University of Hawaii Physics 311

Theoretical Mechanics II - Spring Semester 2015

Course Information and Syllabus

Classes: **Monday,Wednesday and Friday 0930-1020 in 114 Watanabe Hall, UH Manoa**

See schedule below.. **updated 10 February 2015 (fixed Good Friday date)**

Prerequisites: Physics 151 or 170, and Math 232 (concurrent alright), and Physics 310 or equivalent (see instructor for exceptions).

General Information and Comments:

- The text will be ``**Classical Mechanics" by John R. Taylor**, University Science Books. Website http://www.uscibooks.com
- The pace will be about 2 weeks per chapter. Having covered Chapters 1-8 in the Fall, we will cover Chapters 9-16 this semester:

1. Newton's Laws of Motion
2. Projectiles and Charged Particles
3. Momentum and Angular Momentum
4. Energy
5. Oscillations
6. Calculus of Variations
7. Lagranges's Equations
8. Two-Body Central Force Problems
9. Non-Inertial Frames
10. **Rotation of Rigid Bodies**
11. **Coupled Oscillators and Normal Modes**
12. **Chaos**
13. **Hamiltonian mechanics**
14. **Collision Theory**
15. **Special Relativity**
16. **Continuum Mechanics**

- Please read the chapters before the lecture dates and try the problems to sharpen your understanding.
- We will cover the mathematical topics as needed 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 the mathematical 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 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 known chapter: it is not light reading.
- Everyone needs an email account.
- Grades will be 30% class participation and homework, 40% midterms, and 30% final exam. Paper possible for extra credit. This is a 3 credit course.
- See student learning outcomes below.

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

Month	Date	Week	Day	Topic in Class	Assign due this Class Day	Assign #
Jan	12	1	Mon	Introduction		
	14		Wed	10	Read Chapter 10	
	16		Fri	10	10.2, 10.12	1
	19	2	Mon	MLK Holiday		
	21		Wed	10	10.6, 10.16	2
	23		Fri	10	10.18, 10.25	3
	26	3	Mon	10	10.33, 10.38	4
	28		Wed	10	10.45, 10.47	5
	30		Fri	10	10.55, 10.57	6
Feb	2	4	Mon	11	Read 11	
	4		Wed	11	11.1, 11.2	7
	6		Fri	11	11.5, 11.12	8
	9	5	Mon	11	11.14, 11.20	9
	11		Wed	11	11.24, 11.29	10
	13		Fri	11	11.32, 11.35	11
	16	6	Mon	President's Day		
	18		Wed	First mid-term	Chapts 10,11		
	20		Fri	12	Go over exam, Read Chapt. 12	
	23	7	Mon	12	12.1, 12.5	12
	25		Wed	12	12.6, 12.7	13
	27		Fri	12	12.10, 12.13	14
Mar	2	8	Mon	12	12.20, 12.27	15
	4		Wed	12	12.32	16
	6		Fri	13	Read 13	
	9	9	Mon	13	13.1, 13.3	17
	11		Wed	13	13.7, 13.11	18
	13		Fri	13	13.18, 13.23	19
	16	10	Mon	13	13.25, 13.35, Read 14	20
	18		Wed	14	14.1, 14.2, 14.7	21
	20		Fri	14	14.9, 14.12, 14.18	22
	23	x	Mon	Spring Break		
	25		Wed	Spring Break		
	27		Fri	Spring Break		
	30	12	Mon	14	14.20, 14.23	23
Apr	1		Wed	14	14.27, 14.29	24

	3		Fri	Good Friday Holiday		
	6	*12*	Mon	Second Mid-Term	Chapts 12,13,14	
	8		Wed	15	15.2, 15.3, 15.5, 15.7	*25*
	10		Fri	15	15.14, 15.28	*26*
	13	*13*	Mon	15	15.35, 15.46, 15.48	*27*
	15		Wed	15	15.53, 15.59, 15.78	*28*
	17		Fri	15	15.79, 15.90, 15.109	*29*
	20	*14*	Mon	16	Read 16	
	22		Wed	16	16.1, 16.2, 16.5	*30*
	24		Fri	16	16.9, 16.12, 16.17	*31*
	27	*15*	Mon	16	16.25, 16.26, 16.28	*32*
	29		Wed	16	16.31, 16.32	*33*
May	1		Fri	16	16.36, 16.38	*34*
	4	*16*	Mon	Review		
	6		Wed	Last Class		
	8		Fri	Study Day		
	11	*17*	Mon	Exam Week		
	13		Wed	Exam Week		
	15		Fri	Final Exam	? 9:45-11:45 114 Watanabe Hall	

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;**
2) **mastered Newtonian Mechanics;**
3) **come to appreciate the importance of oscillations in phenomena, and**
4) **carry out simple calculations with the simple harmonic oscillator;**
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, Lagrangian Dynamics**
8) **and perhaps most important, have made progress in learning to "think like a physicist".**

teacher: **Prof. John G. Learned**
office: **327 Watanabe Hall, UHM**
office phone: **(808)-956-2964**
email: **jgl at phys.hawaii.edu**
office hours: **after class until lunch time, and other times by appointment.**
Back to John Learned's Home Page
Department of Physics and Astronomy