PHYS522 – Mechanics – Spring 2007

Lecture: Tu/Th, 11:30-12:25 a.m. CW 146
Recitation: M 3:30 p.m. CW 023

Textbook: *Classical Dynamics of Particles and Systems, Fifth Edition*, Thorton and Marion

Suggested References: *Analytic Mechanics*, Fowles; *Classical Mechanics*, Goldstein; *Wave Physics*, Nettel; *Mathematical Methods for Physicists*, Arfken and Weber;

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Office hours: M/W/F 9:30-10:30 PM or by appt.

Purpose and Goals: The purpose of this course is to expose you to advanced formalisms of classical mechanics, thus introducing the foundation for other areas of physics. Another important purpose is to for you to develop a strong conceptual understanding of mechanics, and to develop the problem-solving techniques needed to handle sophisticated problems in classical mechanics.

The overall goals of this class are:

- Introducing "new" formalisms of classical mechanics and how these formalisms are related to other areas of physics.
- Expanding your current knowledge of mechanics.
- Introducing the concept of symmetry and its relationship to conservation principles.
- Developing essential mathematical and numerical methods and tools.
- Improving your writing and problem-solving skills
- Improving your conceptual understanding of mechanics, and your ability to communicate your knowledge.

Grading:

Exam 1	100 pts	200 pts
Exam 2	100 pts	
Final Exam		300 pts
Homework (12)		480 pts
Quizzes		20
Total possible		**1000 pts**

Exams: There will be two exams plus a cumulative final exam. The exams will either be in-class or a take home exam, to be agreed upon by the class and instructor.

In-Class Quizzes: Surprise quizzes on the reading material may be given during the lecture or recitation. The purpose of the quiz is the make you read the book *before* attending class.

Homework: It is expected that you will learn the course material mostly by completing the homework. Note that the **course material will be challenging**, so you will need to work hard on the homework to be successful. Homework assignments will be given approximately once per week and will take about 10 hours. Discussing the homework with your classmates is encouraged but you should be able to write up the assignment on your own. In the case when you get stuck on a problem, credit will be given for a statement indicating how your solution is incorrect.

Guidelines for the homework:

- Read the textbook before doing the homework
- Draw a detailed diagram, write down the given variables, and write out what is to be found.
- Think about the solution beforehand, and then see if the guess corresponds to your solution.
- Discuss the homework with your classmates but write the homework out on your own.
- Ask thoughtful questions if you get stuck.
- It is important for you, the scientist in-training, to learn how to communicate scientific information in a clear and precise manner. It is your responsibility to present the homework solutions in a readable and logical manner. If this is not done there will be a grade penalty.

Disabilities: If you have any condition such as a physical or learning disability, which will make it difficult for you to carry out the work as I have outlined it or which will require academic accommodations, 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 K-State Undergraduate Catalog and the Undergraduate Honor System Policy on the Provost's web page: http://www.ksu.edu/honor/.

Tentative Course Schedule, Mechanics PHYS 522, Spring 2007

Date	L/R	Topic	Book	Homework
Jan. 11 (Th)	L1	Course introduction, review of Newton's laws	Ch. 1 & 2	
Jan. 15 (M)		*** Student Holiday ***		
Jan. 16 (Tu)	L2	Conservation laws, energy, vector algebra and calculus	Ch. 2	
Jan. 18 (Th)	L3	Projectile motion with retarding forces	Ch. 2	
Jan. 19 (F)	R1	Make-up recitation: differential equations	Ch. 3	HW1 Due
Jan. 22 (M)		Class Cancelled		
Jan. 23 (Tu)		Class Cancelled		
Jan. 25 (Th)	L4	Simple harmonic oscillator, damped oscillators	Ch. 3	
Jan. 26 (F)	L5	Damped oscillators	Ch. 3	HW2 Due
Jan. 29 (M)	R2	Oscillation problems, Fourier series		
Jan. 30 (Tu)	L6	Sinusoidal forcing functions and resonance	Ch. 3	
Feb. 1 (Th)	L7	Sinusoidal forcing functions and analogy to circuits	Ch. 3	
Feb. 5 (M)	R3	Problems in forced oscillators, HW2		
Feb. 6 (Tu)	L8	Impulsive forcing functions, Greens function	Ch. 3	HW3 Due
Feb. 8 (Th)	L9	Impulsive forcing functions, Fourier transforms	Ch. 3	
Feb. 12 (M)	R3	Examples of Fourier transforms, forced oscillators, HW3		
Feb. 13 (Tu)	L10	Nonlinear oscillations, introduction to chaos	Ch. 4	HW4 Due
Feb. 15 (Th)	L11	Gravity and the gravitational potential	Ch. 5	
Feb. 19 (M)	R4	Go over HW4	Ch. 6	
Feb. 20 (Tu)		Calculus of variations, Review for Exam		HW5 Due
Feb. 22 (Th)		Exam 1		
Feb. 26 (M)	R5	Go over Exam 1		
Feb. 27 (Tu)	L13	Problems in calculus of variations, Hamilton's principle	Ch. 6	
Mar. 1 (Th)	L14	Lagrangian mechanics, generalized coordinates	Ch. 7	
Mar. 5 (M)	R6	Redo part of Exam 1, Questions on homework 6	Ch. 7	
Mar. 6 (Tu)	L15	Problems in Lagrangian mechanics	Ch. 7	
Mar. 8 (Th)	L16	Conservation laws revisited!, Noether's theorem	Ch. 7	HW6 Due
Mar. 12 (M)	R7	Work homework 6, Questions on homework 7	Ch. 7	
Mar. 13 (Tu)	L17	Hamiltonian dynamics, formalisms in physics	Ch. 7	
Mar. 15 (Th)	L18	Problems in Hamiltonian dynamics	Ch. 7	HW7 Due
		*** Spring Break: March 29-23 ***		
Mar. 26 (M)	R8	Work homework 7, questions on homework 8		
Mar. 27 (Tu)	L18	Central force problems	Ch. 8	HW8 Due
Mar. 29 (Th)	L19	Central force problems, stable orbits	Ch. 8	
Apr. 2 (M)	R8	Work homework 8		
Apr. 3 (Tu)	L20	Dynamics of system of particles: collisions	Ch. 9	
Apr. 5 (Th)	L21	Dynamics of system of particles: scattering	Ch. 9	
Apr. 9 (M)	R9	Go over Homework 9		HW9 Due
Apr. 10 (Tu)		Motion in a noninertial reference frame	Ch. 10	
Apr. 12 (Th)		Exam 2		
Apr. 16 (M)	R10	Go over Exam2		HW10 Due
Apr. 17 (Tu)	L22	Dynamics of rigid bodies, moment of inertia tensor	Ch. 11	
Apr. 19 (Th)	L23	Dynamics of rigid bodies, rolling problems	Ch. 11	
Apr. 23 (M)	R11	Go over Homework 10		
Apr. 24 (Tu)	L24	Coupled oscillators	Ch. 11	HW11 Due
Apr. 26 (Th)	L25	Coupled oscillators	Ch. 11	
Apr. 30 (M)	R11	Go over Homework 11		
May 1 (Tu)	L26	Waves on a loaded string	Ch. 12	
May 3 (Th)		Mechanics of music		HW12 Due
May 7 (M)		Final Exam 9:40 a.m. - 11:30 a.m.		