

# MA951-15 Graduate Algebra

**21/22**

**Department**

Warwick Mathematics Institute

**Level**

Research Postgraduate Level

**Module leader**

Jose Rodrigo

**Credit value**

15

**Module duration**

10 weeks

**Assessment**

100% exam

**Study location**

University of Warwick main campus, Coventry

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## Description

### Introductory description

This module takes the foundations of algebra learned at undergraduate level and extends them to the research level.

### Module aims

- (a) surveying the range of topics from a higher more unified perspective;
- (b) introducing and applying categorical and homological methods, providing the language of research algebra and extending knowledge in Group Theory, Ring Theory and the Theory of Modules.
- (c) exposing set piece graduate topics in Group Theory, Ring Theory or the Theory of Modules.

### 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.

- Group Theory
- Ring Theory
- Theory of Modules.

- Elements of Category Theory,
- Elements of Homological Algebra
- Representation Theory,
- Derived Functors.

## Learning outcomes

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

- (a) surveying the range of topics from a higher more unified perspective; (b) introducing and applying categorical and homological methods, providing the language of research algebra and extending knowledge in Group Theory, Ring Theory and the Theory of Modules. (c) exposing set piece graduate topics in Group Theory, Ring Theory or the Theory of Modules.

## Subject specific skills

Develop a deep understanding and applicability of the following topics:

- Free groups (with proof of existence), generators and relations.
- Tensor product and multilinear algebra
- Basics of category theory (definition of a category, functors, initial objects/universal properties, natural transformations).
- Basic homological algebra (exact sequences, homology)
- Basic noncommutative algebra (to Wedderburn's theorem)
- Introduction to representation theory.
- Galois theory

## Transferable skills

- sourcing research material
- prioritising and summarising relevant information
- absorbing and organizing information
- presentation skills (both oral and written)

## Study

### Study time

Type	Required
Lectures	30 sessions of 1 hour (20%)
Private study	120 hours (80%)
Total	150 hours

## Private study description

Review lectured material.

Work on supplementary reading material.

Source, organise and prioritise material for additional reading.

## Costs

No further costs have been identified for this module.

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## Assessment

You must pass all assessment components to pass the module.

Students can register for this module without taking any assessment.

### Assessment group A

	Weighting	Study time	Eligible for self-certification
Oral Exam	100%		No
An oral exam involving a presentation by the student, followed by questions from the panel (2 members of the department)			

### Feedback on assessment

Students will receive feedback from the course instructor after the oral exam, to cover also areas like presentation skills and use of technologies (or blackboard)

[Past exam papers for MA951](#)

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## Availability

There is currently no information about the courses for which this module is core or optional.