

## Physics 106 vs. Physics 196 – Which one's for you?

Physics 196 was added to the curriculum to provide an advanced version of Physics 106 for students with a strong mathematics background, and who have excelled in previous physics courses (an A or A+ in Physics 12 is recommended).

### Description of the courses:

Physics 106abc concentrates on the fundamentals of analytical mechanics and Electricity and Magnetism. The course aims to provide a solid basis for future graduate study in physics. Emphasis will be on the core material contained in Hand and Finch (Mechanics) and Griffiths (Electricity and Magnetism), with weekly problem sets to provide practice in the application of the fundamental principles, as well as in mathematical manipulation and analysis. The course assumes a background in ordinary and partial differential equations, but also assumes the student will benefit from some review of the mathematics, and from problem solving experience. The course grade will be based on problem sets, a midterm, and a final.

Physics 196a (also CDS140a) combines analytic mechanics with an introduction to basic dynamical systems theory. The course philosophy will be to focus on fundamentals of qualitative local and global analysis of nonlinear differential equations, with classical mechanics as the main area of application. Topics to be covered include a brief review of linear systems theory, Lagrangian and Hamiltonian formulations of mechanics, the Hartman–Grobman Theorem, classification of fixed points in planar dynamical systems, small oscillations, center manifold theory, periodic orbits and limit cycles, weakly nonlinear oscillations, and basic bifurcation theory. The first half of Ph196b will continue with rigid body dynamics and basic symmetry techniques.

During the first half-year, Ph196 will be run as a seminar with mandatory attendance. Reading assignments and homework problems will be posted ahead of class, and students will be held responsible for the material in discussions and at-the-board problem solving. Grading will be based on class participation, problem sets, and a final exam.

The second half-year of Physics 196 will cover electricity and magnetism at the level of Jackson.