

Computational Applied Mathematics MSc welcome

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Programme director: Tibor Antal, tibor.antal@ed.ac.uk

from second semester: James Maddison

Cohort lead: Tibor Antal,

Student advisor: Lewis Allan, studentsupport@maths.ed.ac.uk

- Queries about your degree programme: programme director
- Academic queries about a course: course organizer
- Organizational queries about a course (e.g. workshop groups): course administrator or course organizer
- Queries about choosing courses and other academic queries: cohort lead
- Non-academic support (e.g. special circumstances):
studentsupport@maths.ed.ac.uk

If you are concerned/unsure about anything you can always contact me/Tibor.

Welcome week information at: <https://teaching.maths.ed.ac.uk/main/postgraduate-taught/getting-started/welcome-week>

Programme website

- <https://teaching.maths.ed.ac.uk/main/postgraduate-taught/msc-programmes/computational-applied-mathematics>

Postgraduate taught (PGT) websites

- <https://teaching.maths.ed.ac.uk/main/postgraduate-taught>

Course options:

- CAM Path <https://path.is.ed.ac.uk/degrees/PTMSCCOMAM1F>
- DRPS <http://www.drps.ed.ac.uk/>

Course materials: Learn

- Usually access via MyEd (login required): <https://www.myed.ed.ac.uk>

The year is split into three pieces:

- Semester 1: Taught courses and exams, Sep-Dec
- Semester 2: Taught courses and exams, Jan-May
- Summer dissertation project: Jun-Aug

- 1 week welcome
- Semester 1
 - 11 weeks of (intensive) teaching
 - 1 week of revision
 - 2 week for exams
- 3 weeks of break
- Semester 2
 - 5 weeks of (intensive) teaching
 - 1 week break
 - 6 weeks of (intensive) teaching
 - 3 week break / revision
 - 4 weeks for exams
- Followed by 12 weeks for dissertation project

Taught courses:

- 120 credits of taught courses
 - Cannot take more/fewer for credit
- Must take *at least* 90 credits at level 11

Dissertation:

- 60 credits

Course options:

- CAM Path <https://path.is.ed.ac.uk/degrees/PTMSCCOMAM1F>
- DRPS <http://www.drps.ed.ac.uk/>

Optional course topics:

Applied and Computational:

- Stochastic Modelling
- Industrial Mathematics
- Applied Stochastic Differential Equations
- Machine Learning in Python
- Uncertainty Quantification
- Numerical Ordinary Differential Equations and Applications
- Numerical Methods for Data
- Fluid Dynamics

Optional course topics:

Introductory statistics:

- Introductory Probability and Statistics
- Statistical Methodology

Statistics:

- Bayesian Theory
- Statistical Programming
- Bayesian Data Analysis
- Time Series

Operational Research:

- Fundamentals of Optimization
- Large Scale Optimization for Data Science
- Optimization Methods in Finance
- Nonlinear Optimization

Outside option:

- High Performance Data Analytics

Pre-requisites:

- Undergraduate course pre-requisites do not apply to you
 - ... but may give an idea of assumed background
- MSc course pre-requisites *do* apply to you
 - ... unless you can meet pre-requisites from previous study – discuss with cohort lead
 - Large Scale Optimization for Data Science (semester 2) requires Fundamentals of Optimization (semester 1)
 - Bayesian Data Analysis (semester 2) requires Bayesian Theory (semester 1)

For extra background in statistics, probability:

- Statistical Methodology (Statistics)
- Introductory Probability and Statistics (Probability, statistics)

You need cohort lead (Tibor) approval to take these courses.

Introductory Probability and Statistics is not suitable if you have taken an equivalent introductory course in statistics in a previous degree.

