Physics 310 - Theoretical Mechanics I - Fall Semester 2009

Course Information and Syllabus

Undergraduate Theoretical Mechanics I (3 credits)

Classes: **Tuesday and Thursday 0900-1015 in 114 Watanabe Hall, UHM**

See schedule below.. **updated 9 September 2009**

Prerequisites: Physics 151 or 170, and Math 232 (concurrent alright), or equivalent (see instructor for exceptions).

General Information and Comments:

- The text will be ``**Classical Dynamics of Particles and Systems'' by Thornton and Marion**, Fifth Edition, Thomson (2004). Website http://info.brookscole.com /thornton
- The pace will be about 1-2 weeks per chapter. We will cover chapters:
    1) Mathematical Introduction
    2) Newtonian Mechanics - Single Particle
    3) Oscillations
    4) Non-linear Oscillations and Chaos
    5) Gravitation
    6) Some Methods in the Calculus of Variations
    7) Hamilton's Principle - Lagrangian and Hamiltonian Dynamics
- Please read the first chapter before Thurs, 27 August and do first problems. We will lightly cover the mathematical topics there, and come back to them as needed later in the course. Much of this course will depend upon this knowledge, and it is important preparation for later more advanced courses. So, if you are weak in this area, or have never seen some of this material, it is time to hit the books before you get swamped. It will make more sense as we see the applications.... but these are tools you need for this semester and much more for later, and as a professional physicist.
- Class attendance required (or -1 grade). Students will sometimes be asked to present problem solutions on the board in class. This is good practice, and

helps us all get mutual understanding.
- Homework requires thinking; no copied old solutions accepted. Think of solving these problems as a game, a mental exercise, a workout like going to the gym. The point is in doing them, not so much getting the precise answer... it is the mental struggle which is the real learning goal, learning to think like a physicist.
- Classes will alternate between lectures and problem solving.
- Because this is a small class, we will run it more in the British tutorial style. Coming to class unprepared will not work. You need to put aside time to at least quickly read the chapter before class. It takes me an hour to read a chapter, it is not light reading.
- Computer experience will be part of course. Everyone needs an email account.
- Grades will be 30% class participation and homework, 40% midterms (dates TBD), and 30% final paper and/or exam.
- See student learning outcomes below.

Schedule: These dates and some problem numbers will change, but the schedule will be roughly the same…

Month	*Date*	*Day*	*Topic in Class*	*Assign due this Class Day*
Aug	25	Tu	Introduction	Read Chapt. 1
	27	Th	Chapt. 1	1-3, 1-8
Sep	1	Tu	1	1-11, 1-22, 1-40
	3	Th	2	2-1, 2-2
	8	Tu	2	2-33
	10	Th	2	2-49, 2-53
	15	Tu	3	Read Chapt. 3
	17	Th	3	3-1, 2, 3
	22	Tu	3	3-8, 18, 19
	24	Th	3	3-26, 30, 40, 45
	29	Tu	3	Review of Elect. Circ.
Oct	1	Th	First mid-term	Chapts 1-3
	6	Tu	Review exam	
	8	Th	4	4-1, 4
	13	Tu	4	4-20, 24
	15	Th	5	5-2, 3, 6
	20	Tu	5	5- 10, 11
	22	Th	5	5- 15, 18
	27	Tu	Review	

	29	Th	2nd Mid-Term	Chapters 4-5
Nov	3	Tu	Go over exam	
	5	Th	6	6-3, 4
	10	Tu	6	6-6, 7
	12	Th	6	6-10, 14
	17	Tu	7	Read Chapt. 7
	19	Th	7	7-3, 4, 6
	24	Tu	7	7-7, 8, 10
	26	Th	Thanksgiving	Holiday
	1	Tu	7	7-16, 18, 22
	3	Th	7	7-24, 25, 27
Dec	8	Tu	7	7-30, 35, 36, 37
	10	Th	Review	7-37, 40
	15	Tu	09:45-11:45, W114	**Final Exam**

Student Learning Outcomes-

At the successful completion of this course a student is expected to have:
1) **modest facility with the mathematical methods needed for this level of course, as outlined in the book in Chapter 1;**
2) **mastered Newtonian Mechanics;**
3) **come to appreciate the importance of oscillations in phenomena, and carry out simple calculations with the simple harmonic oscillator;**
4) **an appreciation of non-linear oscillations and chaos;**
5) **mastered first level applications in Newtonian gravitation;**
6) **understood some methods in the Calculus of Variations;**
7) **gotten beginning appreciation of, and facility with, Hamilton's Principle - Lagrangian and Hamiltonian Dynamics**
8) **and perhaps most important, have made progress in learning to "think like a physicist".**

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