SMSTC, Structure and Symmetry

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- ★ **Geometry** (from the Ancient Greek: geo- "earth", -metron "measuremen") is a branch of mathematics concerned with questions of shape, size, relative position of figures, and the properties of space.
- ★ **Topology** (from the Greek topos, place, and logos, study) is concerned with the properties of a geometric object that are preserved under continuous deformations, such as stretching, twisting, crumpling and bending, but not tearing or gluing.

Theme overview

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Semester 1

★ **Groups, Rings and Modules**

- Louise Theran, University of St. Andrews
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- Qingyuan Jiang, University of Edinburgh
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★ **Algebraic Topology**

- Alessandro Sisto, Heriot-Watt University
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- Dinakar Muthiah, University of Glasgow
  dinakar.muthiah@glasgow.ac.uk

Theme overview

Semester 2

- ★ **Algebras and Representation Theory**
- ★ **Manifolds**

Prerequisites

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- **Groups, Rings and Modules**
  - Basic linear algebra and basic algebra concepts.
    - Definitions and examples of groups, rings and fields.
  - Basic notions of group theory.
    - Lagrange's theorem, normal subgroups and factor groups.

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- **Algebraic Topology**
  - A course in metric spaces or topological spaces.
  - A course in group theory.
    - Group actions.
    - Finitely generated abelian groups.

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- The notion of a module and related concepts.
- Basics on noetherian and artinian modules.
- Some commutative algebra.

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- **Algebras and Representation Theory**
  - The notion of a module and related concepts.
  - Basics on noetherian and artinian modules.
  - Some commutative algebra.
- **Manifolds**
  - Standard calculus courses.
    - Green's theorem.
  - Basic courses in linear algebra.
    - Abstract vector space.

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- Representation Theory.
  - Representations and characters.
  - Orthogonality relations.
  - Induced representations.
  - Computing character tables.

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(9) Euler characteristic, the Gauss-Bonnet Theorem for surfaces.

Enjoy the Theme!