

Physics 505, Autumn 2010 - Proposed Syllabus:

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| 1. Introduction & Review – Newtonian Mechanics | Chap 1 & 2 | F&W |
| ❖ Central forces, orbits scattering | | |
| ❖ Inertial and non-inertial reference frames | | |
| 2. Methods of Lagrange (and Hamilton) | Chap 3 | F&W |
| ❖ Calculus of variations, Lagrange's equations | | |
| ❖ Constrained motion, Forces of constraint | | |
| ❖ Generalized Coordinates | | |
| ❖ Symmetries and Conserved Quantities | | |
| ❖ Hamilton's equations | | |
| ❖ Flows in Phase Space | | |
| 3. Small Oscillations and Normal Modes | Chap 4 | F&W |
| ❖ Normal modes | | |
| ❖ Coupled oscillators | | |
| ❖ N-body and Continuous systems | | |
| 4. Rigid body motion | Chap 5 | F&W |
| 5. Hamiltonian Dynamics | Chap 6 | F&W |
| ❖ (More on) Hamilton's Equations | | |
| ❖ Canonical Transformations | | |
| ❖ Hamilton-Jacobi Equation | | |
| 6. Introduction to Chaos | Chap 1 | B&G |
| ❖ Phase space flows | | |
| ❖ Attractors | | |
| 7. Damped, Driven Pendula (A chaotic example) | Chap 3&4 | B&G |
| ❖ Poincare maps | | |
| ❖ Bifurcation diagrams | | |
| ❖ Period doubling and on to chaos | | |
| 8. Chaotic Systems | Chap 5&6 | B&G |
| ❖ Self-similarity and fractal dimensions | | |
| ❖ Lyapunov exponents | | |
| ❖ Intermittency | | |