

The tentative syllabus is:

- Review of properties of differential equations.
- Lower order systems, phase portraits.
- Existence and uniqueness theorems.
- Overview of the theory of linear systems.
- Singularities of linear systems:
 - Singularities of first kind.
 - Singularities of second kind.
- Integrable and chaotic systems. Criteria of solvability.
- Equilibria.
- Periodic orbits
- Stability (local, global, asymptotic).
- Limit sets.
- Global nonlinear techniques.
- The Poincaré-Bendixson theorem.
- Center manifolds.
- Attractors, bifurcations, genericity.
- Stable and unstable manifolds.
- Bifurcations: the flip and Hopf bifurcation.
- Homoclinic and heteroclinic intersections.
- Strange attractors

Other subjects of interest to the students can be added.

I will **provide course notes for most topics**, based on the following bibliography:

-E.A. Coddington and N. Levinson, *Theory of Ordinary Differential Equations*, McGraw-Hill, New York, (1955).

-M.W. Hirsch, S. Smale and R.L. Devaney, *Differential Equations, Dynamical Systems and an Introduction to Chaos*, 2nd Edition, Elsevier, New York, (2004).

-V.I. Arnold, *Geometrical Methods in the Theory of Ordinary Differential Equations*, 2nd edition, Springer, (1996).

-David Ruelle, *Elements of differentiable dynamics and bifurcation theory*, Academic Press, 1989

-M. Brin, G. Struck, *Introduction to dynamical systems*, Cambridge University Press, 2002.