PHYS 522: Mechanics

Lecture: TU 11:30, CW 146
Recitation: M 3:30, CW 023
Spring 2006

Instructor:

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Textbook:

Classical Dynamics of Particles and Systems, Fifth Edition, Thornton and Marion

Supplements:

In order of increasing difficulty level:

- *Analytical Mechanics*, Fowles and Cassiday
- *Mechanics*, Symon
- *Classical Mechanics*, H. Goldstein

See also p. 626–627 of Thornton and Marion.

Grading:

Exam 1	10%
Exam 2	10%
Final	30%
Homework	50%

Course philosophy:

This course will challenge you. I expect that you will learn the most from the homework, so there will be quite a bit of it: assignments will be given roughly once per week and will take an average of about 10 hours each. I encourage you to discuss the problems with your classmates, but you should write up the assignment *on your own*. Some assignments will require computer work.

Guidelines for homework:

- Discuss your homework with classmates as much as you like, but *write your homework solutions on your own!* There will be a severe grade penalty for copying.
- As a scientist in training, you need to learn to communicate scientific information in an effective, efficient manner. You should consider homework assignments as practice in this art. It is your responsibility to present your homework solutions in a readable, logical manner — not mine to decipher and interpret them. There will be a grade penalty.
- In an incorrect solution, I will reward statements in homework and on exams that show you know it is incorrect and why. I will also reward any effort above and beyond what is explicitly asked for in a problem.

Students with disabilities:

If you have any condition such as a physical or learning disability that will make it difficult to carry out the work as I have outlined it or that will require academic accomodations, please notify me and contact the Disabled Students Office (Holton 202) in the first two weeks of the course.

Plagiarism:

Plagiarism and cheating are serious offenses and may be punished by failure on the exam, paper, or project; failure in the course; and/or expulsion from the University. For more information refer to the "Academic Dishonesty" policy in the *K-State Undergraduate Catalog* and the *Undergraduate Honor System Policy* on the Provost's web page at `http://www.ksu.edu/honor/`.

Tentative Course Outline:

The following is the tentative list of topics that will be covered in lecture (we may not get to the whole list and there may be others added):

Chap. 1 Matrices, Vectors, and Vector Calculus
We'll cover a bit of this first, then pick up other bits as we go.

Chap. 2 Newtonian Mechanics — Single Particle
Should be review. We'll cover it relatively quickly.

Chap. 3 Oscillations
Important topic throughout all of physics.

Chap. 4 Nonlinear Oscillations and Chaos
We'll cover just a few sections, mostly about nonlinear oscillations.

Chap. 5 Gravitation
Should be partially review, but useful for it's connection to EM.

Chap. 6 Some Methods in the Calculus of Variations
A very useful mathematical method that can be used in many areas of physics.

Chap. 7 Hamilton's Principle — Lagrangian and Hamiltonian Dynamics
Reformulation of classical mechanics in forms more useful for later applications in quantum mechanics and even EM. Many important concepts!

Chap. 8 Central-Force Motion
Obviously an important topic, and one that resurfaces in quantum mechanics.

Chap. 9 Dynamics of a System of Particles
Preliminary considerations for dealing with N particles.

Chap. 10 Motion in a Noninertial Reference Frame
Coriolis and centrifugal/centripetal forces.

Chap. 12 Coupled Oscillations
Small oscillations and normal coordinates. Finding eigenmodes of a system of particles — something that will be used for quantum mechanics, too.

Chap. 13 Continuous Systems; Waves
Wave physics shows up most everywhere: EM and QM, for instance.

Chap. 14 Special Theory of Relativity