

Fall 2013
Syllabus for PHYS0070
Analytical Mechanics

This course in mechanics is intended for concentrators in science, including but not limited to physics. At least a year of high school physics and calculus is assumed. PHYS 0070 will cover essentially the same material as PHYS 0050 but it will use a much more sophisticated and mathematical approach. **It is intended to be a challenging course for well prepared students.** This course serves as a prerequisite for PHYS0060 and PHYS0160.

Course Topics: Kinematics, Newton's Laws and Forces, Forces in Accelerating Reference Frames, Energy, Momentum, Angular Momentum, Rotational Dynamics for Rigid Bodies, Planetary Motion, Oscillations

Goals: Through this course on mechanics, students will develop general capacities to

- analyze sophisticated physical phenomena using differential and integral calculus
- describe rotations and angular dynamics using vectors
- employ approximation techniques, such as Taylor Series expansions, for the solution of physics problems
- identify the fundamental principles controlling a given phenomenon and apply them to describe it
- solve problems and understand physical phenomena by transforming to different frames of reference

Lectures:

Room 168, Barus and Holley, MWF 9:00-9:50 AM

Professor Chung-I Tan, BH 501, extension 31465, chung-i_tan@brown.edu

Textbook: The text for the course is **An Introduction to Mechanics**, by Kleppner and Kolenkow (Cambridge University Press, 2010; identical to the original 1973 edition). The homework problems will be taken from this book.

Conferences: Times to be announced. They provide an opportunity for questions and discussions of concepts and problems introduced in the lectures and to help you with the homework. New material will not be introduced in the conferences. Attendance is voluntary but, of course, you are encouraged to come.

Laboratory: There is a weekly, two hour lab starting the week of September 16. The lab is based on self-designed projects, each taking two lab periods. You will receive a sign-up sheet for listing your scheduling preferences. ***You must complete the lab work and all reports in order to complete the course.***

Laboratory Director: Professor Richard Gaitskell, Barus-Holley room 516, extension 39783, richard_gaitskell@brown.edu. Office hours: to be announced; you can also send an e-mail or call at another time if you need help.

Homework Problem Sets: These are due on the date shown by 5 pm. You can slide the homework under Prof. Tan's door (BH 501) if he is not in his office. ***Late homework cannot be accepted.***

Doing problems is an essential part of learning physics, and it is **very important** that you do the homework problems in this course. You will find it hard to do the problems by yourself, and it is likely that you will waste a lot of time sitting staring at the text. You are **strongly encouraged** to find a group of students with whom you can work on the problems. If you can't find a group to work with, please let Prof. Tan know. If you cannot do a particular problem in a reasonable time, bring it along to one of the conference sections, or contact Prof. Tan to discuss it.

Academic Code in Physics 70: Although you are encouraged to work with other students on homework, please understand that this collaboration is to be limited to discussions about how to approach and solve the problem. The written work that you turn in for homework **must be your own work**, and must not be copied from anyone else. Please consult with Prof. Tan if you have any questions about this policy.

Grading: The course grade will be based on performance in the lab (20 %), homework (20 %) (the lowest two problem set scores will be dropped), midterm exams (20 % each), and the final exam (20 %). You must complete the lab work and all lab reports in order to complete the course.

Exams: The two mid-term exams will be in class, **beginning at 8:30 AM, on Friday, October 4 and Friday, November 8**. They will be closed book exams.

Date: 9/1/2013