MAST90068 Groups, Categories & Homological Algebra

Credit Points:	12.50
Level:	9 (Graduate/Postgraduate)
Dates & Locations:	This subject is not offered in 2011.
Time Commitment:	Contact Hours: 36 hours comprising 1 two-hour lecture per week and 1 Total Time Commitment: 3 contact hours and 7 hours private study per week.
Prerequisites:	None
Corequisites:	None
Recommended Background Knowledge:	It is recommended that students have completed a third year subject in algebra (equivalent to 620-321 Algebra).
Non Allowed Subjects:	None
Core Participation Requirements:	For the purposes of considering requests 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 for 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/
Contact:	Email: craigw@unimelb.edu.au
Subject Overview:	As well as being beautiful in its own right, algebra is used in many areas of mathematics, computer science and physics. This subject provides a grounding in several fundamental areas of modern advanced algebra including Lie groups, combinatorial group theory, category theory and homological algebra. The material complements that covered in the subject Commutative and Mutlilinear Algebra without assuming it as prerequisite.
Objectives:	On completion of this subject, students should have an understanding of: * The geometry of Lie groups, and important examples coming from linear groups, * Lie algebras, the exponential map, and the relation with Lie groups, * Free groups, presentations, free products (with amalgamation), * Basic category theory: categories, functors, natural transformations, adjoints. (Co)products, universal objects, (co)limits, especially pushouts and pullbacks, * Homological algebra: (pro/in)jective objects, resolutions, chain complexes, homotopy, the snake lemma. Applications: Ext, Tor, group homology, * Noncommutative algebra: semisimple rings, modules, Wedderburn theorem. Be able to: * prove results about Lie groups and algebras, * give presentations of groups and algebras, * construct and compute derived functors.
Assessment:	Up to 60 pages of assignments (60%: three assignments worth 20% each, due early, mid and late in semester), a two-hour written examination (40%, in the examination period).
Prescribed Texts:	None
Recommended Texts:	Representations of compact Lie groups," by Theodor Bröcker, Tammo tom Dieck, Springer Graduate Texts in Mathematics, 1985. "Representations and Cohomology, I and II," by David J. Benson, Cambridge University Press, 1998. "An introduction to homological algebra," by Charles Weibel, Cambridge University Press, 1995.
Breadth Options:	This subject is not available as a breadth subject.
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
Related Course(s):	Master of Science (Mathematics and Statistics)