Syllabus
Physics 105, Spring 2010
Analytic Mechanics

Lectures: TR, 10:30 – 11:45 am, Classroom Building, Room 276
Discussion: T, 1:00pm – 1:50pm, Classroom Building, Room 286

Course Description

This course provides a rigorous, mathematical foundation in classical mechanics. Topics include Newtonian mechanics; motion of particles in one, two and three dimensions; mechanics of continuous media; rotations of rigid bodies; oscillations; normal modes; Lagrange's equations; and Hamiltonian methods. *Prerequisite: PHYS 8 and MATH 22.*

Course Goals

This course is designed to help you:

- Strengthen your foundation and explore advanced problems in mechanics
- Learn alternative approaches to mechanics: Lagrangian and Hamiltonian
- Connect textbook material to contemporary research topics
- **Develop the problem-solving perseverance required to succeed in physics**

Instructor Information

Dr. Carrie Menke, cmenke@ucmerced.edu
Academic Office Building, Room 178
Office phone: 209-228-3078

Office Hours

Wednesdays, 2:30 – 4:30pm, and by appointment.

Textbook (required)

Classical Mechanics by John R. Taylor
University Science Books (2005)

Student Learning Outcomes

Learning outcomes provide measureable ways to determine how well you've mastered the course material, and they're designed to incorporate various levels of expertise with course material. So, by the end of the course, you should be able to:

1. *explain* and *apply* principles of classical mechanics to intermediate-level physics problems.
2. *analyze* intermediate-level physical systems with classical mechanics models presented in the course and *support* your conclusions verbally, mathematically, and in writing.
3. *summarize* contemporary physics research material presented in lecture, scientific literature and seminars.

	Learning Outcomes		
Portion of Course	**1**	**2**	**3**
Homework	X+	X+	X
Seminar			X+
Presentation			X+
Exams	X+	X+	X-

+/- gives emphasis to specific learning outcome in that portion of the course

Grading

Homework	30%
Seminar Review	5%
Presentation	5%
Midterms (2)	30%
Final Exam	30%

Grades will be given using the *approximate* framework: A: 100-90%, B: 90-80%, C: 80-70%, D: 70-60%. The flavor of letter grade (+, even, -) will be determined when final grades are assigned.

Course Policies & Structure

CROPS site

The CROPS website (S10-PHYS 105 01) will be used extensively throughout the course. Look there for announcements, resources (i.e. homework assignments, articles, etc.), and grades. Also, the most recent course information, office hours and contact information will be posted on the home page.

Homework

The main mechanism for learning physics is working problems

On average, a problem set will be turned in every Thursday. Each problem set will include regular problems and ***mastery problems***. Regular problems are just like normal homework problems. Mastery problems, on the other hand, will be repeatedly worked until you do them correctly. For each REDO of a mastery problem, some credit will be docked. *If you do not attempt every homework problem, turn in your homework late, or neglect to redo a mastery problem the assignment score will automatically be deducted by 25%.*

Observe the following guidelines for the problem set:

1. Look at the problems right away. Read through it, and ask me any clarifying questions. Some of them may actually take all week to complete. So… don't wait until the evening before to begin work.
2. Begin each solution with a complete statement of the problem; this may be a photocopy or typed.
3. Resubmit all of your previous work each time you redo a mastery problem. Work redo problems on a new sheet of paper titled REDO, and staple it to the back of the original problem set.
4. In the unlucky event that you have multiple redos, begin each submission with REDO^n for $n > 1$. Always turn in all previous work.
5. Clearly write down any assumptions you are making. More than one solution may be acceptable depending on the assumptions you make.
6. If you work with, or receive appreciable help from, a classmate then include their name(s) under yours at the top of your paper. You should study and do homework in groups, but all work turned in must be your own. You are not allowed to copy a solution should you find it posted elsewhere (see Academic Integrity).

Seminar

You are required to attend one physics-related seminar during the semester. I will try to announce these before they occur, but sometimes the notice will be short. Complete the seminar form (on CROPS site) and hand it in for credit. Seminar rooms can accommodate a limited number of people; therefore, refer to the dates below for valid seminars and due dates. If your schedule prohibits you from attending all eligible seminars, contact Dr. Menke well before your due date. ***There will be No Extensions for this assignment!***

If your last name begins with the letter:	**Attend a seminar between:**	**Your seminar summary is due at the beginning of lecture on:**
A – M	Tues., Jan. 19th – Wed., Mar. 17th	Thursday, March 18th
N – Z	Fri., Mar. 19th – Wed., May 5th	Thursday, May 6th

Presentation

Each student will give a 10-15 minute presentation on a journal article. The presentations will be given during the discussion session. There is a selection of articles on CROPS, and you are *highly* encouraged to choose your own article. Dr. Menke must approve your article and two students may not present on the same article. If you're doing research that relates to course material, you may present your research work *and* turn in a short journal article summary that is related to your research.

Midterm and Final Exams

All exams will consist of qualitative and quantitative problems, based on homework and lecture material. A combination of familiar and new problems will test your command of the course material. I will give you more information about the timing and content of the midterms and final exam as the dates approach. *There will be no make-up exams or early exams!* If you are sick during an exam, please bring a note from your doctor verifying your illness. Your course grade will then be determined by the rest of your course work.

