MAST90065 Exactly Solvable Models

Credit Points:	12.50
Level:	9 (Graduate/Postgraduate)
Dates & Locations:	2011, Parkville This subject commences in the following study period/s: Semester 2, 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:	None
Corequisites:	None
Recommended Background Knowledge:	It is recommended that students have completed subjects in linear algebra and real and complex analysis. No prior knowledge of physics 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:	Assoc Prof Jan De Gier
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Subject Overview:	In mathematical physics, a wealth of information comes from the exact, non-perturbative, solution of quantum models in one-dimension and classical models in two-dimensions. This subject is an introduction to this beautiful and deep subject. Yang-Baxter, Bethe ansatz and matrix product techniques are developed in the context of the critical two-dimensional Ising model, dimers, free fermions, the 6-vertex model, percolation, quantum spin chains and the stochastic asymmetric simple exclusion model. The algebraic setting incorporates the quantum groups, and the Temperley-Lieb and braid-monoid algebras with applications to knot theory. A general treatment of correlation functions includes applications to random polynomials and random matrices.
Objectives:	After completing this subject students should • have learned how exactly solvable models apply to a variety of problems in applied mathematics and mathematical physics; • appreciate the role of exact solutions and universality in mathematical physics and be able to use concepts of real and complex analysis to determine asymptotic behaviour; • be able to compute correlation functions using matrix product techniques or random matrix theory; • be familiar with the basic mathematical techniques of exactly solvable models including Yang-Baxter equation, Bethe Ansatz, commuting transfer matrices and matrix product states; • understand the basic concepts of random matrix theory and appreciate their applicability; • have the ability to pursue further studies in these and related areas.
Assessment:	Up to 40 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:	R.J. Baxter, Exactly Solved Models in Statistical Mechanics, Dover (2007).
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)