

620-295 Real Analysis with Applications

Credit Points:	12.50
Level:	2 (Undergraduate)
Dates & Locations:	2009, This subject commences in the following study period/s: Semester 1, - Taught on campus. Semester 2, - Taught on campus. Lectures, practice classes and computer laboratory classes.
Time Commitment:	Contact Hours: 36 one-hour lectures (three per week), 11 one-hour practice classes (one per week), 4 one-hour computer laboratory classes (during semester) Total Time Commitment: 120 hours total time commitment.
Prerequisites:	One of <ul style="list-style-type: none"> # <i>Calculus 2</i> # 620-143 (prior to 2009) and one of <ul style="list-style-type: none"> # 620-122 (prior to 2008) # 620-142 (prior to 2009) # <i>Linear Algebra</i> # <i>Accelerated Mathematics 1</i> (620-157 Mathematics 1 prior to 2009) # 620-190 (UMEP Mathematics for High Achieving Students), # 620-192 (prior to 2006) # 620-194 (prior to 2006) # 620-211 (prior to 2008)
Corequisites:	None
Recommended Background Knowledge:	None
Non Allowed Subjects:	Students who gain credit for <i>Real Analysis with Applications</i> may not also gain credit for 620-113 (prior to 2008), 620-120 (UMEP Mathematics for High Achieving Students) (prior to 2008), 620-121 (prior to 2008), 620-123 (prior to 2008) or <i>Accelerated Mathematics 2</i> (620-158 Mathematics 2 prior to 2009)
Core Participation Requirements:	It is University policy to take all reasonable steps to minimise the impact of disability upon academic study and reasonable steps will be made to enhance a student's participation in the University's programs. Students who feel their disability may impact upon their participation are encouraged to discuss this with the subject coordinator and the Disability Liaison Unit.
Coordinator:	Assoc Prof Jerry Koliha
Subject Overview:	This subject introduces the field of mathematical analysis both with a careful theoretical framework and its application in numerical approximation. A review of number systems; the fundamentals of topology of the real line; continuity and differentiability of functions of one and several variables; sequences and series including the concepts of convergence and divergence, absolute and conditional, and tests for convergence; Taylor's theorem and series representation of elementary functions with application to Fourier series. The subject will introduce methods of proof such as induction and also introduce the use of rigorous numerical approximations. Topics include the definition of limits, \limsup , \liminf ; Rolle's Theorem, Mean Value Theorem, Intermediate Value Theorem, monotonicity, boundedness, and the definition of the Riemann integral.
Objectives:	On completion of the subject the students should acquire

	<ul style="list-style-type: none"> # 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; # a good knowledge of the theory and practice of power series expansions and Taylor polynomial approximations; # an ability to numerically compute integrals based on theoretical groundwork and on practical computation using software packages
Assessment:	Up to 50 pages of written assignments 20% (due during semester), a 3-hour written examination 80% (in the examination period).
Prescribed Texts:	None
Recommended Texts:	Bartle and Sherbet, <i>Introduction to Real Analysis</i> , 3rd ed. (only), Wiley 2000 Ghorpade and Limaye, <i>A Course in Calculus and Real Analysis</i> , Springer 2006
Breadth Options:	<p>This subject potentially can be taken as a breadth subject component for the following courses:</p> <ul style="list-style-type: none"> # Bachelor of Arts (https://handbook.unimelb.edu.au/view/2009/D09) # Bachelor of Commerce (https://handbook.unimelb.edu.au/view/2009/F04) # Bachelor of Environments (https://handbook.unimelb.edu.au/view/2009/A04) # Bachelor of Music (https://handbook.unimelb.edu.au/view/2009/M05) <p>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.</p>
Fees Information:	Subject EFTSL, Level, Discipline & Census Date, http://enrolment.unimelb.edu.au/fees
Generic Skills:	<p>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:</p> <ul style="list-style-type: none"> # 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:	<p>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.</p> <p>Students undertaking this subject are required to regularly use computers with the computer algebra system Maple and the numerical software Matlab installed.</p>