MAST90060 Mathematical Statistical Mechanics

Credit Points:	12.50
Level:	9 (Graduate/Postgraduate)
Dates & Locations:	2013, Parkville This subject commences in the following study period/s: Semester 1, Parkville - Taught on campus.
Time Commitment:	Contact Hours: 36 hours comprising 2 one-hour lectures and 1 one-hour practice class per week. Total Time Commitment: 3 contact hours and 7 hours private study per week.
Prerequisites:	The following subject, or equivalent.

Subject	Study Period Commencement:	Credit Points:
MAST20009 Vector Calculus	Not offered 2013	12.50

Corequisites:	None
Recommended Background Knowledge:	It is recommended that students have completed the following, or equivalent.

Subject	Study Period Commencement:	Credit Points:
MAST20026 Real Analysis	Not offered 2013	12.50

No prior knowledge of physics or thermodynamics is assumed.

Non Allowed Subjects:	No disallowed subject combinations among new-generation subjects.
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/
Coordinator:	Prof Paul Pearce
Contact:	Email: **papearce@unimelb.edu.au (mailto:papearce@unimelb.edu.au)**
Subject Overview:	The goal of statistical mechanics is to describe the behaviour of bulk matter starting from a physical description of the interactions between its microscopic constituents. This subject introduces the Gibbs probability distributions of classical statistical mechanics, the relations to thermodynamics and the modern theory of phase transitions and critical phenomena. The central concepts of critical exponents, universality and scaling are emphasized throughout. Applications include the ideal gases, magnets, fluids, one-dimensional Ising and Potts lattice spin models, random walks and percolation as well as approximate methods of solution.
Objectives:	After completing this subject students should: # have learned how the ensembles and methods of classical statistical mechanics apply to a variety of problems in applied mathematics and mathematical physics; # appreciate the role of critical phenomena in modern thermodynamics and to be able to use the principles of critical exponents, universality and scaling to describe the behaviour of complex systems;

	# understand the basic concepts of phase transitions as applied to fluids, magnets, lattice spin models, random walks and percolation and appreciate their applicability; # be familiar with the basic mathematical techniques of statistical mechanics including transfer matrices, real-space renormalization group and approximate methods and their applications; # have the ability to pursue further studies in these and related areas.
Assessment:	Up to 50 pages of written assignments (40%: two assignments worth 20% each, due mid and late in semester), a 3 hour written examination (60%, in the examination period).
Prescribed Texts:	None
Recommended Texts:	C.J. Thompson, Classical Equilibrium Statistical Mechanics, Oxford Science Publications (1988).
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 Philosophy - Engineering Master of Science (Mathematics and Statistics) Ph.D.- Engineering
Related Majors/Minors/ Specialisations:	Mathematics and Statistics