

# MA131-24 Analysis

**22/23**

**Department**

Warwick Mathematics Institute

**Level**

Undergraduate Level 1

**Module leader**

Daniel Ueltschi

**Credit value**

24

**Assessment**

Multiple

**Study location**

University of Warwick main campus, Coventry

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## Description

### Introductory description

At the beginning of the nineteenth century the familiar tools of calculus, differentiation and integration, began to run into problems. Mathematicians were unsure of how to apply these tools to sums of infinitely many functions. The origins of Analysis lie in their attempt to formalize the ideas of calculus purely in the language of arithmetic and to resolve these problems.

[Module web page](#)

### Module aims

There will be considerable emphasis throughout the module on the need to argue with much greater precision and care than you had to at school. With the support of your fellow students, lecturers and other helpers, you will be encouraged to move on from the situation where the teacher shows you how to solve each kind of problem, to the point where you can develop your own methods for solving problems. You will also be expected to question the concepts underlying your solutions, and understand why a particular method is meaningful and another not so. In other words, your mathematical focus should shift from problem solving methods to concepts and clarity of thought.

### 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.

You will study ideas of the mathematicians Cauchy, Dirichlet, Weierstrass, Bolzano, D'Alembert, Riemann and others, concerning sequences and series in term one, continuity and differentiability in term two and integration in term one of your second year.

By the end of the year you will be able to answer many interesting questions: What do we mean by 'infinity'? How can you accurately compute the value of  $\pi$  or  $e$  or  $\sqrt{2}$ ? How can you add up infinitely many numbers, or infinitely many functions? Can all functions be approximated by polynomials?

## Learning outcomes

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

- Understand what is meant by 'infinity'
- Develop their own methods for solving problems
- Accurately compute the value of  $\pi$  or  $e$  or  $\sqrt{2}$
- Add up infinitely many numbers, or infinitely many functions
- Answer: Can all functions be approximated by polynomials?

## Indicative reading list

M. Hart, Guide to Analysis, Macmillan. (A good traditional text with theory and many exercises.)

M. Spivak, Calculus, Benjamin.

R.G Bartle and D.R Sherbert, Introduction to Real Analysis (4th Edition), Wiley (2011)

L. Alcock, How to think about Analysis, Oxford University Press (2014)

## Subject specific skills

Analysis gives first-year undergraduates a first excursion in to pure mathematics. The students will gain a new perspective and a deeper understanding of familiar mathematics which they have seen in school (e.g. real numbers, functions and differentiation). In Analysis, these concepts are developed with mathematical rigour, which characterises much of university mathematics to follow.

## Transferable skills

Critical thinking

Group work (through group supervision)

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## Study

## Study time

Type	Required	Optional
Lectures	30 sessions of 1 hour (34%)	
Seminars	20 sessions of 2 hours (45%)	9 sessions of 1 hour
Tutorials	18 sessions of 1 hour (20%)	
Total	88 hours	

## Private study description

152 hours private study, revision for exams, and non-assessed assignments

## 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 D2

	Weighting	Study time	Eligible for self-certification
Weekly assignments	7%		Yes (waive)
Assessed work in Term 1			
Weekly Assignments	8%		Yes (waive)
Assessed work in Term 2			
In-person Examination	60%		No
Exam in June			
Online Examination	25%		No
Exam in January			

- Online examination: No Answerbook required

### Assessment group R2

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

## **Feedback on assessment**

Assignments marked by supervisors, typically returned within one week. Group project marked by personal tutors.

[Past exam papers for MA131](#)

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## **Availability**

## **Courses**

This module is Core for:

- Year 1 of UMAA-GV18 Undergraduate Mathematics and Philosophy with Intercalated Year