MAST90103 Random Matrix Theory

Credit Points:	12.5
Level:	9 (Graduate/Postgraduate)
Dates & Locations:	2016, Parkville This subject commences in the following study period/s: Semester 1, Parkville - Taught on campus.
Time Commitment:	Contact Hours: 36 hours consisting of 3 one hour lectures per week Total Time Commitment: 170 hours
Prerequisites:	

Subject	Study Period Commencement:	Credit Points:
MAST30021 Complex Analysis	Semester 1, Semester 2	12.5

Corequisites:	None
Recommended Background Knowledge:	

Subject	Study Period Commencement:	Credit Points:
MAST20004 Probability	Semester 1	12.5
MAST30031 Methods of Mathematical Physics	Semester 2	12.5

Non Allowed Subjects:	None
Core Participation Requirements:	For the purposes of considering request for Reasonable Adjustments under the Disability Standards for Education (Cwth 2005), and Student Support and Engagement Policy, academic requirements for this subject are articulated in the Subject Overview, Learning Outcomes, Assessment and Generic Skills sections of this entry. It is University policy to take all reasonable steps to minimise the impact of disability upon academic study, and reasonable adjustments will be made to enhance a student's participation in the University's programs. Students who feel their disability may impact on meeting the requirements of this subject are encouraged to discuss this matter with a Faculty Student Adviser and Student Equity and Disability Support: http://services.unimelb.edu.au/disability
Coordinator:	Prof Peter Forrester
Contact:	Email: **pjforr@unimelb.edu.au (mailto:pjforr@unimelb.edu.au)**
Subject Overview:	Random matrix theory is a diverse topic in mathematics. It draws together ideas from linear algebra, multivariate calculus, analysis, probability theory and mathematical physics, amongst other topics. It also enjoys a wide number of applications, ranging from wireless communication in engineering, to quantum chaos in physics, to the Reimann zeta function zeros in pure mathematics. A self contained development of random matrix theory will be undertaken in this course from a mathematical physics viewpoint. Topics to be covered include Jacobians for matrix transformation, matrix ensembles and their eigenvalue probability density functions, equilibrium measures, global and local statistical quantities, determinantal point processes, products of random matrices and Dyson Brownian motion.
Learning Outcomes:	After completing this subject students should: # have learned what are the objectives of random matrix theory from the viewpoint of mathematical physics, and other areas of mathematics such as probability theory and mathematical statistics; # appreciate the application of matrix Jacobians, diffusion equations, equilibrium measures and loop equations in the analysis of random matrices;

	# understand the concepts of joint eigenvalue probability density functions, correlation functions, and spacing distributions, and their relevance to random matrix theory; # be familiar with the uses of transforms to study global properties and orthogonal polynomials to study local statistical quantities; # have the ability to pursue further studies in these and related areas.
Assessment:	Up to 3 written assignments totalling 50 pages (approximately the equivalent of 1000 words) due at the start, mid and end of the semester (40%) 3 hour written examination held in the examinsation period (60%)
Prescribed Texts:	None
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)