Math 330  Advanced Ordinary Differential Equations

TTh 4:00pm – 5:15pm, Perkin 300

Textbook: Nonlinear Dynamics and Chaos (2nd edition), by Steven Strogatz
Supplemental materials: posted at my website:
   http://www.cems.uvm.edu/ jyang/Teaching.htm

Instructor: Prof. Jianke Yang
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   16 Colchester Avenue
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Office hours: T 1:00 – 2:00pm; F 3:00 – 4:00pm. Additional time by appointment.

Homework: homework problems will be given on irregular basis.
   Computers will need to be used on some of the problems.

Exams: There will be a midterm in-class exam (on Oct. 14), and a final exam (on Dec. 9, 4:30pm-7:15pm). Students are given the option to do a term project in lieu of the final exam. Those interested in this option should talk to this instructor shortly after the midterm exam.

Grading: homework: 50%; two exams: 25% each.

Topics:

1. One-dimensional nonlinear systems and bifurcations (one week)
2. Linear equations with constant coefficients: analytical solutions ( ~ one week).
3. Plane autonomous systems: critical points; linearization analysis; phase portraits; limit cycles; Van der Pol equation (two – three weeks)
4. Weakly nonlinear oscillations: the multiscale perturbation method; weakly nonlinear Duffing’s equation; weakly nonlinear Van der Pol equation ( ~ two weeks)
5. Two-dimensional bifurcations ( ~ two weeks)
6. Lorenz equations, chaos and strange attractors (two – three weeks)
7. Periodic orbits in the Lorenz equations and their stability (two weeks)