

Outline

MATH 553 – Advanced Dynamical Systems
Session 2012W Term 1 (Sep–Dec 2012)

Instructor: Wayne Nagata (e-mail: nagata@math.ubc.ca, tel: 604-822-2573)

Office: Mathematics 112, hours TBA

Web page: <http://www.math.ubc.ca/~nagata/m553/>

Textbook (optional, not required): S. Wiggins (2003), *Introduction to Applied Nonlinear Dynamical Systems and Chaos* [2nd ed.], Springer-Verlag, New York.

Evaluation: three homework problem sets and a seminar project.

Prerequisite: MATH 552 (or equivalent)

Outline of topics:

1. *Topics in Global Dynamics*: The Smale horseshoe map, symbolic dynamics, chaos, orbits homoclinic to hyperbolic fixed points (chaos in the Lorenz equations, the Silnikov phenomenon).
2. *Codimension Two Local Bifurcations*: The codimension of a bifurcation, cusp and degenerate Hopf bifurcations, Takens-Bogdanov bifurcation, a zero and a pure imaginary pair of eigenvalues.
3. *Projections, Exponential Dichotomies and Applications*: Projections, Liapunov-Schmidt reduction, exponential dichotomies, persistence of homoclinic and heteroclinic orbits, travelling waves in reaction-diffusion PDE systems.

References

- [CH] S.-N. Chow & J. Hale (1982), *Methods of Bifurcation Theory*, Springer-Verlag, New York.
- [GH] J. Guckenheimer & P. Holmes (1983), *Nonlinear Oscillations, Dynamical Systems and Bifurcations of Vector Fields*, Springer-Verlag, New York.
- [GS] M. Golubitsky & D. Schaeffer (1985), *Singularities and Groups in Bifurcation Theory, Volume I*, Springer-Verlag, New York.
- [K] Y. Kuznetsov (2004), *Elements of Applied Bifurcation Theory* [3rd ed.], Springer-Verlag, New York.
- [M] J. Meiss (2007), *Differential Dynamical Systems*, SIAM, Philadelphia.