PHY 336K: Classical Dynamics (Fall 2013)

Web page: https://wikis.utexas.edu/x/fAwGAw

Unique Number: 59155

Classroom/Time: RLM 7.104, MWF 1-2 pm

Instructor: Prof. Peter Onyisi (onyisi@physics.utexas.edu).

TA: Yuan-Pao Yang (yjp1986@utexas.edu)

Required material:

- Taylor, *Classical Mechanics*
- Clicker

Prerequisites: The following with a grade of at least C- in each: Mathematics 427L or 364K, Physics 315, and 115L.

Summary and goals: This class is a higher level discussion of classical mechanics than what you experienced in your introductory course. We will cover key results of Newtonian mechanics in greater depth; study specific important systems; introduce the Lagrangian and Hamiltonian formulations of mechanics; and briefly discuss special relativity and chaos if we have time. We will develop important mathematical techniques that will be used extensively in this class and in further physics courses (such as linear differential equations, the calculus of variations, and linear algebra).

Office Hours:

- Prof. Onyisi: Tue 2-3 pm, Wed 2-3 pm, RLM 10.211
- Yang: Tue 3-4 pm, physics grad lounge RLM 9.222

Clicker registration: please register your clicker on Blackboard. Go to http://courses.utexas.edu, select this class, choose "Blackboard Tools" on the left sidebar, then choose "i>clicker" on the right panel. Enter the clicker ID as described.

Grading: Grades will be based on clicker participation (5%), homework (25%), two midterm exams (20% each), and a final exam (30%). The clicker participation component is full credit for responding to at least 80% of questions in class, and no credit for less. The plus/minus grading system will be used. The grades will be curved based on the mean and standard deviation of the class's scores, but in no case will an assigned grade be lower than it would have been uncurved (e.g. a 91 will be at least A-).

Homework: Homework will be due in class on Fridays; no late homework will be accepted. The

lowest two homework scores will be dropped. The homework will be assigned through Blackboard (http://courses.utexas.edu); go to the "Assignments" link on the left sidebar.

You are encouraged to work with each other to understand how to solve problems. However you will not benefit from the class if, after that, you aren't able to solve them yourself. All work handed in must be your own.

Exam policies: The only electronic tools allowed in the exams are calculators. The exams will be open book and open note. The midterm exams cannot be made up, except for accommodation for disabilities or religious holidays; see the policies below. During examinations, you must do your own work. Talking or discussion is not permitted during the examinations, nor may you compare papers, copy from others, or collaborate in any way. Any collaborative behavior during the examinations will result in failure of the exam, and may lead to failure of the course and University disciplinary action.

Students with disabilities: Please notify me as quickly as possible if class materials are not accessible. Any student with a documented disability who requires academic accommodations should contact Services for Students with Disabilities (SSD) at 512-471-6259 (voice) or 1-866-329-3986 (video phone), or reference SSD's website for more disability-related information: http://www.utexas.edu/diversity/ddce/ssd/for_cstudents.php. Faculty are not required to provide accommodations without an official accommodation letter from SSD.

Accommodation for religious holidays: By UT Austin policy, you must notify me of your pending absence at least fourteen days prior to the date of observance of a religious holy day. If you must miss a midterm examination or a homework assignment due date in order to observe a religious holy day, I will give you an opportunity to complete the missed work within a reasonable time after the absence.

Topics

1. Newtonian mechanics: review
2. Oscillations; differential equations; resonance
3. Calculus of Variations & the Euler-Lagrange equation
4. Lagrangian mechanics
5. Two body central force problems; motion in an inverse square force
6. Non-inertial reference frames and pseudoforces
7. Rotational motion
8. Coupled oscillators
9. Hamiltonian mechanics, Liouville's theorem
10. Special relativity
11. Nonlinear mechanics and chaos (if time)

Tentative Class Schedule

Day	Topic	Note
W 8/28	Newton's Laws: review; math quiz	
F 8/30	Newton's Laws: review	HW1 assigned
M 9/2	**No class: Labor Day**	
W 9/4	Projectile motion with drag; differential eqns	
F 9/6	Projectile motion with drag; differential eqns	HW1 due, HW2 assigned
M 9/9	Helical motion; complex exponentials	
W 9/11	Systems of particles	
F 9/13	Systems of particles	HW2 due, HW3 assigned
M 9/16	Energy	
W 9/18	Energy	
F 9/20	Energy	HW3 due, HW4 assigned
M 9/23	Oscillations	
W 9/25	Oscillations: damped oscillations	
F 9/27	Oscillations: driven oscillations	HW4 due, HW5 assigned
M 9/30	Oscillations: driven oscillations	
W 10/2	Calculus of variations	
F 10/4	Calculus of variations	HW5 due, HW6 assigned
M 10/7	Lagrange's equations	
W 10/9	Lagrange's equations	
F 10/11	Lagrange's equations	HW6 due, HW7 assigned
M 10/14	**First midterm**	
W 10/16	Central forces	
F 10/18	Central forces	HW7 due, HW8 assigned
M 10/21	Central forces	

W 10/23	Noninertial frames	
F 10/25	Noninertial frames	HW8 due, HW9 assigned
M 10/28	Noninertial frames	
W 10/30	Linear algebra	
F 11/1	Linear algebra	HW9 due, HW10 assigned
M 11/4	Linear algebra	
W 11/6	Coupled oscillators	
F 11/8	Coupled oscillators	HW10 due, HW11 assigned
M 11/11	Rigid body rotation	
W 11/13	Rigid body rotation	
F 11/15	Rigid body rotation	HW11 due, HW12 assigned
M 11/18	**Second midterm**	
W 11/20	Hamiltonian mechanics	
F 11/22	Hamiltonian mechanics	HW12 due, HW13 assigned
M 11/25	Hamiltonian mechanics	
W 11/27	Special relativity	
F 11/29	**No class: Thanksgiving break**	HW14 assigned
M 12/2	Special relativity	HW13 due
W 12/4	Special relativity	
F 12/6	Special relativity	HW14 due
Sa 12/14	Final	