MA131-24 Analysis

20/21

Department
Warwick Mathematics Institute
Level
Undergraduate Level 1
Module leader
David Wood
Credit value
24
Module duration
20 weeks
Assessment
Multiple
Study location
University of Warwick main campus, Coventry

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 π or e or √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 π or e or √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)

Study

Study time

Type	Required	Optional
Lectures	30 sessions of 1 hour (12%)	
Seminars	20 sessions of 2 hours (17%)	9 sessions of 1 hour
Tutorials	18 sessions of 1 hour (8%)	
Private study	152 hours (63%)	
Total	240 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
Weekly assignments Assessed work in Term 1	7%	
Weekly Assignments Assessed work in Term 2	8%	
In-person Examination Exam in June	60%	
Online Examination Exam in January	25%	

- Online examination: No Answerbook required

Assessment group R2

	Weighting	Study time
In-person Examination - Resit	100%	

	Weighting	Study time
exam		

Feedback on assessment

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

Past exam papers for MA131

Availability

Courses

This module is Core for:

- UMAA-G100 Undergraduate Mathematics (BSc)
  - Year 1 of G100 Mathematics
  - Year 1 of G100 Mathematics
  - Year 1 of G100 Mathematics
- UMAA-G103 Undergraduate Mathematics (MMath)
  - Year 1 of G100 Mathematics
  - Year 1 of G103 Mathematics (MMath)
  - Year 1 of G103 Mathematics (MMath)
- Year 1 of UMAA-G106 Undergraduate Mathematics (MMath) with Study in Europe
- Year 1 of UMAA-G1NC Undergraduate Mathematics and Business Studies
- Year 1 of UMAA-G1N2 Undergraduate Mathematics and Business Studies (with Intercalated Year)
- Year 1 of UMAA-GL11 Undergraduate Mathematics and Economics
- Year 1 of UECA-GL12 Undergraduate Mathematics and Economics (with Intercalated Year)
- UMAA-GV18 Undergraduate Mathematics and Philosophy with Intercalated Year
  - Year 1 of GV18 Mathematics and Philosophy with Intercalated Year
  - Year 1 of GV18 Mathematics and Philosophy with Intercalated Year
- Year 1 of UMAA-G101 Undergraduate Mathematics with Intercalated Year