

MA4N8-15 Topics in Set Theory

26/27

Department

Warwick Mathematics Institute

Level

Undergraduate Level 4

Module leader

Adam Epstein

Credit value

15

Assessment

100% exam

Study location

University of Warwick main campus, Coventry

Description

Introductory description

See learning outcomes.

Module aims

Set theoretical concepts and formulations are pervasive in modern mathematics. For this reason it is often said that set theory provides a foundation for mathematics. Here 'foundation' can have multiple meanings. On a practical level, set theoretical language is a highly useful tool for the definition and construction of mathematical objects. On a more theoretical level, the very notion of a foundation has definite philosophical overtones, in connection with the reducibility of knowledge to agreed first principles.

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.

Overview of MA3H3 Set Theory with attention to the formulation of the ZFC axioms and the main theorems.

Cardinal Arithmetic, with and without Axiom of Choice.

Generalized Continuum Hypothesis.

Applications of Replacement.

Transfinite Recursion.
Large Cardinals.
Grothendieck Universes.

Learning outcomes

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

- Formally state the axioms of Zermelo-Fraenkel set theory.
- Rigourously compare sizes and orderings of sets by means of explicit constructions of injections and bijections, and give interpretations in the terminology of cardinal and ordinal arithmetic.
- Outline the construction of the real number system, though various stages, ultimately from first principles.
- Give examples of mathematical statements which are equivalent to the Axiom of Choice, notice the use of this principle in mathematical arguments, and avoid unnecessary use of it.
- Appreciate the strengths, and also some of the shortcomings, of Zermelo-Fraenkel set theory as a foundation for mathematics.

Indicative reading list

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

Subject specific skills

Appreciate the strengths, and also some of the shortcomings, of Zermelo-Fraenkel set theory as a foundation for mathematics.

Transferable skills

Students will acquire key reasoning and problem solving skills which will empower them to address new problems with confidence.

Study

Study time

Type	Required
Lectures	30 sessions of 1 hour (77%)
Seminars	9 sessions of 1 hour (23%)
Total	39 hours

Private study description

Office hours, private study, preparation for lectures and exams, assignment sheets

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
Assessment component			
In-person examination	100%	36 hours	No
Written 3 hour exam			

Reassessment component is the same

Feedback on assessment

Exam Feedback

[Past exam papers for MA4N8](#)

Availability

Courses

This module is Optional for:

- Year 1 of TMAA-G1P0 Postgraduate Taught Mathematics
- TMAA-G1PC Postgraduate Taught Mathematics (Diploma plus MSc)
 - Year 1 of G1PC Mathematics (Diploma plus MSc)
 - Year 2 of G1PC Mathematics (Diploma plus MSc)

This module is Option list C for:

- UMAA-G105 Undergraduate Master of Mathematics (with Intercalated Year)
 - Year 4 of G105 Mathematics (MMath) with Intercalated Year

- Year 5 of G105 Mathematics (MMath) with Intercalated Year
- UMAA-G103 Undergraduate Mathematics (MMath)
 - Year 3 of G103 Mathematics (MMath)
 - Year 4 of G103 Mathematics (MMath)
- Year 4 of UMAA-G107 Undergraduate Mathematics (MMath) with Study Abroad