

# ME215B: Applied Dynamical Systems II Spring 2012

## Important Information

Lectures: Tuesday, Thursday 11:00AM-12:15PM, Engr II Bldg Room 2243

Office Hours: Tuesday 3:00-4:00, Wednesday 2:00-3:00, 2350 Engr II Bldg

Course Webpage: <http://www.engineering.ucsb.edu/~moehlis/ME215B>

Questions? Contact (email preferred):

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Textbook: *Introduction to Applied Nonlinear Dynamical Systems and Chaos, Second Edition* by Stephen Wiggins, Springer-Verlag, 2003

## Course Description

This course will cover dynamical systems theory, and the application of dynamical systems techniques to mathematical, physical, biological, and technological systems described by ordinary differential equations or maps. The primary focus will be on dissipative systems, so that the course is complementary to the Advanced Dynamics sequence (ME 201 and 202) which primarily focusses on conservative systems.

The following topics will be covered (chapters are from the textbook by Wiggins)

- bifurcations of fixed points of maps (Ch. 21)
- the Smale horseshoe (Ch. 23)
- symbolic dynamics (Ch. 24)
- Liapunov exponents (Ch. 29)
- Takens-Bogdanov bifurcation (Ch. 20, 33)
- Melnikov's method (Ch. 28)
- global bifurcations, including homoclinic explosions and Shil'nikov bifurcation (Ch. 27)
- averaging (Guckenheimer and Holmes, Ch. 4)
- phase models / coupled oscillators
- canards
- dynamical systems with symmetry

These topics build on the topics covered in ME215A, Applied Dynamical Systems I.

## Homework/Grading

- Grades will be determined by performance on homework sets.

## Other Useful Books on Dynamical Systems

- J. Guckenheimer and P. Holmes, *Nonlinear Oscillations, Dynamical Systems, and Bifurcations of Vector Fields*
- S. H. Strogatz, *Nonlinear Dynamics and Chaos: With Applications in Physics, Biology, Chemistry, and Engineering*
- P. Glendinning, *Stability, Instability, and Chaos*