MAST20026 Real Analysis with Applications

Credit Points: 12.50

Level: 2 (Undergraduate)

Dates & Locations:

2012, Parkville

This subject commences in the following study period/s:
Semester 1, Parkville - Taught on campus.
Semester 2, Parkville - Taught on campus.
Lectures and practice classes.

Time Commitment: Contact Hours: 3 x one hour lectures per week; 2 x one hour practice classes per week. Total Time Commitment: Estimated total time commitment of 120 hours

Prerequisites:

One of

Subject	Study Period Commencement:	Credit Points:
MAST10006 Calculus 2	Semester 1, Semester 2	12.50

620-143 Applied Mathematics (prior to 2009)

Plus one of

Subject	Study Period Commencement:	Credit Points:
MAST10007 Linear Algebra	Summer Term, Semester 1, Semester 2	12.50
MAST10008 Accelerated Mathematics 1	Semester 1	12.50

MAST10013 UMEP Maths for High Achieving Students
620-122 Mathematics B Advanced (prior to 2008)
620-142 Mathematics B (prior to 2009)
620-211 Mathematics 2 Advanced (prior to 2008)

Corequisites: None

Recommended Background Knowledge: None

Non Allowed Subjects:

Students who gain credit for MAST20026 Real Analysis with Applications may not also gain credit for any of

MAST10009 Accelerated Mathematics 2
620-113 Applied Mathematics Advanced Plus (prior to 2008)
620-123 Applied Mathematics Advanced (prior to 2008)
620-121 Mathematics A Advanced (prior to 2008)
620-120 UMEP Maths for High Achieving Students (prior to 2008)

Core Participation Requirements: For the purposes of considering request for Reasonable Adjustments under the Disability Standards for Education (Cwth 2005), and Students Experiencing Academic Disadvantage Policy, academic requirements for this subject are articulated in the Subject Description, Subject Objectives, Generic Skills and Assessment Requirements of this entry.The University is dedicated to provide support to those with special requirements. Further details on the disability support scheme can be found at the Disability Liaison Unit website: http://www.services.unimelb.edu.au/disability/

Coordinator: Dr Alexandru Ghitza, Dr Deborah King, Dr Richard Brak

Contact:	Second Year Coordinator **Email: sycoord@ms.unimelb.edu.au (mailto:sycoord@ms.unimelb.edu.au)**
Subject Overview:	This subject introduces the field of mathematical analysis both with a careful theoretical framework as well as selected applications. Many of the important results are proved rigorously and students are introduced to methods of proof such as mathematical induction and proof by contradiction. The important distinction between the real numbers and the rational numbers is emphasized and used to motivate rigorous notions of convergence and divergence of sequences, including the Cauchy criterion. These ideas are extended to cover the theory of infinite series, including common tests for convergence and divergence. A similar treatment of continuity and differentiability of functions of a single variable leads to applications such as the Mean Value Theorem and Taylor's theorem. The definitions and properties of the Riemann integral allow rigorous proof of the Fundamental Theorem of Calculus. The convergence properties of sequences and series are explored, with applications to power series representations of elementary functions and their generation by Taylor series. Fourier series are introduced as a way to represent periodic functions.
Objectives:	On completion of this subject students should # Acquire an appreciation of rigour in mathematics, be able to use proof by induction, proof by contradiction, and to use epsilon-delta proofs both as a theoretical tool and a tool of approximation; # Understand the theory and applications of the Riemann integral and improper integrals; # Be able to determine the convergence and divergence of infinite series; # Have a good knowledge of the theory and practice of power series expansions and Taylor polynomial approximations; and # Understand the role of Fourier series in representing periodic functions.
Assessment:	Ten to twelve written assignments due at weekly intervals during semester amounting to a total of up to 50 pages (20%), and a 3-hour written examination in the examination period (80%).
Prescribed Texts:	None
Recommended Texts:	
Breadth Options:	This subject potentially can be taken as a breadth subject component for the following courses: # **Bachelor of Arts (https://handbook.unimelb.edu.au/view/2012/B-ARTS)** # **Bachelor of Commerce (https://handbook.unimelb.edu.au/view/2012/B-COM)** # **Bachelor of Environments (https://handbook.unimelb.edu.au/view/2012/B-ENVS)** # **Bachelor of Music (https://handbook.unimelb.edu.au/view/2012/B-MUS)** You should visit **learn more about breadth subjects (http://breadth.unimelb.edu.au/breadth/info/index.html)** and read the breadth requirements for your degree, and should discuss your choice with your student adviser, before deciding on your subjects.
Fees Information:	Subject EFTSL, Level, Discipline & Census Date, http://enrolment.unimelb.edu.au/fees
Generic Skills:	In addition to learning specific skills that will assist students in their future careers in science, they will have the opportunity to develop generic skills that will assist them in any future career path. These include: # problem-solving skills: the ability to engage with unfamiliar problems and identify relevant solution strategies; # analytical skills: the ability to construct and express logical arguments and to work in abstract or general terms to increase the clarity and efficiency of analysis; # collaborative skills: the ability to work in a team; # time management skills: the ability to meet regular deadlines while balancing competing commitments.

Notes:	This subject is available for science credit to students enrolled in the BSc (both pre-2008 and new degrees), BASc or a combined BSc course. Students undertaking this subject are required to regularly use computers with the numerical software MATLAB installed.
Related Majors/Minors/ Specialisations:	B-ENG Electrical Engineering stream Science credit subjects* for pre-2008 BSc, BASc and combined degree science courses Science-credited subjects - new generation B-SCI and B-ENG. Core selective subjects for B-BMED.
Related Breadth Track(s):	Mathematics and Statistics