MAST90064 Advanced Methods: Differential Equations

Credit Points:	12.50
Level:	9 (Graduate/Postgraduate)
Dates & Locations:	This subject is not offered in 2013.
Time Commitment:	Contact Hours: One 2-hour lecture per week and one 1-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:
MAST30029 Partial Differential Equations	Not offered 2013	12.50

Corequisites:	None
Recommended Background Knowledge:	It is recommended that students have completed a subject in real analysis. Completion of, or concurrent enrolment in, a subject in complex analysis may also be helpful.
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: **kerryl@unimelb.edu.au (mailto:barrydh@unimelb.edu.au)**
Subject Overview:	This subject develops the mathematical methods of applied mathematics and mathematical physics with an emphasis on ordinary differential equations. Both analytical and approximate techniques are used to determine solutions of ordinary differential equations. Exact solutions by localised series expansion techniques of second-order linear ordinary differential equations and Sturm-Liouville boundary value problems are explored. Special functions are introduced here. Regular and singular perturbation expansion techniques, asymptotic series solutions, dominant balance, and WKB theory are used to determine approximate solutions of linear and nonlinear differential equations. Throughout, the theory is set in the context of examples from applied mathematics and mathematical physics such as nonlinear oscillators, boundary layers and dispersive phenomena.
Objectives:	After completing this subject students should: # have learned how ordinary differential equation models and associated boundary-value problems arise in a variety of areas in applied mathematics and mathematical physics; # appreciate the role of series solution methods for differential equations and be able to construct and use such solutions; # understand the basic concepts of asymptotic analysis and perturbation methods, know how to implement these techniques and appreciate their value and limitations; # be familiar with the basic properties of special functions of 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:	Bender C. M. and S. A. Orszag. Advanced mathematical methods for scientists and engineers: Asymptotic methods and perturbation theory. Springer. 1999. Kervorkian J. and J. D. Cole. Multiple scale and singular perturbation. Springer Verlag 1996. Nayfeh, A. H. Introduction to perturbation techniques. John Wiley and Sons 1981.
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