Computational Applied Mathematics MSc welcome

Dr James R. Maddison

School of Mathematics, The University of Edinburgh

Contacts

Programme director: James Maddison, j.r.maddison@ed.ac.uk
Cohort lead: Tibor Antal, tibor.antal@ed.ac.uk
Student Learning Advisor: Kaete Followwill, 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): student support

Welcome week

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

Mon Welcome

Wed Course fair, course enrolment drop-in

Thu Support services talks, Blackford hill walk

Fri Online test

New for 2022/23

New students: you!

Super cosmopolitan class!

New course: Numerical Methods for Data

- Computational techniques in data science and machine learning: networks, inverse problems, deep learning with artificial neural networks, adversarial attacks

Websites

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: Path

- CAM Path link (login required): https://path.is.ed.ac.uk/degrees/PTMSCCOMAM1F

Course materials: Learn

- Usually access via MyEd (login required): https://www.myed.ed.ac.uk
- Should have guest Learn access to all programme options

Academic year

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

Academic year

- 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

Courses

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

Courses

Semester 1:

Compulsory courses: 30 credits

- Research Skills for Computational Applied Mathematics (full year)
- Numerical Linear Algebra
- Python Programming

Optional courses: Choose 30 credits, all 10 credits

- Bayesian Theory
- Stochastic Modelling
- Statistical Programming
- Introductory Probability and Statistics
- Industrial Mathematics
- Fundamentals of Optimization
- Applied Stochastic Differential Equations
- Statistical Methodology

Courses

Semester 2:

Compulsory courses: 30 credits
- Research Skills for Computational Applied Mathematics (full year)
- Applied Dynamical Systems
- Numerical Partial Differential Equations

Optional courses: Choose 30 credits, all 10 credits
- Bayesian Data Analysis
- Time Series
- Machine Learning in Python
- Data Assimilation
- Biomedical Data Science
- Optimization Methods in Finance
- Numerical Ordinary Differential Equations and Applications
- Mathematics in Action B (this year's topic: Fluid Dynamics)
- Large Scale Optimization for Data Science
- Data Analytics with High Performance Computing
- Numerical Methods for Data

Courses

Optional course topics:

Applied and Computational:
- Stochastic Modelling
- Industrial Mathematics
- Applied Stochastic Differential Equations
- Machine Learning in Python
- Data Assimilation
- Numerical Methods for Data
- Numerical Ordinary Differential Equations and Applications
- Mathematics in Action B

Statistics:
- Bayesian Theory
- Statistical Programming
- Introductory Probability and Statistics
- Statistical Methodology
- Bayesian Data Analysis
- Time Series

Courses

Optional course topics:

Operational Research:

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

Outside option:

- Data Analytics with High Performance Computing

Courses

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)

Courses

For extra background in statistics, probability:

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

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

Courses

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

Courses

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

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

Courses

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

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

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

Dissertation

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 (19/20)

- Parallel methods for solving ordinary differential equations
- Effects of ageing on accumulation of mutations in bacteria
- Mathematical modelling of aggregation and swarming in nematodes
- Pseudo-spectral methods for multi-scale problems
- Detecting periodicity in solar dynamics
- Overcoming catastrophic forgetting
- Treating data driven correlation matrices for weather forecasting
- Measuring the depth of deep Gaussian process
- Thermodynamic machine learning with Adlala
- Non-backtracking centrality on lattices
- Applying modern network algorithms to a graph database
- Asynchronous training algorithms for distributed machine learning
- Physics informed emulators
- Predicting outbreaks in seasonally forced epidemic models
- Mathematics of opinion formation
- Stratified fluid mechanics
- Dynamics of social balance on random graphs
- Solving partial differential equations with parallel processing
- New directions in deep learning-based side channel analysis
- Friends of friends
- Geometric analysis of Leslie-Gower type predator-pray models
- Mixed-mode dynamics in models for el Nino-southern oscillation
- Data-driven prediction of extreme torsion and curvature of tracer particle trajectories in turbulent flows
- Using machine learning and character recognition tools to extract text from historic maps
- Multi-level irreversible Markov chain Monte Carlo

Time management

- 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
- Weeks 6–8 might be busiest – plan ahead!

Course enrolment

- Meetings with cohort lead, programme director, course organizers *this week*
- Complete registration online, change registration by email
  - Complete this week to be 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

Contacts

The CAM MSc has an email list: Msc_cam_22@mlist.is.ed.ac.uk

Messages sent to this list are received by:

- All students on the programme
- Teaching and admin staff

Messages may be sent to this list from Edinburgh addresses (@[sms.]ed.ac.uk)

Also a CAM Piazza class

Questions?