Welcome to SMSTC!

David Pritchard

SMSTC Director

Department of Mathematics and Statistics
University of Strathclyde

What is SMSTC?

SMSTC is the Scottish Mathematical Sciences Training Centre.

We provide graduate mathematics courses to all of Scotland.

There are eight member departments.

Why do we exist?

UK higher education in mathematics has traditionally been:

- short: typically 3 years undergrad + 1 year Masters + 3 years PhD, which is shorter than most of the rest of Europe;
- narrow: e.g. in the USA, you'd probably spend your first year or two of graduate school taking courses.

The 2004 International Review of UK mathematics concluded that PhD graduates were often strong in their narrow field, but lacked breadth.

As a result:

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As a result:

- the standard PhD programme was lengthened to 3.5 years,
- with the first 0.5 years to be spent on broadening training.

This training is provided by six 'taught course centres' across the UK.

Who are we?

SMSTC is a community project, not an external body. It includes:

- Students: mostly 1st year maths PhD, but also higher years, other subjects, other universities, postdocs, staff, ...
- Lecturers: 40–50 per year, drawn from all eight universities.
- Administrator: Johanna McBryde.
- Director: David Pritchard.
- Theme Heads: Natalia Bochkina, Heiko Gimperlein, Sira Gratz.
- Technical staff at each university.
- Postgraduate directors of studies at each university.
- Tutors at each university.
- External advisers from outwith Scotland.
- Student representative at each university (volunteers needed!)
- Student representative on the SMSTC committee (volunteer needed!)

What courses do we offer?

We run core modules and supplementary modules.

Core modules:

- run every year;
- are aimed at first-year PhD students;
- consist of two-hour lectures once a week for ten weeks;
- have graded assignments.

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Supplementary modules:

- appear and disappear from year to year: an ever-changing selection;
- may be more advanced and taken by higher-year PhD students;
- may be shorter;
- usually don't have graded assignments.

If you want a supplementary module to count towards your department's training requirements, talk to your supervisor or postgraduate coordinator.

First semester

Core modules:

- Algebraic Topology
- Asymptotic and Analytical Methods
- Continuum Mechanics
- Dynamical Systems and Conservation Laws
- Foundations of Probability
- Groups, Rings and Modules
- Measure and Integration
- Regression and Simulation Methods

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- Continuum Mechanics
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- Regression and Simulation Methods

Supplementary modules (this year's selection):

- Advanced PDE I
- Convergence of Probability Measures and its Applications
- Ethics in Mathematics
- Galois Theory of Commutative Rings
- Stochastic PDEs: Applications and Numerics

Second semester

Core modules:

- Algebras and Representation Theory
- Elliptic and Parabolic PDEs
- Functional Analysis
- Manifolds
- Mathematical Biology and Physiology
- Modern Regression and Bayesian Methods
- Numerical Methods
- Stochastic Processes

Second semester

Core modules:

- Algebras and Representation Theory
- Elliptic and Parabolic PDEs
- Functional Analysis
- Manifolds
- Mathematical Biology and Physiology
- Modern Regression and Bayesian Methods
- Numerical Methods
- Stochastic Processes

Supplementary modules (this year's selection):

- Advanced PDE II
- Algebraic Statistics
- Classical and Quantum Integrable Systems
- Solving Singular SPDEs with Regularity Structures

Themes

You can take any combination of modules you want, as long as:

- you have the prerequisites (see the Prospectus under the Timetable tab)
- your department agrees.

For convenience, we organize the core modules into four themes:

Analysis

Applications of Mathematics

Probability and Statistics

Structure and Symmetry

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Analysis

Theme Head: Heiko Gimperlein (Heriot-Watt)

Core modules:

- Dynamical Systems and Conservation Laws (Semester 1)
- Measure and Integration (Semester 1)
- Elliptic and Parabolic PDEs (Semester 2)
- Functional Analysis (Semester 2)

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Applications of Mathematics

Acting Theme Head: David Pritchard (Strathclyde)

Core modules:

- Asymptotic and Analytical Methods (Semester 1)
- Continuum Mechanics (Semester 1)
- Numerical Methods (Semester 2)
- Mathematical Biology and Physiology (Semester 2)

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Probability and Statistics

Theme Head: Natalia Bochkina (Edinburgh)

Core modules:

- Foundations of Probability (Semester 1)
- Regression and Simulation Methods (Semester 1)
- Stochastic Processes (Semester 2)
- Modern Regression and Bayesian Methods (Semester 2)

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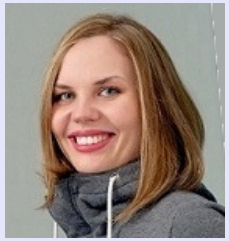
Structure and Symmetry



Theme Head: Sira Gratz (Glasgow)

Core modules:

- Groups, Rings and modules (Semester 1)
- Algebraic Topology (Semester 1)
- Algebras and Representation Theory (Semester 2)
- Manifolds (Semester 2)

How do lectures work?

