MAST90067 Advanced Methods: Transforms

Credit Points:	12.50
Level:	9 (Graduate/Postgraduate)
Dates & Locations:	This subject is not offered in 2011.
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 complex analysis, real analysis and ordinary and partial differential equations.
Non Allowed Subjects:	No disallowed subject combinations among new-generation subjects, but exclude credit for the heritage subject 620-332 Integral Transforms and Asymptotics.
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: **papearce@unimelb.edu.au (mailto:papearce@unimelb.edu.au)**
Subject Overview:	This subject develops the mathematical methods of applied mathematics and mathematical physics with an emphasis on integral transform and related techniques. An introduction is given to the calculus of variations and the Euler-Lagrange equation. Advanced complex contour integration techniques are used to evaluate and invert Fourier and Laplace transforms. The general theory includes convolutions, Green's functions and generalized functions. The methods of Laplace, stationary phase, steepest descents and Watson's lemma are used to asymptotically approximate integrals. Throughout, the theory is set in the context of examples from applied mathematics and mathematical physics such as the brachistochrone problem, Fraunhofer diffraction, Dirac delta function, heat equation and diffusion.
Objectives:	After completing this subject students should • have learned how the calculus of variations, transform methods and associated asymptotic analysis apply in a variety of areas in applied mathematics and mathematical physics; • appreciate the role of advanced contour integration techniques of complex analysis and to be able to use these techniques to calculate transform integrals; • understand the basic concepts of asymptotic evaluation of integrals, know how to implement Laplace's method, stationary phase and steepest descents and appreciate their applicability and limitations; • be familiar with the basic properties of generalized functions and Green's functions in applied mathematics and mathematical physics 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:	Carl M. Bender and Steven A. Orszag, Advanced mathematical methods for scientists and engineers: Asymptotic methods and perturbation theory. Springer. (1999). George F. Carrier, Max Krook, and Carl E. Pearson, Functions of a Complex Variable: Theory and Technique, SIAM (2005).
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)