620-297 Group Theory and Linear Algebra

Credit Points:	12.50
Level:	2 (Undergraduate)
Dates & Locations:	2009, This subject commences in the following study period/s: Semester 2, - Taught on campus. Lectures and practice classes
Time Commitment:	Contact Hours: 36 one-hour lectures (three per week), 11 one-hour practice classes (one per week) Total Time Commitment: 120 hours total time commitment.
Prerequisites:	One of # 620-122 (prior to 2008) # *Accelerated Mathematics 1* (620-157 Mathematics 1 prior to 2009) # 620-190 (UMEP Mathematics for High Achieving Students) # 620-194 (prior to 2006) # 620-211 (prior to 2008) **Or** A grade of H1 in either 620-142 (prior to 2009) or 620-192 (prior to 2006) and additional reading; **Or** Linear Algebra and one of # Real Analysis with Applications, # 620-120 (UMEP Mathematics for High Achieving Students) (prior to 2008) # 620-121 (prior to 2008) # *Accelerated Mathematics 2* (620-158 Mathematics 2 prior to 2009)
Corequisites:	None
Recommended Background Knowledge:	None
Non Allowed Subjects:	Students may only gain credit for one of *Group Theory and Linear Algebra* and 620-222 (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 Craig David Hodgson
Subject Overview:	This subject introduces the theory of groups, which is at the core of modern algebra, and which has applications in many parts of mathematics, chemistry, computer science and theoretical physics. It also develops the theory of linear algebra, building on material in earlier subjects and providing both a basis for later mathematics studies and an introduction to topics that have important applications in science and technology. Topics include: modular arithmetic and RSA cryptography; abstract groups, homomorphisms, normal subgroups, quotient groups, group actions, symmetry groups, permutation groups and matrix groups; theory of general vector spaces, inner products, linear transformations, spectral theorem for normal matrices, Jordan normal form.
Objectives:	On completion of this subject, students should

	Understand the concepts of: # abstract groups, homomorphisms and quotient groups; # abstract vector spaces, inner product spaces and linear transformations; Be able to: # do calculations in modular arithmetic and apply these to RSA cryptography; # find eigenvalues, eigenvectors, minimal polynomials and normal forms for linear transformations; # analyse groups of permutations, symmetries, and matrices; # prove simple results in group theory and linear algebra.
Assessment:	Up to 50 pages of written assignments 20% (due during semester), a 3-hour written examination 80% (in the examination period).
Prescribed Texts:	Lecture Notes for Group Theory and Linear Algebra, Department of Mathematics and Statistics.
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/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)** 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.