Lectures are delivered by videoconference.

Example: If you're in Dundee and the lecturer is in Aberdeen, you see this:

Screen 1

The definition

A metric space X is positive definite if for every finite $A \subseteq X$, the matrix Z_A is positive definite.

E.g.: $\mathbb{R}^n$ with the Euclidean or taxicab metric, hyperbolic space, any ultrametric space.

Theorem (Meckes)

All sensible ways of extending the definition of magnitude from finite metric spaces to compact positive definite spaces are equivalent.

E.g.: For a compact positive definite space A, we can define

$$|A| = \sup\{|B| \ : \ \text{finite } B \subseteq A\}.$$

Or equivalently, we can choose a sequence (B_n) of finite subsets with $B_n \to A$ in the Hausdorff metric, then define $|A| = \lim_{n\to\infty} |B_n|$.

The definition can also be expressed directly, without using finite approximations.

Screen 2

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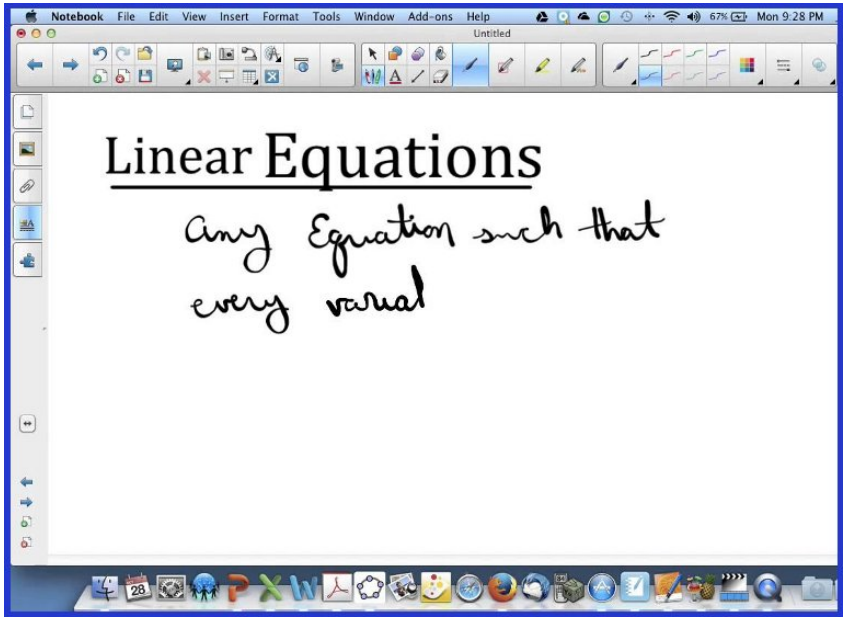

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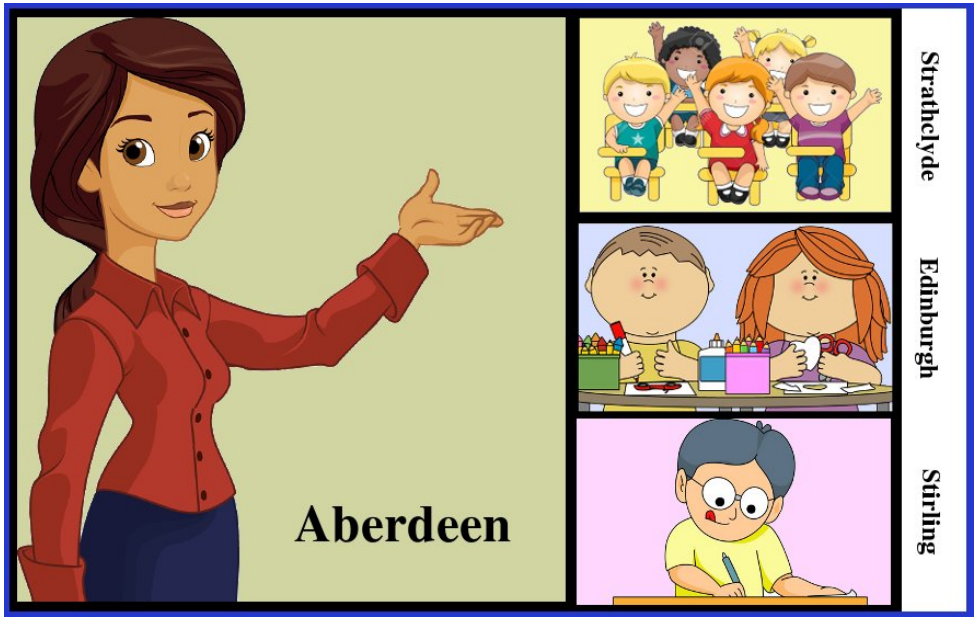

