

Calculus and mathematical analysis

MATH1050

School of Mathematics, University of Leeds

- 10 credits
- Taught Semester 1
- Year running 2008/09
- Pre-requisites: A-level Mathematics
- Objectives: Calculate the derivatives and integrals of elementary functions. Do arithmetic calculations with complex numbers, including calculation of n -th roots. Calculate limits of simple sequences. Use different tests to study the convergence of infinite series. Compute Taylor power series.
- Syllabus: Differentiation; Hyperbolic functions and their inverses: properties and derivatives; Integration; Complex numbers: definition, de Moivre's theorem, the logarithmic function; Sequences: definition and calculation of limits; Infinite series; Taylor series.
- Form of teaching
Lectures: 22 hours
- Form of assessment
5 Examples (0%). 4 Workshop quizzes (15%). One 2 hour examination at end of semester (85%). Your answers to the examples will be returned to you with comments but they do not count towards the final grade of the module.
- Dates for handing in Examples
Examples 1: 8 October. Examples 2: 22 October. Examples 3: 5 November. Examples 4: 19 November. Examples 5: 3 December.
- Dates for Workshop quizzes
Quiz 1: 20 October. Quiz 2: 3 November. Quiz 3: 17 November. Quiz 4: 1 December.
- Lecture notes for this module have been developed and prepared by Dr. Carmen Molina-París. She wants to thank and acknowledge the contribution of Prof. M. Rathjen, Prof. C. Read and Dr. E. Cole for their lecture notes and suggestions.

Details:

CARMEN MOLINA-PARÍS

Office: 10.22f

Phone: 0113 343 5151

E-mail: carmen@maths.leeds.ac.ukWWW: <http://www.maths.leeds.ac.uk/~carmen/1050>**Schedule:** two lectures every week, for eleven weeks (from 29/09/08 to 12/12/08).

Tuesday 10:00–11:00 RSLT 18

Wednesday 13:00–14:00 RSLT 19

Other activities: tutorials and workshops every week, for ten weeks (from 06/10/08 to 12/12/08), alternating with MATH1050 (even weeks) and MATH1400 (odd weeks).

Tutorials on Monday 11:00–12:00 (check your group for exact details of location)

Workshops on Monday 14:00–15:00 (check your group for exact details of location)

Pre-requisite: A-levels mathematics**Outline of course:**Introduction:

- basics
- notation
- functions
- mathematical induction

Limits:

- definition
- elementary properties of limits
- continuity

Differentiation:

- definition
- the quotient rule
- derivatives of special functions
- the chain rule

Special functions and their derivatives:

- the exponential function
- the logarithmic function
- basic properties of the logarithmic functions
- trigonometric functions
- hyperbolic functions

Inverse functions and their derivatives:

- | definition
- | inverse trigonometric functions
- | differentiating the inverse function

The integral:

- | definition
- | upper and lower sums
- | the definite integral
- | the fundamental theorem of calculus
- | integration by substitution
- | integration by parts
- | indefinite integral

Complex numbers:

- | definition
- | the geometry of complex numbers
- | de Moivre's theorem
- | the principal value
- | powers of complex numbers
- | roots of complex numbers
- | exponential function, trigonometric functions and hyperbolic functions

Sequences:

- | definition
- | limit of a sequence
- | bounded sequences
- | divergence and convergence

Infinite series:

- | definition
- | the vanishing condition
- | various tests

Power series:

- | definition
- | radius of convergence
- | Taylor and Maclaurin series

Book list:

K. F. Riley, M. P. Hobson and S. J. Bence, "Mathematical methods for physics and engineering", Cambridge, 2006.

A. Jeffrey, "Mathematics for engineers and scientists", Chapman & Hall, 1996.