# MAST20019 Dynamical Systems and Chaos

**Credit Points:** 12.50

**Level:** 2 (Undergraduate)

**Dates & Locations:**

2011, Parkville

This subject commences in the following study period/s:
Semester 2, Parkville - Taught on campus.
Lectures, practice classes and computer laboratory classes.

**Time Commitment:**

Contact Hours: 3 x one hour lectures per week, 8 x one hour practice classes during the semester, 4 x one hour computer laboratory classes during the semester (Either a practice class or a computer lab will run each week.) Total Time Commitment: Estimated total time commitment of 120 hours

**Prerequisites:**

One of

| Subject | Study Period Commencement: | Credit Points: |
|---|---|---|
| MAST20026 Real Analysis with Applications | Semester 1, Semester 2 | 12.50 |
| MAST10009 Accelerated Mathematics 2 | Semester 2 | 12.50 |

# 620-113 Applied Mathematics Advanced Plus (prior to 2008)
# 620-123 Applied Mathematics Advanced (prior to 2008)
# 620-143 Applied Mathematics (prior to 2009)

And one of

| Subject | Study Period Commencement: | Credit Points: |
|---|---|---|
| MAST10007 Linear Algebra | Summer Term, Semester 1, Semester 2 | 12.50 |
| MAST10008 Accelerated Mathematics 1 | Semester 1 | 12.50 |

# MAST10013 (620-190) UMEP Maths for High Achieving Students
# 620-122 Mathematics B Advanced (prior to 2008)
# 620-211 Mathematics 2 Advanced (prior to 2008)
# 620-142 Mathematics B (prior to 2009)

**Corequisites:** None

**Recommended Background Knowledge:**

Completion of

| Subject | Study Period Commencement: | Credit Points: |
|---|---|---|
| MAST20009 Vector Calculus | 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 Students Experiencing Academic Disadvantage Policy, academic requirements for this subject are articulated in the Subject Description, Subject Objectives, Generic Skills and Assessment Requirements of 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/

**Coordinator:** Prof John Sader

| | |
|---|---|
| **Contact:** | Second Year Coordinator<br>**Email: sycoord@ms.unimelb.edu.au (mailto:sycoord@ms.unimelb.edu.au)** |
| **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 subject discusses 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:<br># Appreciate the wide range of scientific areas that give rise to discrete and continuous dynamical systems<br># Understand how simple dynamical systems can produce complex behaviour<br># Be able to determine local stability of solutions in simple discrete and continuous dynamical systems<br># Learn how dynamical systems can change their qualitative behaviour as a parameter is varied |
| **Assessment:** | Two computer based assignments due mid-semester and at the end of semester (20%), and a 3-hour written examination in the examination period (80%). |
| **Prescribed Texts:** | None |
| **Breadth Options:** | This subject potentially can be taken as a breadth subject component for the following courses:<br># **Bachelor of Arts (https://handbook.unimelb.edu.au/view/2011/B-ARTS)**<br># **Bachelor of Commerce (https://handbook.unimelb.edu.au/view/2011/B-COM)**<br># **Bachelor of Environments (https://handbook.unimelb.edu.au/view/2011/B-ENVS)**<br># **Bachelor of Music (https://handbook.unimelb.edu.au/view/2011/B-MUS)**<br>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:<br># problem-solving skills: the ability to engage with unfamiliar problems and identify relevant solution strategies;<br># 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;<br># collaborative skills: the ability to work in a team;<br># time management skills: the ability to meet regular deadlines while balancing competing commitments.<br># computer skills: the ability to use mathematical computing packages. |
| **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.<br>Students undertaking this subject are required to access a computer with the software MATLAB installed, currently in every open-access campus laboratory.<br>Students are expected to use the software MATLAB but no programming knowledge is expected. |

| | |
|---|---|
| **Related Course(s):** | Bachelor of Science |
| **Related Majors/Minors/ Specialisations:** | Science credit subjects* for pre-2008 BSc, BASc and combined degree science courses |
| **Related Breadth Track(s):** | Accelerated Mathematics |