MAST90064 Advanced Methods: Differential Equations

Credit Points:	12.5
Level:	9 (Graduate/Postgraduate)
Dates & Locations:	2015, Parkville This subject commences in the following study period/s: Semester 1, Parkville - Taught on campus.
Time Commitment:	Contact Hours: One 2-hour lecture per week and one 1-hour practice class per week. Total Time Commitment: 170 hours
Prerequisites:	One of the following subject, or equivalent: Subject / Study Period Commencement: / Credit Points: MAST20030 Differential Equations / Semester 2 / 12.50 MAST30029 Partial Differential Equations (pre-2014)
Corequisites:	None
Recommended Background Knowledge:	It is recommended that students have completed, or have concurrent enrolment in: Subject / Study Period Commencement: / Credit Points: MAST30021 Complex Analysis / Semester 1, Semester 2 / 12.50
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:	Dr James Osborne
Contact:	Email: **j.osborne@unimelb.edu.au (mailto:j.osborne@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.
Learning Outcomes:	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