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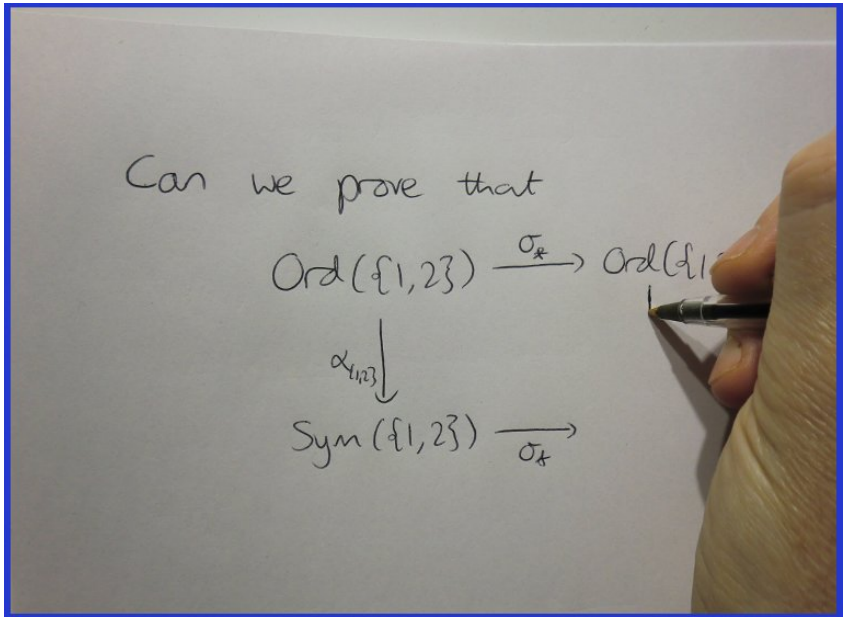

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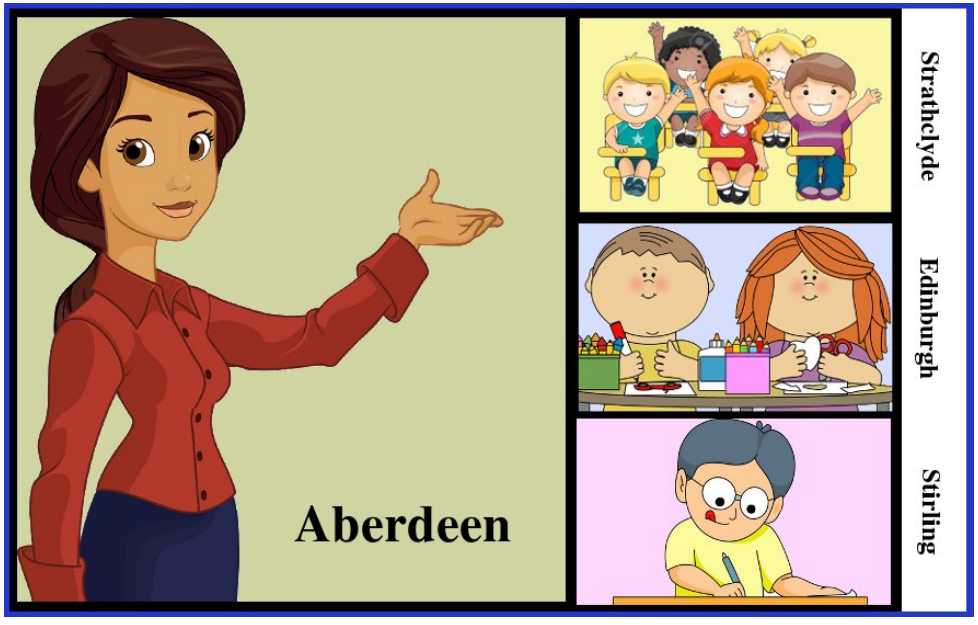

