

Lectures. I plan to give 10 lectures and have students give 10 lectures.

1. Quiz. Basic examples. Basic objects. ODEs. Flows. Maps. On the line. On the circle. Linearization. Linear maps and flows. Gradient flows. Limit cycles. Geodesic flows.
2. Omega and alpha limit sets. Monogenic elements. Irrational flow. Simon's paper. Can any closed subset of an M^n be an omega-limit set?
3. Local invariants of v-fields. Recall flow-box theorem (= straightening lemma). Fixed points. Linearization at a fixed point. Hyperbolicity. Hartman-Grobman theorem (statement). Conjugation theorems. Poincare-Dulac. Special nature of eigenvalues for Killing vector fields, Hamiltonian vector fields, etc.
4. Orbital elements. Periodic orbits. Piecing together orbital elements. Homoclinic and heteroclinic orbits. In the pendulum. For surfaces of revolution?
5. Stable manifold theorem. *May turn into two lectures, with a proof of special case of the theorem regarding Normal Hyperbolicity.*
6. The Horseshoe. Hetero and Homo clinic tangles.
7. The extremes of geodesic flow. Integrable vs Anosov.
8. Conley's perspective. Chain recurrence.
9. N body intro. Open problems.
10. Variational methods, overview: historic, Hamiltonian, geodesics, Conley-Zehnder-Floer, quantum mechanics and Feynman integral. Colin-de-Verdiere.