Syllabus for Master's Comprehensive Exam
Applied Nonlinear Ordinary Differential Equations

Topics

1. Autonomous systems, phase diagram analysis, linear approximations, index theory, energy methods.
2. Periodic solutions, limit cycles, amplitude and frequency estimates, harmonic balance methods, Bendixson's criterion, the Poincare-Bendixson theorem
3. Perturbation methods, Lindstedt's method
4. Stability; poincare stability, Liapunov stability, uniform stability, asymptotic stability, Liapunov methods for determining stability
5. Bifurcations; hopf bifurcations, homoclinic and heteroclinic bifucations

References

1. Nonlinear Ordinary Differential Equations; An introduction to Dynamical Systems, 3rd Ed., Jordan and Smith, Oxford University Press, 2003
2. Nonlinear dynamics and chaos, Steven Strogatz, Addison-Wesley, 1994
3. Differential equations and dynamical systems, Lawrence Perko, Springer, 1991
4. Elementary differential equations and boundary value problems, 8th ed, Boyce and Diprima, Wiley, 2005.

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