

## MAU23302: Euclidean and Non Euclidean Geometry

Semester 2, 5 credits

### Contact Hours

11 weeks, 3 lectures per week

### Lecturer

Professor David Wilkins

### Learning Outcomes

On successful completion of this module, students will be able to:

- justify with reasoned logical argument basic properties of triangles, circles and polygons in the Euclidean plane on the basis of recognized principles of synthetic geometry;
- identify, and justify with reasoned logical argument, significant geometric principles that are common to both Euclidean and non-Euclidean geometries, and also other geometric principles characteristic of non-Euclidean geometry;
- provide mathematical proofs of aspects of spatial intuition that do not involve the use of Cartesian coordinate systems and calculations in algebra.

### Module Content

The initial focus is on the early books of Euclid's *Elements of Geometry*. The focus then switches to the construction of the hyperbolic plane, satisfying the postulates of Euclidean geometry with the exception of the Parallel Postulate, using methods of coordinate geometry in two and three dimensions.

- Euclidean geometry: an exploration of Euclid's *Elements of Geometry*, based on editions freely available online, with detailed discussion of selected propositions contained in the first four books, and including the geometric construction of a regular pentagon with straightedge and compass.
- Non-Euclidean geometry: stereographic projection; inversions of the Euclidean plane; conformal properties of stereographic projection and inversions, and their action on lines and circles; construction of the hyperbolic plane, hyperbolic geometry.

### Module Prerequisite

None

### Assessment Detail

This module will be examined in a 2 hour **examination** in Trinity term.

Module Coordinator: MAU23302: Euclidean and Non-Euclidean Geometry

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