Syllabus

**Course:** Physics 15a, Advanced Introductory Physics I

**Instructor:** David H. Roberts  
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**Office Hours:** M 2-3, W 3-4, & by appointment (via email, please)

**Class Hours:** Block E (MWTh 12-1) & Block X1 (M 6:30-8:30, for exams & recitations, every week)

**Classroom:** TBD

**Text:** Kleppner & Kolenkow, *An Introduction to Mechanics*, 2nd Ed.

**Supplement:** Boas, *Mathematical Methods in the Physical Sciences*

This is a course in classical mechanics, covering much the same material as Physics 11a but at a more sophisticated level in both physics and mathematics.

**Learning Goals:** You will learn kinematics, the dynamical laws of motion, the laws of conservation of momentum, energy, and angular momentum, and the laws of rigid body motion, all in their Newtonian formulations. Special topics to be included are the harmonic oscillator, the pendulum, the laws of planetary motion and exo-planets, methods of solution for homogeneous and inhomogeneous linear ordinary differential equations of first and second order, and the use of the program *Mathematica*. We will also do selected topics in mathematics from the first few chapters of Boas’ text, which is a book you will find useful your entire four years at Brandeis.

**Skill Goals:** You will learn how to apply the laws of physics that you have learned to solve challenging problems in classical mechanics. This will include the use of complex arithmetic, differential and integral calculus of a single variable, and some multivariable calculus.

This course is intended for students with excellent preparation in both physics and mathematics. Differential and integral calculus will be used without explanation from day one; if you have had either form of AP calculus you should be OK, even

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1Subject to revision. Any changes will be posted and announced via LATTE. Version of 22 August 2016.
if you are enrolled in Math 10b. Vector and multi-variable calculus will be introduced during the semester.

A special feature of this course is that problem sets will be done in small groups and the solutions presented to the class by the students during the Monday evening recitations. The exact form this will take will depend on the final class size.

The total number of meeting hours is six per week. Success in this four credit hour course is based on the expectation that students will spend a minimum of nine hours per week in preparation for class (readings, problem sets, etc.).