The University of Western Australia  
School of Mathematics and Statistics

3A7 Chaos and Dynamical Systems (MATH3327)

GENERAL INFORMATION SHEET 2010

Web pages
See this page for credit, timetable, content, assessment, prerequisites.

See this page for announcements, lecture notes, question sheets, assignments, and solutions question sheets.

Lecturer
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Assessment
Assessment will comprise an exam worth 65% and continuing assessment of 35% made up of one project like assignment (20%) and three short tests (5% each).
You should also be aware of the University policies on plagiarism.

Calculators
Calculators will be permitted in exam and tests, but are probably of little help.

Books
There is not a text book for the unit, however, useful references are:

These books may have more recent editions. The library has many shelves of books on dynamical systems and chaos. Many of these will also provide suitable treatments of material covered in this unit.

There are a number of popularist books on Chaos. I recommend
Outline
This is only an approximate guide. I am likely to vary content and order on a whim, at least within the constraints of the University handbook description.

• Introduction:
  – What is a dynamical system?
  – Historical development
  – Discovery of Chaos
  – Importance of nonlinearity
  – Stability and instability
  – Modelling, uncertainty and prediction
  – Applications

• Differential equations:
  – Pictures of flows.
  – Fundamental Theorem of Flows.
  – Gronwall inequality
  – Fixed points and Stability analysis
  – Hartman-Grobman Theorem
  – Saddle-node bifurcation
  – Periodic orbits
  – Hopf bifurcation
  – Poincaré-Bendixson Theorem
  – Lorenz equations and chaos

• Maps
  – Poincaré maps
  – Baker’s map
  – Symbolic dynamics
  – 1D maps
  – Period doubling bifurcation
  – Lyapunov exponents
  – 2D maps (Horseshoe maps)