Applied Dynamical Systems 1MA444.

Course Webpage:
http://www.math.uu.se/∼gaidash/1MA444/1MA151.html

Lecturer:
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Objectives of the course:

1) Understand the fundamental concepts of the dynamical systems, specifically:
   - dynamics of the quadratic family,
   - topological dynamics; recurrence, mixing and transitivity,
   - stable and unstable manifolds, homoclinic and heteroclinic intersections, horseshoes,
   - fractals,
   - one and two dimensional flows, phase space, limit cycles and Poincaré-Bendixson Theorem,
   - bifurcations in flows and maps.
2) Understand and be able to explain/present applications of the theory in biology, physics and engineering.
3) Understand and and be able to perform computations in models in biology and physics, such as, the Selkov system, the dampened oscillator, the coupled oscillator, models of neural networks, models of enzyme kinetics, N-body problem.
4) Solve representative problems in the above-mentioned topics.
5) Carry out numerical studies of dynamical systems.

Textbooks:
Primary text: Steven H. Strogatz, *Nonlinear Dynamics And Chaos: With Applications To Physics, Biology, Chemistry, And Engineering (Studies in nonlinearity)*, Publisher: Westview Press 2001-01-19, 512 Pages, ISBN: 0738204536.

Secondary text: M. W. Hirsch, S. Smale, R. L. Devaney, *Differential Equations, Dynamical Systems and an Introduction to Chaos*, Academic Press (Elsevier) 2004.

Bits and pieces from:

1) M. Brin, G. Stuck, *Introduction to Dynamical Systems*, Cambridge University Press 2002. Available for purchase as e-book at `www.cambridge.org`.

2) A. Katok, B. Hasselblatt, *Introduction to the Modern Theory of Dynamical Systems*, Cambridge University Press 1995, partially freely available at Google Books, `www.books.google.com`.

3) Kathleen T. Alligood, Tim Sauer, James A. Yorke. *Chaos: an introduction to dynamical systems*, Springer, 1996, partially freely available at Google Books, `www.books.google.com`.

Grading:
Two homeworks 66%, and a project, 34% of the grade.