This is archived information. Please visit http://www.maths.manchester.ac.uk for current course unit information

MATH31022

Analytic Number Theory

Unit code:	MATH31022
Credit Rating:	10
Unit level:	Level 3
Teaching period(s):	Semester 2
Offered by	School of Mathematics
Available as a free choice unit?:	N

Requisites

Prerequisite

- MATH20101 - Real and Complex Analysis (Compulsory)
- MATH20142 - Complex Analysis (Compulsory)

Additional Requirements

MATH31022 pre-requisites

Students must have taken MATH20401 OR MATH20411

Students are not permitted to take more than one of MATH31022, MATH41022 or MATH61022 for credit, either in the same or different undergraduate year or in an undergraduate programme and then a postgraduate programme, as the contents of the courses overlap significantly.

Aims

To show how the tools of Mathematical analysis can be used to prove results about prime numbers and functions defined on the integers.

Overview

We start by giving two proofs of the infinitude of primes. The methods are elementary but poor in that they do not tell us the truth of how many primes there are. Stronger tools are introduced, improving the results until we can indicate, at least in outline, a proof of the Prime Number Theorem

Assessment Further Information

End of semester examination: two hours weighting 100% (MATH31002).

Learning outcomes

On completion of this unit students

- will be able to utilise the correspondence between the product of Dirichlet series and composition of arithmetic functions,
- will be able to use the methods of Partial Summation and replacing sums by integrals,
- be able to prove elementary results on sums over primes,
- be able to prove some analytic properties of the Riemann zeta function,
- appreciate a proof of the Prime Number Theorem,
- will be able to use the Composition Method to estimate sums of arithemtic functions.

Syllabus

- Two proofs of the infinitude of primes. [3]
- Arithmetic functions and Dirichlet Series. [5]
- Elementary Prime Number Theory. [5]
- The Prime Number Theorem. [5]
- Sums of arithmetic functions. [3]

Recommended reading

- T. Apostol, Introduction to Analytic Number Theory, 1st edition. 1976, Corrected 5th edition 2010, Springer, 1441928057
- G.J.O. Jameson, The Prime Number Theorem, LMS Student Texts 53, CUP 2003, 0-521-89110-8.

Feedback methods

Tutorials will provide an opportunity for students' work to be discussed and provide feedback on their understanding.

Study hours

- Lectures - 22 hours
- Tutorials - 11 hours
- Independent study hours - 67 hours

Teaching staff

Mark Coleman - Unit coordinator