Tentative Exam Schedule			
Exam	**Date**	**Chapters Covered**	**Time**
Midterm 1	Tuesday, Mar. 2nd	1-4	**in discussion**
Midterm 2	Tuesday, Apr. 13th	5-9	**in discussion**
Final	Thursday, May 15th	Comprehensive	11:30-2:30

Exam Regrading

- If your score was tabulated incorrectly, please let me know and I'll correct it. *Once you leave the room after picking up your exam, you may not request a correction.*
- If you believe a problem has been unfairly graded I will regrade your exam. Write a note on the front explaining why you want a regrade. Please note that the entire exam will be regraded, which may result in a higher score, a lower score, or no change. *Once you leave the room after picking up your exam, you may not request a regrade.*

Discussion Sessions

Discussion session time will be devoted to answering your questions, clarifying lecture material, mini-lectures on mathematical techniques (as needed), student presentations, presenting homework problems, working through examples, discussing relevant research topics, etc. Attendance is expected. *Note that the midterms will be held during the discussion sessions.*

Accommodations for Students with Disabilities

The University of California Merced is committed to ensuring equal academic opportunities and inclusion for students with disabilities based on the principles of independent living, accessible universal design and diversity. I am available to discuss appropriate academic accommodations that may be required for student with disabilities. Requests for academic accommodations are to be made during the first three weeks of the semester, except for unusual circumstances. Students are encouraged to register with Disability Services Center to verify their eligibility for appropriate accommodations.

Academic Integrity (summarized)

- **Each student in this course is expected to abide by the University of California, Merced's Academic Honesty Policy.**
- *Any work submitted by a student in this course for academic credit will be the student's own work.* Collaborating is allowed in discussions, labs, and on homework. (See the relevant sections above.)
- You are encouraged to study together and to discuss information and concepts covered in lecture and the sections with other students. You can give "consulting" help to or receive "consulting" help from such students. However, this permissible cooperation should never involve one student having

possession of a copy of all or part of work done by someone else, in the form of an e-mail, an e-mail attachment file, a diskette, or a hard copy. ***Should copying occur****, both the student who copied work from another student and the student who gave material to be copied will both automatically receive a zero for the assignment*. Penalty for violation of this Policy can also be extended to include failure of the course and University disciplinary action.

- 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.*
- Full policy online. Go to studentlife.ucmerced.edu, click on Student Judicial Affairs, click on Academic Honesty Policy.

Tentative Weekly Schedule

This schedule is subject to change. Check the CROPS course site for the most update information.

Week	Day	Date	Topic	Chapter	Notes
1	Tues	19-Jan	Introduction & Newton's Laws of Motion	1	
	Thurs	21-Jan	Newton's Laws of Motion	1	
2	Tues	26-Jan	Projectiles: Linear Resistance	2	
	Thurs	28-Jan	Projectiles: Quadratic Resistance	2	
3	Tues	2-Feb	Charged Particles & Complex Exponentials	2	
	Thurs	4-Feb	Momentum: Linear	3	
4	Tues	9-Feb	Momentum: Angular	3	
	Thurs	11-Feb	Energy: Work, K, U, Conservative Forces	4	
5	Tues	16-Feb	Energy: Gradient, Conservative Forces, U(t)	4	
	Thurs	18-Feb	Energy: 1D Systems & Central Forces	4	
6	Tues	23-Feb	Energy: Interaction	4	
	Thurs	25-Feb	Oscillations: SHO, Damped	5	
7	Tues	2-Mar	Oscillations: Damped, Driven, Resonance	5	**MT1 in disc.**
	Thurs	4-Mar	Oscillations: Fourier Series	5	
8	Tues	9-Mar	Calculus of Variations: Euler-Lagrange Equation	6	
	Thurs	11-Mar	Lagrange's Equations:	7	
9	Tues	16-Mar	Lagrange's Equations:	7	
	Thurs	18-Mar	Lagrange's Equations:	7	
			Spring Break: March 22 - 26	8	
10	Tues	30-Mar	Two-Body Central Forces	8	
	Thurs	1-Apr	Two-Body Central Forces: Orbits	8	
11	Tues	6-Apr	Noninertial Frames	9	
	Thurs	8-Apr	Noninertial Frames & Rotational Motion	9, 10	
12	Tues	13-Apr	Rotational Motion: Principle Axes	10	**MT2 in disc.**
	Thurs	15-Apr	Rotational Motion: Principle Axes, Eigenvalue Eqns.	10	
13	Tues	20-Apr	Rotational Motion: Euler's Equations	10	
	Thurs	22-Apr	Hamiltonian Mechanics	13	
14	Tues	27-Apr	Hamiltonian Mechanics	13	
	Thurs	29-Apr	Coupled Oscillators	11	
15	Tues	4-May	Coupled Oscillators	11	
	Thurs	6-May	Coupled Oscillators	11	
Final	Thurs	13-May	**Final Exam, 11:30 - 2:30**		