

Applied Math 5460 Fall 2019

Dynamical Systems, Differential Equations and Chaos

Class: MWF 9:00-9:50 AM ECCR 257
Instructor: J.D. Meiss ECOT 236 jdm@boulder.colorado.edu

Text: Differential Dynamical Systems, J.D. Meiss (SIAM, 2017)
(Electronic Copy: Free Download from SIAM (on campus)
<<https://doi-org.colorado.idm.oclc.org/10.1137/1.9781611974645>>
Paper copy: \$87 list, 30% discount for SIAM members (students join for free!) or 20% discount with code (ask me!)

Prerequisites: Undergraduate courses equivalent to APPM 2360, & 3010

Dynamical Systems & Modeling

Linear Systems (Review)

- Eigenvalues and Vectors
- Exponentials of Operators
- Floquet Theory
- Stability

Dynamical Systems

- Existence and Uniqueness
- Attractors and Omega-Limit Sets
- Poincaré maps
- Hartman-Gröbman Theorem
- Index Theory

Invariant Manifolds

- Stable & Center Manifolds
- Normal Form Theory

The Phase Plane

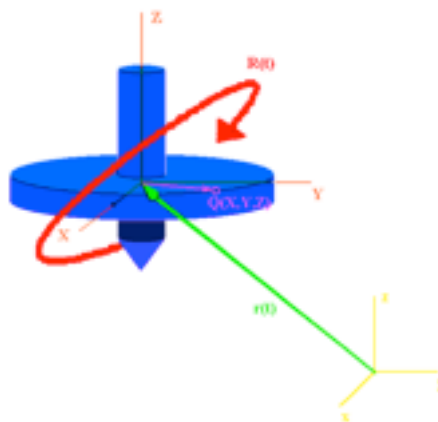
- Topological Phase portraits
- Poincaré-Bendixson Theory
- Index Theory

Chaotic Dynamics

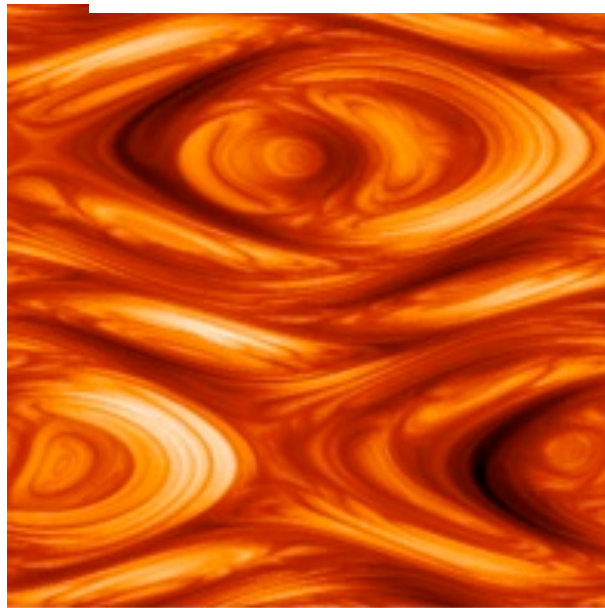
- Lyapunov Exponents
- Hyperbolicity
- Strange Attractors
- Homoclinic Bifurcations to Chaos

+ at least one more topic:

- Bifurcation theory
- Perturbation Theory
- Hamiltonian Systems



Modeling the Leviton



Chemical tracer in the ABC flow
<<http://www.atm.damtp.cam.ac.uk/people/zn202/>>