Final course marks are given as a percentage

- 40% is the pass mark
- 50% is the “masters” pass mark
- 60% is the merit mark
- 70% is the distinction mark

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To progress to the dissertation

- Pass at least 80 credits of taught courses at 50%
- Have an average of 50% across *all* taught courses
- Satisfy any other program criteria

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To obtain the MSc

- 50% in the dissertation for the MSc
- 60% in each of the dissertation and taught courses for merit
- 70% in each of the dissertation and taught courses for distinction

Some corner cases e.g. related to borderlines: see full regulations,

<https://www.ed.ac.uk/files/atoms/files/taughtassessmentregulations.pdf>

Course enrolment

- Course Fair
- Select your courses: Course Enrolment Sessions
- To *change* your courses: Week 1 and Week 2 Course enrolment sessions

Welcome week information at: <https://teaching.maths.ed.ac.uk/main/postgraduate-taught/getting-started/welcome-week>

- Complete course registration this week
 - Ready for week 1 teaching
 - Semester 1 course choices must be finalized by the end of week 2
- If you have taken a course similar to a compulsory course before
 - Discuss with cohort lead / programme director
- Semester 2 course choices are entirely provisional
 - Can change any / all semester 2 options at the start of semester 2

After completing the taught courses you start work on your dissertation project, for 60 credits

Different research areas, may include

- Mathematical biology
- Mathematical aspects of data science
- Numerical analysis
- Fluids and continuous media
- Molecular dynamics
- Inverse methods
- Uncertainty quantification

Dissertation

Examples of dissertation titles (21/22)

- Multiple scales in models for three-trophic-level food chains
- Space Intelligence - Creating habitat maps from sparse labels
- Accelerated (subsampling) Gauss-Newton algorithm for Deep Learning & inverse problems
- Adversarial attacks and the limitations of neural networks
- Viapontica AI - Scaling Machine Learning Training using Data Reduction Techniques
- New insights into turbulence with convolutional neural networks
- Ventient - Performance Validation Using Reference Turbines
- Combining delayed acceptance Markov chain Monte Carlo methods and machine learning for efficient inference
- Disease Spread on a Hypergraph Model of Edinburgh
- Learning Non-Monotonic Mixture Models
- Understanding ice-shelf basal channels through coupled ice-ocean modelling
- Measuring the depth of deep Gaussian processes
- Principles of algorithmic differentiation
- Affects of ageing on accumulation of mutations in bacteria
- Viapontica AI - Scaling Machine Learning Training using Federated Learning Techniques
- Efficient Bayesian adaptation of neural network topology
- Exponential asymptotics for integrals
- Parallel solver for ray-tracing of atmospheric and oceanic waves
- Differential equation constrained optimization and uncertainty quantification
- Solving sign-changing PDEs in domains with corners
- Predicting if a customer will buy a car insurance policy
- Generalized stability theory
- Optimal low-dimensional representation of large-scale dynamics in a turbulent boundary layer
- Ancestral trees of simple birth death models
- Applications of neural networks to studies of ocean turbulence
- Positron emission particle tracking reconstruction
- Investigating the Feasibility of Automatic ROV Image Analysis
- Can we do something useful with a Koopman decomposition?
- Space Intelligence - Mapping forests with spaceborne lidar
- Choosing ML algorithms and training sets to predict specific output variables of computational mechanics (DEM) simulations

- The CAM MSc has a high workload
- Good time management is important
- Check course assessment schedules at the start of each semester
- Start assignments
 - *when they are issued*
 - *not* just before they are due!
- Otherwise you will be
 - *very busy* at the end of the first semester
 - *even busier* at the end of the second semester
- Latter half of the semester can be busy – plan ahead!

- Important way for us to gain feedback on the running of the programme
- Attend Student Staff Liaison Committee (SSLC) meetings, meets ~ 3 times over the year
- Contact: studentsupport@maths.ed.ac.uk



CAM MSc Socials

Tibor.Antal@ed.ac.uk

Semester 1

Week 0: Thursday 2pm Hill Walk

Week 2: Food with course choices

Week ?: Games and Curry night

Week ?: Scottish Ceilidh Dance

Week 11: End of teaching pizza

Semester 2

Week 1: Food with course choices

Week ?: Games and Pizza night

Week ?: Cinema with food

Dissertation submission deadline BBQ

Concerned/unsure about anything? Please ask me/Tibor!

Questions?