620-299 Dynamical Systems and Chaos

Credit Points:	12.50
Level:	2 (Undergraduate)
Dates & Locations:	2009, This subject commences in the following study period/s: Semester 2, - Taught on campus. Lectures, practice classes and computer laboratory classes.
Time Commitment:	Contact Hours: 36 one-hour lectures (three per week), 8 one-hour practice classes, 4 one-hour computer laboratory classes (Either a practice class or a computer lab will run each week.) Total Time Commitment: 120 hours total time commitment.
Prerequisites:	One of # *Real Analysis with Applications* # *Accelerated Mathematics 2* (620-158 Mathematics 2 prior to 2009) # 620-113 (prior to 2008) # 620-123 (prior to 2008) # 620-143 (prior to 2009) # 620-193 (prior to 2006) and one of # *Linear Algebra* # *Accelerated Mathematics 1* (620-157 Mathematics 1 prior to 2009) # 620-122 (prior to 2008) # 620-142 (prior to 2009) # 620-190 (UMEP Mathematics for High Achieving Students) # 620-192 (prior to 2006) # 620-194 (prior to 2006) # 620-211 (prior to 2008)
Corequisites:	None
Recommended Background Knowledge:	None
Non Allowed Subjects:	None
Core Participation Requirements:	It is University policy to take all reasonable steps to minimise the impact of disability upon academic study and reasonable steps will be made to enhance a student's participation in the University's programs. Students who feel their disability may impact upon their participation are encouraged to discuss this with the subject coordinator and the Disability Liaison Unit.
Coordinator:	Prof John Elie Sader
Subject Overview:	This subject introduces the basic concepts and tools of dynamical systems and chaos. It will encompass systems that are discrete and continuous in time, and explore the practical applications from which they may arise. The student will appreciate under what conditions chaos exists and the intricate array of phenomena that arise from non-linear dynamical systems. This will include the generation of fractal patterns such as the Mandelbrot and Julia sets and a discussion of self-similar structure, which has proved useful in areas such as image compression. In short, the subject will present an exposition of basic mathematical theorems and develop their application through sample dynamical systems. This will empower the student with tools and knowledge for interpreting real world phenomena.
Objectives:	On completion of this subject, students should: # Appreciate the wide range of scientific areas that give rise to discrete and continuous dynamical systems

	# Understand how simple dynamical systems can produce complex behaviour # Be able to determine local stability of solutions in simple discrete and continuous dynamical systems # Learn how dynamical systems can change their qualitative behaviour as a parameter is varied
Assessment:	Two computer-based assignments 20% (held during semester), a 3-hour written examination 80% (in the examination period).
Prescribed Texts:	None
Breadth Options:	This subject potentially can be taken as a breadth subject component for the following courses: # **Bachelor of Arts (https://handbook.unimelb.edu.au/view/2009/D09)** # **Bachelor of Commerce (https://handbook.unimelb.edu.au/view/2009/F04)** # **Bachelor of Environments (https://handbook.unimelb.edu.au/view/2009/A04)** # **Bachelor of Music (https://handbook.unimelb.edu.au/view/2009/M05)** You should visit **learn more about breadth subjects (http://breadth.unimelb.edu.au/breadth/info/index.html)** and read the breadth requirements for your degree, and should discuss your choice with your student adviser, before deciding on your subjects.
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. # computer skills: the ability to use an appropriate computing package.
Notes:	This subject is available for science credit to students enrolled in the BSc (both pre-2008 and new degrees), BASc or a combined BSc course. Students undetaking this subject are required to access a computer with the software Matlab installed, currently in every open-access campus laboratory. Students are expected to use the software Matlab but no programming knowledge is expected.