measures, starting with the algebra of sets on which a measure is defined. We explore the concept of outer measure and its most common application, the Lebesgue measure on Euclidean space. We end the course by applying measures to functions and their integration, including the monotone and dominated convergence theorems.

Stochastic Processes

Dr Terry Soo, UCL

This course aims to introduce the main ideas and methods of simple applied probability, together with examples of a variety of applications. Main topics: Markov chains in discrete and continuous time, and Poisson-based processes.

10 November - 8 December 2025 (Block 2)

Analytical Methods

Professor Helen Wilson, UCL

We will study perturbation methods, alongside other analytical techniques, in the context of ordinary and partial differential equations. Topics covered will include matched asymptotics, steepest descents, conformal mappings, WKB expansions and multi-scale analysis.

Introduction to Optimal Transport and its Applications

Professor Codina Cotar, UCL

Optimal transport is a powerful mathematical theory at the interface of probability theory, PDEs, optimization and functional analysis. It has applications in many areas such as image processing and restoration, statistics and machine learning. I will give an overview of the theory, present some efficient computational algorithms and introduce some applications.

Measure-theoretic Probability

Professor Alexander Gnedin, QMUL

The course provides a measure-theoretic background for modern Probability Theory and introduces important stochastic processes. The selected topics include construction of measures, conditioning and martingales, types of convergence and limit theorems, construction and properties of Brownian motion, weak convergence of measures in application to Donsker's invariance principle. Each lecture is supplemented by a set of exercises of varying levels of difficulty.

Representation Theory of Finite Groups

Dr Yusra Naqvi, UCL

In this course, we study finite groups via their actions on vector spaces, which allows us to make use of methods from linear algebra. We will first discuss important results in the more general representation theory of associative algebras and then specialise to a closer examination of finite groups.

12 January - 9 February 2026 (Block 3)

Theory of Linear Models

Professor Michael Pitt, KCL

This course describes the theory behind the common methods of estimation and inference in linear models and extensions to related classes of models, such as transformed models, linear mixed models, generalised linear models, semiparametric regression models, machine learning models and nonlinear models.

Special functions and applications

Professor Rod Halburd, UCL

Special functions are solutions of certain differential or functional equations that are useful for expressing solutions of large classes of problems. We will study elliptic and theta functions, orthogonal polynomials, generalised hypergeometric functions and Heun functions as well as their confluence limits. Solutions of equations arising in various applications will be discussed.

16 February - 16 March 2026 (Block 4)

Cryptography, Mathematical Ciphers

Dr Thomas Kecker, University of Portsmouth

This course will introduce number theoretic concepts needed for modern mathematical ciphers used in today's everyday online communication, in particular public-key ciphers such as RSA, ElGamal and Elliptic Curve Cryptography. We also discuss the underlying principles that make these ciphers secure and how they could potentially be broken in the future.

Graph Theory

Professor Peter Allen, LSE

Our aims in this course are twofold. First, to discuss some of the major results of graph theory, and to provide an introduction to the language, methods and terminology of the subject. Second, to emphasise various approaches (algorithmic, probabilistic, etc.) that have proved fruitful in modern graph theory.