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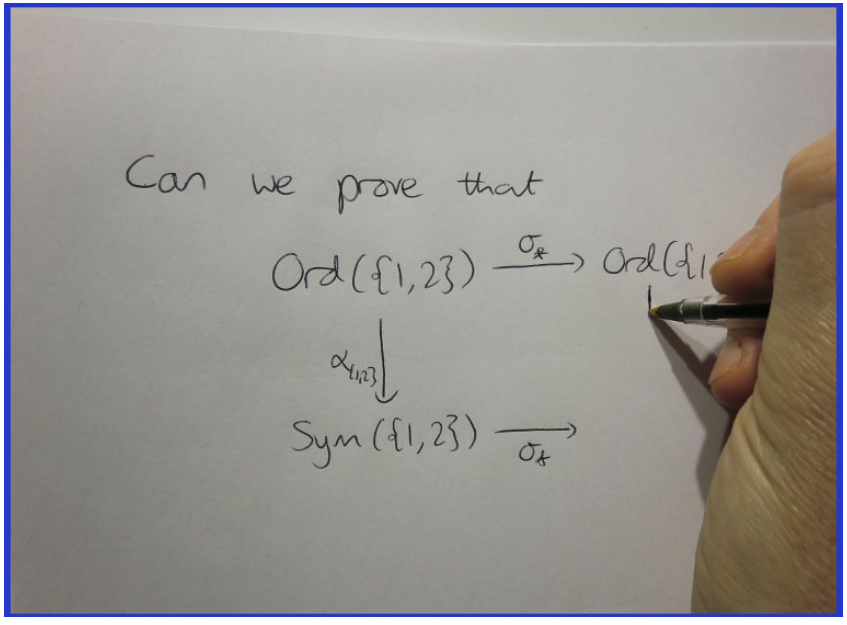

Screen 2

It's interactive: you can ask and answer questions. (But please keep the microphone off otherwise!)

What happens outside lectures?

Material on the website: The website (www.smstc.ac.uk) is crucial!

Study the notes, do the exercises, follow up on suggested texts, etc.
Some modules are 'flipped': you're expected to read in advance.

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Assessment: Each core module is assessed in either one or two assigments.

You get written feedback, a grade for each assignment, and an overall grade for the module. All this is visible to your supervisor.

How many modules should I do?

If you're EPSRC-funded, the amount of training that EPSRC demands is equivalent to five or six modules.

If you're not EPSRC-funded, your department will probably require a similar amount anyway.

Your postgraduate director of studies decides what's required (not us).

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Example scenarios:

- Student A takes six core modules.
- Student B has already done a lot of high-level courses in her Master's degree, so only takes three modules: two core, one supplementary.
- Student C takes four core modules, but wants to learn some other subjects that SMSTC doesn't offer, so also takes an undergraduate course and a reading course.

How much time does all this take?

Typically, about 75% of your time for the first six months of your PhD is intended to be spent on training.

Make sure your supervisor doesn't overload you with other work.

Warning: You are likely to have clusters of assignment deadlines around the middle and end of semesters.

Plan ahead for this!

What doesn't SMSTC do?

SMSTC doesn't force you to do anything.

Your department might, your supervisor might, your funder might...

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SMSTC doesn't provide tutorials.

These are the responsibility of your department.

Lectures are done centrally by videoconference—organized by SMSTC.

Tutorials are done locally in person—organized by your department.

If you're not being offered tutorial support, *complain to your department!*

Whom can I ask stuff?

Local tutors: e.g. specific mathematical points.

Lecturer: e.g. points that your tutor can't answer.

Theme Head: e.g. feedback on course provision.

Postgraduate director of studies and supervisor: e.g. questions about your training.

Johanna McBryde (SMSTC administrator): purely administrative questions.

David Pritchard (director): questions about SMSTC as a whole.

Me, now: . . . ?

Why, oh why?

We have a feedback exercise every spring to get detailed feedback from you on every module.

This is extremely useful for future students.

But you don't have to wait for spring!

Feedback is welcome at all moments. Options:

- Speak directly to the lecturer or theme head.
- Talk to your student representative, who will pass it on to us.
- Talk to me.

What now?

Here's what happens over the next couple of days:

- An overview of each theme, including content, prerequisites and assessment, and giving you
  - help to make up (or change) your mind on which modules to take
  - a chance to broaden your knowledge, even if you've already made your choices
- Presentations on essential skills for PhD students
- Meeting students and staff from universities across Scotland
- ~~Some fun~~ Networking and team-building: curling and dinner.