MAST90017 Representation Theory

Credit Points:	12.5
Level:	9 (Graduate/Postgraduate)
Dates & Locations:	This subject is not offered in 2016.
Time Commitment:	Contact Hours: 36 hours comprising three 1-hour lectures per week. Total Time Commitment: 170 hours
Prerequisites:	The following subject, or equivalent:

Subject	Study Period Commencement:	Credit Points:
MAST30005 Algebra	Semester 1	12.50

Corequisites:	None
Recommended Background Knowledge:	None
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: **aram@unimelb.edu.au (mailto:aram@unimelb.edu.au)**
Subject Overview:	Symmetries arise in mathematics as groups and Representation Theory is the study of groups via their actions on vector spaces. It has important applications in many fields: physics, chemistry, economics, biology and others. This subject will provide the basic tools for studying actions on vector spaces. The course will focus on teaching the basics of representation theory via favourite examples: symmetric groups, diagram algebras, matrix groups, reflection groups. In each case the irreducible characters and irreducible modules for the group (or algebra) will be analysed, developing more and more powerful tools as the course proceeds. Examples that will form the core of the material for the course include SL2, cyclic and dihedral groups, diagram algebras: Temperley-Lieb, symmetric group and Hecke algebras, Brauer and BMW algebras, compact Lie groups. Among the tools and motivation that will play a role in the study are characters and character formulas, induction, restriction and tensor products, and connections to statistical mechanics, mathematical physics and geometry. If time permits, there may be some treatment of loop groups, affine Lie algebras and Dynkin diagrams.
Learning Outcomes:	After completing this subject students should be able to: # understand the concepts of irreducible representations, indecomposable representations, group algebras, semisimplicity; # understand the concepts of characters, composition series, induction and restriction; # understand how to label representations of small groups and diagram algebras; # describe dimensions and characters of representations of symmetric groups, dihedral groups, and cyclic groups; # describe dimensions and characters of semisimple Lie algebras; # give examples of nonsemisimple algebras and representations. # have the ability to pursue further studies in this and related areas.

Assessment:	Up to 50 pages of written assignments (50%: two assignments worth 25% each, due mid and late in semester), a 3-hour written examination (50%, in the examination period).
Prescribed Texts:	None
Recommended Texts:	TBA
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):	Doctor of Philosophy - Engineering Master of Philosophy - Engineering Master of Science (Mathematics and Statistics)
Related Majors/Minors/ Specialisations:	Mathematics and Statistics