PHYS 311- (Undergraduate) Theoretical Mechanics II (3 credits)
Department of Physics & Astronomy, University of Hawaii
Instructor: Prof. Pui K. Lam
Spring Semester 2012
http://www2.hawaii.edu/~plam/ph311

Time: MWF 9:30 - 10:20 a.m.
Place: WAT 114
Instructor: Prof. Pui K. Lam (956-2988; plam@hawaii.edu)
Office Hours: MW F: 10:30-11:30 a.m. at WAT 433
Grader: Xiang Lu

Text: "Classical Mechanics" by John R. Taylor, University Science Books.

Pre-req: Ph310 (or instructor's consent)

Course Outline:

Ch. 10 - Rotational Motion of Rigid Bodies
Ch. 11 – Coupled Oscillations and Normal Modes
Ch. 12 – Nonlinear Mechanics and Chaos
Ch. 13 – Hamiltonian Mechanics
Ch. 14 – Collision Theory
Ch. 15 – Special Relativity
Ch. 16 – Continuum Mechanics

Student Learning Outcomes:

At the successful completion of this course a student is expected to have:

- A good understanding of Newtonian (non-relativistic) mechanics of a system of particles; the types of approximations needed to render the problems tractable.
- Formulation of mechanics in terms of the Hamilton's principles
- A good understanding of the fundamental difference between non-relativistic and relativistic mechanics
- A set of mathematical skills to solve a variety of problems in mechanics

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Course Grade Scale:

Based on an absolute scale.

Total (100%) = Homework (35%) + (Midterm 1+ Midterm 2 + Final=(60%)) + Reading questions (5%)

The combined % for Midterm 1+ Midterm 2 + Final=60%; the highest score=25%, middle score=20%, lowest score=15%

Exam Format:

Midterms: 15 conceptual questions (2 pts each), 2 calculational problems (35 pts each)
** The conceptual question part of the midterm and final is cumulative.

A sheet of hand-written note (8.5" x 11") is allowed.

Homework:

Typically, one homework set per week, 3 or 4 questions per set, and due on Wednesday. The idea of having homework due on Wednesday is that typically students work on homework on weekends; if there are questions they can ask them in class or during office hours the following Monday.

Homework Answer Format:

In between formulae, there should be narrative explaining what you are doing (pretend you are writing a solution manual). If I don't know what you are doing or trying to do, I can't give you credits.
I believe that it is very important to recap your steps in solving a problem.
** At the end of each problem, I generally ask you to write a summary paragraph to explain how you solved the problem, give reasons to justify your approach. You get credit for these paragraphs. **

Reading assignment questions:

Email me 3 questions by 5 p.m. on Sunday.
These are questions that arise during your reading or homework (presumably done over the weekend). The reading questions assignment serves several purposes:

- Encourage you to read the materials and think about the concepts.
- Serves as a feedback for me to structure the lecture materials.
- Students earn maximum of 5% credit.

Grade Scale:

- 96-100 (A+), 91-95 (A), 86-90 (A-)
- 81-85 (B+), 76-80 (B), 71-75 (B-)
- 66-70 (C+), 61-65 (C), 56-60 (C-)
- 51-55 (D+), 46-50 (D), 41-45 (D-)
- <40 (F)
- No "incomplete" (I Grade) will be given.

Tentative Course calendar:

			Physics 311,Spring 2012,Tentative Course Calendar	REV: 4/17/2012
Month	**Date**	**Day**	**Topics**	**sections**
Jan.	9	M	Overview of the course, CM, Angular Momentum	10.1
	11	W	Rotation of Rigid Bodies - Rotational Inertia Tensor	10.2,10.3
	13	F	Principal Axes of Inertia, Eignevalue Eqautions	10.4,10.5
	16	M	**Martin Luther King Day**	
	18	W	Principal Axes of Inertia, Eignevalue Eqautions - II	10.4,10.5
	20	F	Precession due to a week torque, Euler's Equations	10.6,10.7
	23	M	Euler Equation with Zero Torque	10.8
	25	W	Euler Angles, Motion of a Spinning Top - qualitative	10.9,10.10
	27	F	More on Rotation (added based on students' questions)	
	30	M	More on Rotation	
Feb.	1	W	Coupled Osc. & Normal Modes - 2 masses & 3 Springs	11.1,11.2
	3	F	Two weakly coupled oscillators	11.3
	6	M	Lagrangian Approach	11.4,11.5
	8	W	Lagrangian Approach	11.4,11.5
	10	F	Three coupled pendulums	11.6
	13	M	Normal Coordinates	11.7
	15	W	Review	
	17	F	**Midterm 1**	
	20	M	**President's Day**	
	22	W	Hamiltonian mechanics - basic variables, 1-D	13.1,13.2
	24	F	Hamiltonian's Eqns in several dimensions	13.3
	27	M	Ignorable coordinates, Lagrangian vs Hamiltonian Equations	13.4,13.5
March	29	W	Ignorable coordinates, Lagrangian vs Hamiltonian Equations	13.4,13.5
	2	F	Phase-space orbits, Liouville's Theorem	13.6,10.7
	5	M	Phase-space orbits, Liouville's Theorem	13.6,10.7
	7	W	Collision Theory - scaterring angle and impact parameter	14.1
	9	F	Collision Cross Section	14.2,14.3
	12	M	Differential Cross Section	14.4,14.5
	14	W	Rutherford Scaterring	14.6
	16	F	Relation of CM and Lab Scattering Angles	14.8
	19	M	Relation of CM and Lab Scattering Angles	14.8
	21	W	Review for Midterm 2	
	23	F	**Midterm 2**	
			Spring Break 3/26-3/26/30	
April	2	M	Relativity -Postulates of Gailliean, Special Relativity	15.1,15.2,15.3
	4	W	Time Dilation, Length Contraction	15.4,15.5
	6	F	**Good Friday**	
	9	M	Lorentz Transformation, Velocity Addition	15.6,15.7
	11	W	Four Vectors, Invariant Scalar Product,	15.8,15.9,
	13	F	Light Cone	15.1
	16	M	Dopller Effect, 4-momentum	15.11,15.12,1
	18	W	Conservation of 4-momentum for an isolated system	5.13
	20	F	Collision	15.14
	22	M	Collision	15.14
	25	W	Force in Relativity	15.15
	27	F	Continuous Mechanics - wave equartion	16.1,16.2
	30	M	Continuous Mechanics - wave equartion	16.1,16.2
May	2	W	Review	
	7	M	Final Exam 9:45.-11:45a.m.	