# **MA271-10 Mathematical Analysis 3**

## 23/24

Department Warwick Mathematics Institute Level Undergraduate Level 2 Module leader Vedran Sohinger Credit value 10 Module duration 10 weeks Assessment Multiple Study location University of Warwick main campus, Coventry

# Description

## Introductory description

This is the third module in the series Analysis 1, 2, 3 that covers rigorous Analysis. It covers convergence of functions and its applications to Integration, Fourier Series and Complex Analysis.

Module web page

## Module aims

- 1. Continuity, differentiability and integral of the limit of a uniformly convergent sequence of functions.
- 2. Fourier series and their convergence.
- 3. Foundations of Complex Analysis.

## **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.

- Uniform convergence of sequences and series of functions; Weierstrass M-test
- Application to integration: integrals of limits and series, differentiation under the integral sign
- Fourier series: convergence, Parseval, and Gibbs phenomenon (differentiability and rate of

decay of coefficients)

- Complex power series and classical functions (exponential, logarithm, sine and cosine, including periodicity)
- Complex integration, contour integrals and Cauchy's Theorem
- Applications of Cauchy's formula to evaluate real integrals
- Laurent series, Calculus of residues

#### Learning outcomes

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

- · Learn how to compute contour integrals: Cauchy's integral formulas and applications
- Understand uniform and pointwise convergence of functions together with properties of the limit function
- Learn the continuity, differentiability and integral of the limit of a uniformly convergent sequence of functions
- Develop working knowledge of complex differentiability (Cauchy-Riemann equations) and complex power series
- Develop understanding of Fourier Series including Gibbs phenomenon

## Subject specific skills

- Working knowledge of series and sequences, including the development of the notions of convergence and uniform converge for sequences and series of functions.
- Good understanding of Fourier series, including their convergence, Parseval's identity and Gibbs phenomenon.
- Working knowledge of Complex Analysis, including power series, exponential and circular maps, contour integration.
- Mastery of applications of Cauchy's formula to compute integrals in R.

## 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** Lectures Tutorials Total Required 20 sessions of 1 hour (20%) 9 sessions of 1 hour (9%) 100 hours

Туре	Required
Private study	71 hours (71%)
Total	100 hours

## **Private study description**

71 hours private study, revision for exams, and 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 D

	Weighting	Study time
Assignment	15%	
Examination	85%	

• Answerbook Pink (12 page)

## Assessment group R

	Weighting	Study time
In-person Examination - Resit	100%	

• Answerbook Gold (24 page)

#### Feedback on assessment

Support classes, marked assignments and exam feedback.

Past exam papers for MA271

## Availability

Courses

This module is Core for:

- Year 2 of UMAA-GV19 Undergraduate Mathematics and Philosophy with Specialism in Logic and Foundations
- UPXA-GF13 Undergraduate Mathematics and Physics (BSc)
  - Year 2 of GF13 Mathematics and Physics
  - Year 2 of GF13 Mathematics and Physics
- UPXA-FG31 Undergraduate Mathematics and Physics (MMathPhys)
  - Year 2 of FG31 Mathematics and Physics (MMathPhys)
  - Year 2 of FG31 Mathematics and Physics (MMathPhys)

This module is Optional for:

• Year 3 of USTA-G300 Undergraduate Master of Mathematics, Operational Research, Statistics and Economics

This module is Core option list A for:

- UMAA-GV17 Undergraduate Mathematics and Philosophy
  - Year 2 of GV17 Mathematics and Philosophy
  - Year 2 of GV17 Mathematics and Philosophy
  - Year 2 of GV17 Mathematics and Philosophy

This module is Option list A for:

- USTA-G302 Undergraduate Data Science
  - Year 2 of G302 Data Science
  - Year 2 of G302 Data Science
- UCSA-G4G1 Undergraduate Discrete Mathematics
  - Year 2 of G4G1 Discrete Mathematics
  - Year 2 of G4G1 Discrete Mathematics
- Year 2 of UCSA-G4G3 Undergraduate Discrete Mathematics
- USTA-GG14 Undergraduate Mathematics and Statistics (BSc)
  - Year 2 of GG14 Mathematics and Statistics
  - Year 2 of GG14 Mathematics and Statistics
- USTA-Y602 Undergraduate Mathematics, Operational Research, Statistics and Economics
  - Year 2 of Y602 Mathematics, Operational Research, Stats, Economics
  - Year 2 of Y602 Mathematics, Operational Research, Stats, Economics

This module is Option list B for:

- USTA-Y602 Undergraduate Mathematics, Operational Research, Statistics and Economics
  - Year 3 of Y602 Mathematics, Operational Research, Stats, Economics
  - Year 3 of Y602 Mathematics, Operational Research, Stats, Economics

This module is Option list E for:

• Year 3 of USTA-G300 Undergraduate Master of Mathematics, Operational Research, Statistics and Economics