

MA4P3-15 Classical Groups

26/27

Department

Warwick Mathematics Institute

Level

Undergraduate Level 4

Module leader

Gareth Tracey

Credit value

15

Module duration

10 weeks

Assessment

Multiple

Study location

University of Warwick main campus, Coventry

Description

Introductory description

Classical groups are a fundamental class of matrix groups that appear throughout mathematics and physics, often described as groups of automorphisms that preserve a bilinear or sesquilinear form on a finite-dimensional vector space. They are closely related to the geometry of Euclidean spaces and are central to the classification of finite simple groups; the latter are the building blocks of finite and infinite groups. This module provides an introduction to the subject of classical groups that does not assume knowledge beyond the second year algebra.

Module aims

Introduce and study classical groups, an important area of modern mathematics.

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.

1. Introduction and revision of group actions.
 1. General and special linear groups.
 2. Introduction to projective geometry.

3. Sesquilinear forms.
4. Classical groups and their simplicity.
5. Geometric subgroups of classical groups.

Learning outcomes

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

- Define the classical groups over arbitrary fields.
- Establish the simplicity of many of the classical groups.
- Understand important aspects of the subgroup structure of the classical groups, using the underlying geometry.

Indicative reading list

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

Subject specific skills

Develop a deep understanding and applicability of the following topics:

- **Simplicity of certain classical groups;**
- **The underlying geometry of the classical groups;**
- **Constructing geometric subgroups of classical groups;**
- **Finding generating sets for classical groups using geometric techniques.**

Transferable skills

Be able to transfer knowledge between distinct areas of mathematics (in this case Algebra and Geometry) to prove results in both areas.

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.

Assessment

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

Assessment group B

	Weighting	Study time	Eligible for self-certification
Centrally-timetabled examination (on-campus)	100%		No

Assessment group R

	Weighting	Study time	Eligible for self-certification
Centrally-timetabled examination (on-campus)	100%		No

Feedback on assessment

Solutions to homework problems, support classes, solutions to exam papers.

[Past exam papers for MA4P3](#)

Availability

Courses

This module is Option list C for:

- UMAA-G105 Undergraduate Master of Mathematics (with Intercolated Year)
 - Year 4 of G105 Mathematics (MMath) with Intercolated Year
 - Year 5 of G105 Mathematics (MMath) with Intercolated Year
- UMAA-G103 Undergraduate Mathematics (MMath)
 - Year 3 of G103 Mathematics (MMath)
 - Year 4 of G103 Mathematics (MMath)