Physics 303/573 Syllabus

Professor: Martin Roček

1. Overview

Phy 303 is a rigorous introduction to classical mechanics; ***it requires the students to be not just familiar with algebra and calculus but comfortable using them***.

These are most of the topics for the last several years; I may try other things.

- A crash course in linear algebra.
- Projectile motion with power law drag for any power.
- Multiparticle systems – center of mass, spin and orbital angular momentum.
- Multivariate calculus in arbitrary coordinates systems, including Stokes and Gauss theorems.
- Harmonic oscillators including Fourier series, pertubative and WKB expansions, and nonlinear oscillators.
- Variational methods, Fermat's principle.
- Lagrangian dynamics, Hamiltonian dynamics, Noether's theorem, Poisson brackets.
- Central forces and gravitation; effective potentials, orbits, stability of orbits, etc.
- Rotating reference frames, Coriolis effect, etc.
- Rigid body motion
- Coupled harmonic oscillators, normal modes.
- A smattering of scattering–kinematics and cross-sections.

2. Textbook

Classical Mechanics by John R. Taylor.

However, I post notes with all the material that I cover, and follow those notes.

3. Homework

Generally one homework set a week, typically with about five problems, though some of these are quite challenging.

4. Exams

There is one midterm and one final.

5. Grading

Grades are based on a combination of the homework and the two exams. I generally calculate three grades giving different weights to the three components and choose the highest of the three for each student, but the final is always at least 50% of the grade. For example, if the normalized homework grade is H, the midterm grade is M, and the final grade is F, then I might take the best of $(.3H + .15M + .55F)$, $(.15H + .3M + .55F)$, and $(.15H + .15M + .7F)$, but I might modify these formulae depending on how hard the midterm is, etc. ***I reserve the right to adjust final grades as I see fit***.