

# MA243-15 Geometry

**26/27**

**Department**

Warwick Mathematics Institute

**Level**

Undergraduate Level 2

**Module leader**

Martin Gallauer

**Credit value**

15

**Module duration**

10 weeks

**Assessment**

Multiple

**Study location**

University of Warwick main campus, Coventry

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## Description

### Introductory description

Geometry is the attempt to understand and describe the world around us and all that is in it; it is the central activity in many branches of mathematics and physics, and offers a whole range of views on the nature and meaning of the universe.

Klein's Erlangen program describes geometry as the study of properties invariant under a group of transformations. Affine and projective geometries consider properties such as collinearity of points, and the typical group is the full matrix group. Metric geometries, such as Euclidean geometry and hyperbolic geometry (the non-Euclidean geometry of Gauss, Lobachevsky and Bolyai) include the property of distance between two points, and the typical group is the group of rigid motions (isometries or congruences) of 3-space. The study of the group of motions throws light on the chosen model of the world.

[Module web page](#)

### Module aims

To introduce students to various interesting geometries via explicit examples; to emphasize the importance of the algebraic concept of group in the geometric framework; to illustrate the historical development of a mathematical subject by the discussion of parallelism.

## Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

Examples of 'geometries' including: Euclidian, Spherical, hyperbolic and projective.

For these geometries, a metric will be defined and their isometry groups will be determined in terms of linear maps.

Their existence and uniqueness of parallel lines and the sum of the angles of a triangle will be analysed.

Projective linear transformations will be covered, and then the course will build towards axiomatic projective geometry.

## Learning outcomes

By the end of the module, students should be able to:

- make analytic and algebraic calculations within the framework of Euclidean geometry,
- understand the geometry of the sphere and the hyperbolic plane,
- compare the different geometries in terms of their metric properties, trigonometry and parallels,
- concentrate on the abstract properties of lines and their incidence relation, leading to the idea of affine and projective geometry.

## Indicative reading list

[Reading lists can be found in Talis](#)

## Subject specific skills

Ability to qualitatively assess and discuss the different examples of geometry in terms of their metric properties and orthogonal and parallel lines, and to concentrate on the abstract properties of lines and their incidence relation.

## Transferable skills

The module provides technical competence in geometric calculations often required in applications. Beyond this, students will acquire key reasoning and problem solving skills which will empower them to address new problems with confidence.

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## Study

## Study time

Type	Required
Lectures	30 sessions of 1 hour (20%)
Seminars	9 sessions of 1 hour (6%)
Private study	111 hours (74%)
Total	150 hours

## Private study description

Homework, assignments, engagement with departmental support and feedback mechanisms, exam preparation.

## Costs

No further costs have been identified for this module.

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## Assessment

You do not need to pass all assessment components to pass the module.

### Assessment group D

	Weighting	Study time	Eligible for self-certification
Assessed work	15%		No
Centrally-timetabled examination (On-campus)	85%		No

- Answerbook Pink (12 page)

### Assessment group R

	Weighting	Study time	Eligible for self-certification
In-person Examination - Resit	100%		No

- Answerbook Pink (12 page)

## Feedback on assessment

Exam and assessed work feedback.

## Availability

### Courses

This module is Optional for:

- Year 2 of UMAA-G105 Undergraduate Master of Mathematics (with Intercalated Year)
- UMAA-G100 Undergraduate Mathematics (BSc)
  - Year 2 of G100 Mathematics
  - Year 2 of G100 Mathematics
  - Year 2 of G100 Mathematics
- UMAA-G103 Undergraduate Mathematics (MMath)
  - Year 2 of G100 Mathematics
  - Year 2 of G103 Mathematics (MMath)
  - Year 2 of G103 Mathematics (MMath)
- Year 2 of UMAA-G107 Undergraduate Mathematics (MMath) with Study Abroad
- Year 2 of UMAA-G101 Undergraduate Mathematics with Intercalated Year