

# Math 330    Advanced Ordinary Differential Equations

TTh 1:00pm - 2:15pm, VOTEY 220

**Textbook:** Nonlinear Dynamics and Chaos, by Steven Strogatz

**Instructor:** Prof. Jianke Yang

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**Office hours:** TTh 4:00-5:00pm. 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:** No. But a final-term project will be assigned.

**Grading:** homework: 50%; project: 50%

## Topics:

1. Linear Equations: Homogeneous and inhomogeneous equations; second-order linear equations; linear equations with constant coefficients; (  $\sim$  one-two weeks ).
2. One-dimensional nonlinear systems and bifurcations (one week)
3. Plane Autonomous Systems: Linear systems; nonlinear systems; critical points; damped nonlinear oscillators; limit cycles; Van der Pol equation ( $\sim$  three weeks)
4. Weakly Nonlinear Oscillations ( $\sim$  two weeks)
5. Two-dimensional Bifurcation Theory ( $\sim$  two weeks)
6. Lorenz Equations, Chaos, Strange Attractors and Fractals ( $\sim$  three weeks)